Financial and Economic Issues in Emerging Markets

Editors
Professor Tuğrul KANDEMİR • Assoc. Prof. Mehmet Fatih BUĞAN

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Preface

The world is experiencing a severe change and transformation in every field with the effect of globalization that emerged in the last quarter of the 20th century. These changes make themselves felt primarily in the economic area. In particular, the globalization and liberalization of financial markets bring along a series of changes, opportunities, and risks in both economies and financial systems worldwide. Owing to the effect of economic globalization, and the emergence of complex and dynamic financial transactions that significantly redound the uncertainties, notedly in emerging markets, have gradually increased market participants' financial risks.

This process has augmented the efforts of banks, non-bank financial institutions, institutional investors, and companies to search for methods and tools to better control the risks they face by applying complex strategies to hedging. To this end, parallel to the development of new financial instruments and markets that led to the emergence of complex and dynamic financial transactions, risk measurement and management techniques have also significantly changed.

The global risks that have recently arisen from different sources like health, energy, food, climate, military, politics, etc., are more evident in the economic area. Many studies have been

conducted in the academic literature to measure and understand the economic impacts of these global risks based on different sources and to develop solutions. This study, titled "Economic and Financial Issues in Emerging Markets," is the product of such an effort. This study contains fifteen chapters written by twenty-nine academicians and experts in their fields. The book includes mainly theoretical and applied studies on risk, return, exchange rate, stock market, emerging markets, economic growth, energy, and logistics. Finally, I'd like to thank Assoc. Prof. Mehmet Fatih BUĞAN and the authors of the chapters for their hard work in turning the study into a book, which I believe will be valuable to readers, researchers, and market specialists and as a basis for coming studies.

Professor Tuğrul KANDEMİR

Afyon Kocatepe University

Ön Söz

Dünya 20. Yüzyılın son çeyreğinde ortaya çıkan ve süregelmekte olan küreselleşme etkisi ile her alanda ciddi bir değişim ve dönüşüm yaşamakta, bu değişim ve dönüşüm kendisini en fazla ekonomik alanda hissettirmektedir. Özellikle Finansal piyasaların küreselleşmesi ve liberalleşmesi, tüm dünyada hem ekonomilerde, hem de mali sistemlerde fırsatların ve risklerin yanı sıra bir dizi değişimi de beraberinde getirmektedir. Ekonomik küreselleşmenin etkisi ile özellikle gelişmekte olan piyasalarda belirsizlikleri büyük ölçüde artıran karmaşık ve dinamik mali işlemlerin ortaya çıkması, piyasa katılımcıların karşı karşıya oldukları mali riskler de giderek artırmıştır.

Bu süreç, daha geniş yelpazeli finansal araçlar ile derinleşmiş finansal piyasalar, bankaların, banka dışı mali kuruluşların, kurumsal yatırımcıların ve şirketlerin riskten korunmak amacıyla karmaşık stratejiler uygulayarak karşılaştıkları riskleri daha iyi kontrol edebilmelerine yönelik yöntem ve araç arama çabalarını artırmıştır. Dolayısıyla karmaşık ve dinamik mali işlemlerin ortaya çıkmasına neden olan yeni finansal araçların ve piyasaların gelişmesine paralel olarak, risk ölçüm ve risk yönetim teknikleri de büyük ölçüde değişmiştir.

Son dönemlerde ortaya çıkan küresel risklerin sağlık, enerji, gıda, iklim, askeri, siyasi, vb. çok farklı kaynaklara dayandığını

ama etkilerinin en belirgin olarak ekonomik alanda ortaya çıktığını görmekteyiz. Farklı kaynaklara dayanan küresel nitelikteki bu risklerin ortaya çıkardığı ekonomik etkileri ölçmeye, anlamaya ve çözüm önerileri geliştirmeye yönelik akademik yazında da çok sayıda çalışma yapıldığını görmekteyiz. "**Gelişmekte Olan Piyasalarda Ekonomik ve Finansal Konular**" başlığını taşıyan bu çalışma da böyle bir gayretin ürünüdür. Bu çalışmada yirmi dokuz akademisyen ve alanında uzman kişilerin kaleme aldığı on beş bölüm yer almaktadır. Kitapta içerikleri itibariyle ağırlıklı olarak risk, getiri, döviz kuru, borsa, gelişmekte olan piyasalar, ekonomik büyüme, enerji, lojistik gibi konularda teorik ve uygulamalı çalışmalar yer almaktadır. Hasıl-ı kelam, çalışmanın okuyuculara, araştırmacılara, piyasa uzmanlarına faydalı olmasını, yapılacak yeni çalışmalara kaynak oluşturması temennisi ile çalışmanın kitaba dönüşmesinde büyük emeği olan Doç. Dr. Mehmet Fatih BUĞAN ve bölüm yazarlarına teşekkür ediyorum.

Prof. Dr. Tuğrul KANDEMİR
Afyon Kocatepe Üniversitesi

Contents

CHAPTER 1

Hisse Senedi Fiyatları ile Döviz Kuru Arasındaki Nedensellik İlişkisi

Yunus Yılmaz[1]

Yıldız Yıldız[2]

1. GİRİŞ

Global piyasalarda döviz kurları finansal göstergeleri etkilemekte ve yatırımcılar tarafından önemli göstergeler arasında yer aldığı için özenle takip edilmektedir. Döviz kurunda yaşanan dalgalanmalar şirketlerin kârlılığı üzerine tesir etmektedir. Bu nedenle döviz kurunda meydana gelen dalgalanmalar şirketlerin hisse senedi değerlerinin artıp/azalmasını da etkilemektedir. Dolayısıyla yatırımcıların yatırım kararları, döviz kurundan etkilenmekte olan şirketlerin hisse senetlerine yatırım yapma/yapmama şeklinde ortaya çıkmaktadır.

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Döviz kurları, başlıca finansal ve ekonomik faktörler arasında yer almakta olup hisse senedi değerlerini ve nakit akışlarını etkilemektedir (Frankel ve Rose, 2000). Birçok ülkede dalgalı döviz kuru rejimlerinin benimsenmesi ve uluslararası ticaretin hızla genişlemesi döviz kurlarında oynaklığın artmasına neden olmaktadır (Khan, 2019). Joseph (2002) çalışmasında, döviz kurunun hem çıktı hem de girdi fiyatı üzerindeki etkisinin, şirketlerin değerini ve uluslararası rekabet gücünü doğrudan etkilediğini belirtmektedir. Yatırımcıların yatırım fırsatlarını değerlendirirken alacakları kararlarda döviz kurlarındaki dalgalanmalar önemli rol oynamaktadır. Riski değerlendirmek için bu kullanılabilirlik, büyük ölçüde döviz dalgalanmasındaki bir düşüşün genellikle riskli yatırım kararlarına yol açması gerçeğinden kaynaklanmaktadır (Muriu, 2003). Yatırımcıların hisse senetlerine olan yatırım kararlarını etkileyen önemli göstergeler arasında döviz kurları yer almaktadır. Şirketlerin girdi/çıktı fiyatlarını ve dolayısıyla hisse senedi değerlerini etkilemesi, döviz kurlarının bu denli önem arz etmesinin nedenleri arasında yer almaktadır.

Yatırımcıların yatırım kararlarını etkileyen döviz kurları ile hisse senetleri arasındaki ilişkiyi iki temel teori açıklamaktadır. Bu teoriler mal piyasası teorisi ile portföy dengeleme teorisi olarak adlandırılmaktadır. Değer kazanan yerel para cinsinin ihracatçılara zarar verdiğinin, dolayısıyla bu çeşit şirket hisselerinin nispeten az arzu edilir duruma geleceğinin ileri sürüldüğü mal piyasası teorisinde, döviz kurlarından hisse senedi piyasalarına negatif bir korelasyon içinde nedensellik ilişkisi olduğu varsayılmaktadır. Tersine, portföy dengesi teorisinde ise, hisse senedi piyasalarından döviz kurlarına doğru nedenselliğin olduğu ileri sürülmektedir (Tian ve Ma, 2010). Kısaca, porföy dengeleme teorisinde hisse senedi piyasalarından döviz kurlarına doğru, mal piyasası teorisinde ise döviz kurlarından hisse senedi piyasalarına doğru bir nedensellik olması beklenmektedir.

Bir ülke için ulusal para biriminin istikrarsızlığı, diğer ülkeler ile ekonomik faaliyetlerde bulunmakta olan bütün sektörlerle şirketler

bakımından kâr-zarar ihtimalleri doğurmakta; bilhassa ithal malları/hizmetleri kullanmakta olan, enternasyonal piyasalar aracılığıyla kazanç sağlayan şirketlerde bu etkiler bariz belli olmaktadır. Kur riski kaynaklı doğabilecek zararlar şirket maliyetinin artmasına sebebiyet vermekte, bu nedenle kâr düşüşü beklentisi ile ilişkili şirketin hisse senetleri olumsuz yönde etkilenmektedir. Dolayısıyla sektör ile döviz kurları arasındaki ilişkinin irdelenmesi, gerek şirketlere gerekse piyasa katılımcılarına fikir oluşturması bakımından yarar sağlamaktadır (Eyüboğlu ve Eyüboğlu, 2018: 9).

Bu çalışmanın amacı, 2003:M01-2022:M03 dönemine ait aylık veriler kullanılarak dolar (USD/TRY Alış) kuru ve Borsa İstanbul'da işlem gören BIST Ticaret Endeksi arasındaki nedensellik ve eşbütünleşme ilişkisini analiz etmektir.

Bu amaçla değişkenler arasındaki eşbütünleşme ilişkisinin analizinde ARDL sınır testi, değişkenler arasındaki nedensellik ilişkisinin analizindeyse Granger Nedensellik testi, çalışmanın ikinci kısmında döviz kurları ve çeşitli borsa endeksleri arasında olan ilişkiyi inceleyen araştırmalardan bazıları özetlenmiş; üçüncü kısmında kullanılan veri seti ile yöntemler açıklanmış; dördüncü kısmında yapılmış olan analizlerin bulguları sunulmuş ve son kısmında ise sonuçlara yer verilmiştir.

2. LİTERATÜR İNCELEMESİ

Literatürde, döviz kuru ve çeşitli borsa endeksleri arasındaki ilişkinin araştırıldığı birçok çalışma bulunmaktadır. Yapılan literatür araştırması sonucunda bazı çalışmalarda ilişkinin varolduğu, bazı çalışmalarda ise ilişkinin varolmadığı görülmüştür. Literatürde bu konu ile ilgili yapılmış olan araştırmalardan bazıları aşağıda verilmiştir.

Aydemir ve Demirhan (2009), Ulusal 100, hizmetler, finans, sanayi ve teknoloji endeksleri ile döviz kuru arasındaki ilişkiyi Toda-Yamamoto aracılığıyla analiz etmişlerdir. 2001:02-2008:01 dönemi arasındaki günlük verileri kullanarak yapmış oldukları

analiz sonucunda döviz kuru ile hisse senedi fiyatları arasında çift yönlü nedensellik ilişkisi olduğu sonucuna ulaşılmıştır.

Yurttançıkmaz (2012) çalışmasında, döviz kuru, tüketici fiyatları endeksi (TÜFE) ve hisse senedi değişkenlerine veriler kullanılarak hisse senedi getirileri üzerinde enflasyonun ve döviz kurlarının etkisi için Johansen Eşbütünleşme testi ile Granger nedensellik testinden faydalanarak analiz etmiştir. 1994:01-2010:12 dönemi arasındaki verileri kullanarak yapmış olduğu analiz sonucunda döviz kurundan hisse senedi getirilerine doğru negatif yönde ve zayıf bir ilişki olduğu sonucuna ulaşılmıştır.

Berke (2012), TL/USD döviz kuru ile İMKB100 fiyat endeksi arasındaki ilişkiyi FMOLS, CCR ve DOLS yöntemleri aracılığıyla analiz etmiştir. 2002:04-2012:07 dönemi arasındaki verileri kullanarak yapmış oldukları analiz sonucunda döviz kuru ile IMKB100 Endeksi arasında negatif bir ilişkinin olduğu sonucuna ulaşılmıştır.

Doğru ve Recepoğlu (2013) çalışmasında, hisse senedi fiyatı ile Euro/TL ve Dolar/TL döviz kurları arasındaki uzun ve kısa dönem ilişkileri doğrusal olmayan eş bütünleşme yaklaşımı aracılığıyla analiz etmişlerdir. 1990-2013 dönemi arasındaki aylık verileri kullanarak yapmış oldukları analiz sonucunda döviz kurundan hisse senedine doğru bir nedensellik ilişkinin varolduğu ve hisse senedi ile döviz kuru arasındaki bu ilişkinin uzun dönemde pozitif iken, kısa dönemde negatif yönde olduğu tespit edilmiştir.

Akel ve Gazel (2014) çalışmasında, BIST Sınai ile REDKE (Reel Efektif Döviz Kuru Endeksi), EUR/TRY Döviz Kuru ve DXY (Dolar Endeksi) arasındaki uzun ve kısa dönem denge arasındaki ilişkiyi ARDL modeli aracılığıyla analiz etmiştir. 2005:01-2013:12 dönemi arasındaki aylık verileri kullanarak yapmış oldukları analiz sonucunda BIST Sınai ile DXY ve EUR/TRY kuru arasında uzun dönemde pozitif ve istatistiki olarak anlamlı bir ilişki olduğu; hata düzeltme modelinin sonuçlarına göre BIST Sınai endeksi ile diğer tüm değişkenler arasında anlamlı bir ilişki olduğu; REDKE ile

BIST Sınai endeksi arasındaki ilişkinin yönü pozitif iken DXY ve EUR ile BIST Sınai endeksi arasında ilişkinin yönünün negatif olduğu sonucuna ulaşılmıştır.

Yıldız (2014) çalışmasında, BIST 100 Endeksi, hizmet sektör endeksi, sanayi ve mali endeksler ile USD kuru arasındaki ilişkiyi Granger nedensellik testi aracılığıyla analiz etmiştir. 2010:01-2013:09 dönemi arasındaki günlük verileri kullanarak yapmış olduğu analiz sonucunda sektörel hisse senedi endekslerinden USD kurlarına doğru tek yönlü nedenselliğin varolduğu; USD ve BIST100 endeksi arasında çift yönlü nedenselliğin varolduğu; etki tepki analiz sonuçlarına göre ise dolar kuruyla BIST 100 endeksi, sanayi ve hizmet arasında negatif ilişkinin olduğu, mali sektörle çok az pozitif ilişkinin olduğu sonucuna ulaşılmıştır.

Ceylan ve Şahin (2015) çalışmasında, hisse senetleri ile döviz kurları arasında olan ilişkiyi Johansen eşbütünleşme ve hata düzeltme modelleri aracılığıyla analiz etmiştir. 2006:01-2015:04 dönemi arasındaki aylık verileri kullanarak yapmış oldukları analiz sonucunda hisse senetlerinden döviz kurlarına nedenselliğin olmadığı ancak döviz kurlarından hisse senetleri fiyatlarına güçlü bir nedenselliğin bulunduğu sonucuna ulaşılmıştır.

Kendirli ve Çankaya (2016) çalışmasında, BIST Bankacılık ile döviz kurları, tüketici fiyat endeksi (TÜFE) arasında olan ilişki için Johansen Eşbütünleşme testi ile Granger nedensellik testinden faydalanarak analiz etmişlerdir. 2009:1-2015:3 dönemi arasındaki aylık verileri kullanarak yapmış oldukları analiz sonucunda döviz kurları, TÜFE ve BIST Bankacılık Endeksi arasında eşbütünleşme ilişkisinin olmadığı; bankacılık endeksinden döviz kurlarına doğru tek yönlü ilişkinin bulunduğu sonucuna ulaşılmıştır.

Belen ve Karamelikli (2016) çalışmalarında, hisse senedi getirisiyle döviz kuru ilişkisini ARDL modeli aracılığıyla analiz etmiştir. 2006:01-2014:12 dönemi arasındaki aylık verileri kullanarak yapmış oldukları analiz sonucunda USD kuru ile BIST100 Endeksi arasında eşbütünleşmenin olduğu; döviz

kurlarının hisse senedi fiyatlarını beklentiyle uyumlu biçimde negative etkilediği ayrıca para arzını da beklentiyle paralel şekilde hisse senedi fiyatlarını pozitif etkilediği sonucuna ulaşmışlardır.

Ürkmez ve Karataş (2017), Borsa İstanbul 100 Endeksi (BIST) ile Dolar/TL Kuru (USD) ve Avro/TL Kuru (EUR) arasındaki ilişkiyi Gregory ve Hansen eşbütünleşme testi ve TodaYamamoto Granger nedensellik testi aracılığıyla analiz etmişlerdir. 2002-2015 dönemi arasındaki aylık verileri kullanarak yapmış oldukları analiz sonucunda dolar kurundan borsa endeksine doğru tek yönlü bir nedensellik ilişkinin bulunduğu sonucuna ulaşılmıştır.

Yamak vd., (2018) çalışmalarında, ABD doları ve BIST 100 endeksi arasındaki ilişkiyi Granger nedensellik testi aracılığıyla analiz etmişlerdir. 2007:01-2017:05 dönemi arasındaki günlük verileri kullanarak yapmış oldukları analiz sonucunda pozitif döviz kuru değişim oynaklığından borsa endeks oynaklığına doğru olmak üzere tek yönlü bir nedenselliğin bulunduğu sonucuna ulaşılmıştır.

Eyüboğlu ve Eyüboğlu (2018) çalışmasında, döviz kurları ve BIST sektör endeksleri arasındaki ilişkiyi ARDL modeli aracılığıyla analiz etmiştir. 2011:01-2016:05 dönemi arasındaki günlük verileri kullanarak yapmış oldukları analiz sonucunda EUR kuru ile BIST Tekstil Deri endeksleri arasında; USD kuru ile BIST Tekstil Deri, BIST Ticaret ve BIST Teknoloji endeksleri arasında uzun dönemli ilişki olduğu sonucuna ulaşılmıştır.

Kayral (2020) çalışmasında, BIST Şehir Endeksi ile USD ve EUR arasındaki ilişkiyi ARDL modeli aracılığıyla analiz etmiştir. 2009:07-2019:07 dönemi arasındaki verileri kullanarak yapmış oldukları analiz sonucunda tüm modellerde (BIST Ankara ile EUR ilişkisi hariç) Şehir Endeksleri ile kurlar arasında eşbütünleşmenin yani uzun dönemli ilişkinin olduğu; kısa dönemdeyse gecikmesiz değerlerden sadece İzmir Şehir Endeksi ile EUR arasında pozitif ilişkinin olduğu sonucuna ulaşılmıştır.

Sizer (2022) çalışmasında, Türkiye için 2003Q1-2021Q3 dönemine ait çeyreklik veriler kullanarak hisse senedi fiyatları ile alternatif yatırım araçları arasındaki asimetrik ilişkiyi doğrusal olmayan ARDL modeli yaklaşımıyla incelemiştir. Sonuçta, altın yatırımının hisse senedi yatırımının güçlü bir alternatifi olduğunu tespit etmiştir. Çalışmada, döviz kuru ile hisse senedi endeksinin de aynı yönde hareket ettiği ortaya konulmuştur.

Literatürde BIST Sektör Endekslerinin USD kuru ile ilişkisini ölçmeye çalışan birçok çalışma bulunmakla birlikte yalnızca BIST Ticaret Endeksi ile USD ilişkisini araştıran bir çalışmaya rastlanmamıştır. Bu nedenle bu çalışmada BIST Ticaret Endeksiyle USD kuru arasındaki ilişki değişkenlerin aylık logaritmik verileri kullanılarak ARDL sınır testi analizi ile incelenmiştir.

3. VERİ SETİ VE ARAŞTIRMA YÖNTEMİ

Çalışmada 2003:01-2022:03 dönemine ait veriler kullanılarak dollar (USD/TRY Alış) kurunun BIST Ticaret Endeksi (XTCRT Açılış) ile arasındaki nedensellik ilişkisi araştırılmıştır. Çalışmaya dahil edilen veriler TCMB-EVDS ve Investing.com üzerinden elde edilmiştir.

Çalışmada ilk önce logaritmik tabanda tanımlayıcı istatistikler bulunup yorumlanmıştır. Ardından uzun dönemli ilişkilerin analiz edilmesi için verilere ait alış ve açılış fiyatlarının logaritmik tabanda durağanlık testleri yapılmıştır. Verilerin durağanlık derecesi belirlendikten sonra model üzerine ARDL (Auto-Regressive Distributed Lag) Sınır Testi ile VAR Granger Nedensellik Testi uygulanmış olup analiz için verilerin doğal logaritmik halleri dikkate alınmıştır.

Tablo 1: USD ve XTCRT Değişkenlerine Ait Tanımlayıcı İstatistikler

	LNUSD	LNXTCRT
Ortalama	0.868760	6.632146
Medyan	0.587787	6.972438
Maximum	2.678965	8.209401
Minimum	0.157004	4.410128
Standart Sapma	0.633737	1.035074
Skewness(Çarpıklık)	0.969869	-0.458050
Kurtosis(Basıklık)	2.791990	2.074060
Jarque-Bera	36.63135	16.32984
Olasılık	0.000000	0.000284

Tablo 1'de değişkenlere ait tanımlayıcı istatistikler incelendiğinde, dağılımın normale yakın olduğu görülmektedir.

Dickey ve Fuller'in geliştirmiş oldukları (1981) ADF (Augmented Dickey-Fuller) testi aracılığıyla değişkelere ait durağanlık sonuçları Tablo 2'de verilmiştir.

Tablo 2: USD-XTCRT Değişkenlerine Ait Birim Kök Testleri (Düzey)

Değişkenler		**Sabitli**		**Sabit ve Trendli**	
		ADF Test İstatistiği	**P Değeri**	**ADF Test İstatistiği**	**P Değeri**
LNUSD		3.190429	1.0000	-2.534348	0.3113
LNXTCRT		-1.365679	0.5988	-2.796.011	0.2012
Kritik Değerler(USD)	**1%**	-3.458973		-3.998815	
	5%	-2.874029		-3.429657	
	10%	-2.573502		-3.138345	
Kritik Değerler(XTCRT)	**1%**	-3.458719		-3.998457	
	5%	-2.873918		-3.429484	
	10%	-2.573443		-3.138243	

Tablo 3: USD-XTCRT Değişkenlerine Ait Birim Kök Testleri (1. Fark)

Değişkenler		**Sabitli**		**Sabit ve Trendli**	
		ADF Test İstatistiği	**P Değeri**	**ADF Test İstatistiği**	**P Değeri**
LNUSD		-10.67750	0.0000	-11.61162	0.0000
LNXTCRT		-16.75380	0.0000	-16.78044	0.0000
Kritik Değerler(USD)	**1%**	-3.458973		-3.998815	
	5%	-2.874029		-3.429657	
	10%	-2.573502		-3.138345	
Kritik Değerler(XTCRT)	**1%**	-3.458719		-3.998457	
	5%	-2.873918		-3.429484	
	10%	-2.573443		-3.138243	

Tablo 2'deki ADF birim kök testi (düzey) sonuçlarına göre değişkenler maksimum 14 gecikme uzunluğunda ve %1 anlam düzeyindeki test istatistik değerleri kritik değerlerin altında çıkmış, olasılık değerleri de 0.05 değerinin üstünde kalmıştır. Bu durumda, düzeyde değişkenlerin birim kök içerdiğini varsayan sıfır hipotezi kabul edilmiştir. Ardından serilerin 1. farkları alınmış ve Tablo 3'teki değerlerden görüleceği üzere seriler I(1) düzeyinde durağan hale gelmiştir.

4. BULGULAR

4.1. ARDL Sınır Testi

Değişkenler, I(1) düzeyinde durağanlaşmış olup Pesaran vd., (2001)'in geliştirmiş oldukları ARDL Sınır Testi uygulanmıştır.

Tablo 4'te yer alan değerler incelendiğinde gecikme uzunluğu 3 olarak belirlenmiştir.

Tablo 4: Gecikme Uzunluğunun Belirlenmesi

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-395.158	NA	0.120778	3.561953	3.59251	3.574289
1	678.1594	2117.756	8.26E-06	-6.02834	-5.93666	-5.99133
2	699.6032	41.92606	7.06E-06	-6.18478	-6.031994*	-6.1231
3	710.0179	20.17558*	6.67e-06*	-6.242313*	-6.02841	-6.155962*
4	710.29	0.522286	6.90E-06	-6.20888	-5.93386	-6.09786
5	713.1038	5.350019	6.97E-06	-6.19824	-5.86211	-6.06255
6	714.6267	2.868189	7.13E-06	-6.17602	-5.77878	-6.01566
7	715.4394	1.516014	7.34E-06	-6.14744	-5.68908	-5.9624
8	718.9798	6.541067	7.37E-06	-6.14332	-5.62384	-5.93361

XTCRT'in bağımlı değişken, USD'nin bağımsız değişken olduğu doğrusal regresyon modeli aşağıda (1) nolu denklemde belirtilmiştir:

$$XTCRT_t = \beta_0 + \beta_1 USD_t + e_t \quad (1)$$

Döviz kurunun kısa ve uzun dönemli etkilerini ayrıştırmak için, hata düzeltme modelinden faydalanılmıştır. Bu çerçevede (1) nolu denklem Peseran vd. (2001)'nin geliştirdiği ARDL modeli olarak yeniden düzenlenerek aşağıdaki (2) nolu denklem elde edilmiştir:

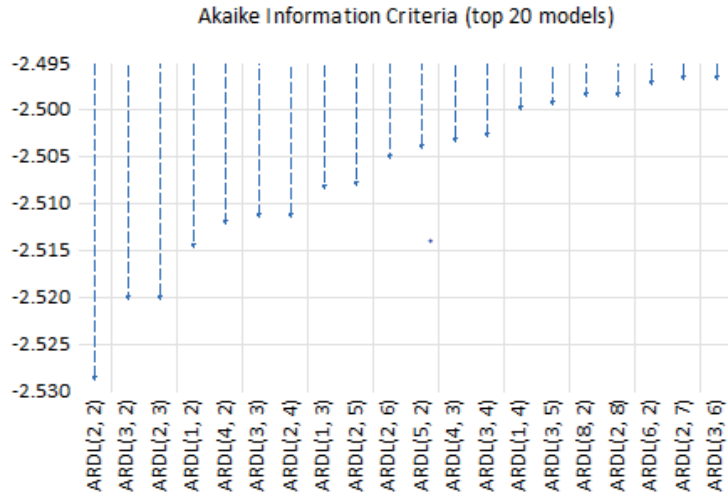
$$XTCRT_t = a_0 + a_1 trend + a_2 XTCRT_{t-1} + a_3 USD_{t-1} + \sum_{i=1}^{p} \beta_{1,i} \Delta XTCRT_{t-i} + \sum_{i=0}^{q} \beta_{2,i} \Delta USD_{t-i} + e_t \quad (2)$$

(2) nolu denklemde a_0 sabit terimi, a_2,a_3 parametreleri uzun dönem katsayılarını ve β_1, β_2 parametreleri ise kısa dönem katsayılarını, t deterministik trendi, (p,q,) uygun gecikme uzunluğunu, Δ fark operatörünü, e_t hata terimini göstermektedir. Anlamlı uzun dönem tahminleri için değişkenler arasında uzun dönemli ilişkinin olması gerekmektedir. Pesaran vd. (2001) çalışmasında değişkenler arasındaki eşbütünleşme ilişkisini tespit

etmek için iki test önermişlerdir. İlk test alt ve üst kritik değerlere sahip F-sınır testidir. Burada Pesaran vd. (2001) çalışmasında elde edilen kritik tablo değerleri hesaplanan test istatistiğiyle karşılaştırılıp; hesaplanan değer üst kritik değerden büyükse, değişkenler arasında eşbütünleşme ilişkisinin bulunmadığını ileri süren sıfır hipotezi reddedilmektedir. Dolayısıyla değişkenler arasında uzun dönemli bir ilişkinin bulunduğu sonucuna ulaşılır. İkinci testte, hata düzeltme modelinde, değişkenlerin uzun dönem denge değerlerine yaklaşması beklenmektedir. Bundan dolayı aşağıdaki (3) nolu denklem tahmin edilmektedir. Modelde yer alan hata düzeltme katsayısının (λ) negatif ayrıca istatistiksel olarak anlamlı çıkması beklenmektedir.

$$\Delta XTCRT_t = a_0 + a_1 trend + \sum_{i=1}^{p} \beta_{1,i} \Delta XTCRT_{t-i} + \sum_{i=0}^{q} \beta_{2,i} \Delta USD_{t-i} + \lambda ECM_{t-1} + e_t \quad (3)$$

(3) nolu denklemde yar alan β_1, β_2 katsayıları modelin dengeye yakınsamasını sağlayan kısa dönem katsayılarını belirtmektedir (Paseran vd., 2001).



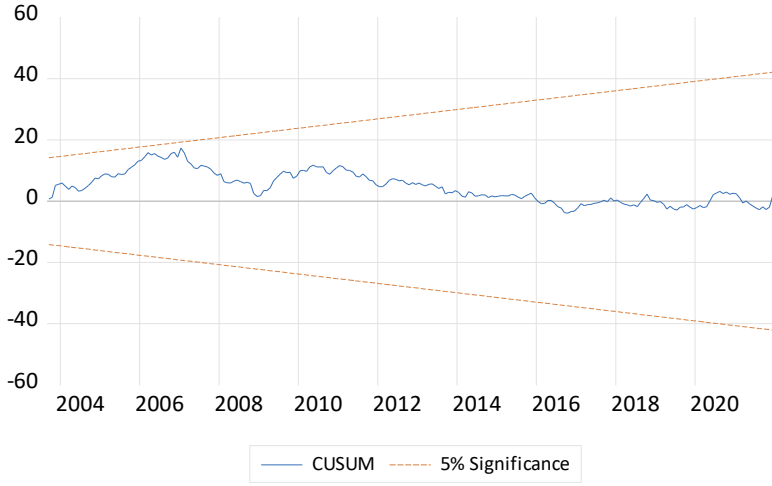
Grafik 1: Akaiki Bilgi Kriteri

XTCRT serisi bağımlı değişken, USD bağımsız değişken olmak üzere ARDL modeli tahmini; maksimum gecikme uzunluğu 12 alınarak, Model 2 üzerinden olası 20 modelin (Grafik 1) içerisinden, AIC kriterine göre karar verilerek ARDL (2, 2) modeli elde edilmiştir. ARDL (2, 2) model tahmin sonuçları Tablo 5'te görülmektedir.

Tablo 5: ARDL Model Tahmin Sonuçları

Bağımlı Değişken: XTCRT	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.***
$LNXTCRT_{t-1}$	0.813212	0.064665	12.57568	0.0000
$LNXTCRT_{t-2}$	0.175365	0.064410	2.722652	0.0070
LNUSD	-0.333170	0.121488	-2.742399	0.0066
$LNUSD_{t-1}$	-0.119043	0.202943	-0.586582	0.5581
$LNUSD_{t-2}$	0.476749	0.127382	3.742679	0.0002
C	0.080781	0.043547	1.855013	0.0649
R^2= 0.995 F= 9820.798(P=0.000), DW=1.986				
Tanı Testleri:				
Serisel Korelasyon(Breush-Godfrey): F=0.303(P=0.738)				
Değişen varyans(ARCH): F=0.933(P=0.334)				

Tablo 5'te görülen ARDL(2, 2) model tahmin sonuçlarına göre bütün katsayılar istatiksel olarak anlamlı ve tanı testleri sonucu modelde değişen varyans, serisel korelasyon sorununun olmadığı görülmektedir. Ayrıca Grafik 2'de Brown vd., (1975) geliştirmiş oldukları CUSUM grafiğine yer verilmiş, ARDL uzun dönem katsayılarının kararlılığını sınanmıştır.



Grafik 2: ARDL (2, 2) Modeli İçin CUSUM Grafiği

Grafik 2'deki görüldüğü üzere ARDL uzun dönem tahmini sonucunda parametrelerin kararlı olduğu sonucuna varılmıştır.

Tablo 6'da seriler arasındaki eşbütünleşme ilişkisi olup olmadığını ortaya çıkarmak için yapılmış olan sınır testi sonuçlarına yer verilmiştir.

Tablo 6: Sınır Testi Sonuçları

H_0: Eşbütünleşme yoktur.				
Test İstatistiği	**Value**	**Signif.**	**I(0)**	**I(1)**
F-İstatistiği	10.419	**10%**	3.113	3.61
K	1	**5%**	3.74	4.303
		1%	5.157	5.917

Tablo 6'da görülen F-Sınır testi için F=10.419 olarak hesaplanmıştır. Bu değer üst kritik değerlerin tüm yanılma düzeyleri için hepsinden büyük (F>I(1)) olduğundan "eşbütünleşme

yoktur" yokluk hipotezi reddedilmiştir. F-Sınır testine göre seriler eşbütünleşik olarak tespit edilmiştir.

Tablo 7'de seriler arasında uzun dönemdeki denge ilişkisinin tahmin sonuçları yer almaktadır.

Tablo 7: Uzun Dönem Tahmin Sonuçları

Bağımlı Değişken: XTCRT	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.***
LNUSD	2.148080	0.884286	2.429168	0.0159
C	7.071876	1.293299	5.468090	0.0000

Tablo 7'deki sonuçlara göre analiz edilen dönem için elde edilen uzun dönem katsayıları XTCRT ve USD kuru arasında pozitif ilişkilerin istatistiksel olarak anlamlı olduğunu göstermektedir. Döviz kurunda meydana gelen %1'lik artış sonucunda BIST Ticaret endeksi %2.1 artmaktadır. Bu da beklentilerimizle uyuşmaktadır.

Tablo 8'de seriler arasında kısa dönemli ilişkiye ait ARDL modeline dayanmakta olan hata düzeltme modeli yer almaktadır.

Tablo 8: Kısa Dönem Tahmin Sonuçları

Bağımlı Değişken: XTCRT	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.***
Δ **LNXTCRT**$_{t-1}$	-0.175365	0.063814	-2.748054	0.0065
Δ **LNUSD**	-0.333170	0.118768	-2.805208	0.0055
Δ **LNUSD**$_{t-1}$	-0.476749	0.124971	-3.814874	0.0002
EC$_{t-1}$	-0.011423	0.002034	-5.615824	0.0000

Tablo 8'de hata düzeltme modeline ait kısa dönem regresyon sonuçları görülmektedir ve hata düzeltme katayısı EC_{t-1}=-

0.011423 olarak hesaplanmıştır. Buna göre XTCRT endeksi ile USD kuru arasındaki kısa dönem ilişkiyi gösteren hata düzeltme katsayısı negatif, 1'den küçük ve aynı zamanda istatistiksel olarak anlamlı bulunmuştur. Ayrıca kısa dönemde döviz kurlarında meydana gelen bir artışın ilgili Borsa İstanbul sektör endeksini negatif yönde etkilediği belirlenmiştir. Bu bağlamda kısa dönemde meydana gelen bir dengesizliğin yaklaşık %1'i bir ay sonra dengeye yaklaşacaktır. Diğer bir ifade ile kısa dönemde oluşacak şokların etkisi yaklaşık (1/0.01=10) 10 ay sonra düzelerek uzun dönem dengesine ulaşacaktır.

4.2. VAR Granger Nedensellik Analizi

Tablo 9'da seriler arasında nedenselliğin bulunup bulunmadığını belirlemek ayrıca yönünü tespit etmek içim Vector Otoregresif Model (VAR) kullanılmıştır. VAR modellerinin, ekonomi teorisinin kesin olarak açıklayamadığı durumlarda da kullanılması nedeni ile yaygın biçimde kullanım alanı bulunmaktadır. Çünkü çalışmalarda kesin şekilde içsel ve dışsal değişken ayrımına ihtiyaç duyulmamakta; değişkenlerin eşanlı olarak incelenmesine ihtiyaç duyulmaktadır. Bu bağlamda model değişkenler arasında ilişkinin doğru kurulmasına imkan vermektedir (Mert ve Çağlar, 2019). Granger (1969) nedensellik testi için serilerin durağan olması gerektiğinden, değişkenlerimizin 1. farkı alınarak analiz edilmiştir.

Tablo 9: XTCRT ve USD İçin Kısa Dönem Nedensellik Sonuçları

Sıfır Hipotezi:	**N**	**F**	**P**
USD, XTCRT'in nedeni değildir.	227	25.19775	0.0000
XTCRT, USD'nin nedeni değildir.		2.350140	0.5030

Tablo 9'da sonuçları verilen nedensellik testi üçüncü gecikmeden tahmin edilmiş olup sonuçlara göre USD, XTCRT'in nedeni değildir şeklinde kurulan temel hipotezimiz reddedilmiştir. Fakat XTCRT, USD'nin nedeni değildir şeklinde kurulan hipotezimiz

reddedilmediğinden USD'den XTCRT değişkenine doğru tek yönlü nedensellik ilişkisi (USD→XTCRT) tespit edilmiş olup, XTCRT değişkeninden USD'ye doğru herhangi bir nedensellik ilişkisi bulunmamıştır. Çıkan sonuçlarımızı incelediğimizde USD'deki artış XTCRT'in de artmasına neden olmaktadır.

5. SONUÇ

Döviz kurunda yaşanan dalgalanmalar şirketlerin kârlılığını dolayısıyla hisse senetlerinin değerleri üzerine etki etmektedir. Bu nedenle yatırımcıların yatırım kararları, döviz kurundan etkilenmekte olan şirketlerin hisse senetlerine yatırım yapma/yapmama şeklinde ortaya çıkmaktadır. Aynı şekilde şirketler ve kanun yapıcılar da yaşanan dalgalanmalardan etkilenmektedir.

Bu çalışmada 2003:01-2022:03 dönemlerine ait veriler kullanılarak dollar (USD/TRY Alış) kurunun BIST Ticaret Endeksi (XTCRT) ile aralarındaki nedensellik ilişkisinin araştırılması amaçlanmıştır. Çalışmada ilk olarak serilerin durağanlığı ADF birim kök testiyle sınanmış, serilerin birinci farkta durağanlaştıkları belirlenmiştir. Bu açıdan ARDL sınır testi ile BIST Ticaret Endeksi ve USD kuru arasında uzun dönemli ilişki analiz edilmiştir. Yapılmış olan analizler neticesindeyse BIST Ticaret Endeksi ile USD kuru arasında uzun dönemli ilişki olduğu belirlenmiştir. Kısa dönemdeyse döviz kurundaki artışın ilgili BIST sektör endeksini negatif olarak etkilediği tespit edilmiştir. Bu bağlamda döviz kurlarında yaşanan oynaklığın maliyetleri etkileyebileceği buna istinaden de kârlılığın etkilenebileceği ve hisse senetlerine yansıyacağı düşünülmektedir. Bu bakımdan elde edilen sonuçlar yatırımcılar için fikir oluşturması nedeniyle yararlı olabilmektedir. BIST Ticaret Endeksi şirketleri açısından ise döviz kurlarında yaşanan oynaklıktan korunmaları risklerin azaltılması bakımından faydalı olabilmektedir. Kanun yapıcıların ise bu oynaklıktan etkilenmekte olan şirket ve yatırımcılara uygun politikalar izlemesi önerilmektedir.

Son olarak yapılan nedensellik testi sonucu neticesinde değer kazanan yerel para cinsinin ihracatçılara zarar verdiğinin, dolayısıyla bu çeşit şirket hisselerinin nispeten daha az arzu edilir duruma geleceğinin ileri sürüldüğü mal piyasası teorisinin geçerli olduğunu ortaya koymuştur. Bu sonuçlar beklenen sonuçlardır ve literatürdeki hisse senedi ile döviz kuru araştırmalarının birçoğu ile örtüşmektedir.

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CHAPTER 2

E7 Ülkelerinde Döviz Kuru ile Borsa Getirileri Arasındaki İlişki [1]

İbrahim Yenigün[2]

Doç. Dr. Ş. Gül Reis[3]

GİRİŞ

Sermaye piyasaları denince akla ilk gelen yatırım aracı pay senedidir. Pay senedi yatırımcıları bireysel ve kurumsal yatırımcılar olarak işlem yaparlar ve sermayenin geniş bir tabana yayılmasına aracılık ederler. Anonim şirketler tarafından ihraç edilen pay

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senetleri, sahibinin sermaye payını temsil eden, üzerinde şirket bilgilerinin yer aldığı, ortaklık bildiren menkul kıymetlerdir.

Küresel piyasalar üzerinde önemli bir etkiye sahip olan bir diğer yatırım aracı da dövizdir. Literatür incelendiğinde döviz kurları ve borsa endeksleri üzerine birçok çalışmanın yapıldığı görülmektedir. Bu çalışma literatürdeki diğer çalışmalardan farklı olarak döviz kuru ve borsa endeksleri arasındaki ilişkiyi ortaya koymak için, Türkiye'nin de içinde yer aldığı E7 ülkeleri üzerine yapılmıştır.

Gerek borsa gerek döviz kurları sürekli değişen ve dalgalanma içinde olan yatırım araçlarıdır. Bu yüzden yatırımcılar bu enstrümanlara yatırım yaparlarken çok iyi analizler yapmak zorundadırlar. Ancak analiz yaparken; doğal afet, savaş, ülke politikaları ve bunun gibi ekonomi üzerinde çok büyük etkisi olan birçok sistematik riskin her an ortaya çıkabilir olması, başarılı bir analiz yapılmasına olanak vermemektedir. Bu çalışma, diğer tüm değişkenler sabit kabul edildiğinde yatırımcıların döviz ve borsa yatırımlarına ışık tutabilecek bilgiler ortaya koymak amacıyla ele alınmıştır. Bu bağlamda çalışmanın literatüre katkısı hem yatırımcılar hem de işletmeler açısından değerlendirilebilir. Öncelikle yatırımcılar açısından değerlendirildiğinde portföylerini oluşturacak varlık seçiminde döviz ve borsa endeksi seçeneklerini anlamaları ve buna göre bir öngörüye sahip olmaları beklenmektedir. İşletmeler açısından ise, piyasa değerlerini etkileyebilecek parametrelerden birisi olarak varsayılan döviz piyasalarının etkisi incelenmiş olacaktır.

E7 ülkelerinde döviz kurlarının borsa endekslerini etkilediği düşüncesiyle ele alınan bu çalışma 4 bölümden oluşmaktadır. Birinci bölmde çalışmanın amacı kısaca anlatılmış ve döviz kuru ile endeks arasındaki ilişkiye değinilmiştir. İkinci bölüm ilgili literatürden oluşmaktadır. Üçüncü bölümde materyal ve yöntem anlatılarak analiz ve bulgulara yer verilmiştir. Son olarak sonuç bölümünde ise elde edilen bulgular değerlendirilmiştir.

Döviz Kuru ve Piyasa Endeksleri Arasındaki İlişki

Literatür incelendiğinde döviz kuru ile piyasa endeksleri arasındaki ilişki konusunda tam bir görüş birliği olmadığı, teorik olarak bu iki yatırım aracı arasındaki ilişkiyi açıklayan iki teori olduğu görülmektedir. Bunlardan ilki Dornbusch & Fisher, (1980)'in geliştirdikleri "geleneksel (akım, mikro) yaklaşım" olup döviz kurlarında meydana gelen değişimlerin o ülkedeki küresel ticareti etkilediğini savunmaktadır. İkincisi ise Branson(1983) tarafından geliştirilen "portföy(stok, makro) dengesi yaklaşımı" olarak bilinmektedir. Bu yaklaşım ise pay senedindeki değişimlerin döviz kurları üzerinde etkili olduğunu savunmaktadır.

Temelini piyasaya gelen tüm bilginin herkes tarafından bilindiğini savunan etkin piyasalar hipotezinin oluşturduğu "geleneksel yaklaşıma" göre pay piyasasının belirleyicisinin döviz kurlarının olduğu varsayılmaktadır. Pay senedi fiyatları çoğunlukla şirketlerin gelecek nakit akımlarının bugünkü değeri olarak açıklanmaktadır. Bu teoride pay senedi fiyatlarına döviz kurlarından bir nedensellik sözkonusudur ve bu değişkenlerin döviz kuru kotalama varsayımından ötürü "pozitif" bir ilişki içerisinde oldukları varsayılmaktadır (Stavarek, 2004). Buna göre döviz kurundaki değişimlerin çok uluslu ve ulusal şirketlerin pay senedi fiyatlarında da değişmelere neden olduğu gözlenmektedir. Döviz kurunda meydana gelen artışların şirketlerin karlarını da arttıracağı pay senedi fiyatlarının da artmasına neden olacaktır (Jorion, 1990). Geleneksel yaklaşıma göre döviz kurunda meydana gelecek bir değişim şirketlerin girdi-çıktı maliyetlerini ve varlıklarını etkileyecek böylelikle de rekabet gücü etkilenecektir. Bu durum şirketlerin karlılığını ve pay senedi getirilerini etkileyecektir. (Granger, Huang, & Yang, 2000). Yani bu yaklaşım, döviz kurundaki artışın; ithalatçı piyasalarda rekabet yapısının bozulmasına ve ulusal pay senedi piyasalarının olumsuz etkilenmesine, öte yandan ihracatçı piyasalarda ise girdi maliyetlerinin düşmesine ve böylece şirket karlılığını artırarak pay senedi piyasalarının olumlu etkilenmesine yol açacağını savunmaktadır (Abdalla & Murinde, 1997).

Geleneksel yaklaşıma göre daha yeni olan portföy dengesi yaklaşımı, döviz kurundaki değişmeleri yabancı varlıklardaki arz talep değişikliklerine bağlayan, uluslararası sermaye hareketlerinin etkisinin önemine işaret eden bir yaklaşımdır (Cengiz, 2018). Teori, yatırımcıların pay senedi getirilerindeki değişmelere göre yatırım portföylerini şekillendirme sürecine göre açıklanmaktadır. Diğer bir deyişle yatırımcılar portföy risklerini azaltmak amacıyla sermaye piyasalarındaki fonlarını çeşitlendirmektedirler (Cushman, 2007). Geleneksel yaklaşımın aksine portföy dengesi yaklaşımı pay senetlerinin döviz kurlarından değil, döviz kurunun pay senedi fiyatlarından etkilendiğin savunmaktadır. Ancak burada döviz kuru ve pay senetleri arasındaki ilişkinin yönü negatif doğrultudadır Buna göre, ülkenin pay senedi fiyatlarında meydana gelen bir azalış, pay senetlerinin talebini düşürerek ülkenin para birimine olan talebi de azaltacaktır. Ülke parasına olan talebin azalması ise faiz oranlarında düşmeye ve yatırımcıların portföylerindeki ülke varlıklarını satarak, yabancı kaynaklı varlıkları satın almalarına neden olacaktır. Bunun sonucunda ise ülke parası değer kaybedecek ve döviz kuru yükselecektir. Ülkenin pay senedi fiyatlarında yükseliş olması durumunda ise pay senetlerinde olan talebin artmasını, yatırımcıların yabancı varlıklardan çekilerek ülke parasının değerinin artmasını ve bu sayede de döviz kurunun düşmesini sağlayacaktır. İşte bu sebeple döviz kuru ve piyasa endeksleri arasındaki korelasyonun negatif yönde olması beklenmektedir (Nath & Samanta, 2003).

LİTERATÜR İNCELEMESİ

Bu bölümde döviz kurunun borsa endeksleri ile olan ilişkisine ilişkin ulusal ve uluslararası literatür araştırılarak özetlenmiştir. Döviz kuru ve borsa endeksleri arasındaki ilişkiyi inceleyen ulusal literatür incelendiğinde çeşitli sonuçlar elde edildiği görülmüştür.

Ayvaz (2006) çalışmasında; döviz kuru ile Ulusal 100 endeksi sanayi sektör endeksi, mali sektör endeksi ve hizmet sektör endeksleri arasındaki ilişkiyi incelediği çalışmasında hizmet sektörü

endeksi haricindeki diğer tüm endekslerle döviz kuru arasında uzun dönemde kararlı bir ilişki olduğu sonucuna ulaşırken; Doğukanlı & Yücel (2010) çalışmalarında Ocak 1999-Haziran 2009 yılları arasında sınai, mali ve hizmetler ana sektör ve 15 alt sektör pay senedi endekslerini inceledikleri çalışmada hizmetler sektörünün çok yüksek duyarlılık, mali sektörün ise çok düşük duyarlılık gösterdiği sonucunu elde etmişlerdir.

Pekkaya & Bayramoğlu (2008) çalışmalarında; 1990-2007 dönemi YTL/USD döviz kuru, İMKB 100 endeksi ve S&P500 endeksi aralarındaki nedensellik ilişkileri incelenmiştir. Araştırmada Granger nedensellik testi kullanılmış olup sonuç olarak çift yönlü nedensellik ilişkisi bulunmuştur. Kriz dönemleri sonrası S&P 500 endeksinin genel etkileyen, döviz kurunun ise endekslerden etkilenen olduğu sonucuna ulaşılmıştır.

Elmas & Esen, (2011) çalışmalarında; Türkiye, Almanya, Fransa, Hollanda, Hindistan ve Rusya olmak üzere 6 Asya/Avrupa ülkesinde döviz kuru (USD) ile ulusal pay senedi piyasa endekslerinin nasıl bir ilişki içerisinde olduğunu araştırmışlardır. Çalışmada değişkenler arasındaki uzun dönemli bir ilişkinin olup olmadığı eş-bütünleşme testleri ile araştırılmıştır. Analiz sonuçlarına göre; döviz kuru ile pay senedi fiyatları arasında "Geleneksel Yaklaşım"ın 4 ülkede geçerli olduğunu desteklerken, "Portföy Yaklaşımı"nın ise 2 ülkede geçerli olduğu anlaşılmıştır.

Belen & Karamelikli (2016) ve Boyacıoğlu & Çürük (2016) yaptıkları çalışmalarda dolar kurunun BIST-100 endeksi arasında anlamlı bir ilişki olduğu sonucunu elde etmişlerdir.

Coşkun & Ümit (2016) çalışmalarında; BİST 100 pay senedi endeksi getirisi ile döviz kuru, altın fiyatı, konut fiyatları ve mevduat faiz oranı arasındaki ilişkiyi incelemişlerdir. 2000:01-2014:07 dönemine ait aylık verileri eşbütünleşme yöntemleri ile analiz etmişlerdir. Araştırma sonucunda; pay senedi endeksinin dalgalanma ve artış eğilimi göstermesine, döviz/mevduat yatırımlarının belirli dönemlerde negatif reel getiri sunmasına

rağmen; hane halkı yatırım tercihlerinde konut ve altına yönelik yatırımlarda geleneksel yatırımları önemini daha da artırarak korumaya devam ettiği ortaya çıkmıştır.

Kendirli & Çankaya (2016) çalışmalarında; döviz kuru ve enflasyonun BİST Bankacılık Endeksine etkisini incelemişlerdir. Türkiye ekonomisinin 2009:1-2015:3 zaman diliminde ortaya çıkan aylık verileri en küçük kareler yöntemi ve Granger Nedensellik Testi ile analiz edilmiştir. Sonuç olarak sadece BİST Bankacılık Endeksi'nden döviz kuruna doğru tek yönlü bir ilişki olduğu, diğer değişkenler arasında nedensellik ilişkisi olmadığı ortaya çıkmıştır.

Şahin & Özkan (2018) çalışmalarında; kredi temerrüt takası, döviz kurları ve BİST 100 endeksi arasındaki ilişkiyi kısa dönemli ve uzun dönemli olarak incelemişlerdir. Bu amaçla çalışmada Türkiye'ye ait döviz kurları, kredi temerrüt takası primleri ve BİST 100 endeksi verileri 2012- 2017 tarihleri arasında aylık olarak kullanılmıştır. Analiz sonucunda; kredi temerrüt takası ile BİST100 endeksi arasında çift yönlü nedensellik olduğu, ancak BİST 100 endeksi ile döviz kurları arasında nedensellik ilişkisi olmadığı tespit edilmiştir.

Cingöz & Kendirli (2019) çalışmalarında; güvenilir yatırım aracı olduğu düşünülen altının, fiyat değişimlerinde BİST 100 Pay Senedi Endeksi ve döviz kurundaki değişimler ile olası ilişkisini incelemişlerdir. Altın fiyatlarını temsilen BIST Altın Endeksi araştırmaya eklenmiş ve her bir değişkenin 2006:01-2018:06 dönemi arasındaki aylık fiyatlarının ortalaması incelenmiştir. Johansen eşbütünleşme testi ve Granger nedensellik testi uygulanan analiz sonucunda altın fiyatlarının üzerinde , dolar kurundaki ve BİST 100 pay endeksindeki değişimlerinin uzun dönemde anlamlı etkisinin olduğu, fakat kısa dönemde bu değişkenlerin altın fiyatları üzerinde anlamlı bir etkisinin olmadığı sonucuna ulaşılmıştır.

Akçalı, Mollaahmetoğlu, & Altay (2019) çalışmalarında; Borsa İstanbul Endeksi (BİST-100) ile Amerikan Dolar Endeksi (DXY), JP Morgan Gelişmekte Olan Ülkeler Tahvil Endeksi - Index Global (EMBI), Chicago Opsiyon Borsası Oynaklık Endeksi-CBOE (VIX), Dow Jones Borsası Endüstri Endeksi (DJI) ve Brent Petrol (BrP) arasındaki volatilite etkileşimi incelenmiştir. 30.09.2009-05.07.2018 dönemine ait günlük getiri serileri GARCH modellerinden zamana bağlı değişen korelasyonu dikkate alan DCC-GARCH modeli ile incelenmiştir. Çalışma sonucunda; volatilitenin, BİST-100 ve diğer değişkenler arasında sürekli etkilere sahip olduğu ve bu piyasalarda yoğun şekilde volatilite kümelenmelerinin oluştuğu gözlemlenmiştir.

Soyaslan (2019) çalışmasında; BİST Turizm Endeksi ile döviz kurları arasında kısa ve uzun dönemde ilişki olup olmadığını incelemiştir. 02/01/2015- 30/03/2018 arasındaki BİST Turizm Endeksi ile Euro ve ABD doları para birimine ilişkin günlük verileri Johansen Eş Bütünleşme Testi ile analiz edilmiştir. Çalışma sonucunda uzun dönemde ilişki olmadığı, ancak kısa dönemde EURO ile ABD Doları'nda oluşan bir değişimin BİST Turizm Endeksinde %5 anlamlılık düzeyinde etkili olduğu ortaya çıkmıştır.

Uluslararası literatür incelendiğinde ise döviz kuru ve borsa endekslerini inceleyen çalışmalarda farklı sonuçlar elde edildiği görülmüştür.

Franck & Young (1972) döviz kuru ve pay senedi arasındaki ilişkiyi inceleyen ilk çalışmayı yapmışlardır. Rhomberg modeli kullandıkları çalışmalarında; ABD' de pay senetleri ile döviz kuru arasında ilişki olmadığını incelemişlerdir. Sonrasında, Aggarwal (1981) 1974-1978 döneminde ABD' de pay senedi fiyatları ile ABD Doları arasındaki ilişkiyi regresyon analizini kullanarak incelemişler, sonuç olarak; kısa dönemde daha güçlü bir etkiye sahip pozitif yönlü bir ilişkinin olduğunu tespit etmişlerdir. Soenen ve Hennigar (1988) önceki çalışmaların aksine, 1980–1986

dönemindeki aylık efektif döviz kurlarını ve pay senedi fiyatlarını kullanmışlar ve sonuç olarak, pay senedi fiyatları ile doların değeri arasında negatif bir ilişki olduğunu tespit etmişlerdir.

Ma & Kao (1990) çalışmalarında; 6 gelişmiş ülkede (İngiltere, Kanada, Fransa, Almanya, İtalya, ve Japonya) döviz kurundaki oynaklıkların pay senedi fiyatlarına etkilerini korelasyon yöntemiyle incelemişlerdir. Ocak 1973-Aralık 1983 arası verileri kullanılmıştır. Sonuç olarak; ihracatın yüksek olduğu ekonomik sistemlerde kur değerlerinin ihracat piyasalarında rekabet açısından azaltıcı etkiye sahip olmasından dolayı iç borsa üzerinde negatif etki göstermekte, bunun yanında ithalat ağırlıklı ülkelerde, döviz değişimlerinin ithalat maliyetlerini düşüreceği ve borsa üzerinde pozitif bir etkiye sebep olacağına dair bulgular elde edilmiştir.

Mukherjee & Naka (1995) çalışmalarında; altı adet makroekonomik gösterge ile Tokyo Borsası arasındaki etkileşimi araştırmışlardır. Döviz kuru ile borsa endeksi arasındaki ilişkiyi araştırmak için vektör hata düzeltme modeli kullanılmıştır. Araştırma sonucunda; para arzı ile sanayi üretim endeksi arasında ilişki olumlu yönde tespit edilirken, sanayi üretim endeksi ile enflasyon arasındaki ilişkinin yönü negatif olduğu ortaya çıkmıştır.

Ajayi, Friedman, & Mehdian (1998) çalışmalarında; 7 gelişmiş (Kanada, Almanya, Fransa, İtalya, Japonya, İngiltere ve ABD), 8 gelişmekte olan ülkede (Tayvan, Kore, Filipinler, Malezya, Singapur, Hong Kong, Endonezya, Tayland) döviz kurları ile pay senedi fiyatları arasında nedensellik olup olmadığını incelemişlerdir. Gelişmiş ülkerlerin tamamında döviz kurlarına pay senetlerinden tek yönlü bir nedenselliğin olduğu ancak gelişmekte olan ülkelerde bir nedeselliğe rastlanmadığı tespit edilmiştir.

Kwon & Shin (1999) çalışmalarında; Güney Kore'nin pay senedi getirileri üzerinde döviz kuru, üretim endeksi, ticaret dengesi ve para arzının etkisini incelemişleridir. Ocak 1980'den Aralık 1992 arası aylık pay senetleri fiyatları vektör hata düzeltme

modeli ve Granger eşbütünleşme testi ile analiz edilmiştir. Araştırma sonuçları döviz kuru, üretim endeksi, ticaret dengesi ve para arzının pay senedi fiyatları ile eşbütünleşik olduğunu, uzun dönemde değişkenler arasında dengenin sağlandığı, buna rağmen pay senedi fiyatlarının bu makroekonomik göstergeler üzerinde öncü gösterge özelliğinin olmadığı tespit edilmiştir.

Granger, Huang, & Yang, (2000) çalışmalarında; bazı Asya ülkelerinde döviz kuru ile pay senedi fiyatları arasındaki ilişkiyi incelemişlerdir. Ocak 1986-Haziran 1998 arası günlük verilerini Granger nedensellik analizi ile araştırmışlardır. Sonuç olarak Endonezya ve Japonya'da ilişki gözlenmemiş, Güney Kore'de döviz kurundan pay senedine doğru, araştırılan diğer ülkelerde ise pay senetlerinden döviz kuruna doğru ilişki olduğu tespit edilmiştir.

Wongbangpo & Sharma (2002) çalışmalarında; Endonezya, Malezya, Singapur, Filipinler ve Tayland' da pay senedi fiyatları ile döviz kuru, tüketici fiyat endeksi, para arzı, faiz oranı ve GSMH arasındaki ilişkiyi incelemişlerdir. 1985-1996 arası aylık veriler Granger nedensellik testi ile analiz edilmiştir. Çalışma sonucunda; pay senedi fiyatları ile seçilen makroekonomik parametler arasıda kısa vadede ve uzun dönemde ilişki olduğu tespit edilmiştir.

Dominguez & Tesar (2006) çalışmalarında; İtalya, Şili, Almanya, Hollanda, Japonya, Fransa,Tayland ve İngiltere olmak üzere sekiz ülkede döviz kuru ile pay senedi fiyatı arasındaki ilişkiyi, sermaye varlıkları fiyatlama modeli ile incelemişlerdir. 1980 ve 1999 yıllarını içeren döviz kurlarını ve firmaendüstri-piyasa getirisi verilerini kullanmışlardır. Sonuç olarak, hem döviz kurlarının firmalar üzerinde ölçülebilir etkileri olduğu hem de firmaların döviz kuru riskine tepki olarak davranışlarını ayarladıkları tespit edilmiştir.

Gan, Lee, Yong, & Zhang (2006) çalışmalarında; Yeni Zelanda'da pay senedi endeksinin döviz kuru, para arzı, enflasyon ve faiz oranları ile ilişkisini araştırmışlardır. 1990-2003 arası aylık

verileri analiz etmek amacıyla Johansen maksimum olasılık ve Granger nedensellik testleri kullanılmıştır. Çalışma sonucunda; pay senedi endeksinin bu makroekonomik parametreler ile uzun dönemde eşbütünleşik olduğu ancak bunlar üzerinde önemli bir etkiye sahip olmadığı tespit edilmiştir.

Çakan & Ejara (2013) çalışmalarında; gelişmekte olan Türkiye, Tayland, Brezilya, Hindistan, Endonezya, Kore, Meksika, Filipinler, Polonya, Rusya, Singapur ve Tayvan ülkelerinde döviz kuru ile pay senedi fiyatı arasındaki hareketli ilişkiyi araştırmışlardır. 31 Mayıs 1994-7 Nisan 2010 verilerinin kulanıldığı çalışmada doğrusal ve doğrusal olmayan Granger nesensellik testi yapılmıştır. Çalışma sonucunda; sadece Brezilya ve Polonya için iki yönlü nedenselliğin olduğu tespit edilmiştir.

Makeri (2014) çalışmasında; Ruanda'da pay senetleri fiyatları ile döviz kuru dalgalanmaları arasındaki ilişkiyi incelemiştir. 2011-2013 yılları arası aylık veriler Granger nedensellik testi ile analiz edilmiştir. Sonuç olarak; değişkenler arasında uzun dönemli ilişki olmadığı, ancak kısa dönemde döviz piyasasından borsa endekslerine tek yönlü güçlü bir ilişki olduğu tespit edilmiştir.

Khan & Ali (2015) çalışmlarında; Pakistan'da döviz kuru ve borsa endeksleri arasındaki ilişkiyi incelemişlerdir. Ocak 1992-Şubat 2013 dönemi verilerini GARCH ve Granger nedensellik testi ile analiz etmişlerdir. Sonuç olarak; değişkenler arasında çift yönlü nedensellik olduğu tespit edilmiştir.

Bhuvaneshwari & Ramya (2017) çalışmalarında; Hindistan'da döviz kuru ve borsa endeksleri arasındaki ilişkiyi incelemişlerdir. Ocak 2006-Haziran 2015 dönemi verilerini Johansen eşbütünleşme testi ve Granger nedensellik testi ile analiz etmişlerdir. Sonuç olarak; değişkenlerin eşbütünleşik olmadığı ancak anlamlı düzeyde ilişkili oldukları, ayrıca değişkenler arasında çift yönlü nedensellik olduğu tespit edilmiştir.

Delgado, Delgado, & Saucedo (2018) çalışmalarında; Meksika'da döviz kuru, petrol fiyatları ve borsa endeksi arasındaki ilişkiyi incelemişlerdir. Ocak 1992-Haziran 2017 dönemini aylık veriler kullanarak VAR model ile analiz etmişlerdir. Sonuç olarak döviz kurunun borsa endeksini negatif yönde anlamlı bir ilişki olduğu tespit edilmiştir.

Ncanywa & Ralarala (2019) çalışmalarında; Güney Afrika'da döviz kuru ve borsa fiyatları arasındaki ilişkiyi incelemişlerdir. 2006-2016 dönemi aylık verileri ARCH ve GARCH modelleri ile analiz edilmiştir. Sonuç olarak; döviz kuru ile borsa fiyatları arasında uzun dönemde negatif yönlü bir ilişki olduğu tespit edilmiştir.

Nguyen, Nguyen, & Nguyen (2020) çalışmalarında; döviz kuru ve petrol fiyatılarının Vietnam borsaları üzerindeki etkisini incelemişlerdir. 25 Ekim 2019-1 Ağustos 2000 arasındaki günlük verileri analiz etmek için GARCH model kullanılmıştır. Sonuç olarak petrol fiyatlarının borsa endeksleri üzerinde pozitif bir etkiye sahip olduğu ancak döviz kurunun borsa endeksleri üzerinde tutarlı bir etkisinin olmadığı tespit edilmiştir.

MATERYAL VE YÖNTEM

Gelişmekte olan ülkelerin yabancı yatırımcı potansiyelinin yüksek olması ve küresel olaylardan daha fazla etkilenmelerinden dolayı döviz kuru ile piyasa endeksi arasında bir ilişki olması beklenmektedir. Bu bağlamda çalışmada E7 ülkelerinde dolar kurları ile piyasa endeksleri arasında bir araştırma yapılmıştır. E7 ülkeleri gelişmekte olan 7 ülkeden oluşmaktadır. Tamamı G20 (Group of 20) üyesi olan ve ekonomileri hızla büyüyen bu ülkeler; Çin, Hindistan, Türkiye, Endonezya, Meksika, Brezilya ve Rusya devletlerinden oluşmaktadır. Çalışmada bu ülkelerin kullanılmasının nedeni hem bu ülkelerin dünya ekonomilerine iyi bir örneklem oluşturacağının düşünülmesinden hem de içlerinde Türkiye'nin de bulunmasından kaynaklanmaktadır. Söz konusu ülkelerin 01/2015- 02/2021 tarihleri arasındaki ABD Dolar

Kurları ve piyasa endeksleri haftalık veriler halinde www.investing.com adresinden alınıp incelenmiştir. Çalışmada kullanılan piyasa endeksleri aşağıdaki gibidir:

- Türkiye, Borsa İstanbul 100 Index (BIST100),
- Brezilya, Bolsa deValores do Estado de São Paulo Index (BOVESPA),
- Hindistan, Stock Market Index (Nifty50),
- Meksika, Índice de Precios y Cotizaciones (IPC),
- Rusya, Russia Trading System Index (RTSI),
- Çin, Shanghai Stock Exchange Composite Index (SSE),
- Endonezya, IDX Composite Index (IDX).

Ülkelerin piyasa endeksleri ve döviz kurları için kullanılan kısaltmalarına ilişkin bilgileri Tablo 1'de verilmiştir.

Tablo 1: Analizde Kullanılan Kısaltmalar Listesi

Kısaltma	**Açıklama**
GDBRZ	Brezilya döviz kuru getiri serisi
GDCIN	Çin döviz kuru getiri serisi
GDEND	Endonezya döviz kuru getiri serisi
GDHIN	Hindistan döviz kuru getiri serisi
GDMEK	Meksika döviz kuru getiri serisi
GDRUS	Rusya döviz kuru getiri serisi
GDTR	Türkiye döviz kuru getiri serisi
GEBRZ	Brezilya piyasa endeksi serisi
GECIN	Çin piyasa endeksi serisi
GEEND	Endonezya piyasa endeksi serisi
GEHIN	Hindistan piyasa endeksi serisi
GEMEK	Meksika piyasa endeksi serisi
GERUS	Rusya piyasa endeksi serisi
GETR	Türkiye piyasa endeksi serisi

Ekonometrik Yöntemler

İktisadi verilerin gerçek değerleri üzerinde değil, genellikle logaritmik değerleri üzerinde doğrusal olduğu, bu nedenle verilerin gerçek değerleri yerine logaritması alınmış değerlerin kullanılması önerilmektedir (Williams, Goodhart, & Gownland, 1976). Bu nedenle çalışmanın bu aşamasında öncelikle "$ln * (p_t/p_{t-1})$" formülü kullanılarak logaritmik getiri serileri oluşturulmuştur. Daha sonra serilerin durağanlığını test etmek amacıyla ADF (Augmented Dickey-Fuller) ve PP (Philips Pheron) birim kök testleri uygulanmıştır.

Serilerin durağanlık kontrolleri yapıldıktan sonra karşılıklı ilişki içerisinde oldukları düşünülen değişkenlerin etkileşimlerini ortaya koymak için kullanılan denklem sistemi olarak bilinen VAR model uygulanmıştır.

İktisadi olaylar, karmaşıklığı nedeniyle tek denklemli modeller yerine eşanlı denklemler yardımıyla incelenebilmektedir. Ancak eşanlı denklem sistemlerinde dışsal-içsel değişken ayrımı gibi güçlükler ortaya çıkmaktadır. Bu zorlukları aşmak için VAR Model öne sürülmüştür (Darnell, 1994). VAR analizi birbiri ile karşılıklı ilişki içerisinde bulunduğu düşünülen değişkenlerin etkileşimlerini ortaya koymak için kullanılan denklem sistemidir (Bahar, 2006). Döviz kurları ile borsa endekslerinin ilişkili olduğu düşünüldüğü için yapılan bu araştırmada kullanılan döviz kurları bağımsız değişken, borsa endeksleri ise bağımlı değişkendir. Çalışmada öncelikle döviz kurları ve borsa endeksleri haftalık zaman serileri halinde düzenlenmiş daha sonra aralarında ilişki olup olmadığını tespit etmek amaçlanmıştır. Bunun için aşağıdaki regresyon formülü uygulanmıştır.

$$y_t = \beta_0 + \beta_1 x_t + u_t$$

x = Bağımsız değişken. Ülkelerin dolar kurunu,

y = Bağımlı değişken. Ülkelerin borsa endekslerini,

u = Rassal hata terimini ifade etmektedir.

Kullanılan bu formül, değişkenlerin logaritması alındığı için **x**'teki (Döviz Kurları) %1'lik değişimin **y**'yi (Borsa Endeksleri) $\%\beta_1$ kadar etkilediğini göstermektedir (Darnell, 1994).

VAR modelin kullanılabilmesi için değişkenlerin durağan olmaları gerekmektedir. Bu nedenle ilk olarak durağanlığı sağlanan verilerin arasında ilişki olup olmadığını anlamak amacıyla VAR testi uygulanmıştır. Standart VAR tahminlemesi yapıldıktan sonra gecikme uzunluğunu belirlemek için AIC (Akaike Information Criterion), SC (Schwarz Information Criterion) ve HQ (Hannan-Quinn Information Criterion) bilgi kriterleri kullanılmıştır. Daha sonra sonuçların güvenirliğini test etmek amacıyla

durağanlık(istikrar) ve otokorelasyon testleri uygulanmıştır. Brezilya ve Hindistan' da gecikme uzunluğu 0 çıktığı için bu iki ülke analize dahil edilmemiş kalan diğer beş ülkede VAR analizi ve diğer testler yapılmıştır. VAR analizinden sonra değişkenler arasında nedensellik ilişkisinin olup olmadığını anlamak üzere nedensellik analizi yapılmış ve son olarak etki tepki analizi yapılarak değişkenlerin diğer bir değişkende bir standart sapmalık şoka verdikleri tepki analiz edilmiştir.

Analiz ve Bulgular

Logaritmik getiri serilerine ilişkin tanımlayıcı istatistiklere bakılmış ve sonuçlar aşağıdaki Tablo 2'de verilmiştir.

Tablo 2: Tanımlayıcı İstatistikler

	Ortalama	Medyan	Maks.	Min.	Standart Sapma	Jarque-Bera	Olasılık
GDBRZ	0,205	0,207	7,552	-7,342	2,047	35,350	0,000
GDCIN	-0,009	-0,012	2,890	-1,558	0,428	822,354	0,000
GDEND	0,075	0,064	7,529	-8,718	0,977	9042,577	0,000
GDHIN	0,082	0,054	4,179	-2,900	0,937	97,379	0,000
GDMEK	0,089	0,013	10,783	-6,792	1,737	614,776	0,000
GDRUS	0,156	0,027	10,257	-8,270	2,042	522,355	0,000
GDTR	0,282	0,197	23,498	-10,644	2,056	20743,210	0,000
GEBRZ	0,085	0,231	16,560	-20,922	3,247	615,596	0,000
GECIN	0,019	0,211	9,074	-14,291	2,867	241,243	0,000
GEEND	0,139	0,310	8,680	-15,690	2,392	1013,771	0,000
GEHIN	0,180	0,270	11,972	-12,956	2,371	255,146	0,000
GEMEK	0,059	0,158	7,531	-10,557	2,185	90,576	0,000
GERUS	-0,002	0,243	14,689	-23,784	3,956	418,479	0,000
GETR	0,178	0,470	8,337	-14,371	3,214	119,552	0,000

******, **, * sırasıyla %1, %5 ve %10 güven düzeyinde anlamlılığı ifade etmektedir.***

Tablo 2 incelendiğinde döviz kuru serileri içerisinde en yüksek standart sapmaya sahip ülkeler sırasıyla Türkiye, Brezilya ve Rusya olarak tespit edilmiştir. Pay piyasası serileri içerisinde en yüksek

volatiliteye sahip ülkeler sırasıyla Rusya, Brezilya ve Türkiye olarak gözlemlenmektedir. Piyasa getirileri içerisinde ortalaması en yüksek ülke Hindistan, en düşük ülke ise Rusya'dır.

Serilerin durağanlık analizi sonuçları sabitli (Model 1), sabitli ve trendli (Model 2) ve sabitsiz ve trendsiz (Model 3) olmak üzere Tablo 3'te verilmiştir.

Tablo 3: ADF ve PP Birim Kök Testi Sonuçları

	ADF Testi Sonuçlar			**PP Testi Sonuçları**		
	Model 1	**Model 2**	**Model 3**	**Model 1**	**Model 2**	**Model 3**
	Sabitli	**Sabitli ve Trendli**	**Sabitsiz ve Trendsiz**	**Sabitli**	**Sabitli ve Trendli**	**Sabitsiz ve Trendsiz**
Değişkenler	**t ist.**	**t ist.**	**t ist.**	**t ist.**	**t ist.**	**t ist.**
GDBRZ	-5,971***	-6,004***	-5,511***	-23,946***	-23,948***	-23,726***
GDCIN	-7,971****	-7,979***	-7,972***	-22,917***	-22,903***	-22,932***
GDEND	-8,640***	-8,660***	-11,142***	-21,221***	-21,212***	-21,176***
GDHIN	-22,299***	-22,300***	-22,166***	-22,333***	-22,334***	-22,224***
GDMEK	-8,699***	-8,693***	-8,567***	-24,332***	-24,314***	-24,285***
GDRUS	-7,629***	-7,622***	-8,426***	-22,613***	-22,597***	-22,601***
GDTR	-6,302***	-6,416***	-5,447***	-24,346***	-24,357***	-24,031***
GEBRZ	-15,351***	-15,391***	-15,345***	-23,990***	-24,034***	-23,994***
GECIN	-22,693***	-22,707***	-22,712***	-22,711***	-22,724***	-22,729***
GEEND	-26,343***	-26,391***	-26,268***	-26,279***	-26,332***	-26,192***
GEHIN	-23,192***	-23,195***	-23,084***	-23,221***	-23,223***	-23,083***
GEMEK	-10,834***	-10,844***	-10,809***	-25,714***	-25,706***	-25,720***
GERUS	-14,069***	-14,074***	-14,082***	-23,599***	-23,599***	-23,619***
GETR	-25,021***	-25,011***	-24,961***	-25,009***	-24,999***	-24,948***

******, **, * sırasıyla %1, %5 ve %10 güven düzeyinde anlamlılığı ifade etmektedir.***

Tablo 3 incelendiğinde değişkenlere yapılan ADF ve PP birim kök testi sonuçlarına göre değişkenlerin her üç model için seviyede durağan oldukları anlaşılmaktadır.

VAR Analizi Sonuçları

VAR analizine uygun gecikme sayısının belirlenmesi ile başlanmaktadır. Yapılan testler sonucunda Çin için en uygun gecikme uzunluğunun 4, Endonezya için en uygun gecikme uzunluğunun 11, Meksika için en uygun gecikme uzunluğunun 7, Rusya için en uygun gecikme uzunluğunun 5 ve Türkiye için en uygun gecikme uzunluğunun 2 olduğu anlaşılmaktadır.

VAR analizini yapabilmek için modelin istikrar koşulunu sağlaması gerekmektedir. Çin, Endonezya, Meksika, Rusya ve Türkiye için otoregresif karaktetistik polinomunun ters köklerinin birim çemberin içerisinde dağıldığı ve modülüs göstergelerindeki tüm sayıların 1'den küçük olduğu gözlemlenmiştir. Belirlenen uygun gecikme ile durağanlık sonucunda hem grafiksel olarak hem de durağanlık koşulu tablosuna göre sonuçlar durağanlık koşulunu sağlamaktadır.

Yapılan testler sonucunda Çin, Endonezya, Meksika, Rusya ve Türkiye için hata terimleri arasında otokorelasyon sorunu olmadığı anlaşılmıştır.

Granger Nedensellik Analizi

Granger (1969)'in geliştirdiği nedensellik testi bir değişkene ait geçmiş verilerini kullanmanın başka bir değişkenin tahmin edilebilme performansını arttıracağı varsayımına dayanmaktadır. Burada bir değişkenin cari değerlerini açıklarken başka bir değişkenin gecikmeli değerlerinin kullanılmasının bu açıklamaya katkı sağlayıp sağlamadığına bakılmaktadır. Aşağıda analize dahil edilen beş ülkenin nedensellik analizi sonuçları her ülke için ayrı ayrı verilmiştir.

Tablo 4: Nedensellik Analizi Sonuçları

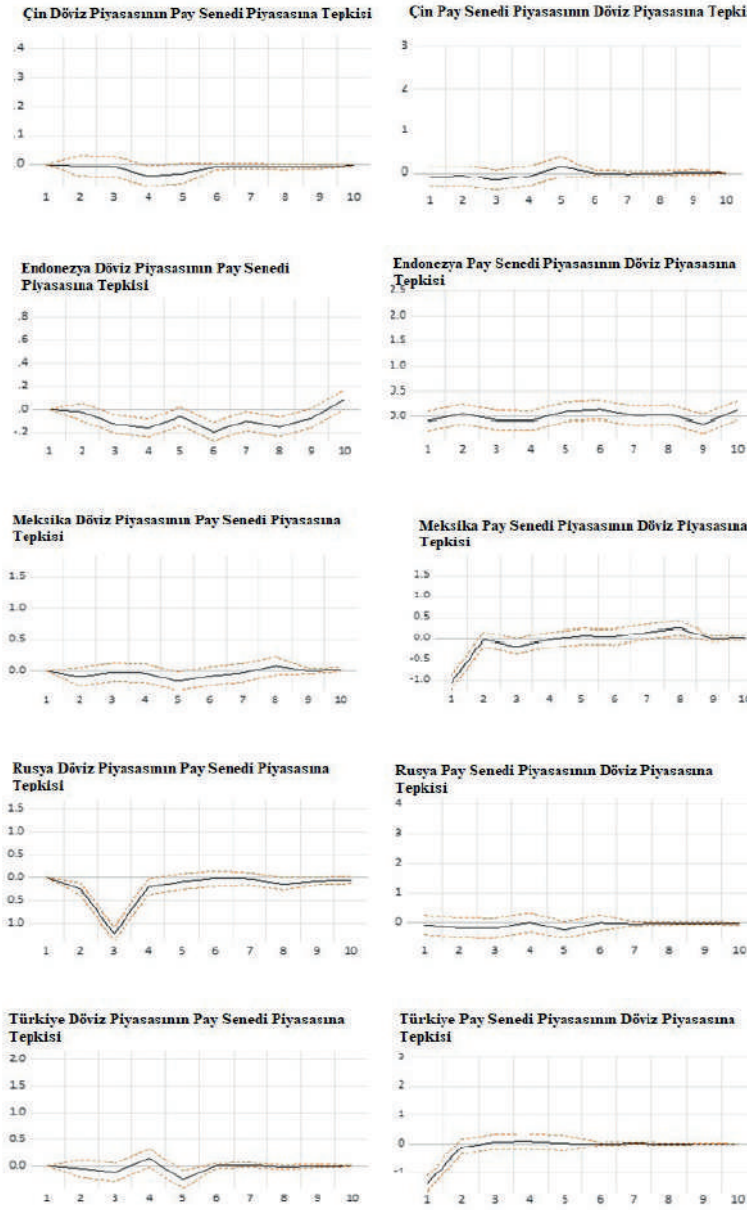
Çin Döviz kuru ve pay piyasası Nedensellik İlişkisi		
Bağımlı Değişken: GDCIN		
	Chi-sq	**Olasılık**
GECIN	7,932	0,094*
Bağımlı Değişken: GECIN		
	Chi-sq	**Olasılık**
GDCIN	4,230	0,376
Endonezya Döviz kuru ve pay piyasası Nedensellik İlişkisi		
Bağımlı Değişken: GDEND		
	Chi-sq	**Olasılık.**
GEEND	84,313	0,000***
Bağımlı Değişken: GEEND		
	Chi-sq	**Olasılık.**
GDEND	9,527	0,573
Meksika Döviz kuru ve pay piyasası Nedensellik İlişkisi		
Bağımlı Değişken: GDMEK		
	Chi-sq	**Olasılık.**
GEMEK	9,130	0,243
Bağımlı Değişken: GEMEK		
	Chi-sq	**Olasılık.**
GDMEK	19,540	0,007***
Rusya Döviz kuru ve pay piyasası Nedensellik İlişkisi		
Bağımlı Değişken : GDRUS		
	Chi-sq	**Olasılık.**
GERUS	362,188	0,000***
Bağımlı Değişken: GERUS		
	Chi-sq	**Olasılık.**
GDRUS	6,303	0,278
Türkiye Döviz kuru ve pay piyasası Nedensellik İlişkisi		
Bağımlı Değişken: GDTR		
	Chi-sq	**Olasılık.**
GETR	14,219	0,007***
Bağımlı Değişken: GETR		
	Chi-sq	**Olasılık.**
GDTR	3,516	0,475

******, **, * sırasıyla %1, %5 ve %10 güven düzeyinde anlamlılığı ifade etmektedir.***

Tablo 4 incelendiğinde Çin döviz kuru piyasalarından Çin pay piyasalarına doğru bir nedensellik olmadığı fakat pay piyasalarından döviz kuruna %10 anlamlılık düzeyinde bir nedenselliğin olduğu anlaşılmaktadır. Endonezya nedensellik tablosu inceleğinde; döviz kurundan pay piyasalarına doğru bir nedenselliğin olmadığı ancak pay piyasalarından döviz kuruna doğru %1 anlamlılık düzeyinde bir nedenselliğin olduğu anlaşılmaktadır. Meksika döviz kuru piyasasından pay senedi piyasasına doğru %1 anlamlılık düzeyinde bir nedenselliğin olduğu ancak pay senedi piyasasından döviz piyasasına bir nedenselliğin olmadığı anlaşılmaktadır. Rusya nedensellik tablosu incelendiğinde döviz kurundan pay piyasasına nedenselliğin olmadığı ancak pay piyasalarından döviz piyasalarına %1 anlamlılık düzeyinde bir nedenselliğin olduğu anlaşılmaktadır. Türkiye nedensellik tablosu incelendiğinde döviz kurundan pay piyasasına nedenselliğin olmadığı ancak pay piyasalarından döviz piyasalarına %1 anlamlılık düzeyinde bir nedenselliğin olduğu anlaşılmaktadır.

Etki-Tepki Analizi

VAR/VECM modeli çerçevesinde tahmin edilen etki-tepki analizi, belirli bir zaman diliminde meydana gelen şokun değişkenlerin gelecekteki değerlerine etki edip etmediğini ölçen etki-tepki fonksiyonunun tahmini ile yapılmaktadır (Pesaran&Shin,1998). Aşağıda her ülke için ayrı ayrı analiz sonuçları verilmiştir.



Şekil 1: Döviz Piyasası ve Pay Senedi Piyasası Etki-Tepki Analizi Sonuçları

Şekil 1 incelendiğinde Çin piyasalarında etki tepki analizlerinden elde edilen sonuçlara göre her iki piyasa için de anlamlı bir sonuç olmadığı ortaya çıkmıştır. Endonezya piyasalarında etki tepki analizlerinden elde edilen sonuçlara göre döviz piyasasında 2. dönem başlayıp 9. döneme kadar anlamlı bir tepki olduğu gözlenmekte fakat pay senedi piyasasından döviz piyasasına anlamlı bir tepki olmadığı görülmektedir. Meksika piyasalarında etki tepki analizlerinden elde edilen sonuçlara göre döviz piyasasında anlamlı bir tepki olmadığı ancak pay senedi piyasasında 1. dönemden 2. döneme kadar negatif bir tepki olduğu anlaşılmaktadır. Rusya piyasalarında etki tepki analizlerinden elde edilen sonuçlara göre döviz piyasasında 1. dönemden 4. döneme kadar pay senedi piyasasına doğru negatif yönlü bir tepki olduğu anlaşılmaktadır. Pay piyasalarından döviz piyasalarına anlamlı bir tepki olmadığı ortaya çıkmıştır. Türkiye piyasalarında etki tepki analizlerinden elde edilen sonuçlara göre döviz piyasasında 5. dönemin ortasında pay senedi piyasasına doğru negatif yönlü bir tepki olduğu ve bu tepkinin 6. dönemden sonra kaybolduğu anlaşılmaktadır. Pay piyasalarından 1. dönemden 2. dönemin ortalarında kadar döviz piyasalarına doğru anlamlı bir tepki olduğu anlaşılmaktadır.

SONUÇ

Bu çalışma E7 ülkelerindeki döviz kurları değişimlerinin ilgili ülkelerin borsa endeksleri üzerinde etkisi olduğu düşünülerek yapılmıştır. Yapılan test ve analizlerde E7 ülkelerindeki diğer değişkenler (savaş, salgın, devalüasyon vb.) göz ardı edilip sadece döviz kurları ile borsa endeksleri arasındaki ilişki araştırılmıştır.

VAR analizi sonuçları; Brezilya ve Hindistan haricinde diğer ülkelerde döviz kuru ve borsa endeksleri arasında bir ilişkinin olduğunu göstermektedir. İncelenen literatüre göre; Ayvaz (2006), Gül & Ekinci (2006), Akçalı, Mollaahmetoğlu, & Altay (2019), Özer, Kaya & Özer (2011), Cingöz & Kendirli (2019), Kwon & Shin (1999), Gan, Lee, Yong & Zhang (2006) yaptıkları çalışmaların sonuçlarının bu çalışmayı destekler niteliktedir

Nedensellik analizi sonuçları Meksika'da döviz piyasasından pay piyasalarına doğru diğer ülkelerde pay piyasalarından döviz piyasalarına doğru bir nedenselliğin olduğunu göstermiştir. İncelenen literatürde; Kendirli & Çankaya, (2016), Cingöz & Kendirli, (2019), Granger, Huang, & Yang, (2000), Wongbangpo & Sharma, (2002), Çakan & Ejara, (2013), Makerı, (2014), Khan & Ali, (2015), Bhuvaneshwari & Ramya, (2017) yaptıkları çalışmalarının sonuçlarının da bu çalışmayı destekler nitelikte döviz piyasası ve pay piyasası arasında bir nedensellik ilişkisi olduğnnu göstermiştir.

Etki tepki analizi sonuçları ise genel olarak döviz piyasaları ve pay piyasalarının ilişkili olduklarını fakat ilişkinin genellikle uzun vadede kaybolduğunu göstermektedir.

Analiz sonuçları E7 ülkelerinde döviz kurları ve borsa endekslerinin uzun vadede birbirleri ile ilişkili olduklarını ortaya koymaktadır. Yatırımcılar döviz piyasasında/ pay piyasasında meydana gelecek beklenmedik bir şok karşısında pay piyasasının/ döviz piyasasının buna nasıl tepki vereceğini bilirlerse portföylerindeki yatırım araçlarının seçiminde daha temkinli olabilirler. Özellikle uluslararası portföy yatırımcılarının piyasa algılarının önemli olması ve beklenmedik şoklardan gelişmekte olan ülkelerin daha fazla etkilenmesi yatırımcıların portföylerini olumsuz etkileyeceğinden çalışmanın bu bağlamda yatırımcılara yol göstereceği düşünülmektedir. Bunun yanı sıra çalışmanın örnekleminde yer alan ülkelerdeki sermaye piyasası düzenleyicilerinin piyasayı etkileyebilecek faktörlerin belirlenmesi sayesinde yapılacak yeni regülasyonlara da katkı sağlaması beklenmektedir

Bu sonuçlar ışığında, ilgili ülkelerde olağan dışı bir durum olmadığı varsayılırsa; yatırımcıların, yatırımlarını olumlu etkileyebilecek ipuçlarına ulaşabilmeleri, şirketlerin ise döviz piyasalarından ne derece etkilendiklerini öngörebilmeleri amacıyla bu değişkenler arasındaki ilişkiyi uzun vadede detaylı analiz etmeleri önerilmektedir.

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CHAPTER 3

Faiz Oranı, Ülke Kredi Riski ve Döviz Kurunun Turizm Hisselerine Etkisi: Gelişmekte Olan Ülke Türkiye Örneği (Borsa İstanbul Turizm Endeksinde Bir Uygulama)

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1. GİRİŞ

Teknolojik gelişmeler bilgiye erişimi kolaylaştırmakla birlikte, hızla ulaşılan bilgi ekonomik ve finansal piyasaların hareketlerinde belirleyici unsurlardan birisi haline gelmiştir. Öyle ki açıklanan bir bilginin finans ve sermaye piyasalarına etkileri anlık olabildiği gibi belirli bir süre boyunca ilgili bilginin gerek doğrudan gerek dolaylı olarak finansal varlıklara etkileri gözlenmektedir.

1 Isparta Uygulamalı Bilimler Üniversitesi

Finansal piyasalarda yaşanan gelişmeler, piyasanın tüm taraflarının piyasa ve varlık hareketlerinin anlaşılması konusunda özel bir önem vermeleri gerekliliği sonucunu doğurmuştur. Piyasaya yansıyan bilgiler ve ekonomideki gelişmeler, herhangi bir sektörün maliyetlerine etki edebildiği gibi doğrudan veya dolaylı olarak faaliyet sonuçlarını da etkilemektedir. Yüksek riskli varlıklardan olan pay senedine yatırım yapanların, hisse değerlerini etkileyen mikro ve makro faktörleri yakından takip etmeleri ve yatırım kararlarında gelişmeleri dikkate almaları gerekmektedir. Dolayısıyla yatırımcılar, politika yapıcılar ve ilgili diğer paydaşlar açısından ekonomik ve finansal değişkenler arasındaki ilişkilerin anlaşılması önemli bir konudur.

Hizmetler sektöründen biri olan turizm sektörü yaşanan gelişmelerden doğrudan ve derin bir biçimde etkilenen sektörlerin başında gelmektedir. Yapılan çalışmalar, hisse senedi piyasalarında yaşanan hareketlerin işletme ve sektöre özgü birçok mikro unsurun yanında makroekonomik faktörlerden etkilendiğini göstermektedir. Enflasyonun satın alma gücüne olan etkisi görece lüks tüketim sayılan turizm ürününe olan talebi negatif etkilerken, para politikası kararlarının döviz kurlarına etkisi dış talebi pozitif yönde etkileyebilmektedir. Dolayısıyla yüksek düzeyde makroekonomik koşullardan etkilenen turizm sektörü hisse senetlerinin makroekonomik faktörlerle olan ilişkisi yatırım kararlarının da belirleyicisi olabilmektedir.

Bu çalışmada makroekonomik faktörlerden gösterge faiz (Türkiye 2 yıllık devlet tahvil faizi), Türkiye'nin kredi riski göstergesi olan 5 yıllık kredi temerrüt takası primi (Credit Default Swap – CDS), turizm sektörünün başlıca pazarlarını kapsayan Avrupa Birliği'nin ortak para birimi olan avro kuru, reel ekonomi ve finansal piyasalar açısından yüksek etkili olan ve öneme sahip Amerikan doları ile turizm sektörü hisseleri ilişkilerinin incelenmesi amaçlanmıştır. Amaç doğrultusunda çalışmada aylık gözlemlerde uzun ve kısa dönemli ilişkiler eşbütünleşme ve nedensellik analizleriyle incelenmiş, etki – tepki analizi ve

varyans ayrıştırma testiyle de değişkenlerin turizm endeksine etkileri belirlenmeye çalışılmıştır. Çalışma amacı doğrultusunda dört bölümden oluşmaktadır. Giriş bölümünün ardından ikinci bölümde ilgili literatür özetlenmiştir. Üçüncü bölümde çalışma yöntemi açıklanarak bulgular sunulmuştur. Son olarak elde edilen bulgulardan hareketle ilgili taraflara önerilerin yer aldığı sonuç bölümüyle çalışma sonlandırılmıştır.

2. LİTERATÜR

Konuyla ilgili literatür incelendiğinde borsa getirisine etki eden birçok unsurun tespit edildiği ve tespit edilen bu unsurlarla ilgili birçok sektörde incelemelerin yapıldığı görülmektedir. Ülke borsalarına yönelik yapılan çalışmalar ağırlıklı olmakla birlikte belirli sektörler üzerine yoğunlaşan çalışmalar da söz konusudur. Ancak gerek yapısı itibariyle gerek arz ve talep yönlü farklılıkları nedeniyle turizm sektörü diğer birçok sektörden elde edilen getiriler ve bu getirileri etkileyen faktörler açısından da farklılaşabilmektedir. Bu kapsamda bu bölümde özellikle turizm sektörüyle ilgili ulaşılan çalışmalar kısaca özetlenmektedir. Ayrıca makroekonomik değişkenler ve çeşitli finansal araçlarla hisse senedi ilişkilerini tespit etmeye yönelik yapılan çeşitli çalışmalar bölüm ekinde sunulmuştur.

Eyüboğlu ve Eyüboğlu (2018) BİST100 ve BİST'te oluşturulan 23 sektör endeksleriyle dolar ve avro kurlarının ilişkisini 03.01.2011 – 26.05.2016 dönemi günlük verilerinde ARDL modeli ile incelemişlerdir. Elde edilen bulgular avro kuru ile tekstil-deri endeksi arasında, dolar kurunda ise tekstil-deri, ticaret ve teknoloji endeksleri arasında uzun dönemli ilişkili olduğunu göstermektedir. Döviz kurlarıyla üç endeks arasında kısa dönemde negatif, uzun dönemde ise pozitif ilişki tespit edilmiştir. Uzun dönem ilişki tespit edilmeyen endekslerle dolar kuru ve avro kuru arasındaki kısa dönemli ilişkide endekslerin döviz kurlarından negatif etkilendiği gözlenmiştir. Çalışmada ayrıca ağırlıklı olarak döviz kurlarından endekslere doğru tek yönlü nedensellik tespit

edilmiştir. Ulaştırma ve turizm sektörlerine yönelik bulgular incelendiğinde, bu sektörlerle döviz kurları arasında uzun dönemli bir ilişkinin olmadığı belirlenmiştir. İlgili sektörlerde kısa dönemli ilişkiler açısından dolar ve avro kurunun negatif anlamlı etkilerinin olduğu gözlenmiştir. Ayrıca hem dolar kurundan hem de avro kurundan ulaştırma ve turizm endekslerine doğru tek yönlü nedensellik saptanmıştır.

Kiracı (2019) yaptığı çalışmada BİST turizm endeksi, dolar kuru, dolar endeksi ve petrol fiyatları arasındaki nedensellik ilişkisini 01.01.2003 – 24.07.2018 dönemi günlük verilerinde Granger nedensellik ve Hatemi-J asimetrik nedensellik testleriyle incelemiştir. Elde edilen bulgular, BİST turizm endeksinden dolar kuru ve petrol fiyatlarına doğru tek yönlü, dolar endeksinden BİST turizm endeksine doğru tek yönlü Granger nedensellik olduğunu göstermektedir. Çalışmada ayrıca dolar kurundaki pozitif (negatif) şoklardan BİST turizm endeksindeki pozitif (negatif) şoklara, BİST turizm endeksindeki negatif şoklardan petroldeki negatif şoklara doğru nedensellik ilişkisi saptanmıştır.

Soyaslan (2019) BİST turizm endeksi, dolar kuru ve avro kuru arasındaki ilişkileri incelemiştir. Değişkenler arasındaki kısa ve uzun dönemli ilişkiler Johansen eşbütünleşme ve varyans ayrıştırma testleriyle 02.01.2015 – 30.03.2018 dönemi günlük verilerinde incelenmiştir. Elde edilen bulgular döviz kurlarıyla turizm endeksi arasında uzun dönemli ilişkinin olmadığı, kısa dönemde ise avro ve zayıf olmakla birlikte dolar kurunun turizm endeksinde etkili olduğu yönündedir. Ayrıca turizm endeksinde oluşan değişimlerin %15,22 seviyesinde avro ve %9,44 seviyesinde ise dolar kurundan kaynaklandığı belirlenmiştir.

Gencer Celik (2020) çalışmasında BİST'te işlem gören turizm işletmeleri hisselerine döviz kuru riskinin etkisini belirlemeyi amaçlamıştır. Hisse senedi getirileri volatilite hesaplamasında GARCH, TARCH ve EGARCH modellerinden yararlanılan çalışmada 02.01.2002 – 13.04.2020 dönemi günlük verileri analiz

edilmiştir. Döviz kuru riskinin turizm işletmeleri hisse senedi getirilerine etkisinin işletme bazında farklılaştığı (üç işletmeyi pozitif, iki işletmeyi negatif etkilediği), turizm işletmeleri hisse getirilerinin cari volatilitesi tahmininde zamana bağlı bileşenlerin daha önemli olduğu, hisse getirileri volatilitesinin yüksek düzeyde kalıcı olduğu, volatilitenin piyasadaki geçmiş dönem şoklarından daha fazla geçmiş dönem volatiliteden etkilendiği ve son olarak şokların volatilite üzerinde asimetrik etkisi olduğu sonuçlarına ulaşılmıştır.

BİST ulaştırma endeksi, dolar endeksi ve petrol fiyatları arasındaki ilişki Kiracı (2020) tarafından 03.01.2000 – 24.07.2018 dönemi günlük verilerinde Granger nedensellik ve Hatemi-J asimetrik nedensellik testleriyle incelenmiştir. Çalışma, dolar endeksinden BİST ulaştırma endeksine tek yönlü nedensellik, dolar endeksindeki negatif şoklardan BİST ulaştırma endeksindeki negatif şoklara tek yönlü nedensellik, BİST ulaştırma endeksindeki pozitif şoklardan dolar endeksindeki pozitif şoklara doğru nedenselliğin olduğunu, petrol fiyatlarındaki pozitif (negatif) şoklardan BİST ulaştırma endeksindeki pozitif (negatif) şoklara doğru nedensellik olduğunu göstermektedir.

Özçalık ve Güler Özçalık (2020) BİST turizm endeksi, dolar kuru, avro kuru arasındaki ilişkiyi 2010:01 – 2019:09 dönemi aylık verilerinde VAR modeliyle analiz etmişlerdir. Döviz kurlarıyla turizm endeksi arasında nedensellik ilişkisinin saptandığı çalışmada, uzun dönemli ilişki tespit edilmemiştir. Ayrıca, Amerikan dolarının turizm endeksini etkileyen en önemli unsurlardan biri olduğu belirlenmiştir.

Yıldırım, Ögel ve Alhajrabee (2020) makroekonomik göstergelerin hisse senedi getirilerine etkilerini incelemeyi amaçladıkları çalışmada, BİST turizm endeksiyle dolar kuru, CDS primi ve VIX endeksi ilişkilerini test etmişlerdir. Çalışmada 2010:03 – 2020:02 dönemi aylık gözlemler VAR modeli ile analiz edilmiştir. Ulaşılan sonuçlar, CDS'den turizm endeksine tek yönlü Granger nedensellik ilişkisinin bulunduğunu; ayrıca dolar ve CDS'nin BİST turizm endeksi üzerinde kısa dönemli negatif etkisi olduğunu göstermektedir.

Demirkale ve Can (2021), BİST turizm endeksi, dolar kuru, faiz oranı, petrol fiyatı arasındaki ilişkiyi araştırmayı amaçladıkları çalışmada VAR modeline dayalı etki-tepki ve VAR Granger nedensellik testleriyle 2008:01 – 2020:12 dönemi aylık gözlemlerinde analiz etmişlerdir. Turizm endeksinin dolar şokuna pozitif tepki verdiği, faiz oranının ise turizm endeksindeki etkisinin 4. döneme kadar zayıf negatif yönde olduğu, petrol fiyatlarının ise endekse etkisinin zayıf pozitif yönde olduğu belirlenmiştir.

Yılmaz ve Çelik (2022) Amerikan doları ve BİST hizmet endeksi arasındaki nedensellik ve uzun dönemli ilişkileri 2003:01 – 2022:03 dönemi aylık verilerinde incelemişlerdir. Değişkenler arasındaki uzun dönemli ilişki ARDL sınır testiyle, nedensellik ilişkisi ise Granger nedensellik testiyle ölçülmüştür. Çalışmada, dolar kuru ve hizmet endeksi arasında uzun dönemli ilişki tespit edilirken, döviz kurundan hizmet endeksine tek taraflı bir nedensellik tespit edilmiştir.

Turizm sektörü örneğinde yapılan çalışmalar incelendiğinde genel olarak döviz kurlarının etkileri ve döviz kurlarıyla turizm hisseleri arasındaki ilişkiler belirlenmeye çalışılmıştır. Turizm örneği dışında konuyla ilgili yapılan çalışmalarda, diğer sektörler ve ülkeler örnekleminde hisse senetleri, piyasa endeksleri ile finansal araçlar ve makroekonomik değişkenlerle ilişkiler araştırılan başlıca konulardandır. Özellikle çalışmada incelenen makroekonomik değişkenlerin hisse senedi endeksleriyle ilişkilerini inceleyen çalışmalara yönelik özet bilgiler Ek 1'de tablolaştırılmıştır.

3. YÖNTEM

3.1. Veri ve Değişkenler

Bu çalışmada turizm sektörü borsa endeksiyle faiz oranı, ülke kredi risk primi ve döviz kurları arasındaki ilişkilerin tespit edilmesi amaçlanmaktadır. Bu amaçla Borsa İstanbul'da işlem gören turizm işletmelerinin dahil olduğu BİST Turizm endeksiyle Türkiye 2 yıl vadeli tahvil faiz oranı, Türkiye 5 yıllık kredi temerrüt takası (Credit

Default Swap-CDS) primi, avro kuru ve dolar kuru değişkenleri arasındaki ilişkiler incelenmiştir.

Yatırımcıların takip etmesi gereken gösterge tahvil, sermaye piyasalarında ortalama vadesi 2 yıl olan tahvildir. Piyasalarda en fazla işlem gören tahvil olmakla birlikte bir ekonomi hakkında önemli bilgiler sunmaktadır, öyle ki yurt içi ve yurt dışı piyasalardaki gelişmelerden doğrudan etkilenmektedir (Özpınar, Özman ve Doru, 2018: 40). Piyasa faiz oranlarının artması işletme maliyetleri ve ekonomik faaliyetlere yaptığı etkiler sebebiyle işletme kârlarını etkileyebildiği gibi, sermaye piyasalarında yatırımcıların tahvil piyasalarına yönelmesiyle hisse değerlerini de etkilemektedir (Coşkun, Kiracı ve Muhammed, 2016: 63). Belirtilen nedenlerle gösterge faiz oranı çalışmada bağımsız değişken olarak dahil edilmiştir. Ülke kredi riski olarak IMF raporları ile kredi derecelendirme kuruluşları notlarının yanı sıra özellikle son yıllarda kredi temerrüt takası önemli bir gösterge olarak kabul edilmektedir (Ersan ve Günay, 2009; Çonkar ve Vergili, 2017; Kılcı, 2017; Özpınar vd., 2018). Borcun ödenmeme riskine karşı korunmak için alacaklı tarafından yapılan bir tür sigorta işlemi olan CDS, kredi riskini transfer eden türev araçlardandır (Çonkar ve Vergili, 2017: 60). Ülke ekonomisi ve piyasalarla ilgili koşulları yansıtan ve oluşabilecek şoklardan etkilenen CDS primleri, piyasaları etkileyebilecek bütün risk faktörlerini kapsadığından, gelecekle ilgili varlık fiyatlarını etkileyebilecek etkenler CDS primlerine yansımaktadır. Ayrıca kredi riskindeki değişimlerin öngörülmesinde erken uyarı sinyali olarak da işlev görmektedir (Senol, 2021: 112; 124). Turizm endeksiyle ilişkisi incelenen ikinci değişken olarak Türkiye 5 yıllık CDS primi dahil edilmiştir. Türkiye'ye yönelik turizm talebi özellikle Avrupa Birliği ülkeleri, Rusya ve Orta Doğu ülkelerindendir. Ayrıca Türkiye için önemli ticari partner olan Avrupa Birliği ülkeleri, Türkiye'de rezerv para birimi olarak Amerikan dolarının yanı sıra avro kurunu önemli bir döviz kuru haline getirmektedir. Bu kapsamda avro ve dolar kurları turizm endeksiyle ilişkisi incelenen döviz kurları olarak çalışmaya dahil edilmiştir.

Çalışmada 2009:01 – 2022:06 dönemi aylık verileri analiz edilmiştir. Turizm endeksi, faiz oranı, CDS primi değişkenlerine ilişkin seriler tr.investing.com adlı internet sitesinden, döviz kuru serileri ise T.C. Merkez Bankası Elektronik Veri Dağıtım Sistemi (EVDS)'nden elde edilmiştir. Doğal logaritmaları alınarak dağılımı normale yaklaştırılan değişkenlere ilişkin tanımlayıcı istatistikler Tablo 1'deki gibidir.

Tablo 1. Tanımlayıcı İstatistikler

	LNTUR	LNFAİZ	LNCDS	LNAVRO	LNDOLAR
Ortalama	4,448	2,407	5,549	1,352	1,151
Medyan	4,221	2,336	5,472	1,155	1,052
Maksimum	6,186	3,198	6,731	2,890	2,833
Minimum	3,439	1,637	4,797	0,656	0,354
Standart Sapma	0,633	0,352	0,410	0,587	0,650
Çarpıklık	1,536	0,541	0,562	0,825	0,659
Basıklık	4,287	2,637	2,564	2,609	2,394
Jarque-Bera	74,880	8,783	9,811	19,388	14,201
Olasılık	0,000	0.012	0.007	0.000	0.001
Gözlem sayısı	162	162	162	162	162

Değişkenlerin logaritmik değerlerine ilişkin tanımlayıcı istatistiklerin yer aldığı Tablo 1 incelendiğinde en düşük oynaklığa sahip değişkenin faiz oranı (0,352) olduğu gözlenmiştir. En yüksek oynaklığa sahip değişken ise dolar kuru (0,650) değişkenidir. Zaman serilerinde normal dağılımı ölçen Jarque-Bera sonuçları (olasılık <,05) incelendiğinde değişkenler normal dağılım sergilememektedir.

3.2. Analiz ve Bulgular

Değişkenler arasındaki ilişkilerin incelenmesi öncesinde serilerde durağanlığın test edilmesi gerekmektedir. Bu kapsamda değişkenlerin durağanlığı Genişletilmiş Dickey-Fuller (Augmented Dickey Fuller-ADF) ve Philips-Perron (PP) birim kök testleriyle incelenerek sonuçlar Tablo 2'de sunulmuştur.

Tablo 2. ADF ve Philips-Perron Birim Kök Test Sonuçları

	ADF*		PP*	
LNTUR	-0,2164 (,9326)	-0,8984 (,9527)	-0,3052 (,9202)	-0,9913 (,9414)
ΔLNTUR	-11,4118 (,0000)	-11,4144 (,0000)	-11,3815 (,0000)	-11,3782 (,0000)
LNFAİZ	-1,1561 (,6926)	-3,0262 (,1284)	-1,3516 (,6047)	-3,1378 (,1012)
ΔLNFAİZ	-11,3183 (,0000)	-11,4409 (,0000)	-11,3146 (,0000)	-11,4174 (,0000)
LNCDS	-1,5258 (,5182)	-3,5559 (,0370)	-1,5368 (,5125)	-3,5647 (,0361)
ΔLNCDS	-12,9117 (,0000)	-13,1215 (,0000)	-12,9106 (,0000)	-13,1505 (,0000)
LNAVRO	2,8997 (1,0000)	-0,3871 (,9873)	3,1973 (1,0000)	-0,1009 (,9945)
ΔLNAVRO	-8,8002 (,0000)	-9,6097 (,0000)	-8,4701 (,0000)	-8,7899 (,0000)
LNDOLAR	2,8620 (1,0000)	-0,7698 (,9653)	3,1976 (1,0000)	-0,3311 (,9892)
ΔLNDOLAR	-8,6296 (,0000)	-9,4296 (,0000)	-8,1020 (,0000)	-8,3334 (,0000)

*t-istatistik değerleridir, olasılık (p) değerleri parantez içinde yer almaktadır.

Birim kök testlerine ilişkin ADF ve PP test sonuçlarının yer aldığı Tablo 2 incelendiğinde, değişkenlerin düzey değerlerinde birim kök içerdiği diğer ifadeyle durağan olmadığı gözlenmiştir. Değişkenlerin birinci farklarına (Δ) yönelik t-istatistik sonuçları incelendiğinde, seriler birinci farkta durağanlaşmakta, birim kök içermemektedir. Tüm değişkenlerin aynı dereceden, I(1) düzeyinde, entegre olması değişkenler arasında uzun dönemli bir ilişkinin olabileceğine işaret etmektedir.

3.2.1. Johansen Eşbütünleşme Testi

Aynı dereceden entegre olan değişkenlerin uzun dönemli bir ilişki içinde olup olmadığının incelenmesi amacıyla eşbütünleşme testi uygulanmaktadır. Birim kök içeren ve aynı derecede (I(1)) entegre olan değişkenlerde uzun dönem denge ilişkileri tek değişkenli modellerde Engle-Granger yaklaşımıyla incelenirken, birden çok bağımsız değişkenin olduğu modellerde Johansen eşbütünleşme analiziyle incelenmektedir (Mert ve Çağlar, 2019). Çalışmada tüm değişkenlerin birinci farkta (I(1)) tümleşik olmaları ve birden fazla bağımsız değişkenin bulunması nedeniyle değişkenler arasındaki eşbütünleşme ilişkisi Johansen eşbütünleşme testiyle incelenmiştir.

Tablo 3. Johansen Eşbütünleşme Testi Sonuçları

Yokluk Hipotezi	İz İstatistiği	,05 için kritik değeri	p
Eşbütünleşme yoktur	60,01948	69,81889	0,2348
En çok 1 eşbütünleşme vardır	33,31396	47,85613	0,5395
En çok 2 eş bütünleşme vardır	18,45653	29,79707	0,5325
En çok 3 eşbütünleşme vardır	8,837470	15,49471	0,3806
En çok 4 eş bütünleşme vardır	1,501783	3,841465	0,2204
Yokluk Hipotezi	**Mak. Özdeğer**	**,05 için kritik değeri**	**p**
Eşbütünleşme yoktur	26,70551	33,87687	0,2794
En çok 1 eşbütünleşme vardır	14,85743	27,58434	0,7594
En çok 2 eş bütünleşme vardır	9,619065	21,13162	0,7796
En çok 3 eşbütünleşme vardır	7,335687	14,26460	0,4502
En çok 4 eş bütünleşme vardır	1,501783	3,841465	0,2204

Johansen eşbütünleşme testi öncesinde VAR modeli kurularak optimal gecikme uzunluğu tespit edilmektedir. Optimal gecikme uzunluğunun belirlenmesinde literatürde de en fazla kullanılan LR testi, son tahmin hatası (FPE), Akaike Bilgi Kriteri (AIC) ve Hannan-Quinn (HQ) Bilgi Kriteri baz alınarak optimal gecikme uzunluğunun 2 olduğu tespit edilmiştir. Gecikme uzunluğu tespit edildikten sonra uygulanan Johansen eşbütünleşme testinde eşbütünleşmenin olup olmadığı Tablo 3'te yer alan iz istatistiği ve maksimum özdeğer ile belirlenmiştir.

Johansen eşbütünleşme test sonuçlarının yer aldığı Tablo 3 incelendiğinde, iz istatistiği ve maksimum özdeğere göre; BİST turizm endeksi, faiz oranı, CDS primi, avro kuru ve dolar kuru arasında uzun dönemde eşbütünleşme tespit edilmemiştir. Diğer ifadeyle değişkenler uzun dönemde birlikte hareket etmemekte,

uzun dönemde bir denge yoktur. Çalışmada ulaşılan bu bulgu BİST turizm endeksi özelinde Eyüboğlu ve Eyüboğlu (2018), Soyaslan (2019) ile Özçalık ve Güler Özçalık (2020)'ın çalışmalarını desteklemektedir.

İncelenen değişkenler arasında bir eşbütünleşme bulunmadığından hata düzeltme modeli uygulanmamıştır. Uzun dönem ilişkilerin dışında değişkenler arasındaki kısa dönemli bir ilişkinin olup olmadığı ise Granger nedensellik testiyle incelenmektedir. Ayrıca değişkenler arasındaki ilişkiler etki-tepki analizi ve varyans ayrıştırma testiyle incelenmiştir.

3.2.2. Granger Nedensellik Analizi

Bir zaman serisinin taşıdığı bilgi miktarının bir bölümü başka bir zaman serisinin geçmiş değerlerinden elde ediliyorsa iki seri arasında bir nedensellik ilişkisi olabilmektedir. Sosyal bilimler açısından herhangi bir nedenin bir sonuca yol açması nedensellik kavramının tanımıdır ve neden sonuç ilişkisi bağlamında ifade edilir. Ekonometrik açıdan nedensellik kavramı ise Granger (1969) tarafından literatüre kazandırılmıştır. Temelinde bir değişkenin cari dönemdeki değeri açıklanırken başka bir değişkenin gecikmeli değerleri bu değişkenin açıklanmasına katkı sağlıyorsa değişkenler arasında bir nedensellik olduğu söylenebilmektedir. Belirli bir modelde *y* değişkeninin gecikmeli değerlerinin yanında *x* değişkeninin gecikmeli değerleri de eklendiğinde modelin açıklama gücü artıyorsa "*x y*'nin Granger nedenidir" şeklinde ifade edilir. *x* ve *y* gibi iki değişken için Granger nedensellik denklemleri Eşitlik 4a ve 4b'de gösterildiği gibidir (Mert ve Çağlar, 2019: 339-340).

$$y_t + \alpha_0 x_t = \delta_1 + \sum_{i=1}^{n} \alpha_i x_{t-i} + \sum_{k=1}^{m} \theta_k y_{t-k} + e_{yt} \qquad \textbf{(4a)}$$

$$x_t + \vartheta_0 x_t = \delta_2 + \sum_{i=1}^{n} \gamma_i x_{t-i} + \sum_{k=1}^{m} \vartheta_k y_{t-k} + e_{xt} \qquad \textbf{(4b)}$$

Eğer eşitlik 4a ve 4b'de $\alpha_0 = \vartheta_0 = 0$ ise basit nedensellik modeli geçerlidir. Burada sıfır hipotezi (H_0), $\sum_{i=1}^{n} \alpha_i = 0$ "x_t, y_t'nin nedeni değildir"; alternatif hipotez ise $\sum_{i=1}^{n} \alpha_i \neq 0$ "x_t, y_t'nin nedenidir" şeklindedir. İki değişken kurulan bir nedensellik denkleminden dört farklı sonuca ulaşılmaktadır (Mert ve Çağlar, 2019: 340). Granger nedensellik test sonucunda, olasılık (p) değeri 0.05'ten küçük ise H_0 reddedilir, yani Granger nedenidir. Olasılık değeri 0.05'ten büyük ise H_0 hipotezi kabul edilir yani Granger nedeni değildir şeklinde kabul edilir.

1. x, y'nin Granger nedenidir.

2. y, x'in Granger nedenidir.

3. x ve y arasında nedensellik yoktur.

4. x ve y arasında çift yönlü Granger nedensellik vardır, yani değişkenler arasında geri besleme süreci vardır.

Değişkenler arasındaki kısa dönemli ilişkinin tespitinde birinci farkları kullanılan değişkenlere Granger nedensellik testi uygulanarak sonuçlar Tablo 4'te sunulmuştur.

Değişkenler arası Granger nedensellik test sonuçlarının yer aldığı Tablo 4 incelendiğinde, %5 anlamlılık düzeyinde faiz oranının turizm endeksinin nedeni olmadığı ancak %10 anlamlılık düzeyinde faiz oranında meydana gelen bir değişimin turizm endeksi değişimleri üzerinde etkilidir. Buna karşılık CDS primi, avro kuru ve dolar kuru turizm endeksinin Granger nedeni değildir. Diğer ifadeyle CDS primi, avro kuru ve dolar kurunda meydana gelen değişimler turizm endeksinde bir değişime neden olmamaktadır.

Tablo 4. Granger Nedensellik Testi Sonuçları

Sıfır Hipotezi	n	F istatistiği	p	H_0
ΔLNFAİZ, ΔLNTUR'un Granger nedeni değildir.	159	2,49793	0,0856	Red
ΔLNTUR, ΔLNFAİZ'in Granger nedeni değildir.		3,36727	0,0370	Red
ΔLNCDS, ΔLNTUR'un Granger nedeni değildir.	159	0,57286	0,5651	Kabul
ΔLNTUR, ΔLNCDS'in Granger nedeni değildir.		3,87343	0,0228	Red
ΔLNAVRO, ΔLNTUR'un Granger nedeni değildir.	159	1,38949	0,2523	Kabul
ΔLNTUR, ΔLNAVRO'nun Granger nedeni değildir.		2,23210	0,1108	Kabul
ΔLNDOLAR, ΔLNTUR'un Granger nedeni değildir.	159	0,80692	0,4481	Kabul
ΔLNTUR, ΔLNDOLAR'ın Granger nedeni değildir.		4,29106	0,0154	Red

Turizm endeksi ile döviz kurları arasındaki Granger nedensellik testine ilişkin bulgular, Eyüboğlu ve Eyüboğlu (2018) ile Soyaslan (2019)'ın günlük frekanslı ve farklı analiz dönemini kapsayan çalışmalarıyla örtüşmemektedir. Yine döviz kurlarıyla ilgili bulgular Yıldırım vd. (2020) ile Demirkale ve Can (2021) tarafından yapılan VAR temelli nedensellik çalışmalarının bulgularıyla örtüşmemektedir. Öte yandan Kiracı (2019) tarafından günlük frekansta incelenen ilişkiler açısından kısmen desteklemekle birlikte ilgili çalışmada dolar endeksinden turizm endeksine doğru bir nedensellik tespit edilmiştir. Benzer biçimde CDS priminin turizm endeksinin nedeni olmadığı bulgusu Yıldırım vd. (2020)'nin çalışma bulgularıyla örtüşmemektedir. Bunun ise çalışmalardaki test farklılıkları ve analiz döneminden kaynaklandığı ifade edilebilir. Diğer yandan Tablo 4 incelendiğinde turizm endeksinde meydana

gelen bir değişim, %5 anlamlılık düzeyinde faiz oranında, CDS priminde ve dolar kurunda meydana gelen değişimlerde etkisi olduğu tespit edilmiştir. Dolayısıyla turizm endeksi faiz oranı, CDS primi ve dolar kurunun Granger nedenidir.

Granger nedensellik sonuçlarına göre BİST turizm endeksi ile 2 yıllık devlet tahvil faizi arasında bir geri belseme süreci söz konusudur. Bu ise iki değişkenin risk düzeyleriyle ilgili olarak birbirlerini etkileme beklentisiyle uyumlu bir sonuçtur. Devlet tahvilinin turizm sektörü işletmeleri hisse senetlerine kıyasla riskinin düşük olması yatırımcıların piyasalarda risk iştahı ve beklentilerine uygun olarak yatırım kararına yönlendirecektir. Dolayısıyla risk beklentisinin karşılamayan getiri yerine yatırımcılar daha düşük riskli yatırımlara yönelerek risk getiri dengesinin oluştuğu yatırımları gerçekleştirecektir. Öte yandan piyasalardaki gelişmelere bağlı olarak döviz kurunda yaşanan gelişmelerin turizm sektörü işletmelerinin faaliyet sonuçlarını ve finansal performanslarını etkilemesi beklenir. Bunun ise turizm işletmelerinin pay değerlerini ve getirilerine etkilerinin olması beklenir. Ancak nedensellik sonuçlarına göre avro ve dolar kurlarından turizm endeksine doğru bir nedensellik tespit edilmemiştir. Söz konusu bu durum, özellikle çalışma analiz döneminin 2008 finans krizi, 2015 Rusya uçak krizi, 2016 darbe kalkışması, COVID-19 pandemisi gibi ulusal ve uluslararası birçok olayı kapsaması nedeniyle bu olayların turizm sektörü pay senetlerine etkilerinin döviz kurlarındaki olumlu (olumsuz) hareketlerin turizm sektörü pay değerlerine olumlu (olumsuz) yansımasının önüne geçmesiyle açıklanabilir. Öte yandan turizm endeksinde yaşanan gelişmelerin dolar kurunun Granger nedeni olması ise döviz açığı yüksek olan Türkiye için, turizmi olumlu (olumsuz) etkileyen durumlarda Türkiye'nin döviz ihtiyacına pozitif (negatif) etki ettiği şeklinde ifade edilebilir.

3.2.3. Etki-Tepki Analizi

Vektör otoregresif (Vector Autoregressive – VAR) modelinde tahmin edilen parametrelerin yorumlanması yerine, sistemin

tahmininden elde edilen artıkların analizi ile geleceğe yönelik yorumlamalar yapılabilmektedir (Alper ve Kara, 2017). VAR modeli tek değişkenli otoregresif (AR) modelin çok değişkenli biçimi olarak Sims (1980) tarafından geliştirilmiştir. VAR modelinde her bir zaman serisinin içsel olarak sisteme dahil edildiği ve zaman serilerinin *p* gecikmelerine kadar bağımsız değişkenler olarak alındığı vektörel denklem sistemi tahmin edilmektedir. VAR sisteminden elde edilen artıkların analizinde kullanılan tekniklerden biri etki-tepki analizidir. Bir VAR modelinde serilere herhangi bir şok verildiğinde diğerlerinin bu şoktan ne yönde etkilendiğini görmek için etki-tepki fonksiyonları grafiğine bakılır (Mert ve Çağlar, 2019: 215; 229-230). Etki-tepki analizi iki değişkenli VAR matris formunda Eşitlik 5'teki şekildedir.

$$\begin{bmatrix} y_t \\ z_t \end{bmatrix} = \begin{bmatrix} a_{10} \\ a_{20} \end{bmatrix} + \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \begin{bmatrix} y_{t-1} \\ z_{t-1} \end{bmatrix} + \begin{bmatrix} u_{yt} \\ u_{zt} \end{bmatrix} \quad (5)$$

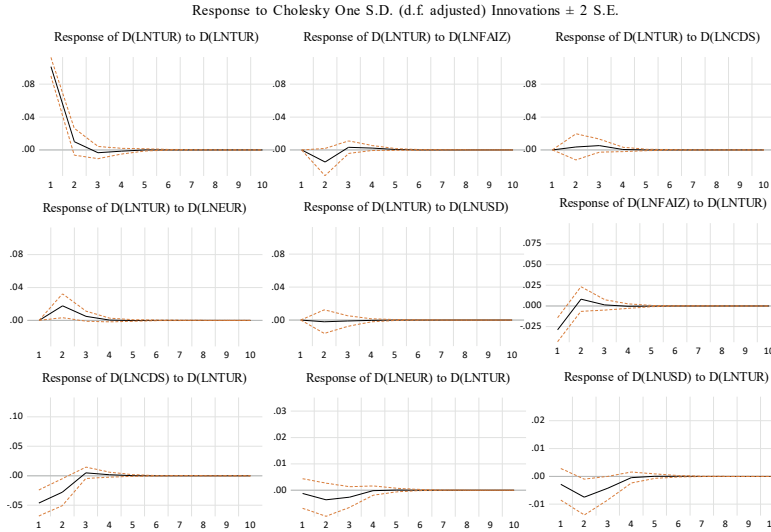
Hareketli ortalama sunumu, $\{\varepsilon_{yt}\}$ ve $\{\varepsilon_{zt}\}$ serileri bağlamında Eşitlik 6 ya da öz halinde Eşitlik 7'teki gibidir.

$$\begin{bmatrix} y_t \\ z_t \end{bmatrix} = \begin{bmatrix} \bar{y}_t \\ \bar{z}_t \end{bmatrix} \sum_{n=0}^{\infty} \begin{bmatrix} \phi_{11}(i) & \phi_{12}(i) \\ \phi_{21}(i) & \phi_{22}(i) \end{bmatrix} \begin{bmatrix} \varepsilon_{yt-i} \\ \varepsilon_{zt-i} \end{bmatrix} \quad (6)$$

$$x_t = \mu + \sum_{j=1}^{p} \phi_i \varepsilon_{t-i} \quad (7)$$

VAR testinde nedensellik incelemesi ve F testleri, modeldeki değişkenlerden hangisinin sistemdeki değişkenlerin her birinin gelecekteki değerleri üzerinde istatistiki olarak anlamlı etkileri olduğu hakkında fikir verir. Ancak bu testlerin sonuçları, ilişkinin işaretini veya bu etkilerin ne kadar sürede gerçekleşmesi gerektiğini açıklamazlar. Yani, testler, belirli bir değişkenin değerindeki değişikliklerin sistemdeki diğer değişkenler üzerinde olumlu veya olumsuz bir etkisinin olup olmadığını veya bu değişkenin etkisinin sistem üzerinde ne kadar süreceğini ortaya çıkarmaz. Bu bilgiler,

etki-tepki analizi ve varyans ayrıştırmasının incelenmesiyle elde edilir. Etki-tepki analizi, VAR'daki bağımlı değişkenlerin her bir değişkene verilen şoklara tepkinin izini sürmektedir. Böylece her bir denklemdeki her değişken için ayrı ayrı hataya bir birim şok uygulanır ve zaman içindeki VAR sistemi üzerindeki etkileri ölçülür. Uygulamada bir birim şok ampirik olarak mantıksız olabileceğinden genellikle bir birimin yerine bir standart sapma şokları kullanılır (Brooks, 2019: 423).



Şekil 1. Etki-Tepki Analizi Sonuç Grafikleri

Özet olarak bir VAR modelinde serilere herhangi bir şok verildiğinde diğerlerinin bu şoktan ne yönde etkilendiğini görmek için etki-tepki fonksiyonları grafiğine bakılır. Değişkenler arasındaki etki-tepki grafikleri Şekil 1'de sunulmuştur. Grafiklerde kesikli eğriler tepkinin ,95 güven aralığının alt ve üst sınırlarını gösterirken bu eğriler arasındaki kesiksiz çizgi ise tepki eğrisidir. Grafiklerdeki Y eksenindeki 0 çizgisi tepkinin söndüğü noktayı (dönemi) gösterirken sıfır çizgisinin üzeri tepkinin pozitif

olduğu bölgeyi, sıfır çizgisinin altı ise negatif olduğu bölgeyi göstermektedir. Grafiklerde önemli olan husus, tepkilerin anlamlı olması için tepki eğrisi ve sıfır çizgisinin tüm dönemlerde güven aralığında kalmaması gerekliliğidir.

Etki-tepki grafiklerinin yer aldığı Şekil 1 incelendiğinde, ilk grafik (üst sol) turizm endeksinin kendisine olan tepkisini göstermektedir. Grafiğe göre turizm endeksine verilen bir şok ikinci aya kadar kendisini pozitif olarak etkilemektedir. İkinci grafikte (üst orta) faiz oranına verilen bir şoka turizmin verdiği tepki görülmektedir. Bu grafiğe göre faiz oranına verilen bir şok turizmde ilk ay herhangi bir tepkiye neden olmazken ikinci ay negatif anlamlı tepki gözlenmektedir. Üçüncü ay pozitif bir tepki gözlenmekle birlikte bu tepki anlamlı değildir. Üçüncü grafikte (üst sağ) CDS priminde meydana gelen bir şoka turizm endeksi ilk ay tepki vermezken ikinci, üçüncü ve dördüncü aylarda pozitif tepki gözlenirken bu tepkiler anlamsızdır. Dördüncü grafikte turizm endeksinin avro kurundaki şoklara tepkisi incelendiğinde, avro kurunda gözlenen bir şok turizm endeksini ilk ay etkilemezken, ikinci ve üçüncü ay anlamlı ve pozitif tepki vermektedir. Son olarak turizm endeksi dolar kurundaki herhangi bir şokta anlamsız zayıf etkiler gözlenmektedir. Diğer yandan turizme verilen bir şoka, faiz oranı bir ay negatif tepki verirken, CDS primi iki aya kadar anlamlı negatif tepki vermektedir. Avro kurunda anlamlı tepkiler gözlenmezken, turizm endeksindeki bir şok karşısında dolar kuru ikinci ve üçüncü ay negatif anlamlı tepki vermektedir.

3.2.4. Varyans Ayrıştırması Testi

Etki-tepki fonksiyonları serilerin verilen şoklara tepkilerinin yönü hakkında bilgi verirken varyans ayrıştırması testi ile göreli olarak toplam değişimin dönemler boyunca seriler tarafından nasıl paylaşıldığı görülebilmektedir (Mert ve Çağlar, 2019: 232). Bir diğer ifadeyle serilerdeki değişimin nedenlerini belirlemek üzere kullanılan tekniklerden biri olan varyans ayrıştırması, istatistiki şokların değişkenler üzerindeki etkilerini test etmektedir.

VAR modelinin hareketli ortalamalarından elde edilen varyans ayrıştırmasında elde edilen bulgular, bir değişkene ilişkin öngörü artıklarının varyansının, diğer değişkenler tarafından açıklanma oranıdır. Yöntemde, değişkenlerin kendilerinde ve diğer değişkenlerde meydana gelen şokların kaynakları yüzde olarak ortaya konmaktadır. Değişkenlerde meydana gelecek bir değişimin yüzde kaçının kendisinden, yüzde kaçının diğer değişkenlerden kaynaklandığı tespit edilmektedir. Eğer verilen şok, bir değişkene ilişkin ileriye dönük hata payı varyansının büyük bir yüzdesini açıklayabiliyorsa, söz konusu değişkenin analizde içsel olduğu kabul edilecektir. Bir değişkende meydana gelen değişmelerin büyük bir bölümünün kendisindeki şoklardan kaynaklanması durumunda ise, bu değişkenin dışsal olarak hareket ettiği söylenebilecektir (Enders, 2015: 302; Alper ve Kara, 2017: 3). Varyans ayrıştırmasında, diğer değişkenlerdeki şoklara karşı bağımlı değişkendeki kendi (içsel) şoklarından kaynaklanan hareketlerin oranı elde edilir. Herhangi bir değişkene gelecek bir şok o değişkeni doğrudan etkileyecektir ancak VAR'ın dinamik yapısı ile sistemdeki diğer tüm değişkenlere de iletilecektir. Varyans ayrıştırmaları, belirli bir değişkenin s adım ileri tahmin hatası varyansının $s = 1, 2, \ldots$ için her bir açıklayıcı değişkene yeniliklerle açıklandığını belirler. Uygulamada, genellikle serinin kendi şoklarının, bir VAR'daki serilerin (tahmini) hata varyansının çoğunu açıkladığı gözlemlenmektedir (Brooks, 2019: 424-425). Göreli olarak toplam değişimin dönemler boyunca seriler tarafından nasıl paylaşıldığı varyans ayrıştırılmasıyla görülmektedir. Bir başka ifadeyle varyans ayrıştırması incelenen bir değişkende meydana gelen bir değişmenin hata varyansının yüzde kaçının kendisinden yüzde kaçının diğer değişkenler tarafından açıklandığını gösterir. Bu kapsamda BİST Turizm endeksindeki bir değişimin 10 dönemlik varyans ayrıştırma sonuçları Tablo 5'te yer almaktadır.

Tablo 5. Turizm Endeksi (DLNTUR) Varyans Ayrıştırması Sonuçları

Dönem	S.E.	D(LN-TUR)	D(LN-FAİZ)	D(L-NCDS)	D(L-NAVRO)	D(LN-DOLAR)
1	0.101316	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.104438	95.01999	1.973017	0.122225	2.847850	0.036921
3	0.104795	94.47150	2.055427	0.367403	3.054816	0.050850
4	0.104834	94.42349	2.099288	0.370697	3.054263	0.052257
5	0.104836	94.42082	2.101847	0.370696	3.054372	0.052262
6	0.104836	94.42081	2.101845	0.370708	3.054373	0.052264
7	0.104836	94.42081	2.101848	0.370708	3.054374	0.052264
8	0.104836	94.42081	2.101848	0.370708	3.054375	0.052264
9	0.104836	94.42081	2.101848	0.370708	3.054375	0.052264
10	0.104836	94.42081	2.101848	0.370708	3.054375	0.052264

Varyans ayrıştırma sonuçlarına göre, birinci ay turizm endeksindeki toplam değişimlerin tamamı (%100) kendisi tarafından açıklanmaktadır. İkinci ay ise turizm endeksindeki toplam değişimin %95,02'si kendisi tarafından açıklanırken, %2,85'lik kısmı avro kuru, %1,97'lik kısmı faiz oranı tarafından açıklanmaktadır. %0,12'si CDS primiyle açıklanan endeksteki değişimin, %0,04'ü dolar kuru tarafından açıklanmaktadır. Üçüncü ayda turizm endeksindeki toplam değişimin yaklaşık %94,47'lik kısmı kendisi tarafından açıklanırken, %3,05'lik kısmı avro kuru, %2,06'u faiz oranı, %0,37'lik kısmı CDS primi, %0,05'lik kısmı ise dolar kuru tarafından açıklanmaktadır. Dördüncü ay faiz oranının açıklama oranı artarken, beşinci aydan itibaren ise fazla bir değişim olmamakla birlikte turizm endeksindeki değişimin %94,4'lük kısmı kendisi, %5,6'lık kısmı ise diğer dört değişken tarafından açıklanmaktadır.

4. SONUÇ

Sanayi devrimi sonrasında sanayileşme yönünden büyük mesafe kat edemeyen ülkeler açısından tarım sektörünün dışında hizmet sektörü önemli bir yere sahiptir. Çeşitli ülkeler için ekonomik

olarak önemli düzeyde katkı sağlayan hizmet sektörü kalkınmanın başat unsuru haline gelmiştir. Hizmet sektörü içerisinde ise turizm, turistik kaynakların bol olduğu ülke ekonomilerinde istihdamın arttırmakta, cari açığa pozitif etki yapmaktadır. Turizm sektörü Türkiye'nin enerjide dışa bağımlılığın sebep olduğu cari açığın kapatılmasında ve istihdam sağlanmasında büyük öneme sahip bir sektördür.

Turizm sektörünün sermaye piyasalarından fon sağlama yoluyla büyümesi sektörün Türkiye ekonomisine katkısının artmasını sağlayacaktır. Yatırımcılar için riskli sermaye varlıklarına yatırım kararı piyasaların içinde bulunduğu durumun bir sonucu olacaktır. Piyasalar için önemli makroekonomik unsurlardan olan faiz oranları, ülke riski, para piyasaları, doğrudan ve dolaylı olarak ülke ekonomisini etkileyen gelişmeler, yatırımcıların risk algısı ve getiri beklentisi yatırım alternatifleri arasında bir yatırım tercihi durumunu ortaya çıkarmaktadır. Bu açıdan makroekonomik değişkenlerin yanı sıra turizm sektörü doğal ve yapay afetler, savaş, hastalık, terör olayları gibi birçok olaya duyarlı olan turizmde ülke riskinin yanında sektör riski yüksek ve kırılgan yapıya sahiptir. Dolayısıyla makroekonomik koşullar ve yaşanan gelişmeler turizm sektörü pay senetlerini etkilemektedir.

Turizm sektörü işletmelerinin pay senedi değerlerinde sektör ve işletmeye özgü koşullar önem taşımaktadır. Bu koşullar kadar önemli düzeyde etkili bir diğer unsur ise makroekonomik unsurlardır. Bu kapsamda bu çalışmada makroekonomik koşullarla turizm sektörü payları arasındaki ilişkinin incelenmesi amaçlanmıştır. Çalışma amacı doğrultusunda, BİST Turizm endeksinin faiz oranı, CDS primi, avro ve dolar kurlarıyla ilişkileri, Johansen eşbütünleşme testi, Granger nedensellik testi, etki-tepki analizi ve varyans ayrıştırma testiyle incelenmiştir. Uzun dönemli ilişkinin incelenmesi amacıyla yapılan Johansen eşbütünleşme testine göre turizm endeksi ile incelenen değişkenler arasında eşbütünleşme ilişkisi tespit edilmemiştir. Kısa dönemli ilişkilerin Granger nedensellik testiyle incelendiği çalışmada faiz oranında meydana gelen bir değişimin

turizm endeksi üzerinde zayıf düzeyde (p<,10) olmak üzere etkili olduğu belirlenmiştir. CDS, avro kuru ve dolar kurunun ise turizm endeksinde meydana gelen değişimlerde bir etkisinin bulunmadığı tespit edilmiştir. Etki-tepki analizine göre, avro kurunda meydana gelen bir şoka turizm endeksinin ikinci ay pozitif tepki gösterdiği gözlenmiştir. Ayrıca diğer değişkenlerde meydana gelen şoklara turizm endeksinde dördüncü aya kadar pozitif veya negatif yönde ancak anlamsız tepkiler gözlenmektedir. Varyans ayrıştırma sonuçlarına göre turizm endeksindeki değişimler büyük oranda kendi içsel değişimleriyle açıklanırken, avro kuru ve faiz oranı ise en fazla etkili olan diğer değişkenlerdir. Elde edilen bulgular, turizm sektörü pay senetlerinin incelenen makroekonomik değişkenlerle görece zayıf ilişkili olduğuna, turizm sektörü pay senetlerinin genel olarak diğer makroekonomik değişkenler, sektör ve işletmeye özgü koşullardan etkilendiğine işaret etmektedir.

Borsa İstanbul Turizm endeksinin faiz oranı, CDS primi, avro kuru ve dolar kuru ile ilişkilerinin incelendiği bu çalışmada turizm işletmeleri hisse senetlerinin aylık gözlemler açısından incelenen makroekonomik koşullar dışında kalan makroekonomik faktörler, sektör ve işletmeye özgü koşullardan etkilendiği faiz oranı ve ülke risk primi ile avro ve dolar kurlarıyla zayıf ilişkili olduğu söylenebilmektedir. Özellikle yatırımın geri dönüş süresinin uzun olduğu turizm sektörünün birçok olaydan etkilendiği göz önüne alındığında bu sonuçların yatırımcı risk-getiri beklentisiyle uygun olduğu ifade edilebilir.

Gelecek çalışmalarda incelenen değişkenlerin yanı sıra diğer makroekonomik faktörler, sektör ve işletmeye özgü unsurların birlikte incelenmesiyle turizm sektörü pay senedi fiyat ve getirileri üzerinde etkili olan unsurların tespit edilmesi yatırımcılar ve paydaşlar için önemli bilgiler sunacaktır. Öte yandan yapılacak çalışmalarda, farklı frekanstaki serilerde incelemelerin yapılmasıyla yatırımcıların kararlarında zaman ufku açısından önemli bilgiler sağlayacaktır. Böylece turizm sektörünü etkileyen faktörlerin bilinmesi ve zaman ufku açısından tahmin şansının olması turizm

sektörü hisselerine olan ilginin dengelenmesini ve artmasını sağlayacaktır. Bu şekilde sermaye piyasalarından sağlanan fonlarla yatırımcıların korunarak sektörün sağlıklı bir şekilde fon sağlamasıyla uluslararası rekabetin finansmanına ve sürdürülebilir büyüme trendinin yakalanmasına katkı sağlayacaktır. Turizm işletmelerinin uzun vadeli finansmana erişimle büyümesi, Türkiye ekonomisi açısından önem taşıyan turizm sektörünün döviz açığına pozitif etkisi artarak geniş yelpazede ekonomik avantajların elde edilmesine imkan sağlayacaktır.

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Ek 1. Hisse Senetleriyle Makroekonomik Değişkenlerin İlişkisini İnceleyen Çalışmalar Özet Tablosu

Yazar(lar)	Değişkenler	Yöntem	Bulgu
Ibrahim (2000)	Malezya bileşik endeksi, reel efektif döviz kuru, nominal efektif döviz kuru, dolar kuru, M2 para arzı, altın hariç resmi rezervler	1979:1 – 1996:6 dönemi aylık verileri eşbütünleşme ve nedensellik analizleriyle test edilmiştir.	Döviz kuru değişkenleriyle bileşik endeks arasında uzun dönemli ilişki saptanmamışken; para arzı ve rezervlerle genişletildiği modelde eşbütünleşme ilişkileri saptanmıştır. Kısa vadede para arzı, döviz kuru ve rezerv politikalarında uyumlu bir duruşun borsa istikrarında önemlidir.
Zubair (2013)	Nijerya borsa endeksi, döviz kuru, M2 para arzı	2001-2011 dönemi aylık verileri Johansen eşbütünleşme ve Granger nedensellik testleriyle incelenmiştir.	Kriz öncesi ve kriz döneminde uzun dönemli ilişkiler bulunmaktadır. Kriz öncesinde para arzından Nijerya tüm hisse endeksine doğru nedensellik saptanmış, kriz döneminde nedensellik tespit edilmemiştir. Döviz kurunda kriz öncesi ve kriz döneminde nedensellik tespit edilmemiştir.
Akel ve Gazel (2014)	BİST Sınai endeksi, reel efektif döviz kuru endeksi, avro kuru, dolar endeksi	2005:01 – 2013:12 dönemi aylık verileri ARDL sınır testi ile incelenmiştir.	Sınai endeksi ile dolar endeksi ve avro kuru arasında pozitif ilişki tespit edilmiştir. Hata düzeltme modeli sonuçlarına göre reel efektif döviz kuru endeksi ile sınai endeksi arasında pozitif, dolar endeksi ve avro kuru ile sınai endeksi arasında negatif yönde ilişki gözlenmiştir.
Khan ve Ali (2015)	Pakistan KSE-100 endeksi, dolar kuru	1992:1 – 2013:2 aylık gözlemlerinde volatilite GARCH modeliyle tespit edilerek Granger nedensellik analiziyle incelenmiştir.	Pakistan'da döviz kuru volatilitesiyle borsa fiyatları volatilitesinin çift yönlü bir nedensellik ilişkisi içinde olduğu gözlenmiştir.
Acar Boyacıoğlu ve Çürük (2016)	İmalat ve Ticaret sektöründen 42 işletme hisse senedi getirileri, reel döviz kuru endeksi	2006-2014 döneminde hisse getirilerine reel efektif döviz kurundaki değişimin etkisi firma yaşı ve ihracat payı kontrol değişkenlerinin dahil edildiği panel veri regresyon analiziyle ölçülmüştür.	İşletmelerin hisse senedi getirilerinde reel efektif döviz kurunun pozitif etkilediği tespit edilmiştir.

Görmüş, Yılancı ve Aydın (2016)	Borsa endeksi, Döviz kuru	Değişkenler arasındaki ilişkiler gelişmekte olan 11 ülkenin 2007:9 – 2015:11 dönemi aylık verilerinde simetrik ve asimetrik nedensellik testleriyle incelenmiştir.	Çeşitli ülkelerde döviz kurundan borsa endeksine, bazı ülkelerde ise borsadan döviz kuruna doğru nedensellik tespit edilmiştir. Asimetrik nedensellik sonuçlarına göre, pozitif bileşenler için Çin, Brezilya, Filipinler, Hindistan ve Endonezya için nedensellik ilişkisi döviz kurundan borsaya iken; Çin, Hindistan, Türkiye, Filipinler, Malezya ve Arjantin için borsadan döviz kuruna doğrudur. Negatif bileşenler için Çin'de döviz kurundan borsaya doğru nedensellik tespit edilmişken, Meksika, Endonezya ve Türkiye'de ise borsadan döviz kuruna doğru nedensellik gözlenmiştir.
Kendirli ve Çankaya (2016)	BİST30 endeksi, dolar kuru	2009:1 – 2014:12 dönemi aylık ve günlük gözlemlerinde nedensellik ilişkisi Granger nedensellik analiziyle incelenmiştir.	Aylık gözlemlerde dolar kuru ile BİST30 endeksi arasında nedensellik tespit edilmemiş, günlük gözlemlerde dolar kurunun BİST30 endeksinin nedeni olduğu ve tek yönlü nedensellik ilişkisi olduğu tespit edilmiştir.
Alper ve Kara (2017)	BİST Sınai endeksi, döviz kuru, faiz oranı, enflasyon, altın, para arzı, petrol fiyatları, dış ticaret dengesi, sanayi üretim endeksi	Reel hisse getirisine makroekonomik değişkenlerin etkisi, 2003:1 – 2017:2 dönemi aylık gözlemlerinde etki-tepki analizi ve varyans ayrıştırma analiziyle incelenmiştir.	Reel hisse getirilerinin kendi gecikmeli değerlerinden etkilendiği, reel hisse senedi getirileri değişkeninin varyansındaki değişmeleri açıklamada etkili olan diğer değişkenlerin önem sırasına göre altın fiyatları, dış ticaret dengesi, sanayi üretim endeksi ve faiz oranı olduğu tespit edilmiştir.
Uzun ve Güngör (2017)	Gelişmiş, gelişmekte olan ve az gelişmiş toplam 50 ülke borsa endeksleri, enflasyon, sanayi üretim endeksi, döviz kuru, faiz oranı ve para arzı	Borsa endeksleriyle makroekonomik değişkenler arasındaki ilişki gelişmiş ve gelişmekte olan 48 ülkenin 2004:1 – 2013:12 dönemi, az gelişmiş 2 ülkenin 2007:9 – 2013:3 dönemi aylık gözlemlerinde panel eşbütünleşme ve nedensellik analizleriyle incelenmiştir.	Gelişmiş ülkelerde borsa endeksinde enflasyon, sanayi üretim endeksi ve faiz oranının uzun dönemli etkili ve nedensellik ilişkisinin olduğu; gelişmekte olan ülkelerde borsa endeksi, enflasyon, para arzı, faiz oranı ve sanayi üretim endeksinden etkilenmekle beraber borsanın da bu değişkenler üzerinde etkili olduğu belirlenmiştir. Az gelişmiş ülkelerde nedensellik daha zayıf ve faiz oranı ile sanayi üretim endeksinin etkili olduğu saptanmıştır.

Kılıç ve Çütcü (2018)	Bitcoin, BİST100	Değişkenler arasındaki ilişki 02.02.2012 – 06.03.2018 dönemi günlük verilerinde Engle-Granger ve Gregory-Hansen eşbütünleşme tesleri ile Toda-Yamamoto ve Hacker-Hatemi-J nedensellik testleriyle incelenmiştir.	Değişkenler arasında orta ve uzun vadede eşbütünleşme saptanmamıştır. Toda-Yamamoto testine göre Borsa İstanbul'dan Bitcoin fiyatlarına doğru tek yönlü nedensellik ilişkisi tespit edilmiştir.
Akdağ ve Yıldırım (2019)	BİST Sanayi ve BİST Finans sektör endeksleri, dolar kuru	Döviz kuru ve sektör endeksleri arasındaki ilişki 01.01.2000 – 31.12.2018 günlük verilerinde Granger nedensellik ve Hatemi-J asimetrik nedensellik analizleri ile test edilmiştir.	Değişkenler arasında iki yönlü nedensellik ilişkisi, dolar kurundaki pozitif (negatif) şoklardan sektör endekslerindeki pozitif (negatif) şoklara doğru nedensellik tespit edilmiştir.
Gürsoy, Alptürk ve Tunçel (2020)	BİST Antalya endeksi, dolar kuru, avro kuru	Döviz kurları ile Antalya şehir endeksi arasındaki getiri ve volatilite yayılımı 02.01.2014 – 25.12.2019 dönemi günlük verilerinde çok değişkenli VAR-EGARCH yöntemiyle analiz edilmiştir.	Dolar ve avro kurlarının Antalya şehir endeksinde anlamlı etkilerinin olduğu ve pozitif şokların negatif şoklara göre volatiliteyi daha fazla artırdığı sonucuna ulaşılmıştır.
Mroua ve Trabelsi (2020)	BRICS ülkeleri hisse senedi piyasa endeksleri, dolar kuru	Nedensellik ve dinamik ilişkiler 1.1.2008 – 23.02.2018 dönemi günlük verilerinde Panel GMM ve ARDL sınır testi ile incelenmiştir.	BRICS ülkeleri hisse senedi piyasa endekslerinin geçmiş ve cari dönem volatilitesinde döviz kurunun etkisi anlamlıdır. Döviz kuru hareketlerinin kısa ve uzun dönemde hisse senedi endekslerinde etkisi anlamlıdır.
İltaş ve Güzel (2021)	BIST100, VIX, CDS	Toda-Yamamoto ve yapısal kırılmaları dikkate alan Fourier Toda-Yamamoto testleriyle 04.01.2010 – 30.06.2020 dönemi günlük gözlemlerinde nedensellik ilişkisi incelenmiştir.	VIX endeksinden BİST100 endeksine doğru tek yönlü nedensellik, BİST100 ve CDS primi arasında çift yönlü nedensellik ilişkisi tespit edilmiştir. Sonuç olarak, VIX endeksi ile CDS priminin borsa endeksini etkilediği belirlenmiştir.

Senol (2021)	BİST100, dolar kuru, faiz oranı, CDS	2.1.2010 – 10.4.2020 dönemi oynaklık yayılımları ve oynaklık ilişkileri GARCH modelleriyle test edilmiştir.	Diğer değişkenleri en fazla etkileyen, en fazla oynaklık yayılımı olan ve en fazla değişkenle oynaklık ilişkisi olan değişken CDS'dir. Oynaklık ilişkilerinde, BİST100'ün faiz ve CDS primleriyle negatif yönlü, CDS primlerinin kur ve faiz ile pozitif yönlü ilişkili olduğu; oynaklık yayılımlarında ise, BİST100 – kur, kur – faiz, faiz – CDS primleri arasında karşılıklı, CDS primlerinden döviz kuruna tek yönlü oynaklık yayılımı saptanmıştır.
Temurlenk ve Lögün (2021)	BRICS ülkeleri borsa endeksleri, döviz kuru	2003:1 – 2019:3 dönemi aylık verilerinde kısa ve uzun dönemli ilişkiler eşik değerli eşbütünleşme ve eşik değerli Granger nedensellik testleriyle incelenmiştir.	BRICS ülkelerinde borsa endeksleri ve döviz kurları arasında uzun dönemli ilişki olduğu, kısa dönemde Güney Afrika ve Rusya için borsa endeksinden döviz kuruna doğru, Çin ve Hindistan için döviz kurundan borsa endeksine doğru nedensellik saptanmıştır. Brezilya'da uzun dönemde borsa endeksi ve döviz kuru arasında farklı yönlerde nedensellik ilişkisi gözlenmiştir.
Yıldırım, Cavadova, Esen ve Temizel (2021)	BİST100 endeks getirileri, döviz kuru	Türkiye'de borsa getirisi ile döviz kuru değişimleri arasındaki ilişkiler 2009Q1 – 2019Q4 dönemi çeyrek verilerinde simetrik ve asimetrik nedensellik testleriyle incelenmiştir.	İki değişken arasında zayıf ilişkinin olduğu ve borsadaki negatif bir gelişmenin döviz kuru artışı ile ilişkili olduğu tespit edilmiştir.

CHAPTER 4

The Volatility Spillover Effects Among Six Major Asian Sovereign Cds Markets

Dr. Huseyin Ozdemir[1]

1. Introduction

In a credit default swap (CDS), the seller of the CDS provides guarantees to the buyer's default risk in exchange for a recurring premium. Credit default swaps can be viewed as a protection against the potential occurrence of a default. Buyers of credit protection benefit from a reduction in credit concentration and regulatory capital, while sellers of credit protection can make money by inheriting substantial risk over a specific term without having to fund the position. The maturity of this relatively young class of assets ranges from 6 months to 30 years. 5-year maturity CDSs are the most liquid and widely traded in contrast to other maturities (Zhang, 2013). The CDS market is divided into two main sub-sectors: the corporate sector and the sovereign sector.

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The share of sovereign entities, which had less than 5% before the global financial crisis, in the overall market continued to rise and reached around 16% at the end of 2017 due to the impact of the global financial crisis and the European debt crisis (Ehlers, 2018). The size of sovereign CDSs reached its maximum (nearly 3 trillion dollars) in 2013, but it then decreased to 1.5 trillion dollars as of 2017.

The global economy has experienced systemic turbulence and heightened uncertainty during the past fifteen years. After the global financial crisis of 2007, which originated in the US subprime market and spread all over the world market quickly, investigating the spillover among financial markets across different entities (i.e., financial markets, countries, assets) has become prominent among academic studies. It has been observed that the interconnectivity of markets and economies contributes to spillover effects, resulting in higher systemic risk (Le et al., 2022). This is important not only for emerging markets but also for advanced markets. Although a financial system is resilient, it can become exceedingly fragile when there is a high level of connectivity because such connections might serve as shock amplifiers rather than shock absorbers (Giansante, 2010). The sovereign CDS market is characterized by a high degree of commonality between countries. This commonality would be significant source of risk among countries due to its highly contagion characteristics (Badaoui et al., 2013).

Several studies, such as Bostanci and Yilmaz (2020), Fender et al. (2012), and Yang et al. (2018), have shown that the dynamics of sovereign CDS are impacted by several external and internal factors in the economy. Several studies, on the other hand (e.g., Atil et al., 2016; Mili, 2018), have focused on the systemic risk posed by the joint movement of sovereign CDS. Spillovers across CDS markets raise the risk of CDS portfolios, and the risk increase when there is a significant degree of spatial interconnection between sovereign markets (Mili, 2018). Hence, keeping systemic risks under control is crucial for reducing the spread of risks.

This paper examines the volatility spillover indexes among the credit default swaps of six major Asian countries (China, Indonesia, Korea, Malaysia, Thailand, and Vietnam) from June 2008 to August 2022. Understanding the risk spillovers across associated sovereign credit default swaps is a key contribution of our work to the relevant finance literature. Wu et al. (2016) reach the conclusion that sovereign credit risk spreads quickly within regions before accumulating worldwide via prolonged risk spillovers. This study primarily aims to achieve the following two objectives: Our primary objective is to determine the direction of risk transmission in Asian markets. This enables investors who intend to guarantee the debts of Asian nations to anticipate future risks emanating from nearby countries in this market. Second, we intend to provide time-varying dynamics of total spillover indexes to capture critical insights into the dynamics of systemic risk in Asian credit markets. Since these countries are close to each other through trade and capital flows, figuring out the systemic risk gives various market actors such as buyer and sellers credit protections, regulators, and policymakers important information. Trade and capital flows are two significant factors of pairwise connectedness across countries (Bostanci and Yilmaz, 2020).

To address these issues, we estimate the volatility spillover indexes among 5-year maturity CDSs of six major Asian countries by using the Diebold and Yilmaz spillover index (DY index) proposed by Diebold and Yilmaz (2009, 2012). The empirical findings can be briefly summarized as follows: First, we find that China, Indonesia, and Vietnam are net receivers of the spillovers, whereas South Korea, Malaysia, and Thailand are net transmitters of volatility in the Asian CDS market. Second, the total volatility spillover index is around 79%, suggesting a very high level of connectedness among these Asian CDS markets and implying high systemic risk among markets. Third, our empirical finding provides strong evidence that the total spillover index can be used as an early warning of the rise of uncertainty in South Korea and China,

especially during crisis periods. Last but not least, the existence of volatility transmission between CDS markets illustrates that an increase in volatility in one credit swap market is a clear indicator of a rise in volatility in other sovereign CDS markets.

The remaining sections of the paper are structured as follows. Section 2 provides the systematic literature review about credit default swaps. Section 3 describes the econometric methodology for generating the DY spillover index. Section 4 describes the data and provides descriptive statistics. Section 5 analyzes and draws conclusions from the empirical results.

2. Literature review

Though the literature on the determinants of CDS spreads is well-established, the study on information spillovers within CDS markets is sparse (Kim et al., 2015). Moreover, spillover analyzes of stock market and foreign exchange rate markets are common in the literature, but there are few studies on sovereign CDS market (Feng et al., 2022). After the European debt crisis, the spillover effect among sovereign CDSs started to attract the attention of researchers (Sun et al., 2020). The relationship between CDS premiums and other assets such as bond markets, stock markets, and exchange rate markets has been extensively studied in the literature. For example, Anton and Nucu (2020) examine the association between sovereign CDS and stock markets in nine Central and Eastern European (CEE) emerging economies using daily data from January 2008 to April 2018. They find evidence to support the existence of bidirectional feedback between sovereign CDS and stock markets in CEE countries.

Aktug et al. (2012), on the other side, investigate the dynamic interaction between sovereign CDS and bond markets in 30 emerging markets over the period from 2001 to 2007. Their empirical findings indicate that bond markets play a substantial role in the CDS price discovery process. Eyssell et al. (2013)

explore the determinants of levels and variations in sovereign CDS spreads in the Chinese market between January 2001 and December 2010. Using both country-specific and global factors, they conclude that China's internal economic conditions were more significant in explaining CDS spread levels and variations in earlier periods. During the global crisis, however, the significance of global variables comes to the fore. Furthermore, Yang et al. (2018) investigate whether interest rate and/or exchange rate have a substantial role in explaining sovereign CDS spreads. They find that the exchange rate has the greatest impact on sovereign CDS spreads, whereas domestic interest rates have a minor impact.

Our study is related to the large body of research that shows the interactions of emerging market sovereign credit default swaps. For instance, Wang and Moore (2012) use dynamic conditional correlation from the multivariate GARCH model to examine the integration of the CDS markets of 38 advanced and emerging economies with the US market during the subprime crisis. Empirical findings show that the Lehman shock appears to have increased the integration of developed markets. Moreover, De Boyrie and Pavlova (2016) utilized a wide range of sovereign credit default swap spreads of contracts with five years to maturity and investigated volatility spillovers among them. The countries included in the study include BRICS countries (Brazil, Russia, India, China, and South Africa) and MIST countries (Mexico, Indonesia, South Korea, and Turkey). However, CDS data of developed countries along with many financial indicators were used as control variables. According to their findings, Brazil and Mexico are two countries that dominate the volatility spillover effects, while China and South Korea have a net directional spillover from the other countries.

The DY spillover index can also be used in network analysis. For example, Bostanci and Yilmaz (2020) can be given as an example of this. Their empirical findings indicate that the high level of credit risk interconnectedness among sovereign CDSs is

equivalent to that of stock markets and foreign exchange markets. Using the same methods as Bostanci and Yilmaz (2020), Sun et al. (2020) focus on three typical multi-country markets, i.e., the sovereign credit default swap, foreign exchange, and stock markets. Using data from 21 countries, they conclude that market sentiment causes many cross-border spillovers in the stock and sovereign CDS markets, whereas economic fundamentals and monetary policy drive such spillovers in the foreign exchange market. Kang et al. (2016) examine the dynamics of return and volatility spillover effects across five Asian sovereign credit default swaps (CDS), specifically China, Indonesia, Korea, Malaysia, and Thailand. They find that the Korean sovereign CDS is a transmitter of spillovers to other sovereign CDSs, whereas the Chinese sovereign CDS is a receiver of spillovers from other sovereign CDSs. Second, their empirical findings provide evidence that the total return and volatility spillover indices rapidly exploded during the subprime mortgage crisis of 2007 and the Lehman Brothers collapse of September 2008. In this study, we extended their study to add Vietnam into the five Asian countries and analysis period including the COVID-19 outbreaks.

As for the studies dealing with Asian markets, Guo et al. (2020) examine the lead-lag relationships between changes in Asian sovereign CDS spreads using the data of ten major Asian economies (China, Indonesia, Japan, Malaysia, Pakistan, Philippines, South Korea, Thailand, Kazakhstan, and Hong Kong). Their results show that changes in Kazakhstan's sovereign CDS spreads can be used to predict changes in the CDS spreads of other Asian economies. Zha et al. (2020) use sovereign and firm-level CDS data for China, Japan, and South Korea and examine the cross-country credit risk spillover by utilizing a bivariate GARCH-full-BEKK model over the period 2009–2018. They provide empirical evidence to support the strong credit risk interdependence valid among corresponding East Asian countries. We also extend such studies that examine the interrelationship of sovereign credit risk

during the Global Financial Crisis and European Debt Crisis by using sovereign CDS: The relationship of sovereign CDS between advanced economies (Alter and Schüler, 2012; Atil et al., 2016; Bekiros et al., 2020; Blasques et al., 2016; Broto and Pérez-Quirós, 2014; Sabkha et al., 2019; Singh et al., 2021) and emerging markets (Beirne and Fratzscher, 2013; Daehler et al., 2021; Sabkha et al., 2019; Sensoy et al., 2017; Wang and Moore, 2012).

3. Methodology

We use the Diebold and Yilmaz (DY) spillover index through variance decomposition of the prediction error based on Diebold and Yilmaz (2009, 2012). In their first study, Diebold and Yilmaz (2009) employed Cholesky decomposition to decompose variance, but this approach suffers from the variable ordering problem. To address this issue, Diebold and Yilmaz (2012) adopted a generalized forecast error variance decomposition (GFEVD) using the approach of Koop et al. (1996) and Pesaran and Shin (1998), hereafter KPSS. In this study, we prefer to use the subsequent approach to avoid the variable ordering problem. A N-dimensional covariance stationary VAR (p) process can be defined:

$$x_t = \Phi_1 x_{t-1} + \Phi_2 x_{t-2} + \cdots + \Phi_p x_{t-p} + \varepsilon_t \tag{1}$$

where x_t is continuous collection from $x_{1,t}, \ldots, x_{N,t}$, φ is a *NxN* coefficient matrix, and $\varepsilon_t \sim iid(0, \Sigma)$ is the vector of independently and identically distributed disturbances. The moving average (MA) representation of covariance stationary VAR process can be expressed as

$$x_t = \sum_{i=0}^{\infty} A_i \varepsilon_{t-i} \tag{2}$$

where A_i is the *NxN* coefficient matrices and can be obtained recursively as $A_i = \Phi_1 A_{i-1} + \Phi_2 A_{i-2} + \cdots + \Phi_p A_{i-p}$. In this recursive

formula A_0 enters the equation as a *NxN* identity matrix. By utilizing MA representation of reduced VAR model, we can calculate the forecast error variance decompositions of each variable to assess the portion of the *H*-step-ahead forecast error variance in forecasting x_i for each i= 1, 2,..., *N*. Hence, we can obtain the *H*-step ahead GFEVDs as follows:

$$\theta_{ij}(H) = \frac{r_{jj}^{-1} \sum_{h=0}^{H-1} (e_i' A_h \Sigma e_j)^2}{\sum_{h=0}^{H-1} (e_i' A_h \Sigma A_h' e_i)^2} \tag{3}$$

where Σ represents the variance matrix of errors vector, ε, r_{jj} denotes the standard deviation of ε for the j^{th} equation, and e_i is the selection vector, which takes the value of one on the i^{th} element and zero otherwise. Since the sum of the rows of the variance decomposition matrix is not equal to one (i.e., $\sum_{j=1}^{N} \theta_{ij}(H) \neq 1$), it should be required to normalize each entry of the relevant matrix as follows:

$$\tilde{\theta}_{ij}(H) = \frac{\theta_{ij}(H)}{\sum_{j=1}^{N} \theta_{ij}(H)} \tag{4}$$

As a result of this calculation, we achieve to equalize the sum of variance decomposition including own shocks is one, that is, $\sum_{j=1}^{N} \tilde{\theta}_{ij}(H) = 1$. For all N numbers of variables, the sum of the total decomposition is equal to $\sum_{i,j=1}^{N} \tilde{\theta}_{ij}(H) = N$. After obtaining the KPPS variance decomposition matrix, numerous relevant metrics may be calculated. The total spillover index is the first measurement, and it calculates the average contribution of spillover shocks across corresponding markets to the total forecast error variance. It can be computed as the following formula:

$$S(H) = 100\ x\ \frac{1}{N} \sum_{\substack{i,j=1 \\ i \neq j}}^{N} \tilde{\theta}_{ij}(H) \tag{5}$$

In the second step, we can also calculate the directional spillovers sourced by all other markets j to market i:

$$S_{N,i\leftarrow\cdot}(H) = 100\ x\ \frac{1}{N}\sum_{\substack{j=1 \\ i\neq j}}^{N}\tilde{\theta}_{ij}(H) \tag{6}$$

Likewise, the directional spillovers transmitted by the market asset i to all other market assets j can be calculated by using following formula:

$$S_{N,i\rightarrow\cdot}(H) = 100\ x\ \frac{1}{N}\sum_{\substack{j=1 \\ i\neq j}}^{N}\tilde{\theta}_{ji}(H) \tag{7}$$

Finally, one may be interested in calculating the net spillovers of any market. This gives us valuable information about whether this market is a net risk transmitter or a net risk receiver in the whole market generated by all the markets used in the study. The formula below illustrates how we compute the net spillover effect.

$$S_{N,i}(H) = S_{N,i\rightarrow\cdot}(H) - S_{N,i\leftarrow\cdot}(H) \tag{8}$$

4. Data and descriptive statistics

We use monthly volatility frequency data in this study. The data includes six major Asian sovereign credit default swaps. The countries consist of China, Indonesia, Korea, Malaysia, Thailand, and Vietnam. We use the 5-year maturity credit default swap series for all countries. The CDS series of Asian countries has different observation lengths, and we dropped the excess observations of the long series to obtain the same number of observations. Our monthly volatility data spans from January 2008 to August 2022. All the data is obtained from the Thomson Reuters Eikon Database.

In this study, we use the first logarithmic differences of the daily CDS series as $r_t = log\left(\frac{P_t}{P_{t-1}}\right)\cdot 100$ when calculating the daily

return series. P_t is the level of the CDS series in the period t. After calculating the daily return series, we derive the monthly realized volatility (historical volatility) series by using the approach of Barndorff-Nielsen and Shephard (2002) across six 5-year maturity CDS markets in Asia. The following illustrates the three-step monthly volatility calculation method: (1) Calculating the daily log returns for month t using the formula $r_{s,t} = log(\frac{P_{st}}{P_{st-1}})$, where $s = 1,2,....S$ represents the day of the month t, (2) Calculating the realized variance by adding the previous T squared returns: $RVar_t = \sum_{s=1}^{S} r_{t,s}^2$, and (3) Calculating the realized variance by taking the square root of the realized variance: $RVol_t = \sqrt{RVar_t}$. As a result of all these calculations, we obtain 171 observations for each sovereign CDS in Asia.

Table 1 reports some basic descriptive statistics of such a related monthly realized volatility series. The country with the lowest average volatility is Vietnam, while the highest average volatility is seen in China and Malaysia. Moreover, the South Korean sovereign CDS series has the largest standard deviation among others. The most important information about whether the observations converge to a normal distribution is understood by looking at the skewness and kurtosis values of the series. According to these statistical results, we can say that none of the CDS volatility series has a standard normal distribution. All CDS series have a positively skewed (or right-skewed) distribution. Besides basic descriptive statistics, we also provide the augmented Dickey-Fuller (1979) test statistic, which is commonly used to test whether a given time series is stationary or not. The results of the ADF test indicate that all the volatility of the CDS series is stationary at the 1% significance level.

Table 1. Descriptive statistics

	Mean	Median	Max	Min	Std. dev	Skewness	Kurtosis	ADF
China	0.15	0.13	0.69	0.03	0.08	2.73	13.16	-8.69***
Indonesia	0.14	0.12	0.76	0.03	0.09	3.49	18.21	-8.26***
Korea	0.14	0.12	0.93	0.02	0.10	3.90	25.92	-8.55***
Malaysia	0.14	0.13	0.71	0.03	0.09	3.24	16.26	-8.01***
Thailand	0.12	0.10	0.73	0.02	0.08	3.23	17.10	-8.01***
Vietnam	0.09	0.07	0.74	0.01	0.08	4.65	32.75	-4.75***

Table 2 shows the correlation table of the corresponding volatility series. The results of the correlation table indicate the existence of highly positive relationships between the corresponding volatility series. Given the high trade volume, high capital flows, and tight political relations between the countries under consideration, it is normally expected to see such a high correlation result. Furthermore, the highest correlation coefficient (0.93) is between Indonesia and Malaysia, while the lowest coefficient (0.79) is between Vietnam and China. Since the standard correlation table cannot capture the lag-lead relationship, we need spillover effect analysis to capture the dynamic mechanisms within such sovereign credit markets.

Table.2 Correlation table

	China	Indonesia	Korea	Malaysia	Thailand	Vietnam
China		0.89	0.88	0.91	0.86	0.79
Indonesia	0.89		0.89	0.93	0.89	0.87
Korea	0.88	0.89		0.91	0.91	0.86
Malaysia	0.91	0.93	0.91		0.91	0.85
Thailand	0.86	0.89	0.91	0.91		0.84
Vietnam	0.79	0.87	0.86	0.85	0.84	

Figure 1 shows the series of realized volatility in six Asian CDS markets from July 2008 to August 2022. First, the values of all CDS volatility series reached their maximum in the 2008 GFC during the observation period. Second, the next highest point is observed during the most recent health crisis, the COVID-19 pandemic. Apart from these, it is interesting to note that the CDS volatility series moves in sync during the observation period. These co-movements of the volatility series can be seen easily from the previous correlation table. As stated by Badaoui et al. (2013), the Asian sovereign CDS markets show very tight relationships among themselves, and this commonality would be a considerable source of risk for countries due to its highly contagious nature. In the next section, we will put forth some empirical results that we use to test the validity of this argument.

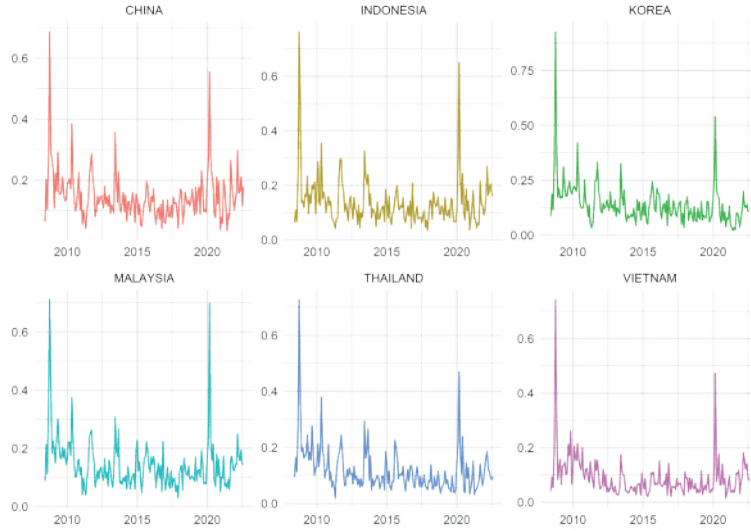

Figure 1 The volatility of return CDS series for six Asian countries

5. Empirical results and discussions

We use the generalized FEVD framework by Diebold and Yilmaz (2012) to figure out the total, directional, and net (pairwise) spillovers. The optimal lag length for our VAR model is determined by the Akaike Information Criterion (AIC). The estimation of full sample volatility spillover results and their decomposition as transmitters and receivers for six major Asian sovereign credit default swaps are provided in Table 3. In addition, we calculate the net directional spillover indexes from these transmitters and receivers for every sovereign CDS volatility series. The variable in the row denotes the volatility spillover contributions from one variable to other variables, whereas the variable in the column represents the spillover recipients from other variables. Both calculations located at the ends of rows and columns include variables' own spillover effects. Therefore, the so-called "*to others*" column in the table represents the effect of a sovereign CDS on another sovereign CDSs. Likewise, the values in the column under '*from others*' illustrate the volatility spillover impact of other sovereign assets. The sum of the values in the rows and columns indicates the total volatility spillovers to (received by) and from (transmitted by) each variable, excluding the own-variable volatility spillovers. In addition, the net spillover effect is determined by subtracting "*to others*" from "*from others*". This estimation is crucial for determining whether an asset is a net transmitter or net receiver on the market. The total volatility spillover index can be obtained by dividing either the row sum (to others) or column sum (from others) to the number of variables (six for our study).

Table 3 presents the volatility spillover estimation results for six major Asian economies. Our empirical findings are as follows: First, the volatility spillover indexes among these countries are relatively high due to their highly interconnected economies. We see this strong relationship from correlation analysis (see Table 2) as well. Unlike correlation analysis, volatility spillover analysis

gives us information about the direction of risk among sovereign credit default swaps. Second, it is worth noting that although China has the largest economy among these Asian countries, it is observed that it has less impact on the transfer of financial risk than the others. It can be explained by the market situation of Asian derivatives. Hohensee and Lee (2006) find that there exists a strong inverse relationship between market sophistication and regulatory restrictions. According to DB Global Markets Research (see Hohensee and Lee, 2006), Philippines, Korea, Malaysia, and Thailand have the most liquid sovereign credit default swap market, while China has the least liquid credit default swap market among other emerging markets. Given that an active credit derivatives market may enhance the safety and efficiency of the financial system through its pricing and diversification of credit risk, active markets are expected to be less affected by market risk. To see if this is the case, we just need to focus on the last column in Table 3, called "*from others*". This argument is fully supported by our findings, as shown in Table 3. Third, China, Indonesia, and Vietnam are the risk-taking countries, whereas South Korea, Malaysia, and Thailand are the risk-contributing countries. Finally, our empirical result shows that the total volatility spillover index is 79%, illustrating serious risk spillover among the Asian CDS derivative markets.

Table 3. Volatility spillover table

	From (*j*)						
To (*i*)	China	Indonesia	South Korea	Malaysia	Thailand	Vietnam	**From others**
China	20.98	15.98	16.55	18.18	16.57	11.73	79.02
Indonesia	15.7	19.37	16.26	17.82	17	13.85	80.63
Korea	15.81	14.75	20.91	17.74	17.51	13.29	79.09
Malaysia	16.18	16.03	16.36	20.92	17.41	13.11	79.08
Thailand	15.02	14.98	16.78	17.87	22.29	13.06	77.71
Vietnam	13.65	15.36	16.58	16.52	16.3	21.59	78.41
To others	76.35	77.1	82.53	88.13	84.78	65.05	473.94
Directional including own	97.33	96.48	103.44	109.05	107.07	86.64	Spillover index
NET spillovers	-2.67	-3.52	3.44	9.05	7.07	-13.36	78.99 %

In the previous analysis, we make a very strong assumption that the spillover effects among CDS markets do not change over time. This assumption is inconsistent with the reality of financial markets. Even daily events cause the nexus between financial markets to change. Therefore, it may lead us to make mistakes while making political inferences with the empirical results obtained from the full sample VAR model. For example, all economies have been seriously affected by the COVID-19 outbreak. It would be a very naive approach to say that the risks carried and conveyed by the CSD markets in the pre- and post-COVID-19 period remain the same and to comment accordingly. To address this issue, we estimate the VAR model using 40-month rolling windows and evaluate the total time-varying dynamics of the volatility spillover index. Besides, we set a forecast horizon of H = 12. Figure 2

reports the time-varying total volatility spillover index among the six major Asian sovereign CDS markets. The empirical result shows us that the total volatility spillover index is not constant and fluctuates over time. As discussed by Balcilar et al. (2018, 2020), our empirical findings reveal that the total risk spillover among financial markets tends to increase during important economic events such as economic crises, wars, health crises, droughts, etc. Moreover, He et al. (2019) propose that one can use the total spillover index as an early warning for a systemic risk. Sovereign CDSs show the debt burden of countries. Accordingly, this finding shows us that the government borrowing risks of these countries are seriously interconnected with each other. In other words, the increase in the total spillover index exposes these six countries to a similar interest rate risk.

Figure 2 also reports the monthly economic policy uncertainty indexes for South Korea and China[2] that are used in this study. It would be reasonable to plot such economic uncertainty indexes (shown on the left-hand side y-axis) alongside our time-varying total volatility spillover index (shown on the right-hand side y-axis) to see if the total volatility spillover index is an early warning for systemic risk in Asian markets. As we see in the figure, the total volatility spillover index in the Asian CDS market moves in parallel to economic policy uncertainty indexes in some periods when the structural breaks occur. For example, the total spillover index and Korean economic policy uncertainty fell sharply at the beginning of 2012. On the other hand, the economic policy uncertainty indexes of these two countries started to decrease after mid-2016, and our spillover index can be seen as an early warning of this economic recovery. Lastly, the figure illustrates that the total spillover index rises sharply after COVID-19 outbreaks, similar to the movement

2 Due to the availability of data, we illustrate just these two countries' economic policy uncertainty indexes. We obtain the related data from the website at https://www.policyuncertainty.com/index.html.

of economic policy uncertainty indexes[3]. The COVID-19 has caused a catastrophic lockdown that has triggered a global recession and destabilized global financial markets (Abuzayed et al., 2021). The total volatility spillover index reaches its maximum point at the beginning of the COVID-19 pandemic, and it slowly decreases then. The fact that this value remains so high shows us that the overall risk of CDS caused by COVID-19 is still high.

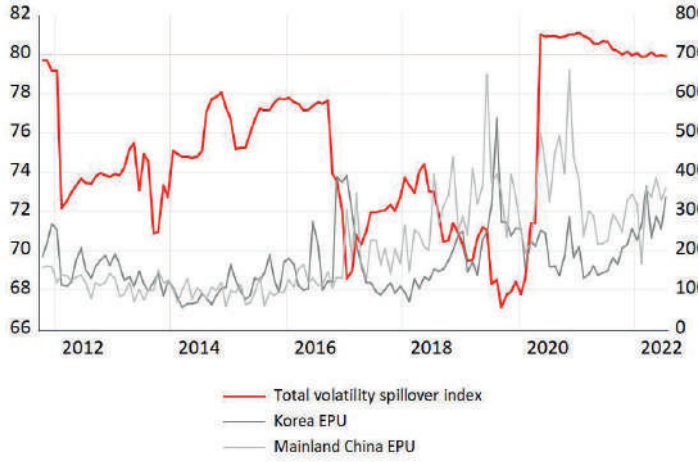

Figure 2. Total volatility spillover index vs economic policy uncertainty

6. Conclusion

This paper builds upon the existing literature on volatility spillovers across financial markets and examines the degree of connectedness across six major Asian CDS markets (China,

3 Of course, we cannot expect these indexes to move in parallel because the EPU indexes for China and South Korea are calculated by considering newspaper articles that contain at least one term in each of three term sets: economics, policy, and uncertainty. On the other hand, the total spillover index is obtained from the variance decomposition analysis of standard VAR model.

Indonesia, Korea, Malaysia, Thailand, and Vietnam) using data from January 2008 to August 2022. We estimate the various volatility spillover indexes by using the spillover index developed by Diebold and Yilmaz (2009, 2012) based on the forecast error variance decomposition. The main results are the following: The full estimation results indicate that the total volatility spillover index is around 79%, suggesting a very high level of connectivity among these Asian CDS markets and implying high systemic risk among markets. The directional risk spillover index results provide evidence that the direction and degree of risk spillovers among these Asian markets differ. Among them, Malaysia (Vietnam) contributed most (least) to the total volatility in the system during the analyzed period. Moreover, the results also suggest that China, Indonesia, and Vietnam are net receivers of the spillovers, while South Korea, Malaysia, and Thailand are net transmitters of volatility in the Asian derivative market. We also carry out a time-varying analysis to detect whether the total spillover index is stable over time. The results suggest, first, that the total spillover index rises sharply during important economic events such as the recent COVID-19 pandemic. Second, this spillover can be used as an early warning of economic uncertainty in some Asian markets. Third, volatility transmission exists between various financial markets, meaning that an increase in volatility in one credit swap market is a clear indicator of a rise in volatility in other sovereign CDS markets. Our findings will certainly be of interest to buyers' and sellers' credit protection, regulators, and policymakers who need to understand the mechanisms of cross-market credit risk transmission among Asian sovereign CDS markets. They should pay close attention in particular to the volatility spillover impact and the volatility of the sovereign CDS markets. This paper suggests further research into sovereign CDS indexes in various global regions.

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CHAPTER 5

Determinants of Overall Risk-Taking and Financial Risk Tolerance: Experimental Evidence from Turkey

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1. Introduction

When individuals and households make economic or financial decisions such as taking a bank credit, establishing a new business, investing in a stock market, there are various factors that can affect those decisions. Overall risk-taking level and financial

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risk tolerance are among these factors. Risk-taking is an act that involves implementing options that can lead to negative results (Byrnes et al., 1999). In this sense, financial risk tolerance implies the maximum amount of uncertainty that a decision-maker is willing to accept for a financial decision (Grable, 2000). Since individuals' overall risk-taking level and financial risk tolerance can significantly affect the households' financial decisions, vast literature have been accumulated about risk-taking, financial risk tolerance, and their determinants. Besides academicians, financial intermediaries and policymakers have been concerned with overall risk-taking levels and financial risk tolerance at micro and macro levels, respectively. At the micro-level, financial intermediaries use the information about individuals' risk characteristics to develop appropriate financial products. Financial institutions and agents provide investment alternatives to individual investors according to their individual differences, thereby ensuring more funds for the financial system. At the macro level, policymakers can determine their country's economic planning to foster saving and investment behaviors by using the risk characteristics of the society (Dinç Aydemir & Aren, 2017).

In developing countries, household savings comprised the vast majority of total savings. Thus, exploring the factors that affect overall risk-taking levels and the financial risk tolerance of decision-makers is essential in determining the nature of household savings. In developing countries such as Turkey, mobilizing savings funds for long-term investment is vital for economic development. Since overall risk-taking level and financial risk tolerance are among the factors that affect the flow of savings to different investment areas, understanding these factors would help determine and implement the policies that will shift the savings to long-term investments (Copur & Gutter, 2019).

Just as the demographic and economic factors, individuals' risk-taking and risk tolerance levels are also dynamic phenomena and can change over time. With the help of changing demographic

and economic factors, individuals can shift their position on the risk-reward spectrum (Anbar & Eker, 2010). Moreover, the determinants of the overall risk-taking level and financial risk tolerance can change from country to country and region to region due to the subjective nature of the risk tolerance. While some researchers focus on purely psychological factors, some examine only demographic and socioeconomic factors to determine an individual's overall risk-taking level and financial risk tolerance (Grable, 2000).

Demographic parameters are among the most examined determinants of financial risk tolerance. Moreover, investment managers and researchers have almost a consensus that demographic characteristics of individuals can be used to differentiate them into risk-tolerance categories (Anbar & Eker, 2010; Grable, 2000). The existing literature shows that demographic factors such as gender, age, marital status, occupation, and income can affect individuals' risk-taking level and financial risk tolerance. Additionally, the effect of demographic factors can differ among countries due to different national cultures. For instance, in one culture, the dominant belief is that men should take greater risks than women, but in others, men may not be expected to take greater risks than women (Slovic, 1966). Therefore, it is crucial to examine the demographic determinants of the overall risk-taking level and financial risk tolerance for different countries.

The purpose of this study is to investigate the relationship between demographic characteristics and overall risk-taking levels, and financial risk tolerance. Using the microdata set of 15,041 respondents, we aim to examine the factors influencing individuals' overall risk-taking level and financial risk tolerance for Turkey. According to the authors' best knowledge, no study examines the determinants of risk-taking levels and financial risk tolerance using comprehensive data that represent the Turkish population as a whole. Some studies investigate these relationships employing the data obtained from university students only (Bayar

et al., 2020; Çankaya et al., 2013; Dinç Aydemir & Aren, 2017; Tütek et al., 2010). It would be safe to assume that studies with limited samples cannot represent the population of Turkey. Our study contributes to the literature in terms of using data that best represents the population of Turkey since our sample covers 89% of the total household populations of Turkey, and participants are the decision-makers in their households.

In the first part of the paper, we investigate the related literature and the studies done so far. The relevant literature has shown that our research is unique in terms of the representative power of our sample. The methodology of the study is stated in the second section. Data and empirical results are presented in the third section. The discussion and conclusion parts are the last parts of the study.

2. Literature Review

The decisions taken by investors in the market are affected by many parameters, and these investments are directly related to the overall risk-taking level and financial risk tolerance. S. Mishra and Mishra (2014) illustrate that numerous studies have investigated the effect of demographic and non-demographic parameters on risk tolerance. Some of these parameters are age, gender, marital status, ethnic background, educational level, number of dependents, income level, and wealth (Grable et al., 2019; Haliassos & Bertaut, 1995; Hallahan et al., 2004; Heo et al., 2020, 2021; Lippi & Rossi, 2020; Noviarini et al., 2021; Riley & Chow, 1992; Sung & Hanna, 1996).

Individuals' overall risk-taking levels are significant because it is a factor that determine the adaptiveness of human behavior and the rationality of human thought. Since overall risk-taking level can affect human decisions, the factor should be studied in the economic context. One of the factors generally mentioned related to risk tolerance is age (Brooks et al., 2018). Vroom and Pahl

(1971), in their study on a sample of 1484 managers, showed that there is a significant negative relationship between risk-taking and age. Moreover, Deakin et al. (2004) showed that older people tend to exhibit less risk-taking and risk adjustment with an experimental method. According to Rolison et al. (2014), while financial risk-taking decreases steeply, ethical and health-related risk-taking reduces smoothly in older age. Therefore, our first hypothesis is:

H_{1a}: There is a relationship between age and overall risk-taking level.

According to literature in psychology and sociology, it is generally accepted that while women are more risk-averse, men are more risk-tolerant. There are various questionnaire-based studies that confirm this common assumption (see Byrnes et al., 1999). In their experimental study, Charness & Gneezy (2012) find strong evidence that women are more risk-averse than men. Also, Niederle & Vesterlund (2007) stated that women tend to avoid competition compared to men. So, the hypothesis is:

H_{1b}: There is a relationship between gender and overall risk-taking level.

Studies have shown that risk preferences can change with education level. Education may influence how people think and decide and, therefore, can affect their behavior about risk-taking. It is assumed that because educated people are more likely to process complex information, they are more confident in risk-taking (Hambrick, 2007). For example, Lee & Moon (2016) showed that the education levels of CEOs, as well as their tenure, have a significant effect on their strategic risk-taking. On the other hand, Y. Wang et al. (2013) examined the relationship between education level and risk-taking with a sample consisting of Chinese managers and found that there is a negative relationship between these two variables. In line with the general view, the hypothesis is:

H_{1c}: There is a relationship between education level and overall risk-taking level.

Marital status may affect individuals' behavior directly or indirectly by creating a social control mechanism. Because of that, the married are less liable to be in risky situations such as accidents and assaults (Cheung, 1998). Because married individuals have greater social and economic responsibilities, they are less willing to be in risky situations and take risky actions that may harm the welfare of their families. So, our hypothesis is:

H_{1d}: There is a relationship between marital status and overall risk-taking level.

We also expect that there would be a relationship between overall risk-taking and individuals' ability to plan for the future. People who can predict the future and plan accordingly may be willing to take more risky actions. Therefore, it is expected that:

H_{1e}: There is a relationship between the level of planning for the future and overall risk-taking level.

It is well stated in the literature that demographic characteristics can affect financial tolerance as well as overall risk-taking. Age and gender are the first parameters that have been investigated among the demographic variables in relation to risk tolerance. Although the relationship between age and risk tolerance is not always linear, it is generally accepted that their financial risk tolerance decreases as people get older. The findings show that younger people are more tolerant of risk than older adults (Al-Ajmi, 2008; Bajtelsmit & Bernasek, 1997; Cardak & Martin, 2019; Faff et al., 2009; Fisher & Yao, 2017; Hartog et al., 2000; Nguyen et al., 2016; Pålsson, 1996). It is believed that because there is not much time for older people to recover from financial losses, they tend to choose to invest in less risky investments (Hallahan et al., 2004). On the other hand, some studies show a positive relationship between age and risk tolerance. For example, Wang & Hanna

(1998) examined the ratio of value of risky assets to total assets and found a positive relationship between financial risk tolerance and age. Also, according to Xiao & Anderson (1997), because wealth accumulates with age, the financial risk tolerance of older people is higher than that of young people. Lastly, some other studies find no relationship between age and financial risk tolerance (see Faff et al., 2009). For example, Van de Venter et al. (2012) examine the financial risk-taking level over an individual's life. The results show that financial risk-taking is unlikely to change substantially over the lifespan of an individual. As a result, in line with the generally accepted view, the hypothesis is:

H_{2a}: There is a relationship between age and financial risk tolerance.

Gender is another factor that has a relationship with financial tolerance. There are many studies that show that men and women react differently to risky situations. The literature generally suggests that men are more risk-tolerant than women (Bernasek & Shwiff, 2001; Brooks et al., 2019; Lawrenson & Dickason-Koekemoer, 2020; Lemaster & Strough, 2014; Powell & Ansic, 1997). For example, Barber & Odean (2001) show that because men feel more confident, they trade more actively in stock exchange. Also, gender differences in financial risk tolerance are investigated in Fisher & Yao's (2017) research. The findings demonstrate that income uncertainty is negatively related to high-risk tolerance for women but positively affects men. Moreover, net worth has a significantly positive association with high-risk tolerance for men. On the other hand, Hibbert et al. (2013) analyze the direct investments of academics in the field of finance, and according to their results, gender has no effect on risk aversion for highly educated people. Çankaya et al. (2013) found that women students to be more risk-averse than men. So, according to the prevailing view, the hypothesis is:

H_{2b}: There is a relationship between gender and financial risk tolerance.

Marital status also is a crucial parameter to explain financial risk tolerance. The literature suggests that single people are more risk-tolerant compared to married ones (Hallahan et al., 2004). Because single individuals do not have as many financial responsibilities as married people, it has been determined that single individuals are more tolerant than married people toward financial risk (Barber & Odean, 2001; Fan & Xiao, 2005; Yao et al., 2004). The higher level of social and financial responsibilities accompanying marriage and dependents could be the reason behind their low risk tolerance. However, some studies show married individuals can be more risk-tolerant. For example, according to Watson & McNaughton (2007), because there is a second income for the household, marriage might promote investments in riskier assets. Lastly, some studies that find no relationship between marital status and risk tolerance (Haliassos & Bertaut, 1995). Therefore, it is expected that:

H_{2c}: There is a relationship between marital status and financial risk tolerance.

There are also some studies examining the relationship between education level and financial risk perception. These studies indicate a positive relationship between education level and financial risk perception. Higher education encourages individuals to invest their money in risky financial instruments (Baker & Haslem, 1974; Bellante & Green, 2004; Shaw, 1996; Sultana & Saradhi, 2011). Duasa and Yusof (2013) shed new light on the issue of determinants of risk tolerance among Malaysians. The results show that risk tolerance is higher among younger people, males, those with a higher level of education, and those in the non-public sector. So, the related hypothesis is:

H_{2d}: There is a relationship between education level and financial risk tolerance.

Another variable discussed in the study is the level of individuals' ability to plan for the future. Here, it is expected that those decision-makers with a high level of ability to plan for the future would be more risk-tolerant. No previous study on the subject has been found in the literature. In this respect, the effect of this variable is thought to be a significant contribution to the literature. The hypothesis is:

H_{2e}: There is a relationship between the level of planning for the future and financial risk tolerance.

The effect of demographic characteristics on the financial risk tolerance of the individuals in Turkey is examined by Bayar et al. (2020) with a study employing a multinomial logistic regression analysis for 1348 respondents. The results demonstrate that demographic parameters of age, gender, education, and income level significantly affect financial risk tolerance. There is a negative relationship between age and risk tolerance as older adults undergo time restrictions to dispose of possible financial losses. In addition, Anbar & Eker (2010) examine the association between financial risk tolerance and demographic parameters for 1,100 university students in Turkey. The findings show that although age, marital status, and the number of children had no significant effect on financial risk tolerance, gender, income, and total net assets have a significant effect in differentiating individuals' risk tolerance. Table 1 demonstrate that the related factors of financial risk tolerance (Grable, 2008).

Table 1: Factors related to financial risk tolerance

Individual characteristic	More Risk-Tolerant	The level of supporting literature
Gender	Male	High
Age	Younger	Moderate
Marital status	Single	Moderate
Marital/gender interaction	Single male	High
Education	Bachelor's degree or higher	Moderate

Note: 80%-100%, 50%-79%, and 0%-49% indicate the level of high, moderate, and low supporting literature, respectively. Grable (2008) reviewed 125 studies which are published between 1960 and 2006.

3. Data and Methodology

3.1. Data

The microdata set was obtained from the Turkey Household Financial Perception and Attitude Survey, conducted by the Finance Office of Presidency of the Republic of Turkey. The dataset comprises 49 urban and rural provinces representing NUTS 1 (Nomenclature of Territorial Units for Statistics) level covering Turkey. These provinces cover 89% of the total population of households and 92% of GDP. The study was carried out by interviewing 15,041 individuals who are decision-makers or partners in financial matters in selected families (The Finance Office of Presidency of the Republic of Turkey, 2020). The survey aims to measure the financial perceptions and attitudes of the Turkish people.

3.2. Methodology

The study aims to explain the overall risk-taking and financial risk tolerance of Turkish people with demographic variables using

the data from the survey conducted by the Finance Office of the Presidency of the Republic of Turkey. Gender, education level, marital status, and age are demographic variables considered as explanatory variables of the study. Moreover, individuals' ability to plan for the future was also included in the analysis as another independent variable. In the survey, this variable was asked as "For how long can you make your future plans for your savings, excluding real estate?".

On the other hand, the variable of the overall risk-taking level was asked as "Do you generally consider yourself as a risk-taking person or a risk-averse person?". The answers for the question range from 1 to 10 (1: not willing to take any risk; 10: entirely willing for risk).

Additionally, an experimental question was asked to determine the financial risk tolerance of individuals: "Assume that you have five different investment options for a one-year period where the probability of winning or losing is equal. If you have an extra 100,000 TL, which of the offers would you choose?" Then they were asked to choose one of the options in Figure 1:

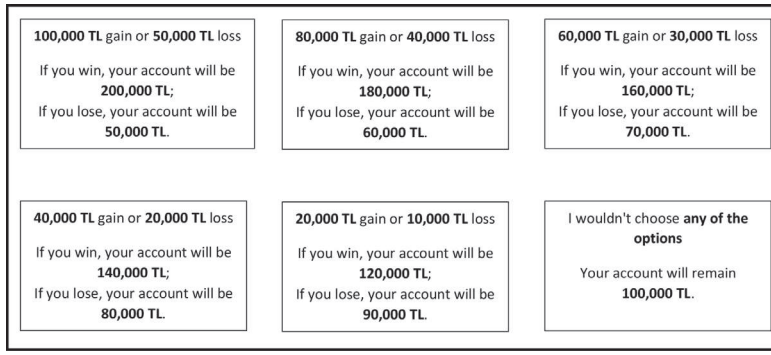

Figure 1: Options for financial risk tolerance question

4. Results

The number of people according to demographic variables and their percentage are indicated in Table 2. Table 2 also shows the mean and standard deviation values of explanatory variables examined within the scope of the study according to the overall risk-taking and financial risk tolerances.

Table 2: Explanatory Variables in Relation to Overall Risk-Taking Level and Financial Risk Tolerance

				Overall Risk-Taking		Financial Risk Tolerance	
		N	%	Mean	Std. Dev.	Mean	Std. Dev.
Gender	Female	6417	42.7	4.67	2.476	2.29	1.620
	Male	8624	57.3	5.01	2.355	2.53	1.710
Education	Primary	4708	31.3	4.53	2.484	2.17	1.574
	Secondary	7011	46.6	5.05	2.356	2.54	1.701
	University/Post Graduate	3318	22.1	4.97	2.377	2.56	1.720
Marital Status	Married	8415	56.0	4.52	2.471	2.26	1.656
	Single	6622	44.0	5.31	2.262	2.63	1.678
Future Planning	None	2648	18.9	4.79	2.524	2.09	1.597
	Less than 6 months	1951	13.9	4.60	2.332	2.14	1.359
	6 months – 1 year	1835	13.1	4.95	2.289	2.45	1.533
	1-2 years	2496	17.8	5.00	2.417	2.49	1.667
	2-5 years	2626	18.7	4.94	2.328	2.69	1.781
	More than 5 years	2474	17.6	5.07	2.252	2.74	1.801

Table 3 shows the correlation coefficients indicating the linear relationships between age, the overall risk-taking level, and financial risk tolerance.

Table 3: Correlations

	Age	Overall Risk-Taking	Financial Risk Tolerance
Age	1	-0.186*	-0.179*
Overall Risk-Taking		1	0.399*
Financial Risk-Taking			1

* Significant at 0.01 level

There is a weak but significant negative relationship between age and both overall risk-taking and financial risk tolerance levels. Therefore, it can be said that as age increases, both overall risk-taking and financial risk tolerances decrease. In addition, there is a moderate positive relationship between overall risk-taking and financial risk tolerance. In other words, the higher the overall risk-taking level of individuals, the higher their level of financial risk tolerance.

Table 4: Univariate Overall Linear Model Analysis (Overall Risk-Taking)

	F	Sig.
Corrected Model	51.914***	0.000
Intercept	7005.393***	0.000
Gender	80.077***	0.000
Education	0.600	0.549
Marital Status	90.670***	0.000
Future Planning	18.739***	0.000
Age	159.817***	0.000
Gender*Education	11.235***	0.000
Marital Status*Gender	0.167	0.683
Marital Status*Education	12.866***	0.000

* Significant at 0.05 level, ** Significant at 0.01 level, ***Significant at 0.001 level;

$R^2 = 0.053$; Adj. $R^2 = 0.052$

The results obtained from the analysis are shown in Table 4. As a result of the analysis, it was seen that gender, marital status, level of planning for the future, and age affect the overall risk-taking levels of individuals. So, according to the results, hypotheses of H_{1a}, H_{1b}, H_{1d}, and H_{1e} were accepted. However, the results showed that there is no significant relationship between education level and overall risk-taking level. Therefore, the H_{1c} hypothesis was rejected. By examining means of sub-groups, it can be seen that the overall risk-taking level of men, singles, young people, and people who can plan ahead is higher. The model explains approximately 5.2% of the variance in the overall risk-taking level.

On the other hand, it was seen in the Figure 2 that gender affects the relationship between education level and overall risk-

taking level. By examining the relationship, it can be seen that the group with the highest level of risk-taking among women is high school-graduated women. In contrast, for men, the risk-taking levels of high school graduates are the lowest.

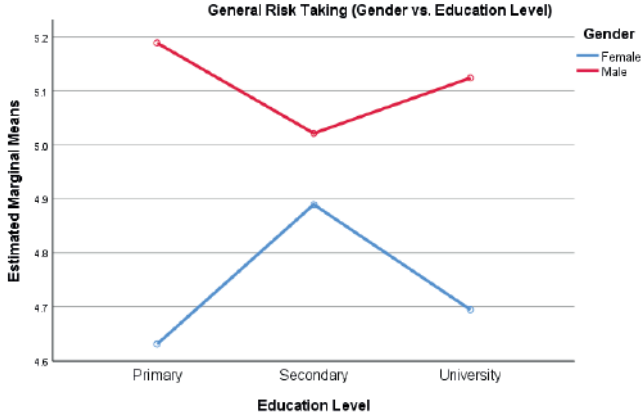

Figure 2: Overall Risk-Taking Level (Gender/Education Level)

However, marital status had no effect on the relationship between gender and overall risk-taking level. As in Figure 3, marital status does not affect the relationship between gender and overall risk-taking level.

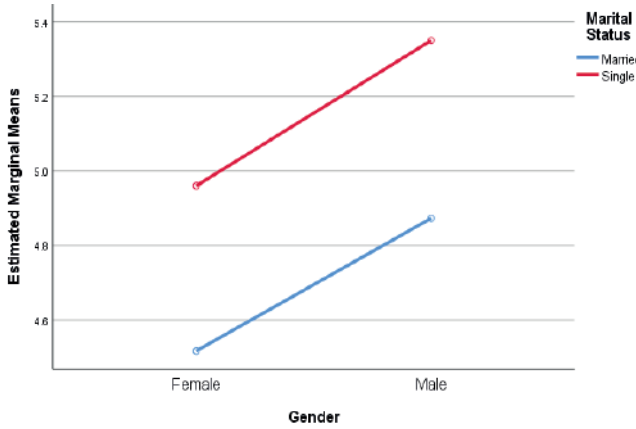

Figure 3: Overall Risk-Taking Level (Marital Status/Gender)

In addition, marital status affects the relationship between education level and overall risk-taking level. According to Figure 4, the risk-taking level tends to increase as the education level increases for married people, while it tends to decrease for single people.

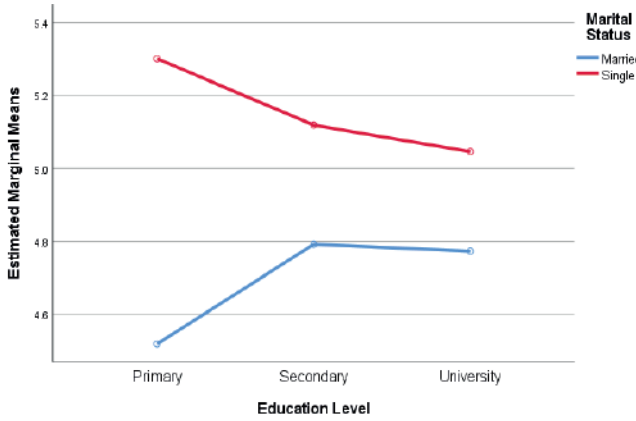

Figure 4: Overall Risk-Taking Level (Marital Status/Education Level)

Table 5: Univariate Overall Linear Model Analysis (Financial Risk Tolerance)

	F	Sig.
Corrected Model	61.264***	0.000
Intercept	4149.307***	0.000
Gender	79.601***	0.000
Education	6.580**	0.001
Marital Status	8.540**	0.003
Future Planning	67.085**	0.000
Age	206.737**	0.000
Gender*Education	1.503	0.223
Marital Status*Gender	2.976	0.085
Marital Status*Education	3.443*	0.032

* Significant at 0.05 level, ** Significant at 0.01 level, ***Significant at 0.001 level;

$R^2 = 0.062$; Adj. $R^2 = 0.061$

The results of the analysis are shown in Table 5. As a result of the analysis, it was seen that gender, marital status, education level, future planning level, and age were effective on the financial risk tolerance. So, hypotheses of H_{2a}, H_{2b}, H_{2c}, $H_{2d,}$ and H_{2e} were accepted. According to the group means, men's financial risk tolerance is higher while the financial risk tolerances of primary school graduates are lower compared to other education groups. Moreover, the financial risk tolerance of singles is higher than that of married people. In addition, the financial risk tolerance of those who can plan for the future is higher than that of those who cannot. Finally, there is a low-level negative relationship between age and financial risk tolerance. The model explains approximately 6.1% of the variance in the financial risk tolerance.

On the other hand, it was seen that gender did not affect the relationship between education level and financial risk-taking.

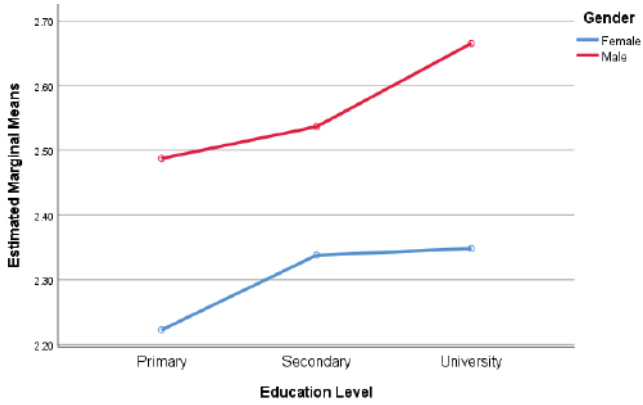

Figure 5: Financial Risk tolerance (Gender/Education Level)

In addition, the analysis shows that marital status does not affect the relationship between gender and level of financial risk-taking (Figure 6).

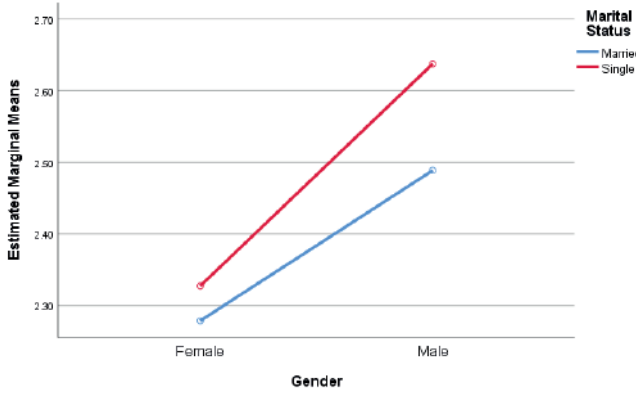

Figure 6: Financial Risk tolerance (Marital Status/Gender)

However, marital status does have an impact on the relationship between education level and financial risk tolerance. When Figure 7 is examined, it is seen that for married people, as the level of education increases, the financial risk tolerance increases more than singles.

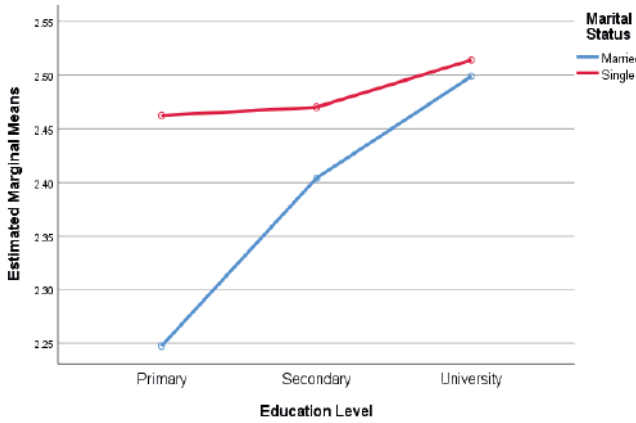

Figure 7: Financial Risk tolerance (Marital Status/Education Level)

5. Discussion and Conclusion

This study aims to investigate the relationship between demographic characteristics and overall risk-taking level, and financial risk tolerance. Using the microdata of 15,041 respondents, this study examines the factors influence the level of individuals' financial risk tolerance for Turkey. The findings demonstrate that while gender, marital status, level of planning for the future, and age affect individuals' overall risk-taking levels and financial risk tolerance, education only affects financial tolerance. There is a weak but significant negative relationship between age and both overall risk-taking and financial risk tolerance. Therefore, it can be said that as age increases, both overall risk-taking and financial risk tolerance decrease. Our results confirm the results in the literature

(Al-Ajmi, 2008; Bajtelsmit & Bernasek, 1997; Faff et al., 2009; Fisher & Yao, 2017; Hartog et al., 2000; Nguyen et al., 2016; Pålsson, 1996).

We detected that single individuals are more tolerant than married people toward financial risk. These results are in line with the result of Barber & Odean (2001), Fan & Xiao (2005), and Fisher & Yao (2017). Also, the results of studies by Nguyen et al. (2016), Anbar & Eker (2010), and M. Mishra & Mishra (2016) confirm that men's financial risk tolerance is higher, while the financial risk tolerances of primary school graduates are lower compared to other education groups. In addition, as expected, there is a moderate positive relationship between the overall risk-taking and the financial risk tolerance. In other words, the higher the overall risk-taking level of individuals, the higher their level of financial risk tolerance.

Overall, the results of the study are substantially consistent with existing literature. Turkish men's financial risk tolerance is higher than women's. Moreover, the financial risk tolerance of singles is higher than that of married people. These two findings are highly related to Turkish family structure since the father usually takes the economic and financial decisions in Turkish family culture. As Fisek (1991) stated, most families are nuclear families with a working father and a stay-at-home mother. Traditional and patriarchal authoritarian norms are still strong in Turkish families. These patriarchal authoritarian norms lead to financial decisions and risks taken by the father in the family.

As a consequence of this situation, married people take lower risks because they are responsible for looking after other family members. In contrast, single people can take more financial risks because their financial decisions are unlikely to affect many people. However, married people's risky decisions can jeopardize their family's livelihood.

Our findings demonstrate that low educated people have lower risk tolerances, whereas high educated people have higher. This finding can be related to the level of financial literacy. As Bajo et al. (2015) stated, low educated people have lower financial literacy. Since they have less information about financial instruments, they may not invest in capital market instruments, such as stocks and equity funds. On the other hand, our findings show that younger people take more financial risks than older people. In other words, as age increases, the level of financial risk-taking decreases. Although some studies (Grable & Lytton, 1998; Jianakoplos & Bernasek, 2006) suggest that age is not a significant factor for risk tolerance, it has been widely assumed that older people tend to have lower risk tolerances than younger people. The reason behind this assumption is that older people have less time to recoup their financial losses than do younger people. Our findings confirm the common heuristic belief that younger people take more financial risks than older do. Moreover, as some studies suggest, it can be derived from biological changes in enzymes due to the aging process. Both results related to age and education have significant implications for stock markets and financial management.

The study has significant results for financial intermediaries and policymakers. Financial intermediaries use these findings to develop appropriate financial products. For example, they can develop risky financial products for young, male, and high-educated people but low-risk products for old, low educated people or women. Using these findings, financial intermediaries can contribute to ensuring more funds to the financial system. Moreover, the findings can be beneficial for policymakers in terms of developing policies to foster saving and investment. Turkey currently tries to improve its capital market and develop new capital market instruments. To improve its capital market, policymakers should encourage people who would stay away from capital markets as they think it is risky to invest. For this purpose, they should focus on married, old, and low-educated people in their policies.

It can be noted that this study involves some limitations. First, the study used cross-sectional data to examine the factors influence the individuals' overall risk-taking and financial risk tolerance level. Cross-sectional data give us the results at a specific point in time. However, longitudinal data gives better results in detecting the determinants of financial risk tolerance. In other words, collecting data by monitoring and observing people over a period of time leads to more valid results. Second, the questions in the questionnaire are not explicitly designed for this study, and therefore their representation of variables is not somehow perfect. Also, this study used a limited number of variables such as age, gender, education, marital status, and future planning. There are some other important variables that can affect risk tolerance, such as income and wealth. So, in future studies, researchers can add other parameters such as income, religion, and living area (rural-urban) and include more appropriate questions to measure determinants of risk tolerance.

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CHAPTER 6

Are Countries' R&D Expenditures Effective on Financial Development and Economic Growth?: An Application on Some Countries in the Developing Economies Class in Europe

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INTRODUCTION

In the twenty-first century, as in all countries of the world, a serious restructuring process has been experienced in countries with emerging economies. Technological innovations and inventions, which contribute greatly to both social and economic development, have played an important role in this structuring process. Countries that want to increase their financial diversity have started to reform their financial markets seriously, they have focused on the aim of realizing the financial liberalization and development, which gained momentum after 1980, by giving importance to open policies. In line with this purpose, the importance given to technological investments has started to increase and significant progress has been made in sustainable economic growth (Atamtürk, 2007).

It is seen that R&D expenditures have an effect on the financial development of countries depending on the economic events and technological developments that have developed in recent years. Countries think that the funds they use for R&D activities provide advantages in terms of manufacturing, employment, increase in national income and technological development. In order to take place in global markets and to keep up with the emerging competitive environment, many countries have turned to innovation and have started to support their activities within this scope through national policies. R&D activities are at the forefront of innovation activities that many businesses attach importance to. Within the scope of these activities, the expenditures of the countries increased; The understanding of transition from labor-intensive capital to technology-intensive capital has started to gain momentum (Knoll, 2003:3).

The accelerating financial liberalization in developing countries has created a basis for foreign investors to enter the market more easily, thus competition between countries has begun to increase. Depending on the increasing competition, financial investments

have also increased, so financial development has started to take place among the main objectives of the countries. For this reason, countries have begun to attach great importance to R&D expenditures. R&D expenditures, which are of great importance in the financial development of countries, contribute to the social, economic, political, etc. of the countries. may differ according to their circumstances. Again, situations such as the countries' financial liberalization and regulation policies, their desire to increase their financial instruments and usage have also been effective on R&D expenditures; revealed the fact that these two greatly influence each other (Ayouni et all., 2014; 678).

The fact that countries produce high value-added and technological products in exports in recent years increases the importance of R&D even more. For this reason, the share of R&D expenditures, which is the independent variable of the study, in GDP is important. In addition, developed countries are ahead of developing and underdeveloped countries in terms of technology, innovation and innovation. Therefore, developing and underdeveloped countries should attach as much importance to R&D as least developed countries.

The aim of the study is to investigate the effects of R&D expenditures on the financial development of countries in emerging economies. For this reason, research has been conducted on Some Countries in the Developing Economies Class in Europe. The 2003-2020 period was examined annually. Since there are two different dependent variables in the study, two models were established. In Model-1, the dependent variable is the indices in which the largest shares of countries are traded, representing financial development, and growth in Model-2. The independent variable is the ratio of R&D Expenditures to GDP. Westerlund cointegration test, MGE and AMG estimators were used as a method. The results of the study are expected to contribute to policy makers and academic studies in countries that follow innovations and focus on development.

LITERATURE

Recently, the importance of R&D activities and expenditures made in this context in terms of economic growth of countries has started to increase. Some of the national and international academic studies examining the relationship between R&D expenditures and financial development and economic growth from different perspectives are given below. Some of the studies that deal with and examine the relationship between R&D expenditures and financial development are as follows:

Chang et al (2005), in their study, wanted to examine the effects of these on the export performance of countries by taking into account the financial development levels and R&D expenditures of the countries. The researchers, who examined the 16 countries they included in their research with both theoretical and econometric findings, concluded that there is a positive relationship between R&D expenditures and financial development.

Hwang et al. (2010), based on macroeconomic indicators, mentioned the relationship between R&D activities and the financial system. The researchers, who reached the conclusion that there is a close bond between the two, argued that the efficiency and quality of the financial structure are closely related to R&D activities and that they affect each other positively.

Maskus et al. (2012) included 18 OECD countries and 22 manufacturing enterprises in their research, in which they examined the interaction between national and international financial market developments and R&D activities. As a result of the study, the R&D intensity for financial development at the national level; They concluded that foreign capital investments are effective for financial development from an international perspective. Another result obtained in the study is that there is a strong link between the application of different financing methods and R&D activities.

Meierrieks (2014) examined 51 developed and developing countries based on the years 1993-2008 in his study. In the study, it is aimed to reveal the effect of financial development of countries on innovation within the scope of R&D activities. In the study, it was concluded that positive increases in the level of financial growth strengthen R&D innovations.

Kocamış and Güngör (2014) examined the technology companies operating in Borsa Istanbul in this study, in which they wanted to investigate the effect of R&D expenditures on the profitability of enterprises. 16 companies were included in the research and as a result of the study, it was determined that there is a positive and significant relationship between R&D expenditures and firm profitability rates.

Ayaydın and Karaaslan (2014) wanted to examine the variables that affect the financial performance of companies in their study and focused on the impact of research and development investments in this direction. The researchers, who analyzed the data of 145 manufacturing companies traded in BIST for the years 2008-2013 using the GMM system estimator, determined that the intensity of R&D expenditures had a positive effect on the financial performance of the companies.

Yücel and Ahmetoğulları (2015) wanted to examine the effect of expenditures on R&D activities on the net profit changes and earnings per share values of the enterprises. In the study, technology, informatics and software companies registered in BIST were examined on the basis of a 14-year period. It is concluded that the effect on the earnings per share is lagged for three periods.Demirci (2017) examined the relationship between R&D expenditures and financial development level of private sectors in Turkey. The research was based on the periods between 1990 and 2014; preferred to use causality, cointegration, variance decomposition and impulse-response analysis methods. When the

findings obtained from the research were examined, it was revealed that there was a cointegrated situation between the two.

Tandoğan (2017), In the study, the effects of financial development on total factor productivity were examined based on Turkey between 1980 and 2015. In the study, in which the ARDL bounds test method was used, it was concluded that financial development greatly supported R&D expenditures and technological investments and were influenced by each other.

Ayaydın et al. (2018) investigated whether innovation and R&D expenditures in BRICS-TM countries have an effect on financial development. As a result of the study, it has been determined that there is a positive relationship between the financial development of innovation and R&D expenditures, and there is a one-way causality relationship from R&D expenditures to financial development.

Helhel (2018) used the Pedroni cointegration approach in his study, which deals with the relationship between financial development and R&D expenditures; E-7 analyzed country data. Another result obtained in the study, which concluded that there is a long-term relationship between R&D expenditures and financial development, is that financial developments have a positive effect on R&D expenditures.

Some of the studies showing the effect of R&D expenditures on the economic growth of their countries are given below:

Samimi and Alerasoul (2009) wanted to examine the effects of developing R&D activities on economic growth and included 30 developing countries in their studies. In their study using panel data analysis, they concluded that there is a statistically negative relationship between R&D expenditures and economic growth.

Yıldırım and Kesikoğlu (2012) aimed to reveal the relationship between R&D expenditures and exports by examining Turkey's 1996-2008 period. As a result of the study, it was determined that

there is a one-way causality relationship from R&D expenditures to exports. As a result of this determination, it has been concluded that R&D related policies can be a tool to be considered in increasing exports, but exports do not cause R&D expenditures.

Fung and Lau (2013), in the study in which the relationship between the incentives provided depending on the R&D expenditures and the economic growth of the countries was aimed to be examined, it was concluded that the incentives provided to carry out research and development activities had a positive effect on the economic growth of the countries.

Göçer (2013) used panel data analysis in the research based on the years 1996-2012 from Azerbaijan, China, S. Korea, India, Kazakhstan, Malaysia, Pakistan, Russia, Singapore, Thailand and Turkey. The aim of the research is to reveal the relationship between R&D expenditures and the export and economic growth of countries. In this context, the effects of expenditures on exports of high technology products, exports of information and communication technologies, total exports and economic growth, and the effect of exports of high technology products on foreign trade balance are examined. As a result of the research, it is concluded that a one percent increase in R&D expenditures increases the exports of high-tech products by six and a half percent, the exports of information and communication technologies by below zero point and the economic growth by zero point forty-three percent.

Dam and Yıldız (2016) investigated the relationship between R&D expenditures and innovation and economic growth. In line with this research, BRICS-TM countries were examined and as a result of the research, it was determined that there is a statistically positive and significant relationship between expenditures, innovation and economic growth.

Sungur et al. (2016), ; They examined the 1990-2013 Turkey data in their study, which aimed to analyze the impact on R&D

expenditures and all related exports and growth. As a result of the study in which Granger and Hatemi-J used the asymmetric causality test, it was determined that there were relations between the components.

As a result of the literature review, it is seen that there are studies on growth with R&D and different variables. However, there are almost no studies examining the relationship between R&D and financial development. This situation highlights the originality of the study. In addition, the use of both growth and financial development as the dependent variable, and the fact that different sample countries have been applied with different methods, differentiates the study from the studies in the literature and reveals its originality. It is expected to contribute to the literature with these aspects.

DATA AND METHODOLOGY

In this part of the study, the analysis findings of the variables of the countries will be included.

The aim of the study is to investigate the effect of research and development expenditures of some countries in the Developing Economies Class in Europe on the financial development and growth of the country. The information about the variables used is as follows:

Table 1. Variables Used in the Study

	Variable	**Formula**	**Reference**
RD	R&D Expenditures	R&D Expenditures of Countries/GDP	The World Bank
LogFD	Financial Development	Logarithm of Stock Market Indices of Countries	TR Investing
GDP	Growth Rate	GDP (%)	The World Bank

Since the stock market indices of the countries are in different amounts, the logarithm of the values is included in the analysis in order to make a healthy comparison and analysis. Countries in the emerging economies class in Europe constitute the sample countries of the study (Wikipedia, 2022). The sample countries and the stock market indices used to represent the financial developments of the countries are given below:

Table 2. Countries and Stock Indices Included in the Study

Country	Stock Market Index
Bulgaria	BES SOFIX
Hungary	Budapest SE (BUX)
Poland	WIG20
Romania	BET (BETI)
Russia	MOEX Russia (IMOEX)
Turkey	BIST-100
Ukraine	PFTS (PFTSI)

The period of the study was primarily determined as 1996-2020, and the 25-year period was considered, especially since the 2001 crisis was also included in the study. However, since some countries do not have financial development variables for the 1996-2002 period, the period of the study is 2003-2020 and the 18-year period has been examined. Since the problem of cross-section dependence between the variables exists for both models, secondary generation analysis techniques were used. In the cointegration test, which is based on the error correction model developed by Westerlund in 2007, two groups are expressed as average statistics and the other two groups are expressed as panel statistics. This method can be used if all series are stationary at the first difference (Westerlund, 2007, 718). In this method, the

relationship is investigated with four different panel cointegration tests. Of these four different tests, Gt and Ga represent the average group statistics, and Pt and Pa represent the panel statistics. At the root of these tests is to investigate the cointegration relationship as a result of each panel owning its own error correction. Taking into account the correlation between the panels, bootstrap simulations are used in this method (Yerdelen Tatoğlu, 2018: 200; Zeren, 2017:177).

In the case of a cointegration relationship, either causality tests or coefficient estimators are generally used in the literature. With these methods, the direction and degree of the relationship between the variables are determined. Parameter estimations averaged in the MGE estimator, which is one of these methods, are stable. However, it is known that this method includes the possibility of certain series and indicators being the same between groups (Özcan and Özer, 2018: 203; Şit, 2022: 98). For this reason, the AMG estimator was used as well as the MGE method. The AMG estimator technique, on the other hand, is a bitwise method that takes into account the common aspects of the variables as well as the common dynamic effects and enables the calculation of different coefficients between the sections (Göçer, 2013: 233; Acaravcı et al., 2015: 125). In the method, if the series is homogeneous, a coefficient is calculated for the panel in general, and if it is heterogeneous, a coefficient for the sections is calculated and the group average is calculated for the panel based on the weighted averages of these coefficients. The AMG test can be applied both in cases where the series are I(1) and in cases where the integration degrees are different (Songur, 2017: 127; Eberhardt, 2012). The basic equations of the two different models are as follows:

$$\ln FD_{i,t} = \beta_0 + \beta_1 RD_{i,t} + \varepsilon_{i,t} \quad (1)$$

$$GDP_{i,t} = \beta_0 + \beta_1 RD_{i,t} + \varepsilon_{i,t} \quad (2)$$

The lnFD in Formula (1) represents the logarithmic values of the index values of the most traded shares of the countries representing

financial development, the share of R&D expenditures of R&D countries in GDP, the GDP in Formula (2), the growth rate of the countries in both formulas. represents the margin of error.

FINDINGS

The frequency values of the variables are given in Table 3:

Table 3. Statistical Values of Variables

Variable	Obs	Mean	Std. Dev.	Min.	Max.
R&D	126	0.8176821	0.2996818	0.38161	1.60766
FD	126	5042.532	8522.26	63.65667	41640.51
GDP	126	3.074605	4.35265	-15.13647	11.79535
LogFD	126	3.240456	0.6239314	1.803844	4.619516

As can be seen in Table 3, when the stock market indices of countries representing financial development are used in their raw form, it can be seen from the standard deviation value that there is a high difference in the stock market variables of the countries. When this value is taken as the logarithm, it is seen that the standard deviation has decreased considerably.

Table 4. Cross-Section Dependency Test

	Stat.	Prob
Model-1 (LogFD)	9.599	0.0000
Mode-2 (GDP)	10.964	0.0000

Since there is a cross-section dependency problem in both models, the analysis will be done with second-generation tests.

Table 5. CADF Unit Root Test

	t-bar	cv10	cv5	cv1	Z[t-bar]	P-value
LogFD	-1.037	-2.210	-2.340	2.600	-1.781	0.963
GDP	-1.946	-2.210	-2.340	-2.600	-0.555	0.289
R&D	-1.810	-2.210	-2.340	-2.600	-0.205	0.419

According to the unit root test results in Table 5, the fact that the statistical values of the variables are smaller than the critical values at 1%, 5% and 10% significance levels indicates that the variables are not stationary and have unit roots.

Table 6. Swamy Homogeneity Test

	Statistics	Prob.	Decision
Model-1 (LogFD)	1892.57	0.0000	The model is heterogeneous.
Mode-2 (GDP)	16.77	0.1584	The model is homogeneous.

The results of the Westerlund cointegration test to investigate the cointegration relationship between the variables are as follows:

Table 7. Westerlund ECM Panel Cointegration Test

	Value		Z-value		P-value	
Statistic	Model-1	Model-2	Model-1	Model-2	Model-1	Model-2
G_t	-4.385	-3.530	-6.683	-3.869	0.000 ***	0.000***
G_a	-19.495	-12.057	-3.022	-0.063	0.001***	0.475
P_t	-10.160	-8.807	-5.323	-3.747	0.000***	0.000***
P_a	-16.416	-13.957	-3.305	-2.216	0.001***	0.013**

******, ** denote 1% and 5% significance level, respectively. The AIC criterion was chosen as the lag length.***

According to both models, there is a cointegrated relationship between the variables in the long run. There is a long-term relationship between the financial development and growth rate, which are the dependent variables, and the ratio of countries' research and development expenditures to GDP.

AMG and MGE coefficient estimators were used to determine the direction and significance of this relationship. Analysis results are shown in Table 8.

Table 8. MGE Coefficient Estimator Results

	Coef.		**Std. Error**		**Prob**	
	Model-1	**Model-2**	**Model-1**	**Model-2**	**Model-1**	**Model-2**
Bulgaria	-0.3338534	-8.698711	0.2432479	4.411917	0.170	0.049 **
Hungary	0.5134064	-1.882589	0.1441134	3.605223	0.000 ***	0.602
Poland	-0.0488575	-3.322532	0.085498	1.75868	0.568	0.059*
Romania	1.815984	10.57368	0.7938865	22.19163	0.022**	0.634
Russia	-1.720141	-8.405996	0.5663083	13.63148	0.002***	0.537
Turkey	1.283835	-8.211441	0.130052	-8.211441	0.000***	0.086*
Ukraine	-0.4588288	11.86822	0.3109329	7.808822	0.140	0.129
Panel	0.1502206	-1.154196	0.4454775	3.35116	0.736	0.731

****, **, * denote 1%, 5% and 10% significance levels, respectively.***

According to the results of the Mean Group estimator developed by Pesaran & Smith in 1995; In the model, in which stock market indices are the dependent variable representing financial development, it is seen that R&D expenditures throughout the panel are not effective on the stock market. When viewed on a country basis; It is seen that R&D expenditures are effective on the financial development of countries at the 1% significance level in Hungary, Russia and Turkey, and at the 5% significance

level in Romania. While 1 unit increase in R&D expenditures of countries in Hungary, Turkey and Romania increased their financial developments by 0.51, 1.28 and 1.81, respectively, it decreased by 1.72 in Russia.

In Model-2, where the growth rate is the dependent variable, it is seen that the R&D expenditures are not effective on the growth throughout the panel. When viewed on a country basis; It is seen that R&D expenditures are effective on growth at the 5% significance level in Bulgaria and 10% significance level in Poland and Turkey. Unit increase in R&D expenditures in Bulgaria, Poland and Turkey reduces the growth rate by 8.69, 3.32 and 8.21, respectively. But since model 2 is homogeneous, the panel should be interpreted as a whole. That is, there is no relationship between the variables.

To consolidate the MGE estimator results, the Augmented Mean Group estimator (Eberhardt & Bond 2009; Eberhardt & Teal, 2010) results are listed in Table 9:

Table 9. AMG Estimator Results

	Coef.		**Std. Error**		**Prob.**	
	Model-1	**Model-2**	**Model-1**	**Model-2**	**Model-1**	**Model-2**
Bulgaria	-0.6259462	-0.7601832	0.2322716	2.545248	0.007***	0.765
Hungary	0.140428	6.774839	0.093988	2.500136	0.135	0.007***
Poland	-0.2847607	-1.088274	0.0371811	1.690322	0.000***	0.520
Romania	-0.5060069	11.91619	0.3184184	13.59934	0.112	0.381
Russia	0.112673	0.2012465	0.3473031	5.34954	0.746	0.970
Turkey	0.8861668	0.0802991	0.1322073	4.969999	0.000***	0.987
Ukraine	0.756167	-1.538032	0.2408142	4.711295	0.002***	0.744
Panel	0.0683887	2.226584	0.222844	1.935662	0.759	0.250

*** ***Indicates 1% significance level.***

According to AMG Estimator Results; In Model-1, it is seen that R&D expenditures are not effective on financial development throughout the panel. However, when viewed on a country basis; It is concluded that R&D expenditures in Bulgaria, Poland, Turkey and Ukraine have a strong effect on financial development at the 1% significance level. While a one-unit increase in R&D expenditures in Turkey and Ukraine increases financial development by 0.88 and 0.75, respectively, it decreases it by 0.62 and 0.28, respectively, in Bulgaria and Poland.

In Model-2, it was concluded that R&D expenditures were not effective on growth throughout the panel. However, it is concluded that R&D expenditures in Hungary have a strong effect on growth at the 1% significance level. In Hungary, 1 unit increase in R&D expenditures increases the growth by 6.77. Although there is a relationship for Hungary, it is seen that there is no relationship because the model is homogeneous.

RESULTS AND RECOMMENDATIONS

The role of growth and financial development, which are the basic economic barometers of countries, is inevitable. For the development of these indicators, countries are expected to prefer the way of producing technological and high value-added products. These productions will be possible by increasing the research and development activities of the countries. It would be preferable to increase the share of expenditures made by countries for research and development in their budgets.

The aim of this study is to investigate the effect of countries' research and development expenditures on the financial development and growth of countries. Analysis was made with 18 years of data for the 2003-2020 period. Some European Countries in the Developing Economies Class (Bulgaria, Hungary, Poland, Romania, Russia, Turkey, Ukraine) were chosen as the sample countries. The dependent variables are the stock market indices in which the largest

shares of countries are traded, representing financial development, and rates of change in GDP representing growth; As an independent variable, the share of countries' research and development expenses in GDP is taken. Westerlund ECM cointegration test, MGE and AMG estimators were used as a method.

As a result of the analysis, it is seen that there is a cointegrated relationship between R&D expenditures and financial development and growth in the long run. According to the MGE estimator results, it is seen that R&D expenditures are effective on the financial development of the countries at the 1% significance level in Hungary, Russia and Turkey, and at the 5% significance level in Romania. While 1 unit increase in R&D expenditures of countries in Hungary, Turkey and Romania increased their financial developments by 0.51, 1.28 and 1.81, respectively, it decreased by 1.72 in Russia. While R&D expenditures affect financial development more in Turkey and Romania, they affect less in Hungary. This can be explained by the fact that Hungary's R&D expenditures have less impact on the stock markets as a larger share is allocated in the budget. Russia is the country that allocates more money to research and development among the sample countries studied. For this reason, as these countries allocate a share above the average for R&D, their stock markets are adversely affected. This can be explained by the fact that if Russia invests in other investment areas instead of R&D, its stock markets can develop more. It is seen that R&D expenditures are effective on growth at the 5% significance level in Bulgaria and at the 10% significance level in Poland and Turkey. Unit increase in R&D expenditures in Bulgaria, Poland and Turkey reduces the growth rate by 8.69, 3.32 and 8.21, respectively. In this situation, it is expected that the budget deficit will increase if the R&D expenditures of the countries increase in the GDP, and the expected return from the R&D expenditures or if the goal is not achieved, it will have a negative effect on the growth.

According to the AMG estimator results, it is concluded that R&D expenditures in Bulgaria, Poland, Turkey and Ukraine have

a strong effect on financial development at the 1% significance level. While a one-unit increase in R&D expenditures in Turkey and Ukraine increases financial development by 0.88 and 0.75, respectively, it decreases it by 0.62 and 0.28, respectively, in Bulgaria and Poland. These results support the MGE results. In other words, while the stock markets are positively affected by this ratio in countries with lower R&D expenditures, which are allocated in GDP, countries with higher shares are negatively affected. It is concluded that R&D expenditures in Hungary have a strong effect on growth at the 1% significance level. In Hungary, 1 unit increase in R&D expenditures increases the growth by 6.77. As R&D expenditures positively affect the growth rate in Hungary, it is expected that Hungary, which aims for a higher growth rate, will increase the share of R&D expenditures in GDP.

In summary, since the first model is heterogeneous, there is a relationship between variables on the basis of countries. However, since the second model is homogeneous, although there is a relationship for countries, there is no relationship between variables because there is no relationship across the panel. The main limitation of the study can be stated that the study was only applied to some countries in the Developing Economies class in Europe, and the lack of research on other countries. While the findings obtained from the study gave results in parallel with the study of Meierrieks (2014), Chang et al. (2005), Hwang et al. (2010), Tandogan (2017), Ayaydın et al. (2018) gives partially similar results with their studies. The study can be improved by increasing the number of sample countries, the number of periods and applying different methods.

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CHAPTER 7

Investigation of the Relationship of Unemployment Rates, Net Foreign Direct Capital Investments and Gross Domestic Increasing Rate With Ardl and Toda Yamamoto Tests: Turkey (1991-2020)

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Introduction

The concept of unemployment has been one of the leading macroeconomics topics that national economies have been

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trying to analyze since the Industrial Revolution. This is because unemployment is not only an individual problem, but also a comprehensive social problem with a negative multiplier effect. When the literature on unemployment is reviewed, there are many studies on the causes and consequences of unemployment and policy recommendations for the solution of unemployment. However, although the number of studies on it is high, only fiew talk about the existence of a policy proposal that has yet completely solved the unemployment problem. In this study, considering the 1991-2020 data, Turkey's net foreign direct investment data and the relationship between the rate of increase in gross domestic product and the unemployment rate were examined through the ARDL limit test and Toda Yamamoto tests with the Eviews 9 package program. The goal of the study is to analyze whether there is a relationship between the variables in the short or long term, the causality between the variables and the time required for a possible shock effect in unemployment rates to pass through the system. In the first part of the study, the conceptual framework was included, in the second part, the samples, methods and results of similar studies in the literature were mentioned, the analysis findings of the study were shared in the third part, and comments and suggestions regarding the analysis results were shared in the last part.

1. Conceptual Framework

Investments from foreign capital investments, which are examined under two headings as indirect and direct, include portfolio investments coming from investors outside that country, while direct investments are from investors outside the country, It refers to investments made in the form of "establishing production facilities, opening branches, acquiring real estate or buying part or all of the shares of an existing company" (Akkaya, 2019: 285).

It is known that FDI, as an important source of capital, is complementary to local investments and has a supportive effect

on the economic growth of the host country (Chowdhury ve Mavrotas, 2005: 1). Although FDI is a product of the global economy and acts as a catalyst for economic development, the output benefit of this task cannot be observed equally in all areas of the economy (Palat, 2011: 261). Therefore, while some macro variables are positively affected by FDI, other have shown negative affect in the analysis of FDI. Net Foreign Direct Investment, on the other hand, expresses the difference between the investment in the host country and the outgoing investment, while this difference gives a negative result if the incoming investment is more than the outgoing investment. While GDP means the total economic value of all final goods and services produced by a country's resident institutional units, the GDP growth rate represents the percentage change of this total value compared to the previous year (OECD, 2022).

Another important concept that forms the basis of this study is the unemployment rate. First, the concept of unemployed is used in the sense of "an individual who cannot work although he wants to work or cannot contribute to the economy although he works", and the situation of people who are suitable for this definition is expressed as unemployment (Metin, 2022: 25). Unemployment rate, on the other hand, is defined as "the ratio of the unemployed population in the labor force" (TÜİK, 2022).

In this study, statistical data on the concepts described above were obtained through the World Bank (https://data.worldbank.org/).

2. Similar Studies in the Literature

When the literature on the subject is reviewed, we found many theoretical and empirical studies prepared both for Turkey and for different countries. Prominent observed studies on the subject have been tried to be included through the following tables.

In Table 1.1, there are national and international studies that found a significant relationship or causal link between unemployment rates, FDI and GDP.

Table 1.1. Some Studies Finding a Relationship Between Unemployment, FDI and GDP in the Literature Review

Author and Publication Date	Sample, Years Covered and Method	result
Chowdhury ve Mavrotas (2005)	Chile, Thailand 1969- 2000 Toda-Yamamoto	It has been determined that there is a "bidirectional causality relationship between the variables" in Malaysia and Thailand.
Jayaraman, T. K., Singh, S., (2007)	Fiji 1970-2003 ARDL Granger	They concluded that Foreign Direct Investment (FDI) positively affects employment.
Chang, S. C. (2007)	Taiwan 1981-2003 VAR	It has been revealed that employment is affected by FDI.
Ajaga, E., Nunnenkamp, P., (2008)	America, 1977-2001 Johansen Cointegration Toda-Yamamoto Granger	Besides cointegration, two-way causality was found between FDI and outcome variables.
Palát, M. (2011)	Japan 1983-2009 correlation	It has been determined that there is a significant relationship between FDI and unemployment.
Shaari, M. vd. (2012)	Malaysia 1980-2010 Least Squares	They found that FDI reduces the unemployment rate and increases GDP.

Stamatiou,P., Driksakis, N. (2014)	Greece 1970-2012 ARDL - VECM Granger	It has been determined that there is a strong unidirectional causality between the unemployment rate, FDI, and economic growth in the long run, between economic development and FDI in both the short and long run, from economic development to FDI.
Şahin, L. (2016)	Some SADC Countries (Madagascar, Lesotho, Mozambique, South Africa, Namibia, Tanzania, Zimbabwe and Zambia) 1992-2013 Panel dynamic least squares method	"It was concluded that there is a positive relationship between FDI and employment".
Erçakar, M.E., Güvenoğlu, H. (2018)	Turkey 1980- 2016 Johansen cointegration test Granger causality test	There is a negative and statistically significant relationship between FDI and unemployment, but no relationship could be found between FDI and unemployment in the short run.
Bayır, M., Şahin Kutlu, Ş. (2019)	Turkey 1988-2017 ARDL Limit Test	It has been determined that GDP, "vocational education and university education have a negative effect on youth unemployment in the long term, and a statistically significant and positive effect on GDP unemployment in the short term".

Korkmaz, Ö., Daştan, B. (2020)	Turkey 2005- 2019 Maki cointegration test Toda-Yamamoto causality test	It has been determined that "there is no long-term relationship between FDI and unemployment", but "there is a unidirectional causal link from unemployment rate to foreign direct investment".

Some of the national and international empirical studies that stand out in the literature and have determined that there is no relationship or causal link between unemployment, FDI and GDP are listed in Table 1.2.

Table 1.2. Some Studies Not Finding a Relationship Between Unemployment, FDI and GDP in the Literature Review

Author and Publication Date	Sample, Years Covered and Method	result
Bilgin, M. H. (2004)	Turkey 1980- 2002 Regression Analysis	No significant relationship was found between FDI and employment level.
Peker, O., Göçer, İ. (2010)	Turkey 2000-2009 ARDL	There is no statistically significant relationship between FDI and unemployment in the long run, and it has been determined that FDI increases unemployment in the current period, but decreases after two periods in the short run.
Üçler, G. Vd (2013)	Turkey 1989-2011 ARDL	It has been determined that FDI has no significant effect on employment.
Noyan Yalman, İ., Koşaroğlu, Ş.M., (2017)	Turkey 1988-2016 Granger Toda-Yamamoto	There is no causal relationship between FDI and national income and unemployment.

Balkanlı, O.A. (2019)	Turkey 1985-2017 Cointegration and stationarity analysis	It has been determined that there is a positive relationship between FDI and economic growth in the long run.
Ağır, H., Rutbil, M. (2019)	Turkey 1974-2017 VAR analysis based impulse response functions, variance decomposition and causality estimations	It has been determined that FDI coming to Turkey, "fixed capital investments and per capita gross domestic product variables are not cointegrated" and that FDI has a limited effect on explaining economic growth.
Akkaya, M. (2019)	China, Brazil, India, Russia, Turkey, 1995-2016 Dynamic panel data method	Although there is a relationship between FDI and economic growth, there is no relationship between FDI and interest, openness, domestic consumption and unemployment.
Canbay, Ş., Kırca, M. (2020)	Turkey 1991-2016 ARDL Limit Test Granger Causality Test	Although the variables are cointegrated, there is no statistically significant relationship with FDI in the short run, a 1% increase in FDI in the long run increases unemployment by approximately 0.96%, "according to the results of the causality analysis based on the error correction model in the long run". It has been determined that there is a causal relationship from unemployment to unemployment.

Bayrakdar, S., Soyyiğit, S., (2020)	China, India, Brazil, Russia, Indonesia, Mexico, Turkey, 1993-2017 Structural break cointegration analysis	"There is a long-run relationship between the share of FDI in GDP and employment; It was seen that it had a negative effect for Brazil and India, but did not have a statistically significant effect for Turkey and Mexico.

When the studies in the tables are examined, it is hard to conclude that there is a causal relationship between FDI and GDP and unemployment rates. Because the relationship and causality bond differ according to the period in which the empirical analysis is made and the data of the country that is the basis of the analysis. However, it has been determined that almost none of the studies have been analyzed with the net of foreign direct investment and the effect of this factor on unemployment rates has not been examined.

Based on the differences in results, in this study, the relationship between Turkey's net foreign direct investment data and the rate of increase in gross domestic product with unemployment rates was examined in order to draw attention to a possible lack of literature.

3. Analyzes and Results

In the study, annual NFDI, GDP growth rate and unemployment rate data of Turkey covering the years 1991-2020, compiled using World Bank data.

The data based on the analysis are given in Table 2.1. Since Turkey's DNYSY data reported negative results every year (since the incoming capital is more than the outgoing capital), this variable has been used in the analysis by making it positive, as follows.

Table 2.1. GDP, Unemployment Rates, Net Foreign Direct Investment (NFDI): Turkey 1991 – 2020 (Source: The World Bank, 2021).

Years	GDP (Annual, % Increase)	Unemployment Rates (Annual, %, ILO Model)	DNYSY ($)
1991	0,72	8,21	783.000.000
1992	5,04	8,51	779.000.000
1993	7,65	8,96	622.000.000
1994	4,67	8,58	559.000.000
1995	7,88	7,64	772.000.000
1996	7,38	6,63	612.000.000
1997	7,58	6,84	554.000.000
1998	2,40	6,89	573.000.000
1999	3,26	7,69	138.000.000
2000	6,93	6,50	112.000.000
2001	5,75	8,38	2.855.000.000
2002	6,45	10,36	939.000.000
2003	5,76	10,54	1.222.000.000
2004	9,80	10,84	2.005.000.000
2005	8,99	10,64	8.967.000.000
2006	6,95	8,72	19.261.000.000
2007	5,04	8,87	19.941.000.000
2008	0,82	9,71	17.302.000.000
2009	4,82	12,55	7.032.000.000
2010	8,43	10,66	7.617.000.000
2011	11,20	8,80	13.812.000.000
2012	4,79	8,15	9.638.000.000
2013	8,49	8,73	9.927.000.000
2014	4,94	9,88	6.287.000.000
2015	6,08	10,24	14.167.000.000
2016	3,32	10,84	10.697.000.000
2017	7,50	10,82	8.339.000.000
2018	2,98	10,89	9.235.000.000
2019	0,89	13,67	6.323.000.000
2020	1,79	13,92	4.699.000.000

For the analysis, ARDL limit test and Toda Yamamoto tests were applied through the Eviews 9 package program and the necessary pre-tests to perform these tests were applied. From the abbreviations used while transferring data to the Eviews program, "UNEMP" refers to unemployment rates, "GDP" refers to GDP growth rate, "FDIN" refers to net foreign direct investment, and "LNFDIN" refers to net foreign direct investment with logarithms.

3.1. Unit Root Test Results

The first pre-test was the Agumented Dickey-Fuiler (ADF) Unit Root test, which is an extended version of the Dickey-Fuller (DF) test to prevent the spurious regression problem (Granger and Newbold, 1974) and to increase the reliability of the analysis. termed and trended". It is used to mean stationary at the I(0) level and stationary at the I(1) difference, and the ADF test results of the variables based on the study are given in Table 3.1.

Among the variables, unemployment rate was found to be stationary in difference I(1), GDP growth rate was found to be stationary at level I(0) and LDNYSY was found to be stationary in difference I(1).

Table 3.1. ADF Unit Root Analysis

Variables	ADF	t-Statistic	prob	Test Critical Values		
				%1	%5	%10
UNEMP	Level Intercept	-0.979493	0.7470	-3.679322	-2.967767	-2.622989
	Level Trend&Intercept	-3.100565	0.1255	-4.323979	-3.580623	-3.225334
	1st Difference Intercept	-4.542682	0.0012	-3.689194	-2.971853	-2.625121
	1st Difference Trend&Intercept	-4.594553	0.0054	-4.323979	-3.580623	-3.225334
GDP	Level Intercept	-4.083127	0.0037	-3.679322	-2.967767	-2.622989
	Level Trend&Intercept	-4.190896	0.0131	-4.309824	-3.574244	-3.221728
	1st Difference Intercept	-4.641283	0.0011	-3.711457	-2.981038	-2.629906
	1st Difference Trend&Intercept	-4.782129	0.0038	-4.356068	-3.595026	-3.233456
LNFDIN	Level Intercept	-1.578735	0.4803	-3.679322	-2.967767	-2.622989
	Level Trend&Intercept	-2.178583	0.4831	-4.309824	-3.574244	-3.221728
	1st Difference Intercept	-5.964540	0.0000	-3.689194	-2.971853	-2.625121
	1st Difference Trend&Intercept	-5.872675	0.0003	-4.323979	-3.580623	-3.225334

3.2. ARDL Limit Test Results

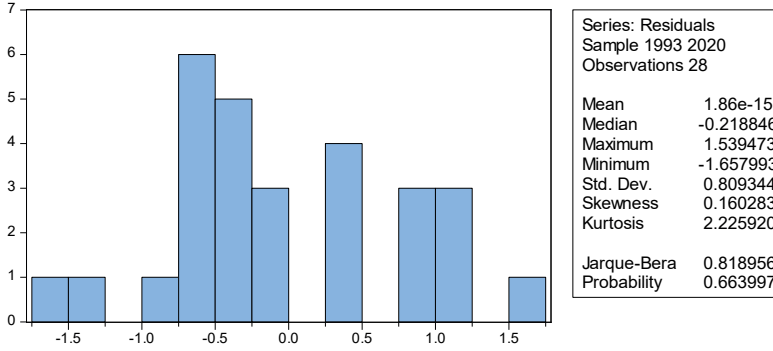
"Autoregressive Distributed Lag" (ARDL), a method that was translated into Turkish as Distributed Delay Autoregressive Model and developed towards the end of the 1990s (Pesaran and Shin, 1997), ARDL bounds test allows "to search for possible long-term relationships between integrated series from different levels" (Destek, 2019: 1481). In order to use this method, there are five pre-tests that need to be examined, the first of which is the "Breusch-Godfrey Serial Correlation LM Test", which is an autocorrelation test. In this test, the f statistic probe value was 0.80. Since the probe value was greater than 0.10, it was determined that there was no autocorrelation problem in the analysis. Then, the varying

variance test was performed, and as a result of the ARCH test, the f statistic probe value was 0.71, and it was determined that there was no varying variance problem. In order to determine whether the correct functional form is used, the RAMSEY Reset test was used, and since the probe value of the f statistic was 0.4924, it was concluded that the correct functional form was used. The mentioned results are given in Table 3.2.

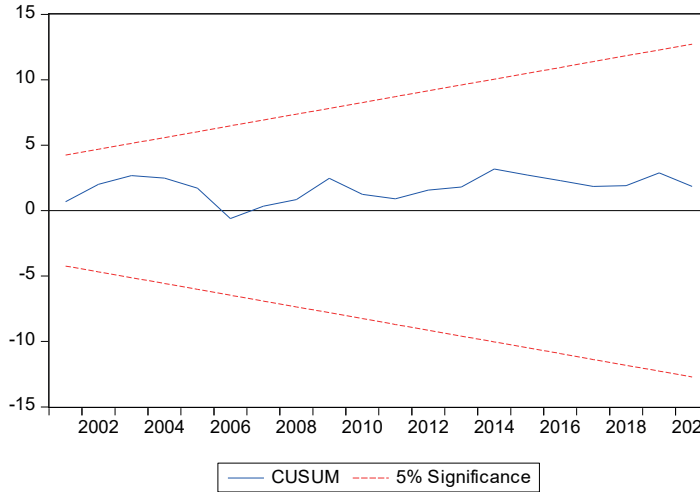
Table 3.2. LM, ARCH and Ramsey RESET Results

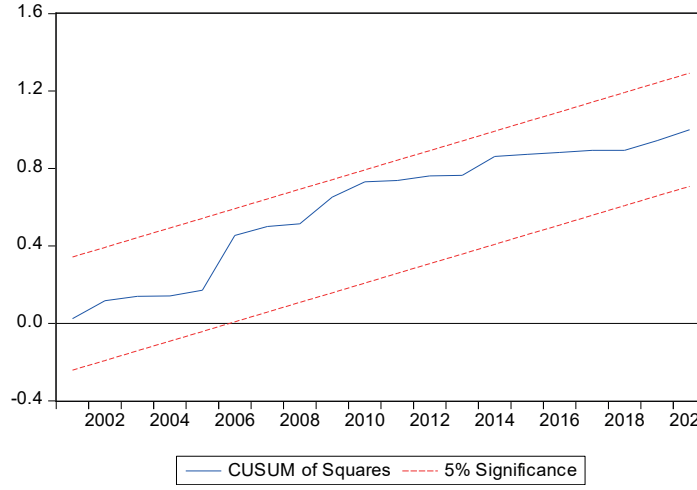
	F-statistic	**Prob.**
LM Test	0.059508	0.8099
ARCH	0.137926	0.7135
Ramsey RESET	0.490126	0.4924

In the Jarque-Bera test performed for the normal distribution, the probe value was 0.663997, and it was concluded that the series showed a normal distribution.



If the parameter stability condition is Cusum and Cusum of Squares test results are given in the graphs below, it is understood that the parameter stability conditions are met.





Limit values are very important for making short and long term interpretations between variables. If the F statistic is below I0 bound, it is interpreted that there is no cointegration relationship, if it is in the I0-I1 Bound range, cointegration can only be interpreted at a different stage, and if it is above I1 Bound,

there is cointegration between the variables (Bingöl ve Pehlivan, 2018: 176). The calculated f statistic is 5.93, and considering the 10% critical value based on the study, it is possible to talk about the existence of a cointegration relationship between the variables, since I1 is above the bound of 4.02.

Table 3.3. Bound Test Results

Test Statistic	**Value**	**K**
F-statistic	5.930770	2
Critical Value Bounds		
Significance	**I0 Bound**	**I1 Bound**
10%	3.38	4.02
5%	3.88	4.61
2.5%	4.37	5.16
1%	4.99	5.85

The results of the short-term coefficients are given in Table 3.4. The effect of an increase in GDP on unemployment rates is significant and negative in the short run. It is seen that direct net foreign capital investments do not have a significant effect on unemployment rates (prob.:0.14) in the short run. However, it is seen that the 1-lagged value of net foreign direct investment investments, in other words, the value of 1 period ago has a positive and significant effect on unemployment (D(LNFIN(-1) prob. 0.024)). The error correction coefficient (CointEg(-1): -0.33) allows to comment on the dependent variable being freed from a shock effect that may occur in the system. Accordingly, it is estimated that it will take approximately 3 years for a shock effect on unemployment to disappear.

Table 3.4. Short run Floor Number Results

Cointegrating Form				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(GDP)	-0.146420	0.060436	-2.422750	0.0250
D(LNFDIN)	0.343645	0.225190	1.526025	0.1427
D(LNFDIN(-1))	0.526476	0.215585	2.442086	0.0240
C	4.682563	0.876930	5.339721	0.0000
CointEq(-1)	-0.339739	0.065044	-5.223173	0.0000

In the long run, an increase in GDP appears to have a significant and negative effect on unemployment rates. However, it has been determined that net foreign direct investment does not have a significant effect on unemployment rates in the long run.

Table 3.5. Long-Run Coefficient Results

Long Run Coefficients				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
GDP	-1.228935	0.624835	-1.966815	0.0632
LNFDIN	0.051730	0.698250	0.074085	0.9417
@TREND	0.141060	0.126972	1.110950	0.2798

3.3. Toda Yamamoto Test Results

Toda Yamamoto (1995) is one of the important analysis methods that reveals the causal relationship between the unit rooted states of the variables without making them stationary. However, it is also important to test the lag lengths in order to ensure the future reliability of the estimates and the relationship between them (Noyan Yalman ve Koşaroğlu: 2017, 199). In this direction, since

the unemployment rate and net foreign direct investment variables are stationary variables in the first difference, the optimum lag lengths of these variables as [d(unemp) (gdp) d(lnfdin)] were tested. As a result of the "VAR Lag Order Selection Criteria" test, all information criteria of "Akaike, Schwarz, and Hannan-Quinn" determined the lag length of 0 as optimum, but the lag length of 1 was considered as the optimum delay since the use of 0 could not give reliable results.

Table 3.6.Delay Length Results

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-132.9183	NA*	6.970865*	10.45526*	10.60042*	10.49706*
1	-124.7944	13.74827	7.511234	10.52264	11.10330	10.68985
2	-119.6554	7.510736	10.45248	10.81965	11.83580	11.11226
3	-116.2918	4.139854	17.54349	11.25322	12.70487	11.67124

The table regarding the causality results of Toda Yamamoto performed with the VAR(dmax+k) model with 1 lag length is as follows. On the basis of probe 0.10 significance level, there is a causality between GDP growth rates and unemployment rates. Likewise, a causality has been determined from direct net foreign capital investments to the unemployment rate. However, no causal relationship was found from unemployment rates to GDP and from NFDI to GDP. Likewise, no causality has been determined from unemployment rates to NFDI and from GDP to NFDI.

Table 3.7. Toda Yamamoto Causality result

Dependent variable: UNEMP

Excluded	Chi-sq	df	Prob.
GDP	5.799016	1	0.0160
LNFDIN	4.703722	1	0.0301
All	8.822041	2	0.0121

Dependent variable: GDP

Excluded	Chi-sq	df	Prob.
UNEMP	0.018352	1	0.8922
LNFDIN	0.785170	1	0.3756
All	0.790850	2	0.6734

Dependent variable: LNFDIN

Excluded	Chi-sq	df	Prob.
UNEMP	0.026402	1	0.8709
GDP	2.417045	1	0.1200
All	2.683916	2	0.2613

Conclusion and Discussion

In the study, it has been tried to analyze whether there is a short or long term relationship between the unemployment rates in Turkey between 1991 and 2020, the rate of increase in gross domestic product and net foreign direct investment, and if there

is, the effect of this relationship and the possible causal relationship between the variables. As a result of the tests, it was concluded that an increase in the GDP growth rate both in the short run and in the long run affects the unemployment rate negatively. Since the negative effect of unemployment rate will mean that unemployment will decrease in percentage, it is concluded that the increase in GDP reduces unemployment both in the short and long run.

In the tests conducted with the net of foreign direct investment, it has been determined that there is no significant relationship between the unemployment rate and the long run unemployment rate. However, it has been concluded that contrary to what is expected or desired by the economic actors in the short run, it affects unemployment rates positively, in other words, it increases unemployment. It is possible to say that this result is due to the entry of foreign capital into Turkey by purchasing various national enterprises, rather than by establishing a new business area. In addition, it is possible to interpret that a net increase in foreign capital will increase unemployment in the short term, as a result of a revision in working relations with the detection of hidden unemployed (employees with marginal productivity) in enterprises.

The analyzes have shown that if there is a shock effect caused by GDP increase rates and NFDI in unemployment rates, this shock effect can be eliminated after approximately 3 years from the system. This estimation not only reveals the importance of the stable increase in GDP, but also reveals the stability that will be brought by growth with domestic capital rather than foreign capital.

In the analysis of causality relations, it has been observed that there is a one-way causality between the GDP growth rate and unemployment rates. Similarly, the one-way causality relationship between NFDI and unemployment rates has been revealed by the analyzes made.

As a result, The analyzes show that the way to reduce unemployment rates for Turkey is to increase the GDP ratios with domestic capital rather than foreign direct investments. In future studies, it will contribute to the literature by going down to the sub-dimensions of unemployment and analyzing the effects of NFDI and GDP growth rates on youth unemployment rates and educated unemployment rates.

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CHAPTER 8

Jeopolitik Riskin Gelişmekte Olan Piyasalar Üzerindeki Etkileri[1]

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1. GİRİŞ

Finansal piyasa getirileri ve volatilite, firmaların finansal durumunu ve gelecek beklentilerini doğrudan etkilediği için uygulayıcılar açısından sermaye bütçelemesi ve portföy yönetimi kararlarında en önemli göstergeler arasında yer almaktadır (Poon ve Granger 2003: 478). Etkin piyasa hipotezinin geçerliliği ile çelişen piyasa hareketlerinin tahmin edilebilirliği ise akademisyenlerin gerçekçi varlık fiyatlandırma modelleri oluşturulmasına yardımcı olmaktadır (Rapach ve Zhou 2013: 330). Hem akademisyenler hem de uygulayıcılar

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açısından öneme sahip olan piyasa getirilerini ve volatiliteyi tahmin etmek oldukça zor olup stokastik ve doğrusal olmayan bileşenleri içerir. Tahmin sürecinde yerel ve uluslararası finansal, makroekonomik, kurumsal, davranışsal ve ekonomik belirsizlikler kullanılır. Bu faktörlerin yanı sıra jeopolitik haber ve olayların (örneğin, terör saldırıları) piyasa getirilerini ve volatilitesini tahmin etmedeki rolünü analiz eden çalışmalar da literatürde yer almaktadır (Apergis vd., 2017: 684-685). Uluslararası terör ve içsel/dışsal çatışmalar gibi makroekonomik olayların sonuçlarını inceleyen Blomberg vd. (2004) bu tür olayların büyüme üzerinde anlamlı ve negatif bir etkiye sahip olduğunu ve terörizmin yatırım harcamalarının yönünü hükümet harcamaları doğrultusunda değiştirdiğini ortaya koymuşlardır (Balcilar vd., 2018: 295). Büyük çaplı jeopolitik olayların genellikle iş dünyasında ve finansal piyasalarda dramatik değişikliklerle sonuçlandığı görülmektedir (Chang ve Chu, 2017: 20).

Jeopolitik risk, bir ülkedeki politika ve durumların ülkedeki işletmelerin kârlılığını destekleyemediği veya negatif etkilediği riskleri ifade etmektedir (Currie vd., 2008: 100). Ülke içindeki ve ülkeler arasındaki askeri ve nükleer gerilimler, savaş tehditleri ve savaşlar, terör tehditleri ve terör saldırıları jeopolitik riskin unsurlarını oluşmaktadır (Kamışlı, 2018: 293). Girişimciler, piyasa katılımcıları ve merkez bankaları jeopolitik riskleri yatırım kararlarının ve piyasa dinamiklerinin temel belirleyicisi olarak görmektedir (Caldara ve Iacoviello, 2018: 2). Gallup tarafından 2017 yılında yapılan ve 1.000'den fazla yatırımcının katılmış olduğu ankette, katılımcıların %75'inin dünya genelinde yaşanan çeşitli askeri ve diplomatik çatışmaların ekonomik etkilerinden endişe duyduğu gözlemlenmiştir. Ayrıca katılımcıların jeopolitik riski ekonomik ve politik belirsizliğin önünde sıraladıkları ve yatırım ikliminin en büyük tehlikesi olarak sınıflandırdıkları görülmektedir (Business Wire, 2017). Haziran 2016'da İngiltere'nin Avrupa Birliği'nden ayrılma kararı (Brexit), Kasım 2016'da ABD'nin Donald Trump'ı seçmesi, 2017'de Kuzey Kore'deki "nükleer kriz", 2020'de Doğu Akdeniz'deki enerji kaynaklarının paylaşılması konusunda Yunanistan, GKRY, Mısır ve İsrail tarafından desteklenen ve yaklaşık 6 milyar dolarlık bir yatırım

öngörülen East-Med projesi ile Türkiye'nin dışlanması ve buna bağlı olarak ortaya çıkan jeopoitik risk, East-Med boru hattına yapılacak yatırımları riske atmış, Türkiye bu duruma tepki göstermek ve haklarını korumak için 27 Kasım 2019 tarihinde Libya ile Akdeniz'de Deniz Yetki Alanlarının Sınırlandırılması Anlaşması imzalamıştır. Bu gibi gelişmeler yakın tarihteki jeopolitik değişimleri öngörülemez hale getirdiği için piyasa tepkilerine neden olan yaygın örneklerdendir (Baur ve Samales, 2018:2, Tuna, 2020:84). Bu olaylar jeopolitik risk ile ilgili verilecek sadece birkaç örnektir. Ancak bu olayların ortak özelliği; bu olaylar yerel veya bölgesel olsa da etkilerinin küresel düzeyde olmasıdır. Örneğin, 2011 yılı baharında Tunus'ta başlayan yerel olaylar Kuzey Afrika, Yakın ve Orta Doğuya yayılan "Arap Baharı"nı tetiklemiştir. Arap Baharı, Suriye'deki tansiyonu yükseltmiş ve uluslararası çatışmalara yol açan Suriye iç savaşının başlamasına neden olan etmenlerden birisi olmuştur. Sonrasında, alışılmamış mülteci göçleri başlamış ve bu göçler Avrupa Birliğinde sistematik krizlere neden olmuştur (Neacşu vd., 2018: 870-871).

Jeopolitik risk, iş dünyasında da hesaba katılması gereken önemli riskler arasında gösterilmektedir. 2018 yılında PwC tarafından CEO'lara yönelik olarak yapılan araştırmada, CEO'lardan işletmelerin büyüme beklentilerine yönelik en fazla endişe duydukları tehditleri sıralamaları istenmiştir. Yedi farklı bölgede yapılan araştırmada CEO'ların verdikleri cevaplar Tablo 1'de sıralanmıştır (PwC, 2018: 16). Tablo 1'de yer alan tehditler CEO'ların işletmeleri için en fazla endişe duydukları ilk on riski içermektedir. Yüzde şeklinde verilen sayılar ise CEO'ların vermiş oldukları "oldukça endişeliyim" cevabının yüzdesini göstermektedir. Tablo incelendiğinde, jeopolitik risk kategorisinde değerlendirilen terörizm ve jeopolitik belirsizlik tehditleri bölgelerin neredeyse tamamında CEO'lar tarafından ilk beş tehdit grubu arasında sıralanmıştır. Jeopolitik belirsizlik riski, Orta Doğu'da CEO'lar tarafından işletmelerin büyüme ihtimalini etkileyecek en fazla endişe duyulan tehdit olarak görülmüştür.

Jeopolitik riske atfedilen öneme rağmen bu risk makroekonomik ve finansal döngüleri şekillendirmede ampirik analizlerin konu-

su olmamıştır. Bunun nedeni, basın, kamu, küresel yatırımcılar ve politika yapıcılar tarafından algılanan gerçek zamanlı jeopolitik riski ölçen bir göstergenin eksikliğidir. Bu eksikliği tespit eden Caldara ve Iacoviello gazete kayıtlarını inceleyerek 2017 yılında jeopolitik risk endeksini (GPR) oluşturmuşlardır. Endeks, 1985 yılından itibaren aylık seriler halinde oluşturulmuştur. Daha sonra araştırmacılar tarafından jeopolitik riskin ekonomik etkileri ampirik olarak incelenmeye başlanmıştır. Jeopolitik risk ile ilgili ampirik araştırmalar incelendiğinde genel olarak araştırmaların son birkaç yıl içerisinde yapıldığı ve konu ile ilgili bir endeksin 2017 yılında oluşturulduğu için literatürde az sayıda çalışma olduğu görülmektedir. Bu nedenle, bu araştırmanın literatürü zenginleştireceği, piyasa düzenleyicilerine ve araştırmacılara fayda sağlayacağı düşünülmektedir.

Jeopolitik risklerden kaynaklı ani ticaret ve sermaye akımı değişimlerinden gelişmiş ülkelere kıyasla gelişmekte olan ülkeler daha fazla etkilenmektedir. Jeopolitik riskin yüksek olduğu bölgelerde tüketiciler tüketim harcamalarını ötelemekte ve firmalar önlem amaçlı yatırımlarını erteleyebilmektedir. Jeopolitik riskin yüksek olması ekonomide durgunlaşmaya, hisse senedi getirilerinde düşüş yaşanmasına ve sermayenin gelişmekte olan ülkelerden gelişmiş ülkelere hareket etmesine neden olabilmektedir. Başarılı bir yatırım politikası için ekonomik trendlerin yanında jeopolitik belirsizliklerin de öngörülmesi gerekmektedir (Kamışlı, 2018: 293). Jeopolitik olaylar ülkeye gelen yabancı turist sayısını etkileyebilmekte, dolayısıyla turizm gelirlerinde azalmaya neden olabilmektedir. Yüksek jeopolitik risk ayrıca gelişmekte olan ülkelere yapılan doğrudan yabancı yatırımları ve finansal yatırımları etkileyebilmektedir. Bu nedenlerden dolayı bu araştırmanın örneklemini hızlı bir gelişim içerisinde olan BRICS (Brezilya, Rusya, Hindistan, Çin ve Güney Afrika) ülkeleri ve Türkiye oluşturmaktadır. Örneklemde yer alan ülkelerin ortak özellikleri hızlı ekonomik büyüme, yüksek dinamizm ve artan nüfuslarıdır (Dilek vd., 2018: 19). Bu çalışmanın bildiğimiz kadarıyla BRICS-T ülke borsalarını ve jeopolitik risk endekslerini ele alan ilk çalışma olması nedeniyle literatüre önemli bir katkı sağlayacağı düşünülmektedir.

Tablo 1: Dünyadaki Bölgelere Göre En Büyük Küresel Tehdit Algıları (PwC, 2018)

	Kuzey Amerika	%	Batı Avrupa	%	Asya-Pasifik	%	Latin Amerika	%
1	Siber tehlikeler	53	Popülizm	42	Anahtar becerilerin mevcudiyeti	52	Popülizm	52
2	Aşırı regülasyon	50	Aşırı regülasyon	35	Teknolojik değişimin hızı	51	Yetersiz temel altyapı	51
3	Jeopolitik belirsizlik	44	Jeopolitik belirsizlik	34	Terörizm	48	Vergi yükü artışı	48
4	Terörizm	43	Siber tehlikeler	33	Siber tehlikeler	44	Aşırı regülasyon	44
5	Teknolojik değişimin hızı	34	Terörizm	32	Aşırı regülasyon	42	Terörizm	42
6	Vergi yükü artışı	34	İklim değişikliği ve çevresel zarar	27	Jeopolitik belirsizlik	41	Teknolojik değişimin hızı	41
7	Anahtar becerilerin mevcudiyeti	27	Anahtar becerilerin mevcudiyeti	24	Vergi yükü artışı	40	Jeopolitik belirsizlik	40
8	Sosyal istikrarsızlık	26	Teknolojik değişimin hızı	23	İklim değişikliği ve çevresel zarar	40	Döviz kuru oynaklığı	40
9	Yerli ekonomiyi koruma	24	Vergi yükü artışı	22	Yerli ekonomiyi koruma	38	İklim değişikliği ve çevresel zarar	38
10	İşgücü demografisinin değişimi	22	Yerli ekonomiyi koruma	22	Döviz kuru oynaklığı	37	Sosyal istikrarsızlık	37
	Orta ve Doğu Avrupa	**%**	**Orta Doğu**	**%**	**Afrika**	**%**		
1	Anahtar becerilerin mevcudiyeti	51	Jeopolitik belirsizlik	63	Sosyal istikrarsızlık	50		
2	Aşırı regülasyon	48	Siber tehlikeler	54	Vergi yükü artışı	49		
3	Jeopolitik belirsizlik	42	Aşırı regülasyon	44	Aşırı regülasyon	48		
4	Terörizm	39	Terörizm	42	Ekonomik büyümedeki belirsizlik	45		
5	Popülizm	39	Teknolojik değişimin hızı	40	Jeopolitik belirsizlik	45		
6	İşgücü demografisinin değişimi	37	Vergi yükü artışı	38	Döviz kuru oynaklığı	45		
7	Sosyal istikrarsızlık	37	Ekonomik büyümedeki belirsizlik	33	Siber tehlikeler	45		
8	Teknolojik değişimin hızı	36	İşsizlik	31	Popülizm	43		
9	Vergi yükü artışı	35	Sosyal istikrarsızlık	31	Anahtar becerilerin mevcudiyeti	43		
10	Döviz kuru oynaklığı	32	Anahtar becerilerin mevcudiyeti	29	İşsizlik	39		

2. LİTERATÜR TARAMASI

Jeopolitik risk ile ilgili yapılan araştırmaların sayısında son yıllarda artış görülmektedir. Caldara ve Iaoviello'nun jeopolitik risk endeksini oluşturmalarının bu artışta bir etkisi olduğu söylenebilir. Ancak literatürde yine de konu ile ilgili sınırlı sayıda araştırma mevcuttur. Jeopolitik risk ile ilgili yapılan araştırmalar incelendiğinde hisse senedi getirileri (Antonakakis vd., 2017; Apergis vd., 2017; Kamışlı, 2018), petrol getirileri (Antonakakis vd., 2017; Chang ve Chu, 2017), volatilite (Apergis vd., 2017; Balcilar vd., 2018; Gkillas vd., 2018), İslami piyasalarda getiri ve volatilite (Bouri vd., 2018), altın getirileri (Baur ve Smales, 2018), şirket yatırımları (Dissanayake vd., 2018), ticaret akışları (Demir vd., 2018), dünya borsaları (Lee, 2018), sigorta primleri (Shahbaz vd., 2018), turizm (Neacşu vd., 2018; Demir vd., 2019) ve ekonomik büyüme (Soybilgen vd., 2019) gibi değişkenler ile jeopolitik risk arasındaki ilişkilerin incelendiği görülmektedir.

Jeopolitik riskin farklı faktörler ile ilişkisini inceleyen araştırmalarda istatistiksel olarak anlamlı ilişkiler elde edilmiştir. Jeopolitik riskin petrol fiyatları üzerinde negatif etkisi olduğu (Antonakis vd., 2017), borsa getirilerinden çok borsa volatilitesi üzerinde etkisi olduğu (Balcilar vd., 2018), İslami piyasalarda borsa getirilerinden çok borsa volatilitesi üzerinde etkisi olduğu (Bouri vd., 2018), ticaret akışlarını negatif etkilediği (Demir vd., 2018), firmaların jeopolitik riske sermaye yatırımlarını azaltarak karşılık verdiği (Dissanayake vd., 2018), jeopolitik riskteki artışın sigorta primlerini artırdığı (Shahbaz vd., 2018) ve turizmi negatif etkilediği (Demir vd., 2019) araştırma bulgularına örnek olarak verilebilir. Literatürde borsalar ile jeopolitik risk arasındaki ilişkiyi araştıran kısıtlı sayıda çalışma mevcuttur.

Bu çalışmalar genel olarak hisse senedi getirileri veya volatilite üzerine yoğunlaşmıştır. Jeopolitik riskin hisse senedi getirilerini ve volatilitesini tahmin etmedeki rolünü araştıran Apergis vd. (2017) küresel savunma sanayide faaliyet gösteren 24 büyük

şirketi örneklem olarak belirlemişlerdir. Araştırmacılar parametrik olmayan testler sonucunda, jeopolitik risk ile hisse senedi getirilerinin tahmin edilebileceğine dair bir kanıt bulamamışlardır. Ancak, jeopolitik risk endeksi şirketlerin %50'sinde gerçekleşen volatiliteyi tahmin edebilmiştir. Balcilar vd. (2018), BRICS ülke borsalarında parametrik olmayan nedensellik testi ile jeopolitik belirsizliğin hisse senedi getirileri ve volatilitesi üzerine etkilerini incelemişlerdir. Bulgular, jeopolitik riskin BRICS ülkelerinde tekdüze şekilde bir etki oluşturmayıp heterojen bir etki gösterdiğini ortaya koymuştur. Araştırmacılar, Apergis vd. (2017) sonuçlarına benzer şekilde jeopolitik belirsizliğin borsa volatilitesi ölçülerini getirilere kıyasla daha iyi tahmin ettiği sonucunu elde etmişlerdir. BRICS ülkelerinden Rusya hem getiri hem volatilite açısından jeopolitik riske en fazla maruz kalan ülke iken Hindistan en dayanıklı ülke olarak bulunmuştur. Balcilar vd.'lerinin (2018) araştırmasına benzer şekilde parametrik olmayan nedensellik testi ile getiri ve volatilite ile jeopolitik risk arasında nedensellik ilişkisini araştıran Bouri vd. (2018) İslami hisse senedi ve tahvil piyasalarını ele almıştır. Bulgular benzer şekilde, jeopolitik riskin İslami piyasa volatilitesini getirilerden daha fazla etkilediğini göstermiştir. Dow Jones Sanayi Endeksi'ndeki volatilite sıçramalarını jeopolitik risk ile tahmin etmeyi amaçlayan Gkillas vd. (2018), standart lineer Granger nedensellik testi sonucunda GPR'nin volatilite sıçramalarına neden olduğuna dair herhangi bir kanıta ulaşamamışlardır. Ancak lineer olmayan yapısal kırılmalar dikkate alındığında model belirleme hatası olduğu belirlenmiş ve parametrik olmayan nedensellik testi kullanılmıştır. Bulgular, volatilite sıçramalarının GPR ile tahmin edilebileceğini göstermiştir. Jeopolitik risk ve 37 dünya borsasının stokastik davranışlarını inceleyen Lee (2018) iki değişkenli copula yaklaşımı kullanmıştır. Bulgular, farklı derecede kuyruk bağımlılığı ve sıra korelasyonu göstermiştir. Buna göre, daha az kuyruk bağımlılığı olan borsaların performanslarının jeopolitik risk ile daha fazla ilişkili olduğu görülmüştür.

3. MATERYAL VE YÖNTEM

Araştırmanın bu bölümünde araştırmanın modeli, veri seti ve kullanılan analiz teknikleri açıklanmıştır.

3.1. Model ve Veri Seti

Jeopolitik risk endeksi ile ilgili incelenen literatür çerçevesinde araştırmanın modeli aşağıdaki biçimde oluşturulmuştur:

$$lnIND_{it} = \delta_0 + \delta_1 lnGPR_{it} + \varepsilon_{it} \quad (1)$$

Denklemde bulunan değişkenlerden lnIND borsa endeksinin logaritmik halini; lnGPR, jeopolitik risk endeksinin logaritmik halini ifade etmektedir.

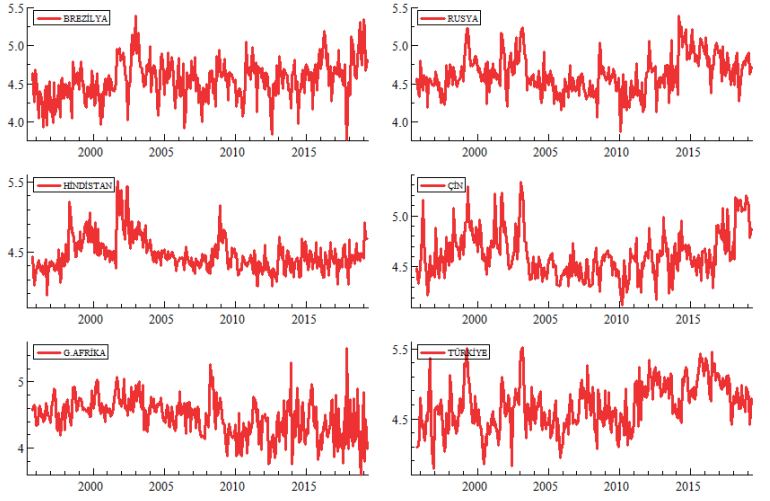
Çalışmada jeopolitik risk endeksi ile BRICS-T (Brezilya, Rusya, Hindistan, Çin, Güney Afrika ve Türkiye) ülkeleri borsa endeksleri arasındaki ilişki incelenmiştir. Bu doğrultuda çalışmada BRICS-T ülkelerine ait borsa endeksleri ve jeopolitik risk endeksi için Ekim 1995 - Nisan 2019 dönemini kapsayan aylık verilerden faydalanılmıştır. Ülkelere ait veri setleri www.yahoo.finance.com sayfasından elde edilmiştir. Jeopolitik risk endeksine ait veriler ise https://www2.bc.edu/matteo-iacoviello/gpr.htm adresinden temin edilmiştir. Çalışmada ele alınan endeksler logaritmik formda kullanılmıştır.

Tablo 2: Tanımlayıcı İstatistikler

	BVP	RTSI	BSE	SSEC	JTOPI	XU100
Gözlem	283	283	283	283	283	283
Ortalama	10.297	6.468	9.218	7.596	9.772	10.066
Medyan	10.664	6.836	9.470	7.635	9.966	10.591
Standart Sapma	0.831	0.970	0.860	0.456	0.790	1.399
Çarpıklık	-0.551	-0.843	-0.100	-0.339	-0.154	-1.122
Basıklık	1.960	2.663	1.460	2.904	1.535	3.453
Min	8.326	3.780	7.941	6.287	8.314	5.969
Max	11.487	7.808	10.572	8.692	10.883	11.691
Jarque-Bera	27.106	34.874	28.427	5.525	26.444	61.808
Olasılık	0.000	0.000	0.000	0.063	0.000	0.000

Tablo 2 incelendiğinde ele alınan dönem çerçevesinde en yüksek ortalama borsa endeksine sahip ülkelerin sırasıyla Brezilya (BVP), Türkiye (XU100), Güney Afrika (JTOPI), Hindistan (BSE), Çin (SSEC) ve Rusya (RTSI) olduğu görülmektedir. Diğer yandan serilere ilişkin standart sapmalar incelendiğinde en yüksek oynaklığa sahip ülkenin sırasıyla XU100, RTSI, BSE, BVP, JTOPI ve SSEC ülke borsa endekslerinde gerçekleştiği görülmektedir.

Şekil: 1 Ülke Borsa Endekslerine Ait Zaman Yolu Grafiği



Şekil 2: Ülke Jeopolitik Risk Endekslerine Ait Zaman Yolu Grafiği

3.2. Yöntem

Çalışmada öncelikle ülkeler arasındaki yatay kesit bağımlılığı incelenmiştir. Paneli oluşturan birimler arasındaki yatay kesit bağımlılığının sınanmasında; LM-Adj (Pesaran vd., 2008) testi ve modelin homojenliğinin sınanmasında Pesaran ve Yamagata (2008) tarafından geliştirilen Delta Tilde ve Delta Tilde-adj testlerinden yararlanılmıştır.

Birim kökün sınanmasında yatay kesit bağımlılığını dikkate alan ikinci nesil birim kök testlerinden Hadri ve Kurozumi (2012) tarafından geliştirilen panel birim kök testi kullanılmıştır.

Değişkenler arasındaki uzun dönem ilişki için, modelde yatay kesit bağımlılığını dikkate alan ve serilerin farklı durağanlık mertebesine sahip olması durumunda analize imkân tanıyan Westerlund (2008) tarafından geliştirilen Durbin-Hausman eşbütünleşme testi kullanılmıştır. Panelde yer alan birimler ve panelin geneli için uzun dönem eşbütünleşme katsayıları Peseran (2006) tarafından geliştirilen CCE tahmincisiyle hesaplanmıştır. Son olarak değişkenler arasındaki nedensellik ilişkisi yatay kesit bağımlılığına ve heterojeniteye izin veren Kónya (2006) panel nedensellik testi ve Yılancı ve Özgür (2019) zaman değişimli panel nedensellik testi ile incelenmiştir.

4. BULGULAR

Araştırmanın bu bölümünde analiz yöntemlerinin test edilmesi ve analiz bulguları yer almaktadır.

4.1. Yatay Kesit Bağımlılığın Test Edilmesi

Çalışmada, yatay kesit bağımlılığının test edilmesinde Pesaran vd. (2008) sapması düzeltilmiş LM testi (LMadj) testi kullanılmıştır. Bu test, $T>N$ ve $T<N$ durumunda kullanılabilen bir testtir. Bu test, grup ortalamasının sıfır ve bireysel ortalamanın sıfırdan farklı olması durumunda daha önce Pesaran (2004) tarafından geliştirilen yatay kesit bağımlılık testi (CD) test istatistiğine varyansı ve ortalamayı dahil ederek daha tutarlı sonuçlar elde edilmesini sağlamaktadır.

$$CD = \sqrt{\left(\frac{2T}{N(N-1)}\right)} \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} (\hat{p}_{ij}) \mathrm{N}(0,1) \quad (2)$$

$$CDLM_{adj} = \sqrt{\frac{2}{N(N-1)}} \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \hat{p}_{ij} \frac{(T-K)\hat{p}_{ij}(\hat{p}_{ij}^2 - \mu_{Tij})}{\sqrt{v_{Tij}^2}} N(0,1) \quad (3)$$

Denklemde yer alan μ_{Tij} açıklayıcı değişken sayısını, v_{Tij}^2 ortalamayı, $(T-K)$ ise $\hat{p}_{ij}^2$'nin varyansını ifade etmektedir.

Bu test istatistiği, $CDLM_{adj} \sim N(0,1)$ ile asimptotik olarak standart normal dağılım göstermektedir (Pesaran vd. 2008). Sıfır ve alternatif hipotez ise;

H_0: Yatay kesit bağımlılığı yoktur.

H_1: Yatay kesit bağımlılığı vardır.

Tablo 3: Yatay Kesit Bağımlılığı Test Sonuçları

	Test istatistiği	**Olasılık**
IND	571.4494***	0.000
GPR	73.047***	0.000
Model	92.164***	0.000

Not: *, **, *** sırasıyla %10, %5, %1 anlamlılık düzeyini ifade etmektedir.

Tablo 3'e göre yatay kesitler ve model için yatay kesit bağımlılık olmadığını belirten sıfır hipotezinin %1 önem düzeyinde reddedildiği görülmektedir. Bu, çalışmada incelenen ülkelerin birinde meydana gelen bir şokun diğer ülkeleri de etkilediğini göstermektedir.

Diğer yandan eğim homojenitesini belirlemek amacıyla Swamy testinin standardize edilmiş bir versiyonu olan Peseran ve Yamataga (2008) testi kullanılmıştır. Swamy test istatistiği;

$$\tilde{S} = \sum_{i=1}^{N} (\hat{\beta}_i - \hat{\beta}_{WFE})' \frac{x_i' M_\tau x_i}{\hat{\sigma}_i^2} (\hat{\beta}_i - \hat{\beta}_{WFE}) \quad (4)$$

$M_\tau = I_T - Z_i(Z_i'Z_i)^{-1}Z_i'$ ve $Z_i = (\tau_T, x_i)$

$\hat{\beta}_i$, havuzlanmış en küçük kareler tahmincisi,

$\hat{\beta}_{WFE}$, ağırlıklandırılmış sabit etkiler tahmincisi

τ_T , Tx1 vektörü

x_i, açıklayıcı değişkenler

$\hat{\sigma}_i^2$, hata terimi varyansı

Peseran ve Yamagata (2008) tarafından standardize edilmiş istatistik aşağıda tanımlanmıştır.

$$\tilde{\Delta} = \sqrt{N} = \left(\frac{N^{-1}\tilde{S} - k}{\sqrt{2k}} \right) \quad (5)$$

$\tilde{\Delta}$, eğim katsayılarının homojen olduğunu ileri süren boş hipotez varsayımı altında asimtotik standart normal dağılıma sahiptir.

Küçük örneklem özellikleri dikkate alındığında $\tilde{\Delta}$ sapması düzeltilmiş olarak geliştirilmiştir;

$$\tilde{\Delta}_{adj} = \sqrt{N}\left(\frac{N^{-1}\tilde{S} - k}{(\sqrt{2k\,(T-k-1)/T+1}} \right) \quad (6)$$

Tablo 4: Modelde Homojenlik ve Yatay Kesit Bağımlılığı Test Sonuçları

		Test istatistiği	**Olasılık**
Homojenite	$\hat{\Delta}$	3.198***	0.001
	$\hat{\Delta}_{adj}$	3.215***	0.001

Not: *, **, *** sırasıyla %10, %5, %1 anlamlılık düzeyini ifade etmektedir.

Pesaran & Yamagata (2008) testi sonuçlarına göre de eğim katsayısının homojen olduğu varsayımını ifade eden boş hipotezin %1 önem düzeyinde reddedildiği, yani heterojen bir model yapısının geçerli olduğu tespit edilmiştir.

4.2. Panel Birim Kök Testi

Tablo 3'den elde edilen sonuçlara göre değişkenler arasında yatay kesit bağımlılığı söz konusu olduğundan değişkenlerin durağanlığının test edilmesinde hem yatay kesit bağımlığına hem de heterojeniteye izin veren ikinci nesil birim kök testlerinden Hadri-Kurozumi (2012) testi kullanılmıştır. Bu test, zaman serisi analizlerinde birim kökün varlığını test eden KPSS testinin panele uyarlanmış halidir. Veri üretme süreci eşitlik 7'de gösterilmiştir;

$$y_{it} = z_t'\delta_i + f_t\gamma_i + \varepsilon_{it}, \tag{7}$$

$$\varepsilon_{it} = \phi_{it}\varepsilon_{it-1} + \cdots + \phi_{it}\varepsilon_{it-p} + v_{it}$$

z_t deterministik terim olmak üzere literatürde yaygın olarak $z_t = z_t^u = 1$ veya $z_t = z_t^\tau = [1, t]'$ olarak kullanılmaktadır. Hadri ve Kuruzomi (2012) z=1 iken $\delta_i = \alpha_i$ ve $z = [1, t]'$ iken $\delta_i = [\alpha_i, \beta_i]'$ olduğu iki durumu dikkate almışlardır. Eşitlik 7'de yer alan $z_t'\delta_i$ bireysel etkileri ifade ederken, f_t tek boyutlu gözlenemeyen faktörleri ifade etmektedir. y_i yükleme faktörünü, ε_{it}, *AR(p)* sürecini izleyen bireysel spesifik hata terimini ifade etmektedir.

Hadri-Kurozumi testinden uzun dönemli varyans Z_A^{SPC} ve Z_A^{LA} olmak üzere iki test istatistiği ile tahmin edilmektedir.

$$Z_A^{SPC} = \frac{1}{\sigma_{iSPC}^2 T^2}\sum_{t=1}^{T}(S_{it}^W)^2 \tag{8}$$

$$Z_A^{LA} = \frac{1}{\sigma_{iLA}^2 T^2}\sum_{t=1}^{T}(S_{it}^W)^2 \tag{9}$$

Eğer serilerde yatay kesit bağımlılık varsa Z_A^{SPC} test istatistiği, yatay kesit bağımlığı yoksa Z_A^{LA} test istatistiği tercih edilmektedir.

Test için boş ve alternatif hipotezler;

H_0': $\phi_i(1) \neq 0 \quad \forall_i$ seride birim kök yoktur.

H_0': $\phi_i(1) = 0$ bazı i'leriçin, seride birim kök vardır.

Tablo 5'e göre serilerin düzey değerleri incelendiğinde, IND ve GPR değişkenleri için durağan süreci ifade eden boş hipotezinin Z_A^{SPC} ve Z_A^{LA} istatistiklerine göre reddedildiği görülmektedir. Serilerin fark değerleri incelendiğinde, boş hipotezin tüm değişkenler için reddedilemediği ve serilerin durağan hale geldiği görülmektedir. Ancak seriler gerçekte durağan iken yapısal kırılmalardan kaynaklı olarak birim kök süreci içerebilmektedir. Bu anlamda incelenen serilerin yapısal kırılmalardan kaynaklı olarak durağan dışı olup olmadığının sınanması gerekmektedir. Çalışmada yapısal kırılmalı birim kök testi olarak Im vd. (2005) tarafından geliştirilen yapısal kırılmalı panel LM testi kullanılmış ve sonuçlar Tablo 6'da sunulmuştur.

Tablo 5: Hadri ve Kurozumi (2012) Panel Birim Kök Testi Sonuçları

Düzey			
lnIND	Z_A^{SPC}	2.047	0.019
	Z_A^{LA}	12.700	0.000
LnGPR	Z_A^{SPC}	18.240	0.000
	Z_A^{LA}	23.207	0.000
Birinci Fark			
lnIND	Z_A^{SPC}	0.605	0.272
	Z_A^{LA}	0.6345	0.262
lnGPR	Z_A^{SPC}	- 2.226	0.987
	Z_A^{LA}	- 2.173	0.985

Tablo 6: Kırılmalı Panel LM Birim Kök Testi Sonuçları

	IND	GPR
Panel LM	-1.113(0.133)	-14.686(0.000)
Panel CA - LM	3.541(1.000)	-0.584(0.280)
Ülkeler	IND Kırılma Dönemleri	GPR Kırılma Dönemleri
Brezilya	Kasım 1999, Eylül 2008	Ağustos 2001, Mart 2003
Rusya	Kasım 1999, Eylül 2008	Şubat 2014, Eylül 2014
Hindistan	Mayıs 2008, Eylül 2008	Ağustos 2001, Ocak 2002
Çin	Mayıs 1999, Temmuz 2009	Nisan 2003, Ekim 2006
Güney Afrika	Haziran 2002, Ağustos 2008	Temmuz 2001, Ağustos 2013
Türkiye	Kasım 1999, Ekim 2000	Ocak 2003, Nisan 2003

Not: Parantez içerisindekiler olasılık değerini ifade etmektedir.

Tablo 6'da iki farklı Panel LM test istatistikleri (Panel LM ve Panel CA-LM) sonuçları verilmiştir. Bu test istatistiklerinden Panel LM birimler arasında yatay kesit bağımlılığı bulunmadığı varsayımından hareket ederken, Panel CA-LM istatistiği yatay kesit bağımlılığı bulunduğu varsayımından hareket etmektedir. Çalışmada ele alınan tüm değişkenlerde yatay kesit bağımlığı bulunduğundan Panel CA-LM istatistiğine göre tüm değişkenlerin birim kök içerdiği görülmektedir. Bu anlamda birim kökün varlığının yapısal kırılmalardan kaynaklanmadığı ifade edilebilir. Ayrıca borsa endeksi ve jeopolitik risk endeksinde meydana gelen kırılma dönemleri incelendiğinde özellikle borsa endeksinde meydana gelen kırılma dönemlerinin Kasım 1999 ve Eylül 2008 dönemlerinde gerçekleştiği görülmektedir.

4.3. Durbin-Hausman Panel Eşbütünleşme Testi

Çalışmada modele ait homojenite testi ve yatay kesit bağımlılığı sonuçlarında modelin heterojen bir yapıya sahip olduğu ve yatay kesit bağımlılık özelliği gösterdiği tespit edilmişti. Bu doğrultuda eşbütünleşme testi için; modelde yatay kesit bağımlılığını dikkate alan, homojen ve heterojen modeller için ayrı test sonuçları üreten Westerlund (2008) tarafından hazırlanan Durbin-Hausman eşbütünleşme testi kullanılmıştır. Bu test için bağımlı değişken I(1) olmak üzere, bağımsız değişkenlerin farklı bütünleşme derecelerine sahip olması durumunda ortak faktörleri dikkate alarak panel eş-bütünleşme analizine imkan sağlamaktadır (Westerlund, 2008).

$$DH_g = \sum_{i=1}^{n} \hat{S}_i(\tilde{\phi}_i - \hat{\phi}_i)^2 \sum_{t=2}^{T} \hat{e}_{it-1}^2 \tag{10}$$

$$DH_p = \hat{S}_n(\tilde{\phi} - \hat{\phi})^2 \sum_{i=1}^{n} \sum_{t=2}^{T} \hat{e}_{it-1}^2 \tag{11}$$

Testin hipotezleri şu şekildedir;

$H_0: \phi_i = 1$, eşbütünleşme ilişkisi yoktur.

$H_1: \phi_i < 1$, eşbütünleşeme ilişkisi vardır

Tablo 7: Durbin-Hausman Panel Eşbütünleşme Testi Sonuçları

	İstatistik değeri	Olasılık değeri
Durbin-H Grup İstatistiği	12.716	0.000
Durbin-H Panel İstatistiği	15.501	0.000

Westerlund (2008) panel eşbütünleşme testinde eşbütünleşme ilişkisini hem grup hem de panelin geneli için ayrı ayrı test etmektedir. Homojen modeller için Durbin-H grup istatistik testi kullanılırken, heterojen modeller için ise Durbin-H panel istatistik test sonucu kullanılmaktadır. Tablo 7'de görüleceği üzere her

iki durum için de sıfır hipotez reddedilmiştir. Ancak çalışmada kullanılan model heterojen bir yapıya sahip olduğundan panelin geneline ait sonuçları yorumlamak daha doğru olacaktır. Bu anlamda panelin geneli için jeopolitik risk endeksi serileri ile borsa endeks serileri arasında eşbütünleşme ilişkisinin olduğu tespit edilmiştir.

4.4. Panel Eşbütünleşme Katsayılarının Tahmini

Jeopolitik risk endeksi ile ülke borsa endeksleri arasındaki eşbütünleşme ilişkisinin belirlenmesinden sonra, panelin geneli ve her ülkeye ait katsayıları belirlemek için hem heterojenliği hem de yatay kesit bağımlılığını dikkate alan CCE (Ortak İlişkili Etkiler) tahmincisi yöntemi kullanılmıştır. Çalışmanın panel modeli olan Eşitlik 1'e dayanarak, çok faktörlü bir hata terimi olan ε_{it} aşağıdaki gibi oluşturulmuştur;

$$e_{it} = \lambda_i' UF_t + u_{it} \tag{12}$$

Eşitlikte yer alan UF_t *m x 1* boyutunda gözlemlenemeyen faktörler vektörünü ifade etmektedir. Hata terimlerinin yatay kesit bağımlılığını dikkate alarak ortak faktörlerin etkisini kukla değişkenler aracılığıyla modele dahil edildiğinde nihai model aşağıdaki gibidir;

$$lnIND_{it} = \delta_0 + \delta_1 lnGPR_{it} + \gamma_0 \overline{lnIND_{it}} + \gamma_1 \overline{lnGPR_{it}} + \varepsilon_{it} \tag{13}$$

Tablo 8: CCE (Ortak İlişkili Etkiler) Tahmin Sonuçları

Ülke	lnGRP	
	Katsayı	Std.Hata
Brezilya	0.045	0.035
Rusya	- 0.590***	0.131
Hindistan	- 0.517***	0.073
Çin	- 0.022	0.089
Güney Afrika	- 0.163***	0.047
Türkiye	- 0.358***	0.078
CCEMG	- 0.267***	0.107

Not: *, **, *** sırasıyla %10, %5, %1 anlamlılık düzeyini ifade etmektedir.

Tablo 8'deki sonuçlar incelendiğinde paneli oluşturan ülkelerde, jeopolitik risk endeksi uzun dönemde Brezilya ve Çin borsa endeksi hariç diğer ülke borsa endekslerini negatif etkilediği görülmektedir. jeopolitik risk endeksinde meydana gelen % 1 artış, uzun dönemde Rusya, Hindistan, Güney Afrika ve Türkiye borsa endeksini sırasıyla %0.590, %0.517, %0.163 ve %0.358 azaltacaktır. Uzun dönemde anlamlı bir ilişki sergileyen değişkenler incelendiğinde jeopolitik risk endeksinden uzun dönemde en çok etkilenen ülke borsa endeksinin sırasıyla Rusya, Hindistan ve Türkiye olduğu, en az etkilenen ülke borsa endeksinin ise Güney Afrika olduğu görülmektedir. Panelin geneline ait CCEMG tahmin sonuçları incelendiğinde ise Jeopolitik risk endeksinin uzun dönemde borsa endeksi üzerindeki etkisi negatif ve istatistiksel olarak anlamlı bulunmuştur.

4.5. Panel Nedensellik Testleri

CCE tahmininden elde edilen sonuçlar sadece değişkenler arasındaki olası ilişkiyi gösterirken, bunlar arasındaki nedensellik

bağını göstermediğinden çalışmada değişkenler arasındaki nedenselliğin de incelenmesi gerekmektedir. Bu doğrultuda çalışmada yatay kesit bağımlılığı ve heterojenite durumunda nedenselliğin incelenmesine olanak sağlayan Kónya (2006) panel nedensellik testi kullanılmıştır.

Kesit bağımlılığını ve ülke heterojenliğini dikkate alan Kónya (2006) özyinelemeli (bootstrap) panel nedensellik testi, Zellner (1962) tarafından geliştirilen görünüşte ilişkisiz regresyona (SUR) ve ülkeye özgü bootstrap kritik değerlerine dayanmaktadır. Ayrıca Kónya (2006), ülkeye özgü bootstrap kritik değerleri kullanıldığından, nedensellik analizinden önce testin birim kök ve eşbütünleşme gibi bir ön test gerektirmediğini belirtmiştir.

Aşağıdaki model özelliklerini Zellner'ın (1962) SUR tahmin edicisini kullanarak tahmin edilmiş ve Kónya (2006) panel nedensellik test sonuçları Tablo 9'da sunulmuştur.

$$IND_{1,t} = \alpha_{1,1} + \sum_{l=1}^{lIND_1} \beta_{1,1,l} IND_{1,t-l} + \sum_{l=1}^{lGPR_1} \gamma_{1,1,l} GPR_{1,t-l} + \varepsilon_{1,1,t}$$

$$IND_{2,t} = \alpha_{1,2} + \sum_{l=1}^{lIND_1} \beta_{1,2,l} IND_{2,t-l} + \sum_{l=1}^{lGPR_1} \gamma_{1,2,l} GPR_{2,t-l} + \varepsilon_{1,2,t}$$

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$$IND_{N,t} = \alpha_{1,N} + \sum_{l=1}^{lIND_1} \beta_{1,N,l} IND_{N,t-l} + \sum_{l=1}^{lGPR_1} \gamma_{1,N,l} GPR_{N,t-l} + \varepsilon_{1,N,t}$$

Tablo 9: GPR ile IND arasında Panel Nedensellik Test Sonuçları

	$H_0 = GPR \nRightarrow IND$				
Ülkeler	Wald ist.	Boot-pval	Kritik değerler		
			1%	5%	10%
Brezilya	3.258**	0.017	3.504	2.306	1.632
Rusya	0.019	0.923	4.285	2.674	1.975
Hindistan	4.866***	0.001	2.207	1.369	0.839
Çin	0.725	0.159	1.909	1.278	1.004
Güney Afrika	0.004	0.96	5.463	3.663	2.863
Türkiye	0.72	0.714	5.842	3.921	3.18

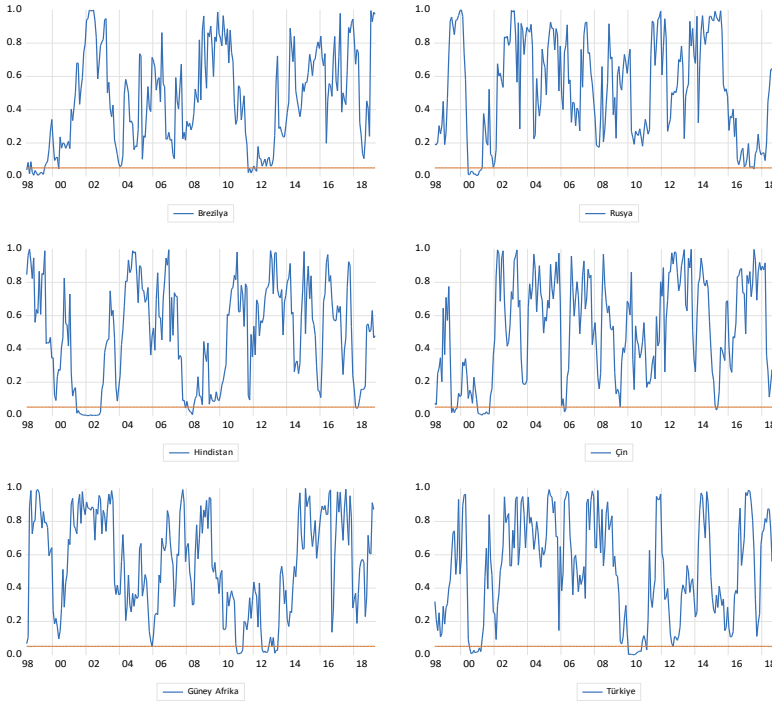
Not: *, **, *** sırasıyla %10, %5, %1 anlamlılık düzeyini ifade etmektedir. Kritik değerler 1000 bootstrap replikasyon ile elde edilmiştir.

Tablo 9'dan elde edilen sonuçlara göre sadece Brezilya ve Hindistan borsası için jeopolitik risk endeksinden borsa endekslerine doğru bir nedensellik ilişkisi tespit edilmiştir.

Yılancı ve Özgür (2019) nedensellik ilişkisinin olduğu dönemleri ve bu nedenselliğin istikrarını belirleyebilmek için tüm örneklem dönemini dikkate alan Kónya (2006) panel nedensellik testinin bootstrap tabanlı zaman değişimli (time-varying) özelliğini dikkate alan yeni bir test önermişlerdir.

Testte yer alan alt örnekleme ait pencere boyutunun seçiminde Phillips ve diğerleri (2015) tarafından önerilen $ss=[T(0.01+1.8/\sqrt{T})]$ yaklaşım kullanılmıştır.

Zaman değişimli panel nedensellik test sonuçları Şekil 3'de sunulmuştur.



Şekil 3: GPR'den IND'ye nedensellik için zaman değişimli Bootstrap p değerleri

Şekil 3, GPR'den IND'ye zaman değişimli nedensellik sonucunu göstermektedir. Şekillerde yatayda yer alan turuncu çizgi %5 kritik seviyeyi göstermektedir. Tablo 9'da sunulan tüm örneklem dönemine ait sonuçların aksine, tüm ülke borsa endeksleri için GPR'den IND'ye doğru alt örneklem bazında bazı dönemler için nedensellik ilişkisinin varlığı görülmektedir. Örneğin, jeopolitik riskten ülke borsa endekslerine doğru nedensellik ilişkisi Brezilya için 1998:06-1999:06; Rusya için 2000:06-2001:03; Hindistan için 2001:06-2002:11; Çin için yılının altıncı ayından 1999:06-1999-10 ve 2001:01-2001:09; Güney Afrika için 2012:07-2012:11 ve son olarak Türkiye için 2000:07-2001:03 ve 2010:01-2010:10 dönemleri için doğrulanmaktadır.

SONUÇ

Finansal piyasalarda yatırımcılar yatırım kararları alırken birçok faktörü hesaba katmaktadır. Bu faktörler genel olarak finansal ve ekonomik değişkenlerden oluşmaktadır. Ancak, özellikle uluslararası portföy yatırımcılarının bu faktörlerin yanı sıra jeopolitik riskleri de göz önünde bulundurması gerekmektedir. Çünkü gerek küresel tehditler açısından gerekse iş dünyasında jeopolitik risklerin etkileri incelenmiş ve jeopolitik tehditlerin ekonomileri ve piyasaları etkilediğine dair kanıtlara rastlanmıştır. Caldara ve Iacoviello'nun jeopolitik risk endeksini oluşturmalarından sonra konu ile ilgili yapılan ampirik araştırmalarda artış görülmüş ve jeopolitik risklerin etkisini analiz etmek mümkün olmuştur.

Bu doğrultuda bu çalışmada, 1995:10-2019:4 dönemi arasında BRICS (Brezilya, Rusya, Hindistan, Çin, Güney Afrika) ülkeleri ve Türkiye'ye ait borsa endeksleri ile jeopolitik risk endeksi arasındaki ilişkiler panel veri yöntemleri ile incelenmiştir. Öncelikle, panelde yer alan ülkeler arasında güçlü bir yatay kesit bağımlılık söz konusu olduğu görülmüştür. Bu durum, paneldeki ülkelerden birinde meydana gelen bir şokun diğer ülkeleri de etkilediğini göstermektedir. Daha sonra yatay kesit bağımlılık durumunda kullanılan ikinci nesil panel birim kök testi sonuçlarına göre incelenen serilerin düzey değerlerinde durağan olmadığı görülmüştür. Söz konusu durağan dışılık panel kırılmalı testler ile de incelenmiş ve durağan dışılığın yapısal kırılmalardan kaynaklanmadığı tespit edilmiştir. Seriler arasındaki uzun dönemli ilişkinin incelenmesinde, yatay kesit bağımlılığına izin veren eşbütünleşme testi ve eşbütünleşme katsayı tahmincisinden yararlanılmıştır. Son olarak seriler arasındaki nedensellik ilişkisi yatay kesit bağımlılığı ve heterojeniteyi dikkate alan Panel nedensellik testi ile incelenmiştir.

Eşbütünleşme tahmin sonuçlarına göre, panelin geneli için borsa endeksleri ile jeopolitik risk endeksi arasında uzun dönemli bir ilişki olduğu tespit edilmiştir. Ülke bazında uzun dönemli katsayılar incelendiğinde ise uzun dönemde jeopolitik

risk endeksi ile Brezilya ve Çin borsası endeksleri arasında anlamlı bir ilişki görülemezken, jeopolitik risk diğer ülke borsa endekslerini beklenildiği üzere negatif etkilemiştir. Söz konusu negatif etki uzun dönemde en çok Rusya, Hindistan ve Türkiye borsa endeksleri üzerinde gözlenmiştir. En az etki ise Güney Afrika borsa endeksinde görülmüştür. Son olarak, jeopolitik risk endeksinden borsa endekslerine yönelik nedensellik test sonuçları incelendiğinde, tüm örneklem dönemi için jeopolitik risk endeksinin Brezilya ve Hindistan borsa endekslerinin nedeni olduğu tespit edilirken, zaman değişimli nedensellik dikkate alındığında ülkelere özgü jeopolitik riskin sair dönemlerde ülke borsa endekslerinin nedeni olduğu sonucuna ulaşılmıştır.

Analiz bulguları yatırımcılar açısından değerlendirildiğinde, yatırımcıların portföy çeşitlendirmesi yaparken ülkelerin jeopolitik risklerini de göz önünde bulundurmaları gerektiği söylenebilir. Jeopolitik risklerden kaçınmak isteyen yatırımcıların çeşitlendirme yaparken BRICS-T ülke borsalarından Güney Afrika borsasını tercih etmesi düşünülebilir.

Jeopolitik risk endeksi ile borsa endeksleri ilişkisi gelecek çalışmalarda farklı ülke grupları ve borsalar için yapılarak yatırımcılara yol gösterici bir takım sonuçlar elde edilebilir. Ayrıca bu endeksin makroekonomik değişkenlerle veya alternatif yatırım araçları ile ilişkileri incelenerek mevcut literatürün zenginleşmesine katkıda bulunulabilir.

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CHAPTER 9

The Relationship Between Renewable Energy Consumption and Economic Growth in Selected Developed and Developing Economies

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1. Introduction

Energy, a very important concept since the existence of man, is defined as the ability of a system to do work. With the increased use of machines in production as a result of the industrial revolution, the energy demand has increased, even more, making energy even more important to humans. Today, it is one of the most important factors that countries need to achieve sustainable economic growth and development. From this point of view, it can be said that the amount of energy produced and consumed by countries is one of

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the most important indicators of their level of development. For this reason, countries that want to increase their level of prosperity make great efforts to produce, extract and consume energy.

Historically, it is known that people first used energy to radiate heat and rays, to heat and warm, and that they usually obtained this energy from firewood. It can be said that as economies develop and become more complex, their energy needs increase dramatically. As the resulting supply of fuelwood and other biomass energy proved insufficient to power growing economies such as Europe and the United States, people used hydropower in the nineteenth century, then coal, oil, and natural gas in the twentieth century, and nuclear power in the 1950s (Timmons et al ., 2014: 3). As the supply of fossil fuels (oil, natural gas, coal, etc.), referred to as non-renewable energy sources, declines, countries are turning to alternative energy sources to meet their energy needs (Hubbert, 1956: 19-20).

As can be seen, the energy that people need can be obtained from many different sources. From this point of view, energy resources can be classified in different ways. According to these classifications, energy resources are divided into renewable and non-renewable energy resources depending on their use. Non-renewable (exhaustible) energy sources are fossil sources (coal, oil, natural gas) and nuclear sources (uranium, thorium); renewable (inexhaustible) energy sources are water, solar, biomass, wind, geothermal, wave, tidal, and hydrogen (Koç and Şenel, 2013: 33). People have accelerated the search for renewable energy sources because non-renewable energy sources are exhausted and their supply is decreasing, costs are increasing, and the natural environment and living beings are being harmed. Renewable energy sources are particularly environmentally friendly because they are a repeatable and inexhaustible source of energy, which increases their importance. The main subject of this study is the impact of the use of renewable energy sources on the welfare level of countries.

We can define economic growth as the increase in the number of goods and services produced in a country in a given period of time. Economic growth is the continuous increase in real GDP over time. Economic growth is the only way to increase the standard of living and the level of welfare of the people living in a country. For this reason, one of the most important macroeconomic goals of countries is undoubtedly economic growth (Uensal, 2009: 14-15). For this reason, countries try to achieve economic growth by using non-renewable energy resources even though they harm the natural environment and living beings. However, with the recent increase in environmental awareness, countries are turning to renewable energy as an alternative to fossil fuels.

The objective of the study is to examine the relationship between renewable energy consumption and economic growth in developed and developing countries. For this purpose, the United States, Germany, France, the United Kingdom, and Japan were selected as developed countries; for developing countries, data from Turkey, China, Russia, Brazil, and Argentina were sampled for the period 1990-2018. In studying the impact of renewable energy consumption on economic growth, separate panel data were created to compare developed and developing countries. CADF and CIPS unit root tests from the second generation of panel data analysis, Westerlund cointegration test for long-run relationships, and DOLSMG and FMOLS estimators for coefficient estimation were used as the method. Following the introductory section of the study, a literature review of previous studies on this topic is provided. Then, the empirical methods used in the study are explained and the results obtained through the analyzes are interpreted. Finally, a general assessment of the study was made and recommendations were made.

2. Literature Review

The rapid growth of the world's population and the energy needs of the developing industrial sector are increasing substantially.

Meeting this energy demand with non-renewable traditional energy sources increasingly endangers the natural environment and human health. For this reason, the extraction and use of renewable energy sources that are compatible with nature are of great importance. The relationship between renewable energy consumption in individual countries and their economic growth has been a focus of interest in the literature in the context of recent environmental problems.

Menegaki (2011) examined the causal relationship between economic growth and renewable energy for 27 European countries in a multivariate panel over the period 1997-2007. Although panel causality tests show short-term relationships between renewable energy and GHG emissions and employment, the experimental results do not confirm causality between renewable energy consumption and GDP. The estimated cointegration factor shows only a weak correlation between economic growth and renewable energy consumption in Europe.

Sebri and Salha (2014), on the other hand, examine the causal relationship between economic growth and renewable energy consumption in BRICS countries over the period 1971-2010 in a multivariate framework. The methods used were the ARDL bound test approach and the Vector Error Correction Model (VECM). The results of the analysis show that there is a bidirectional causal relationship between economic growth and renewable energy consumption. This explains the role of renewable energy in promoting economic growth in BRICS countries.

In another study examining OECD countries, Salim et al. (2014) examine the dynamic relationship between renewable and nonrenewable energy consumption, industrial production, and GDP growth using data for the period 1980-2011. The method used was the Westerlund panel cointegration test and the Granger causality test, which allow for structural breaks. The results show that there is a long-term cointegration relationship between non-

renewable and renewable energy sources, industrial production, and economic growth. Panel causality analyzes show bidirectional causality between industrial production and renewable and nonrenewable energy consumption in the short and long run. However, there is evidence of a bidirectional short-run relationship between GDP growth and non-renewable energy consumption, while there is unidirectional causality between GDP growth and renewable energy consumption.

Jebli and Youssef (2015) use panel cointegration techniques to examine the causal relationship between production, consumption of renewable and non-renewable energy, and international trade for a sample of 69 countries over the period 1980-2010. In the short run, Granger causality tests show bidirectional causality between production and trade (exports or imports), bidirectional causality between non-renewable energy and trade, and unidirectional causality between renewable energy and trade. At the same time, our long-term projections from OLS, FMOLS, and DOLS show that renewable and non-renewable energy consumption and trade have a positive and statistically significant impact on economic growth.

Özşahin et al. (2016) investigated the relationship between renewable energy consumption and economic development using data for BRICS countries and Turkey for the period 2000-2013. The existence of a long-run relationship between the variables was investigated by Pedroni (1999) and Westerlund (2005) using the panel CUSUM cointegration test, and the long-run coefficients were obtained using the panel ARDL estimator. The empirical results show that there is a long-run positive relationship between renewable energy consumption and economic development.

Kılıç and Aslan (2016) studied the impact of renewable and nonrenewable energy consumption on economic growth for the period 1990-2013 for 28 OECD countries. Johansen-Fischer and Pedroni cointegration tests and Granger causality tests were

used as methods. At the same time, the coefficients of the long-run cointegration relationship were estimated using the Pedroni FMOLS method. The results of the analysis show that there is a long-run cointegration relationship between the variables. For the long-run FMOLS coefficients, it was found that some countries are negatively affected by non-renewable energy, but the use of renewable energy contributes to the economic growth of all 28 OECD countries.

İzgi and Destek (2017) studied the impact of renewable and non-renewable energy consumption on economic growth in BRICS and MIST countries for the period 1992-2014, using the Kao cointegration test, panel FMOLS, and DH panel causality test of Dumitrescu and Hurlin (2012) as methods. The results show that there is a cointegration relationship between the variables in the long run. The results of FMOLS coefficients suggest that both renewable energy consumption and non-renewable energy consumption have a positive effect on the economic growth of the whole panel, but in comparison, non-renewable energy consumption was more effective for economic growth. According to the results of the panel causality test, unidirectional causality holds between economic growth and renewable energy consumption, and a bidirectional causal relationship was found between non-renewable energy consumption and economic growth.

In his study, Ito (2017) empirically investigated the relationship between CO2 emissions, renewable, and non-renewable energy consumption, and economic growth using panel data from 42 developed countries during the period 2002-2011. The method used was the difference-GMM estimator proposed by Arellano and Bond (1991) and the PMG estimator based on the autoregressive distributed lag (ARDL) model introduced by Pesaran et al. for a dynamic panel model with lagged dependent variables. The results show that non-renewable energy consumption has a negative impact on the economic growth of developing countries. Moreover, it is

found that renewable energy consumption contributes positively to economic growth in the long run.

In another study, Akdağ and İskenderoğlu (2018) examined the relationship between economic growth and consumption of nonrenewable energy, renewable energy, and nuclear energy. Dynamic panel difference between 2007-2016 of 14 countries (Germany, Belgium, Bulgaria, Czech Republic, Finland, France, Netherlands, England, Spain, Sweden, Hungary, Romania, Slovakia, and Slovenia) in the EU member and candidate countries. The system was tested with GMM data analysis. The results of the analysis show that non-renewable and renewable energy consumption has a positive and significant impact on GDP, while nuclear energy consumption has no significant impact. It can be seen that the influence of renewable energy consumption on GDP is higher than the other variables in both the difference GMM and system GMM methods. This result shows that it is necessary to implement policies in which each country should focus more on renewable energy consumption to achieve higher growth.

Alper (2018) in his study examined the relationship between renewable energy consumption and economic growth in Turkey using the Bayer-Hanck cointegration test and Toda-Yamamoto causality tests for the period 1990-2017. The results show that there is a cointegration relationship between the variables in the long run and that a 1% increase in renewable energy consumption increases economic growth by 0.19%. However, a unidirectional causality relationship was found from economic growth to renewable energy use.

Singh et al. (2019) studied 20 developed and developing countries for the period 1995-2016 using the FMOLS method. The empirical results show that renewable energy has a positive and statistically significant effect on economic growth. The results also show that the impact of renewable energy generation

on economic growth is higher in developing countries than in developed countries.

Rahman and Velayutham (2020) examine the relationship between renewable and non-renewable energy consumption and economic growth for a panel of five South Asian countries (Bangladesh, India, Nepal, Pakistan, and Srilanka) during 1990-2014. The study used Pedroni's (1999, 2004) and Kao's (1999) cointegration tests and Dumitrescue-Hurlin's (2012) panel causality test as methodology. The results showed positive effects of renewable and non-renewable energy consumption and fixed investment on economic growth. Renewable energy consumption, non-renewable energy consumption, and a 1% increase in capital increase economic growth by 0.66%, 0.10%, and 0.58%, respectively. Moreover, it has been shown that there is a unidirectional causality between economic growth and renewable energy consumption.

Ünüvar and Keskinkılıç (2020) investigated the relationship between renewable energy production and economic growth for 19 G20 member countries during 2000-2016 using Kao and Johansen Fisher Panel cointegration, FMOLS, and DOLS tests as methods. The empirical results show that there is a positive relationship between renewable energy production and economic growth.

In another similar study, Ivanovski et al. (2021) examined the impact of renewable and nonrenewable energy consumption on economic growth. A nonparametric modeling technique was used to identify 39 countries for the period 1990-2015, considering OECD countries and other countries as two different models. Dynamic CCEMG and non-parametric LLDVE panel data tests were used. The results show that non-renewable energy consumption has a positive and significant impact on economic growth in all OECD countries. However, the impact of renewable energy consumption on economic growth is statistically non-

zero during most of the time in these countries. Renewable and non-renewable energy consumption promotes economic growth in non-OECD countries, suggesting that developing countries can play an important role in the transition to renewable energy despite the limitations of technological progress.

Asiedu et al. (2021) examine the relationship between renewable and nonrenewable energy consumption, CO2 emissions, and economic growth in 26 European countries over the period 1990-2018. Panel cointegration techniques developed by Kao (1999) and Pedroni (1995) were used to test for the presence of cointegration between variables, and DOLS and FMOLS methods developed by Pedroni (2004), as well as Granger causality tests, were used to determine the long-run flexibility between variables. The results of the analysis show that there is a long-term relationship between nonrenewable and renewable energy, carbon monoxide, and economic growth. There is bidirectional causality between economic growth and renewable energy consumption and a unidirectional causality between renewable energy and non-renewable energy consumption and between renewable energy and CO2 emissions.

There are numerous studies in the literature that examine the relationship between renewable energy consumption and economic growth. The studies differ in terms of the countries/country groups studied, the time period, and the methods used. This study differs from other studies by including actual data in the analysis using different methods and by comparing the groups of developed and developing countries, so it is considered to contribute to the literature.

3. Data, Model, Method, and Empirical Findings

In this part of the study, the data set, models, and methods used in the analysis are explained, and the empirical findings obtained from the analyzes are interpreted.

3.1. Data, Model, and Method

The purpose of this study is to examine the relationship between countries' economic growth levels and the amount of renewable energy they consume, as well as the potential impact of renewable energy consumption on growth. To examine this relationship, the United States, Germany, France, the United Kingdom, and Japan were used as developed countries; two different groups of countries, China, Russia, Turkey, Brazil, and Argentina, were included in the analysis as developing countries.

Economic growth and renewable energy consumption data are from the World Bank's database, World Development Indicators. The time period of the study was 1990-2018, and 29 years of data were used.

In examining the impact of renewable energy on growth, a panel for developed countries and a separate panel for developing countries were created to compare impacts in developed and developing countries.

The study first tested cross-sectional dependence. Second-generation tests are used to continue the analysis in series with cross-sectional dependence. Since there is a problem of cross-sectional dependence between variables, the stationarity of the variables was tested using the CADF and CIPS unit root tests, which are second-generation unit root tests. The presence of a cointegration relationship between the variables was examined using the Westerlund cointegration test. The cointegration model for the variables is as follows:

$$GDP_{it}=\beta_0+ \beta_1 RE_{it} + \varepsilon_{i,t}$$

In the equation, *GDP* represents the growth rates of the countries, *RE* represents the amount of renewable energy in the countries, and ε represents the error term. For the coefficient estimator model built to determine the direction of the relationship between the variables, the homogeneity status was first checked using the

Swamy-S homogeneity test. Since the panel is heterogeneous, the DOLSMG and FMOLS estimators were used.

3.2. Empirical Findings

Pesaran's (2004) CD test was applied to determine the cross-sectional dependence between the variables. The cross-section dependency test result is shown in Table 1.

Table 1. Cross-Section Dependency Test

	Panel		GDP		logRE	
	Developed	**Developing**	**Developed**	**Developing**	**Developed**	**Developing**
CD-Test	9.045	4.199	9.36	4.22	13.68	6.79
P-Value	0.0000	0.0000	0.000	0.000	0.000	0.000

As can be seen in Table 1, the fact that the probability values based on the panel or the variables are less than 5% for both developed and developing countries indicates that there is cross-sectional dependence between the panel and the variables. In this case, the analysis continues with second-generation tests.

CADF and CIPS unit root tests were applied to investigate the stationarity of the variables. The test results obtained are shown in Table 2 below.

Table 2. Unit Root Test Results

CADF					
			Critical Values		
	Developed	**Developing**	**%1**	**%5**	**%10**
GDP	-4.153	-2.369	-2.570	-2.330	-2.210
logRE	-1.516	-2.354			
CIPS					
			Critical Values		
Panel	-1.504	-2.625	-2.57	-2.33	-2.21

According to the results of the CADF unit root test, since the t-bar value of the GDP variable is larger than the absolute value of the critical values for developed countries, this variable does not have a unit root, that is, it is stationary at the level, while the t-bar value of the logRE variable is smaller than the absolute value of the critical values. It was found that the level is not stationary. In developing countries, both GDP and logRE variables are stationary at the 5% and 10% significance levels but have a unit root at the 1% significance level, i.e., they are non-stationary. Looking at the panel in general with the CIPS unit root test, the developed countries are nonstationary at the level, while the developing countries are stationary at the level.

The homogeneity of the slope coefficients of the variables was measured with the S test developed by Swamy. The test results obtained are shown in Table 3.

Table 3. Swamy S Homogeneity Test

	Chi-Square Value		p-value		Result	
	Developed	**Developing**	**Developed**	**Developing**	**Developed**	**Developing**
Model (Co. Vari.: FDI)	14.66	120.54	0.0661	0.0000	Heterogeneous at 10%.	Heterogeneous at 1%.

The fact that the probability value in the Swamy S homogeneity test is below 5% indicates that a change in the variable RE can have a different effect on the variable GDP, i.e. the model is heterogeneous.

The presence of a long-term cointegration relationship between variables was tested using Westerlund cointegration analysis. The test results obtained are presented in Table 4.

Table 4. Westerlund Cointegration Test Results

	Constant				Constant ve Trend			
GDP	Statistic		p-value		Statistic		p-value	
	Developed	**Developing**	**Developed**	**Developing**	**Developed**	**Developing**	**Developed**	**Developing**
G_t	-4.089	-2.682	0.000 ***	0.010 **	-3.802	-3.220	0.000 ***	0.040 **
G_a	-16.497	-12.461	0.000 ***	0.000 ***	-14.737	-13.543	0.040 **	0.060 *
P_t	-9.054	-5.830	0.000 ***	0.040 **	-8.816	-6.450	0.000 ***	0.100
P_a	-17.368	-11.194	0.000 ***	0.000 ***	-15.864	-12.137	0.010 **	0.080 *

****, **, * denote 1%, 5% and 10% significance levels, respectively.***

The fact that the probability values in both developed and developing countries are in part 1% and in part less than 5% shows that there is a cointegrated relationship between the variables in the long run in both the fixed and trend models (table 4).

The results of the DOLSMG and FMOLS coefficient estimator tests applied to determine the direction of this relationship after the cointegration relationship was determined are shown in Table 5.

Table 5. DOLSMG and FMOLS Coefficient Estimators Results

Developed Countries							
Dependent: GDP		**DOLSMG**		**FMOLS**			
		Coefficient	**p-value**	**Coefficient**	**Std. Error**	**p-value**	
Independent logRE	Panel	0.7308	0.6612 **	1.770818	0.431751	0.0001 ***	
	USA	4.474	1.98				
	Germany	1.723	1.788 **				
	France	0.4265	0.3827 **				
	UK	-1.066	-1.499 **				
	Japan	-1.903	-1.174 **				
Developing Countries							
Dependent: GDP		**DOLSMG**		**FMOLS**			
		Coefficient	**p-value**	**Coefficient**	**Std. Error**	**p-value**	
Independent logRE	Panel	-0.02784	-0.1818 **	2.511863	0.696592	0.0004 ***	
	Chinese	9.75	1.847 **				
	Turkey	3.29	0.1919 **				
	Brazil	-6.953	-1.136 **				
	Russia	31.68	0.9233 **				
	Argentina	-37.9	-2.232				

******, **, * denote 1%, 5% and 10% significance levels, respectively. For the FMOLS test, Schwarz criterion for lag length and pooled panel method were considered. The table value of t is 1.96 for α=0.05.***

According to the results of the DOLSMG coefficient estimator for developed countries, it can be said that renewable energy consumption has an impact on economic growth in the whole panel. A one-unit increase in renewable energy consumption increases economic growth by 0.73%. While a one-unit increase in renewable energy consumption increases growth by 1.72% in Germany and 0.42% in France, it decreases growth by 1.06% in the United Kingdom and 1.9% in Japan. It can be said that renewable energy consumption in the United States does not affect economic growth. According to the results of the FMOLS coefficient estimator, renewable energy consumption affects economic growth in the whole panel. A one-unit increase in renewable energy consumption increases growth by 1.77% in the entire panel.

According to the results of the DOLSMG coefficient estimator, we can say that renewable energy consumption has a negative effect on economic growth in the whole panel. A one-unit increase in renewable energy consumption in the whole panel increases economic growth by 9.75%, 3.29% in Turkey, and 31.68% in Russia. In Brazil, a one-unit increase in renewable energy consumption reduces growth by 6.95%. In Argentina, renewable energy consumption does not affect economic growth. According to the results of the FMOLS coefficient estimator, renewable energy consumption affects economic growth in the entire panel. A one-unit increase in renewable energy consumption increases economic growth by 2.51%.

4. Conclusion

Today, it is important for countries to achieve sustainable and healthy economic growth in order to raise people's living standards and welfare levels. Undoubtedly, energy has a large part in the ability of countries to achieve this. Countries that do not have sufficient energy for their economic growth cannot achieve their economic goals. To achieve sufficient energy supply, countries

resort to many methods. Some of these methods include non-renewable (exhaustible) energy resources such as fossil sources (coal, oil, natural gas) and nuclear fuels (uranium, thorium); renewable (inexhaustible) energy sources such as water, solar, biomass, wind, geothermal, wave, tidal, and hydrogen.

The energy that people need to continue their lives and increase their level of prosperity can be obtained from many different sources. However, it is well known that non-renewable sources of energy are being depleted and their supply is decreasing due to increasing costs and the degradation of the natural environment and living beings. For these reasons, people have recently been pushing the search for and using renewable energy sources. Since renewable energy sources are a repeatable and inexhaustible source of energy that is less harmful to the environment, their importance is increasing.

The objective of the study is to examine the potential impact of renewable energy consumption in individual countries on their economic growth. To see the difference between developed and developing countries, the United States, Germany, France, the United Kingdom, and Japan are considered developed countries; developing countries, Turkey, China, Russia, Brazil, and Argentina are included in the analysis. To compare 1990-2018 data with those of developed and developing countries, separate panels were created and analyzes were conducted using the CADF and CIPS unit root tests, the Westerlund cointegration test for long-term relationships, and the DOLSMG and FMOLS estimator methods for the coefficient estimates.

With the Westerlund cointegration test, a long-term cointegration relationship was determined between the renewable energy consumption of countries and their economic growth. According to the results of DOLSMG and FMOLS coefficient estimators in both developed and developing countries, it can be said that renewable energy consumption is effective on economic

growth throughout the panel. In developed countries, a 1 unit increase in renewable energy consumption across the panel increased economic growth by 0.73%; in developing countries, it increases by 9.75%. This finding reveals how important the use of renewable energy is for developing economies. For this reason, it is very important for countries to increase their use of renewable energy in order to achieve sustainable economic growth. In addition, it can be said that renewable energy is very important for a sustainable world in terms of contributing to the economic growth of countries as well as causing less harm to the natural environment and living things. For this reason, it can be recommended that countries or policymakers turn towards the production and use of renewable energy and transfer their resources and technologies to this field.

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CHAPTER 10

The Relationship Between Renewable Energy Consumption, Oil Price, Gold Price, Exchange Rate, and Stock Market

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Introduction

Because oil formation takes many years, it is included in the non-renewable (fossil) resources in the classification of energy resources. Petroleum is a very important energy input in terms of the robustness of the economic structures of countries and their growth. Petroleum is an important fossil resource because it has a high share of in the world in terms of energy consumption. In today's age, oil is still a heavily used energy source. The main reason for this is the widespread consumption network. Today, it is used in a very large areas from electricity generation to logistics activities (Gökçe, 2015). Due to the high share of global energy consumption as a result of this intensive

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use of oil, the change in the prices of oil, which is called black gold, affects the economies of the countries. This power of influence is related to the country's dependence on oil and the share of oil in national income. In oil-dependent and oil-importing countries, the level of prices affects various macroeconomic variables such as the balance of payments, employment, national income, inflation, and interest. The most important effect of these price changes for oil-exporting countries is the positive contribution to the exported oil revenues and directly to the national income (Solak, 2012).

The fluctuations in energy prices after the war between Russia and Ukraine turned the eyes on countries with the largest oil reserves in the world. Although energy, which is among the sanctions that come to the agenda in cases of war between countries, political crisis, etc., is an "inviolable" field, shocks in the energy market show that the increase in prices and more importantly, foreign dependence in energy is as important as defense (Karagöl, 2022a). Countries with energy resources, especially oil reserves, will be less affected by possible crises and will leave with less loss from sanctions.

Because few countries own the vast majority of oil reserves within the above-mentioned issues, there is a compulsory dependency on other countries. This dependency can be at a level that will shake the economies of dependent countries in possible crises. For this reason, countries are looking for alternative energy sources in order not to be dependent, and not be weakened by crises and political blackmail. Each country is trying to discover its geographical advantages. More efforts are being made to find natural gas and geothermal deposits, both on land and in the sea, with geophysical-geological models. For example, as a result of the researches carried out in this context in the Eastern Mediterranean, it has been determined that there are two oil reserves of 1.7 billion barrels and natural gas reserves of 3.45 trillion cubic meters. These energy resources in the Eastern Mediterranean are considered to have a strong global impact. However, the inconsistencies of the countries of the region on fair sharing also contain geopolitical risks in the international market

of energy resources (Tuna, 2020, 79). Since fossil fuel resources are depleted, the world is now working to include "Renewable Energy" resources in energy input to reduce dependency on these resources. These energy sources are seen as a way out for the future of the world since they are both environmentally friendly and renewable.

This effort shows that renewable energy has increased its share of total energy consumption. According to the Renewable Energy Market Outlook Report for May 2022 and 2023 announced by the International Energy Agency (IEA), problems in logistics activities and supply chain due to the covid-19 pandemic that affected the world, the slowdown in the manufacturing industry, production coming to a halt in some sectors, raw materials despite record-breaking increases in prices and the ongoing challenging process, increases in renewable

Investment capacity reached record levels, increasing by 6 percent in 2021. In addition, it is stated in this report that it will have great potential to reduce dependence on fossil fuels in the short and long term. Another point mentioned in the report is that even if the investment costs of solar and wind energy increase, the increase in other fossil resources will accelerate renewable energy investments. As stated before, the war between Russia and Ukraine harmed energy prices and as a result, a global energy crisis was experienced. These astronomical increases in energy prices have led countries to alternative sources. The most important of these alternative sources is renewable energy (Karagöl, 2022b).

World Oil Reserve by Country

Data on oil production, which is still the most important energy input in the world, is presented in Table 1. OECD countries' oil production of 679,968 Mt in 1971 reached 1279.80159 Mt in 2020. When evaluated for the year 2020, although there is a decrease in production compared to the previous year (2019), it is seen that the highest production (1279.80159 Mt) is realized in OECD countries. Afterward, it is seen in the table that the highest production is realized in the Middle East countries (1278.306073Mt).

Table 1: World crude oil production by region, 1971-2020 (IEA)

Units: Mt							
Year	**OECD**	**Middle East**	**Non-OECD Europe and Eurasia**	**China**	**Non-OECD Asia**	**Non-OECD Americas**	**Africa**
1971	679.968	804.628	395.816	39.41	62.456	229.503	276.755
1972	692.148	902.396	420.226	45.67	75.794	217.9	277.632
1973	695.155	1056.303	449.016	53.61	90.567	234.82	288.934
1974	670.645	1088.157	478.758	64.85	90.738	213.751	266.408
1975	660.155	978.06	511.058	77.06	88.459	178.962	244.406
1976	655.832	1109.941	538.747	87.16	103.79	178.013	291.109
1977	696.502	1113.426	563.73	93.64	116.218	178.117	305.166
1978	748.907	1069.747	587.746	104.05	115.027	179.315	299.513
1979	790.415	1089.885	599.021	106.15	118.512	192.577	328.566
1980	828.702	945.095	621.215	105.946	116.551	184.698	303.767
1981	849.765	813.134	626.369	101.221	119.024	182.24	244.434
1982	890.226	664.099	630.147	102.123	112.044	173.485	232.028
1983	914.57	599.985	633.436	106.068	121.932	171.658	232.618
1984	954.475	586.898	629.75	114.613	136.076	180.969	254.458
1985	967.088	528.365	611.549	124.895	129.84	178.691	263.973
1986	955.488	618.213	630.335	130.688	139.381	185.48	261.121
1987	961.835	638.89	638.817	134.14	136.142	179.006	262.39
1988	954.461	754.695	638.644	137.046	138.781	188.873	275.361
1989	917.722	817.571	621.129	137.641	149.003	189.18	293.491
1990	916.4548	844.744	589.763	138.306	159.216	206.163	315.738
1991	935.6177	841.098	535.31	140.992	168.087	220.08	329.282
1992	950.8505	931.507	460.416	142.097	164.94	226.216	332.623

1993	958.3336	984.438	411.595	145.174	166.325	236.773	330.49
1994	993.5991	989.841	373.358	146.082	177.935	250.533	332.433
1995	1011.061	999.524	363.004	150.044	183.515	268.778	340.684
1996	1040.041	1003.44	365.805	157.334	182.895	297.76	359.047
1997	1053.675	1048.554	368.995	160.741	183.122	312.756	374.638
1998	1055.363	1104.183	370.45	161.203	183.66	315.73	374.934
1999	1032.477	1071.012	378.277	160.169	183.029	310.606	367.185
2000	1044.497	1138.255	401.253	163.078	179.058	324.684	379.344
2001	1036.028	1114.641	431.48	164.056	178.418	335.669	382.749
2002	1038.214	1045.791	472.974	167.145	178.69	324.696	382.529
2003	1030.508	1129.619	519.596	169.655	176.888	319.681	415.893
2004	1008.695	1196.808	563.838	175.941	180.498	339.713	452.797
2005	957.336	1238.734	581.29	181.426	180.517	353.7	474.09
2006	940.5334	1249.66	603.396	184.853	177.613	357.36	486.333
2007	924.554	1229.673	626.995	186.421	172.8	350.155	498.543
2008	891.4259	1272.917	631.172	190.559	174.288	360.105	500.035
2009	896.0329	1181.473	646.326	189.616	172.122	349.572	482.312
2010	901.0986	1210.934	662.719	203.156	175.2	353.234	497.082
2011	907.956	1317.454	666.717	203.032	170.515	354.385	421.261
2012	954.7448	1323.093	670.066	207.642	172.859	348.282	452.684
2013	1009.583	1314.265	676.393	210.098	166.464	346.579	416.451
2014	1093.76	1321.233	678.1488	211.622	165.744	354.352	396.226
2015	1140.436	1372.02	683.5501	214.756	169.134	352.301	392.383
2016	1106.447	1501.856	693.7275	199.888	168.535	339.085	367.859
2017	1141.894	1459.534	697.3484	191.7257	163.0546	323.8025	386.5491
2018	1248.25	1473.603	710.4247	189.5618	156.5552	291.6974	393.5521
2019	1320.077	1395.174	714.9597	191.2754	150.9715	275.8916	402.7978
2020	1279.802	1278.306	657.4207	195.0305	141.4422	259.8376	329.4168

The table above shows the regional crude oil production amount. On the other hand, in Table 2, the countries that produce the most crude oil on a country basis, as well as the countries with the most reserves, are presented. The United States takes the first place in the table with a 17% share and a production of 706 Mt. Global crude oil production was 4141 Mt.

Table 2: Crude oil production 2020 (IEA)

Producers	**Mt.**	**% of the world's total**
United States	706	17.0
Russian Federation	512	12.4
Saudi Arabia	511	12.3
Canada	255	6.2
Iraq	201	4.9
people's Rep. Ugh China	195	4.7
United Arab Emirates	174	4.2
Brazil	153	3.7
Kuwait	131	3.2
Islamic Rep. of Iran	130	3.1
Rest of the World	1173	28.3
World	4141	100.0

Renewable Energy Production and Consumption

Since the major countries of the world have a large proportion of crude oil reserves, countries that do not have reserves have a higher risk of reaching this important energy input. The countries that will be most affected by the price fluctuations in any crisis in the world will be the countries mentioned. The worldwide Covid-19

epidemic, the supply problem in energy resources, and subsequent Russia's occupation of Ukraine and Russia's interruption of the natural gas flow caused an increase in the price of fossil energy resources. These price fluctuations have been the motivating force that directs countries to renewable energy sources. With the increase in the share of renewable energy resources in total energy resources, there may be a decrease in the dependence on crude oil, which is a fossil fuel type.

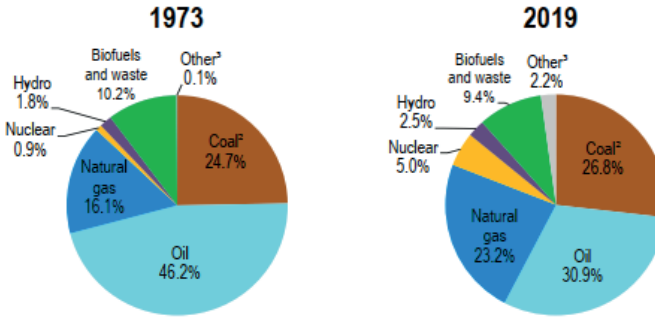

Figure 1: Share of world total energy supply by source, 1973 and 2019 (IEA)

As can be seen in the graphs in Figure 1, while 46.2% of the oil was used as an energy source in 1973, this usage decreased to 30.9% in 2019. This situation shows that the global demand for energy needs has shifted to Natural Gas, nuclear energy, and renewable energy. In other words, we can see statistically that the share of oil in the total energy resource has decreased. The percentage share in these graphs will likely increase in favor of renewable energy sources in the coming years. The actions of international agencies, the work of non-governmental organizations, the R&D investments of companies, the increase in loans given by banks to renewable energy investments, and most importantly, the changes in the current laws of the states and the importance they give will

change the ratio of the shares in the charts. Considering that fossil energy sources will run out one day, there will be a compulsory transition to alternative energy sources.

Literature Review

In the literature review, studies in which the VAR model and Granger causality tests were performed were examined. Studies in different disciplines are explained under the title of the literature review.

Dungey and Pagan (2000) developed an 11-variable structural VAR model for the Australian economy over the period 1980 to 1998. The model includes an overseas sector that differentiates between commodity and asset markets to counteract the effects of shocks from all sources. What sets this work apart from its predecessors is the inclusion of an overseas sector and asset markets. In general, it is seen in the study that the effect of monetary policy on the economy contributes to stability, although its effects are not great.

Amitava (2001) stated in his study that countries around the world have the idea that economic development will increase by strengthening their telecommunication infrastructure, and that there is usually an assumption that there is a causal relationship between these two. The author analyzed aggregated data at the national level to see if there was any empirical evidence to support this assumption. He applied the Granger test for causality using time series data for telecommunications infrastructure and economic activity levels from thirty countries. He noted that the evidence for causality from levels of telecommunications infrastructure to economic activity is stronger than causality in the reverse direction. Moreover, this model seems to apply to both industrialized and developing economies, despite having strong service sectors that are heavily dependent on telecommunications. These findings provided additional insights into the complex relationship between telecommunications and economic activity.

Hoffmann et al. (2005) investigated the relationship between foreign direct investment (FDI) and pollution in 112 countries for 15-28 years using Granger causality tests. The findings can be summarized as follows; In low-income countries, CO_2 levels Granger cause foreign direct investment flows. For middle-income countries, the introverted FDI Granger causes CO_2 emissions. Finally, find Granger causality for high-income countries. It reveals alternative causality relationships between two variables depending on the level of development of the host country.

Narayan and Smyth (2005) examined the relationship between electricity consumption, employment, and real income in Australia within the framework of cointegration and causality. They found that electricity consumption, employment, and real income are cointegrated and cause Granger electricity consumption in employment and real income in the long run, while in the short run there is a weak one-way Granger causality running from income to electricity consumption and from income to employment.

Giordano et al. (2007) examined the effects of fiscal policy on private GDP, inflation, and long-term interest rate in Italy using a structural Vector Autoregression model. For this purpose, a database of quarterly cash data for selected financial variables for the period 1982:1–2004:4 was created, based on the information contained in the quarterly reports of the Italian treasury. The results of the study can be summarized as follows; A shock to government purchases of goods and services has a large and powerful effect on economic activity: an exogenous 1% (in terms of private GDP) shock increases private real GDP by 0.6% after 3 quarters. The response goes to zero after two years, reflecting the low persistence of the shock with a lag. The effects on employment, private consumption, and investment have also been positive. The response to inflation has been positive but small and short-lived. In contrast, public wages combined with purchases in many studies did not have a significant impact on output, while their

employment impact turned negative two quarters later. Shocks to net income have negligible effects on all variables.

Hurlin and Venet (2008) investigated the causal relationship between financial development and economic growth. *Granger used an innovative* econometric method based on panel testing of the *causality hypothesis*. They applied various tests with a sample of 63 industries and developing countries in the 1960-1995 and 1960-2000 periods. They used three standard indicators of financial development. The results show a strong causal relationship between economic growth to financial development. On the contrary, the causality hypothesis from financial development indicators to economic growth can not be rejected in most cases.

Akinboade and Braimoh (2010) analyzed the issue of international tourism, in which South Africa attaches importance to sustainable economic growth. Although international tourism contributes to the growth of many economies, it is also affected by the growth in many developed countries. Real gross domestic product (GDP), international tourism earnings, real effective exchange rate, and export variables were analyzed in a multivariate vector autoregressive model using annual data covering the years 1980–2005. The main focus of their work is to examine the direction of causality between international tourism earnings and South Africa's long-term economic growth, among other variables, using Granger causality analysis. The obtained result showed a unidirectional causality running from international tourism earnings to real GDP both in the short run and the long run. The error correction mechanism also supported this causality.

Saidi and Ben Mbarek (2016) investigated the causal relationship between nuclear energy consumption, CO2 emissions, renewable energy, and real GDP per capita using dynamic panels for nine developed countries covering the period 1990-2013. Capital and labor are included as additional variables. The results showed that there is a unidirectional causality running from renewable energy

consumption to real GDP per capita for the entire panel in the short run. They stated that this would mean that policies aimed at reducing energy consumption may not delay economic growth and income. However, no correlation was found between nuclear energy consumption and real GDP per capita, and a unidirectional causality running from nuclear energy consumption to labor was found. In addition, a bidirectional causality was found between labor and capital and between CO_2 emissions and capital, while there was a unidirectional causality relationship from labor to CO_2 emissions, no causal relationship was found between other variables. It is also concluded that there is bidirectional causality between renewable energy consumption and real GDP per capita in the long run. In addition, the study indicated that there is unidirectional causality from GDP to CO_2 emissions.

Öner (2018) examined the causal relationship between the volatility index (VIX), which is called the fear index, gold, oil, exchange rate and interest. In the study, the author used the working day data of the variables of gold prices, American crude oil (WTI) prices, EUR/USD parity, American treasury 10-year benchmark bond interest rates, and VIX index variables for the period 02 January 2008 – 10 May 2017. In the analysis, the Extended Dickey-Fuller unit root test and Granger causality test were applied and the relationship between the variables was evaluated. According to the results of the study; There is a one-way causality relationship between gold to oil, gold to EUR/USD parity, and gold to US Treasury 10-year benchmark bond interest rates, bidirectional causality relationship between US Treasury 10-year benchmark bond interest rates, and VIX index, and between EUR/USD parity and VIX index.

Avşarlıgil (2020) examined the breaks and changes in the financial markets of COVID-19 in his study. After the cointegration analysis conducted in the pre-epidemic period, the author found that there was no cointegration relationship between the West Texas Crude Oil price (WTI), Bitcoin (BTC), and Euro/Dollar

parity (EUR) variables, while there was a significant cointegration between the three variables in the post-epidemic period. stated. That is, the cointegrated movement was seen between BTC, EUR, and WTI, which were not co-integrated between them before the epidemic. In the study, it was seen that the averages changed significantly in terms of the series before and after the epidemic, and the change in WTI was a reason for the change in BTC, as well as a change in the price of WTI in the change in EUR. In addition, as a result of the Zivot-Andrews unit root test with a structural break, it was concluded that there was no structural break at the beginning of the covid-19 epidemic for both WTI, BTC, and EUR.

Duță (2022) analyzed the effect of oil price (WTI and Brent) on the price of oil stocks traded on the Bucharest Stock Exchange from December 2011 to December 2021, using the VAR Granger correlation and causality test. Three oil companies (OMV Petrom, Rompetrol Rafinere, and OMV AG) participated in the study and five stock indices, the EUR stock market index (Euro Stoxx 50), the China50 stock market index, and the Russian RTS index, whose economy is heavily dependent on oil and gas exports. As a result of the study, it is stated that the WTI oil price has a one-way effect on the OMV AG price and there is a bidirectional effect between the WTI oil price and the Russian capital market. At the same time, it is seen that the Brent oil price does not affect oil companies and stock indices.

Data and Empirical Findings

In the study, the relationship between crude oil prices and 5 different variables was examined. Monthly data for the period between January 2010 and February 2022 were included in the study.

Table 3: Variables used in the study

NO	VARIABLE	UNIT/CODE	SOURCE
1	Gold	OUNCE	en.investing.com
2	Dollar Index	DXY	en.investing.com
3	S&P 500 Energy	SPNY	en.investing.com
4	DJ Oil & Gas	DJUSEN	en.investing.com
5	Renewable Energy Consumption	BTU	www.eia.gov
6	Crude oil	WTI	en.investing.com

To determine the relationship between the variables used in the study, the stationarity of the series was tested before the model was set up. Extended Dickey-Fuller (ADF) and Phillips – Perron tests were used for stationarity. y_t The following equation is used to test the unit-roots of the series (Günaydin, 2004) :

$$\Delta Y_t = \alpha_0 + \alpha_1 t + \delta Y_{t-1} + \sum_{i=1}^{N} \Psi_i \Delta Y_{t-i} + \in_t \qquad (1)$$

first difference operator in the above equation; Δ t is the time trend; $\in_t$ The error term is Y_t the number of lags of the dependent variable determined by the Akaike Information Criterion to remove the series such as public revenue, GNP, interest rate, and the consecutive dependence of the N error terms. In unit root tests, the h_0 hypothesis states that the series is not stationary. During the test, it is desired to reject the h_0 hypothesis. ADF Unit root test is δ based on the estimation of its parameter and the t statistic. If the h_0 hypothesis is δ negative, statistically significant, and different from zero, it is rejected. The ADF test has a problem in itself. It requires the inclusion of additional differences in terms of the test equation. This situation causes a loss in the degrees of freedom

and a decrease in the power of the test. One of the other tests, Phillips-Perron (PP), takes into account the existence of unknown forms of autocorrelation and the conditionally varying variance in the error term and relies on equation (1), excluding N=0. This method uses a non-parametric correction for the serial relationship. Then, the statistics are converted to remove the effects of the serial relationship on the asymptotic distribution of the test statistics (Günaydin, 2004).

In the stationarity test of the study, it was seen that the series were stationary without taking logarithms or differences. However, the logarithms of the series were taken, and then their difference was taken, due to the problems experienced during the subsequent assumptions. Stability test results are shown in Table 4 and Table 5. Akaike information criterion, which is frequently used in finance series, was used in the ADF test. In the tables, the range of the 1%, 5%, and 10% critical values of the test statistic is indicated by the symbol (*).

Table 4: ADF Test

NO	Variable	Intercept	Trend and Intercept
1	dlogGold	-12.9290 (0.000)*	-12.8809 (0.000)*
2	dlogDollar Index	-13,3135 (0.000)*	-13.2688 (0.000)*
3	dlogS &P 500Energy	-12.0182 (0.000)*	-11.9755 (0.000)*
		-12.0364 (0.000)*	-11.9940 (0.000)*
4	dlogDJ Oil & Gas	-3.4536 (0.010)* *	-3.31441 (0.068)*
5	dlogRenewable Energy Consumption		**
6	dlogCrude Oil	-9.4913 (0.000)*	-9.4991 (0.000)*

1% **5% *** Indicates 10% significance level. Values in parentheses indicate probe values.

Table 5: PP Test

NO	Variable	Intercept	Trend and Intercept
1	dlogGold	-13.0070 (0.000)*	-12.9560 (0.000)*
2	dlogDollar Index	-12.2904 (0.000)*	-13.2464 (0.000)*
3	dlogS &P 500 Energy	-12.0182 (0.000)*	-11.9755(0.000)*
4	dlogDJ Oil & Gas	-12.0364 (0.000)*	-11.9940 (0.000)*
5	dlogRenewable Energy Consumption	-35,9600 (0.0001)*	-37.5390 (0.0001)*
6	dlogCrude Oil	-10. 2820(0.000)*	-10,3127 (0.000)*

****1% **5% *** Indicates 10% significance level.***

Bartlett as estimation method in PP Test Kernel and Newey - West Bandwidth are used for bandwidth selection. According to the results of the stationarity tests, in the ADF test and the PP test, it was determined that the series were stationary in level and with a constant - trend. In other words, the null hypothesis h_0 hypothesis "the series has a unit root" was rejected. In the next part of the study, the lag length is determined.

Table 6: VAR Delay Length Selection Criteria

lag	logL	LR	FPE	AIC	SC	HQ
0	1643,364	NA	1. 68e -18	-23.90312	-23.77523*	-23.85115*
1	1693,092	94.37527	1.37e-18*	-24.10353*	-23.20836	-23.73976
2	1716,034	41.53063	1. 66e -18	-23.91291	-22.25044	-23.23732
3	1738,512	38.72109	2.04e-18	-23.71551	-21.28574	-22.72811
4	1762.137	38,62689	2.48e-18	-23.53484	-20,33778	-22.23564
5	1785,300	35.84401	3.06e-18	-23.34745	-19.38309	-21.73643
6	1826.745	60.50303*	2. 93e -18	-23.42693	-18,69528	-21.50410
7	1847.071	27.89332	3. 87e -18	-23.19812	-17.69918	-20.96348
8	1876,711	38,07799	4.54e-18	-23.10528	-16.83904	-20.55883

Table 6 was created to determine the VAR lag length. To determine the lag length in the table, the lag where the (*) sign is added is selected. It is seen in the table that there is an even distribution. In these cases, it is seen that the lag for which the AIC criterion is marked is taken into account in the literature. In this case, 1 delay is passed and the var model is created.

Table 7: VAR model

	DLOGGOLD	DLOG DOLARENDEX	DLOG CRUDE OIL	DLOGOILGAS	DLOGSP500	DLOG RENEWABLE
DLOGGOLD (-1)	-0.090540 (0.09122) [-0.99250]	0.060048 (0.04058) [1.47983]	0.077827 (0.23382) [0.33284]	-0.131299 (0.16012) [-0.82002]	-0.127672 (0.15718) [-0.81228]	-0.109896 (0.12082) [-0.90956]
DLOGDOLARENDEX (-1)	-0.201446 (0.21460) [-0.93871]	-0.025455 (0.09546) [-0.26667]	0.736471 (0.55006) [1.33890]	0.046657 (0.37667) [0.12387]	0.040370 (0.36975) [0.10918]	0.483730 (0.28423) [1.70190]
DLOGHAMPETROL (-1)	-0.015720 (0.04338) [-0.36243]	-0.012920 (0.01929) [-0.66966]	-0.125266 (0.11118) [-1.12671]	-0.079212 (0.07613) [-1.04045]	-0.082057 (0.07473) [-1,09798]	-0.035352 (0.05745) [-0.61536]
DLOGOILGAS (-1)	-2.156835 (1.07362) [-2.00894]	-0.667139 (0.47756) [-1.39699]	5.828560 (2.75187) [2.11804]	0.205761 (1.88442) [0.10919]	0.128172 (1,84981) [0.06929]	-0.026105 (1.42197) [-0.01836]
DLOGSP500 (-1)	2.167631 (1.08553) [1.99684]	0.727794 (0.48286) [1.50727]	-5.245826 (2.78241) [-1.88536]	-0.125513 (1.90533) [-0.06587]	-0.043062 (1,87034) [-0.02302]	0.266399 (1.43775) [0.18529]
DLOGREENABLE (-1)	0.021156 (0.06042) [0.35017]	-0.049646 (0.02687) [-1,84742]	0.135896 (0.15485) [0.87757]	0.095109 (0.10604) [0.89691]	0.11043 (0.10409) [0.97069]	-0.220409 (0.08002) [-2.75449]
C	0.003366 (0.00389) [0.86549]	0.000939 (0.00173) [0.54308]	0.001176 (0.00997) [0.11797]	0.001499 (0.00683) [0.21959]	0.001803 (0.00670) [0.26903]	0.003850 (0.00515) [0.74751]

In the created VAR model, it is necessary to test whether the process is stationary, in other words, whether it contains a unit root. The stationarity of the model is related to the eigenvalues of the coefficient matrix (Hendry and Juselius, 2001) :

$$\begin{pmatrix} x_t \\ x_{t-1} \end{pmatrix} = \begin{pmatrix} \Pi_1 & \Pi_2 \\ I_p & 0 \end{pmatrix} \begin{pmatrix} x_{t-1} \\ x_{t-2} \end{pmatrix} + \begin{pmatrix} \epsilon_t \\ 0 \end{pmatrix} \tag{2}$$

eigenvalues of the complementary matrix are inside the unit circle, $\{x_t\}$ is stationary;

all if the eigenvalues are inside or above the unit circle, $\{x_t\}$ is not stationary;

eigenvalues is outside the unit circle, $\{x_t\}$ is expanding.

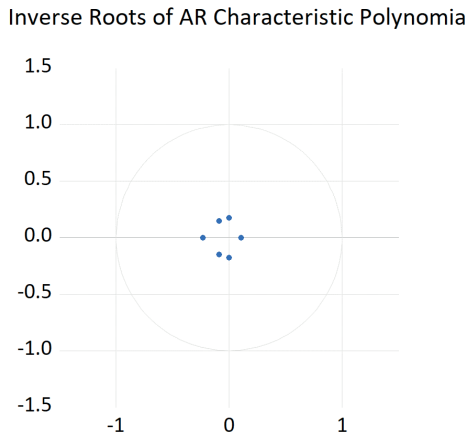

Figure 2: Unit Circle Position of the Inverse Roots of the AR Characteristic Polynomial

Unit Circle Position of the Inverse Roots of the AR Characteristic Polynomial is examined in figure 2. As seen in the figure, all the eigenvalues of the coefficient matrix are inside the unit circle. This shows that our VAR model is stationary.

Table 8: Unit Roots of the Coefficient Matrix and Their Positions in the Unit Circle

root	modulus
-0.231652	0.231652
-0. 000349 - 0.176891i	0.176892
-0.000349 + 0.176891i	0.176892
-0. 087089 - 0.149731i	0.173217
-0.087089 + 0.149731i	0.173217
0.107557	0.107557

The positions of the unit-roots on the unit circle, which are examined graphically in Figure 2, are shown in Table 8. Since all of the values are less than 1, there is no unit root, so the model is stable. The LM test tested whether the

model showed autocorrelation. In the LM test, the null hypothesis of Ho is that there is no autocorrelation. To accept the H0 hypothesis, p>0.05 should be. As can be seen in Table 9, the hypothesis is accepted since the p-value is >0.05 (probe: 0.4002). That is, there is no autocorrelation in our model.

Table 9: Autocorrelation LM test

lag	LRE* stat	df	prob .	Rao F-stat	df	**prob .**
1	37.51370	36	0.3996	1.044964	(36, 556.1)	**0.4002**

Impulse-Response Function Chart Results

Response functions were used to monitor the response of the related variables to a standard deviation (SD) shock given to the Gold, Dollar Index, S&P 500 Energy, DJ Oil & Gas, Renewable Energy Consumption, and Crude Oil variables. The impulse-response functions in the six-variable VAR model are shown graphically in Figure 3 and Figure 4, considering 10 periods.

The 1 SD shock applied to the gold variable, the gold variable responds as a decrease after a rapid increase for the 1st period, and it is seen that the effect disappears by being reset in the 3rd period. Gold can also be affected by its own lagged values and shocks. Despite the 1 SD shock applied to the dollar index, it is observed that the gold variable does not provide a significant response to be taken into account. Likewise, despite the shock applied to the crude oil and gas variables, it was observed that the gold variable did not give a response to be taken into account. In the face of the shock applied to the S&P 500 Energy variable, the response of the gold variable was a small increase until the 2nd Period and disappeared by zeroing in the 3rd Period. Despite the 1 SD shock applied to the renewable variable, the gold variable does not give a significant response. Despite the shock applied to gold, the dollar index showed an opposite movement in the 1st period, while after a small increase in the 2nd period, the 3rd period was reset and lost its effect. Despite the shock applied to the dollar index, the dollar index responded by resetting in the 3rd period after a rapid rise in the 1st period. Despite the shock applied to the Crude Oil, DJ Oil & Gas, S&P 500 Energy, and Renewable Energy Consumption variables, the dollar index gave fluctuating responses, but it lost its effect by zeroing after the 3rd Period. Despite the shock applied to crude oil, DJ Oil & Gas variable and S & P 500 Energy index first increased rapidly, then decreased rapidly, and the effect disappeared after the 3rd period. It is seen in the graph that the response to the 1 SD shock applied to the DJ Oil & Gas index first increases, then decreases, and

after the 3rd week, the response decreases and becomes zero. In general, it is seen in the graphs (figure 3, figure 4) that the other variables do not give strong answers despite the shocks applied to the variables in the impulse-response functions.

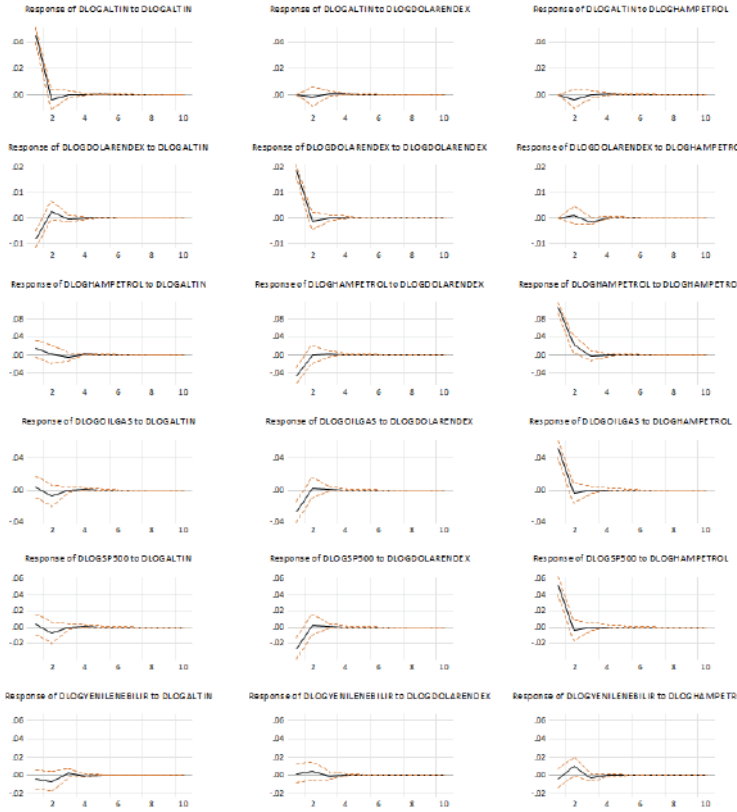

Figure 3: Impulse-Response Graphs

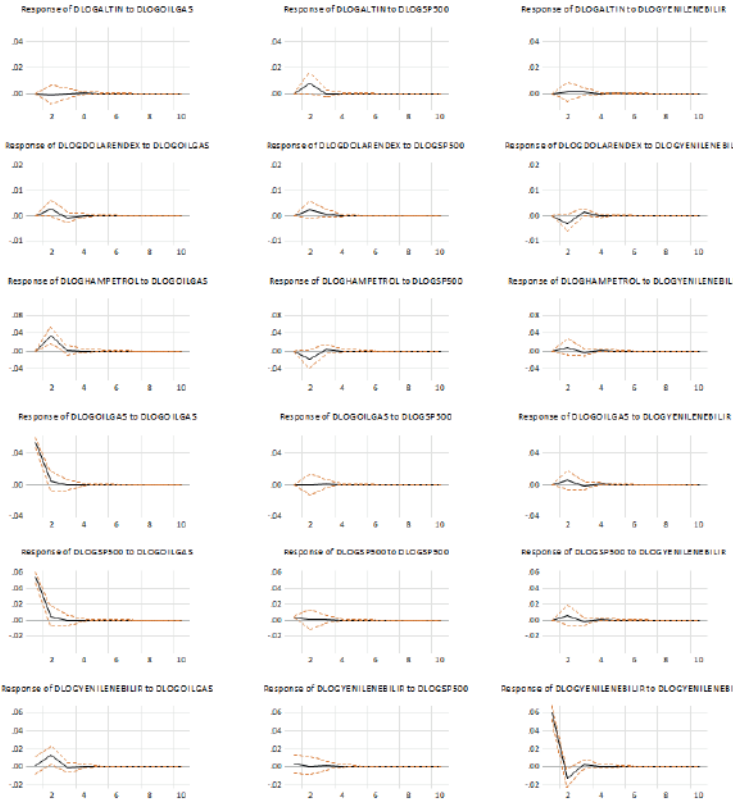

Figure 4: Impulse-Response Graphs (Continued)

Variance Decomposition Results

Variance decompositions offer different methods to observe the movements of the created VAR model in detail. In the model created, the rate of movements in the dependent variables gives shocks to other variables, depending on the shocks of the same variable. For example, a shock applied to variable X will directly affect this variable x, but the important point here is that the applied shock will be transferred to all other variables present in

the model structure. Variance decompositions are to measure how much of the estimation error variance before i step of a certain variable is explained by the innovations in the explanatory variable for i=1,2,3 (Sarıkovanlık et al., 2020).

Table 10: Variance Decomposition of DLOGALTIN

period	SE	DLOGGOLD	DLOG-DOLAREN-DEX	DLOGHAM-PETROL	DLOGOILGAS	DLOGSP500	DLOGRenewable
1	0.045858	100,000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.046912	96.33857	0.156810	0.695031	0.041605	2.693902	0.074082
3	0.046926	96.28153	0.163363	0.704057	0.044286	2.694636	0.112131
4	0.046927	96.27579	0.163428	0.705076	0.044830	2.694506	0.116370
5	0.046927	96.27547	0.163447	0.705160	0.044855	2.694496	0.116576
6	0.046927	96.27546	0.163448	0.705160	0.044855	2.694497	0.116582
7	0.046927	96.27546	0.163448	0.705160	0.044855	2.694497	0.116582
8	0.046927	96.27546	0.163448	0.705160	0.044855	2.694497	0.116582
9	0.046927	96.27546	0.163448	0.705160	0.044855	2.694497	0.116582
10	0.046927	96.27546	0.163448	0.705160	0.044855	2.694497	0.116582

In Table 10, the 10-period variance decomposition results of the gold variable are presented. According to the results, a significant part (96.2%) of the error variance in the gold variable is explained by itself, while the remaining approximately 3.75% is explained by other variables.

Table 11: Variance Decomposition of DLOGDOLARENDEX

period	SE	DLOGGOLD	DLOG-DOLAREN-DEX	DLOGHAM-PETROL	DLOGOIL-GAS	DLOGSP500	DLOGRenew-able
1	0.020398	15.96011	84.03989	0.000000	0.000000	0.000000	0.000000
2	0.021171	16,49866	78.30410	0.256551	1.630989	1.306543	2.003158
3	0.021293	16.33132	77,41575	0.699078	1.746561	1.444922	2.362369
4	0.021295	16,33357	77,40469	0.701282	1.746250	1.444783	2.369430
5	0.021295	16,33412	77.40401	0.701294	1.746278	1.444821	2.369476
6	0.021295	16,33414	77,40398	0.701296	1.746277	1.444830	2.369476
7	0.021295	16,33414	77,40398	0.701296	1.746277	1.444830	2.369476
8	0.021295	16,33414	77,40398	0.701296	1.746277	1.444830	2.369476
9	0.021295	16,33414	77,40398	0.701296	1.746277	1.444830	2.369476
10	0.021295	16,33414	77,40398	0.701296	1.746277	1.444830	2.369476

Table 11 shows the variance decomposition results of the dollar index. As can be seen from the table, 10-period variance decomposition has been made and approximately 77.40% of the dollar index is explained by itself. Other variables explain approximately 22.6%.

Table 12: Variance Decomposition of DLOGHAMPETROL

period	SE	DLOGGOLD	DLOGDOLARINDEX	DLOGHAMPETROL	DLOGOILGAS	DLOGSP500	DLOGRenewable
1	0.117541	1.372241	16.14276	82.48500	0.000000	0.000000	0.000000
2	0.126555	1.184491	13.92517	74.53778	7.889567	2.042971	0.420022
3	0.126756	1.303545	13.89062	74.35242	7.867854	2.091661	0.493903
4	0.126775	1.306085	13.88648	74,33920	7.878453	2.091223	0.498560
5	0.126775	1.306100	13.88640	74,33910	7.878424	2.091218	0.498762
6	0.126775	1.306109	13.88640	74,33908	7.878429	2.091221	0.498769
7	0.126775	1.306110	13.88640	74,33907	7.878429	2.091221	0.498769
8	0.126775	1.306110	13.88640	74,33907	7.878429	2.091221	0.498769
9	0.126775	1.306110	13.88640	74,33907	7.878429	2.091221	0.498769
10	0.126775	1.306110	13.88640	74,33907	7.878429	2.091221	0.498769

As seen in Table 12, while the crude oil variable is primarily affected by its own lagged values, it is seen that other variables are not at a significant level. While 74.33% of the error variance in crude oil is explained by itself, 25.67% is explained by other variables. According to the table, there are no significant changes after the 3rd period.

Table 13: Variance Decomposition of DLOGOILGAS

period	SE	DLOG GOLD	DLOGDOLAR ENDEX	DLOGHAM PETROL	DLOG OILGAS	DLOGS P500	DLOG Renewable
1	0.080489	0.154466	11.98858	42.48368	45.37328	0.000000	0.000000
2	0.081336	1.023283	11,82892	41.90198	44,74731	0.000413	0.498087
3	0.081374	1.030305	11,82636	41.87072	44.72134	0.004358	0.546913
4	0.081377	1.033702	11.82595	41,86809	44.71950	0.004392	0.548370
5	0.081377	1.033774	11.82592	41,86807	44,71944	0.004392	0.548400
6	0.081377	1.033775	11.82592	41,86807	44,71944	0.004393	0.548402
7	0.081377	1.033776	11.82592	41,86807	44,71944	0.004393	0.548402
8	0.081377	1.033776	11.82592	41,86807	44,71944	0.004393	0.548402
9	0.081377	1.033776	11.82592	41,86807	44,71944	0.004393	0.548402
10	0.081377	1.033776	11.82592	41,86807	44,71944	0.004393	0.548402

Table 13 shows the 10-period variance decomposition results of the variables. Unlike the previously explained variance decomposition results, 44.71% of the error variance in the DJ Oil & Gas variable is explained by itself, while 41.86 % is explained by the crude oil variable. 11.82% is explained by the dollar index variable. The remaining 1.61% is explained by other variables.

Table 14: Variance Decomposition of DLOGSP500

period	SE	DLOG GOLD	DLOGDOLAR ENDEX	DLOGHAM PETROL	DLOG OILGAS	DLOGS P500	DLOG Renewable
1	0.079011	0.103068	11,85545	42.00332	45,83927	0.198891	0.000000
2	0.079909	0.977055	11,67798	41.39766	45.17012	0.194763	0.582421
3	0.079951	0.986920	11.67527	41.36408	45.13943	0.20221	0.634085
4	0.079954	0.990616	1167479	41.36126	45.13741	0.200240	0.635679
5	0.079955	0.990693	1167477	41.36124	45.13735	0.200240	0.635714
6	0.079955	0.990695	1167477	41.36124	45.13734	0.200241	0.635715
7	0.079955	0.990695	1167477	41.36124	45.13734	0.200241	0.635715
8	0.079955	0.990695	1167477	41.36124	45.13734	0.200241	0.635715
9	0.079955	0.990695	1167477	41.36124	45.13734	0.200241	0.635715
10	0.079955	0.990695	1167477	41.36124	45.13734	0.200241	0.635715

Table 14 shows the 10-period variance decomposition result of the S&P 500 Energy variable. According to the results, very little (0.20%) of the error variance in the S&P 500 Energy variable is explained by itself. 11.67% of the error variance is explained by the dollar index, 41.36 % by the crude oil, and 45.13% by the DJ Oil & Gas variable. Unlike the variance decomposition results of other variables explained earlier, a very small part of the S&P 500 Energy variable is explained by itself, and a large part of the error variance is explained by other variables.

Table 15: Variance Decomposition of DLOGREENABLE

period	SE	DLOG GOLD	DLOGDOLAR ENDEX	DLOGHAM PETROL	DLOG OILGAS	DLOGS P500	DLOG Renewable
1	0.060737	0.569339	0.048368	0.368817	0.037780	0.229916	98,74578
2	0.064714	1.978555	0.405929	2.395042	3.809343	0.204627	91.20650
3	0.064884	2.037751	0.413692	2.602036	3.840405	0.224581	90.88153
4	0.064888	2.044729	0.414255	2.601745	3.842019	0.226188	90.87106
5	0.064889	2.045231	0.414264	2.601798	3.842012	0.226376	90,87032
6	0.064889	2.045245	0.414264	2.601797	3.842014	0.226381	90,87030
7	0.064889	2.045245	0.414264	2.601798	3.842014	0.226381	90,87030
8	0.064889	2.045245	0.414264	2.601798	3.842014	0.226381	90,87030
9	0.064889	2.045245	0.414264	2.601798	3.842014	0.226381	90,87030
10	0.064889	2.045245	0.414264	2.601798	3.842014	0.226381	90,87030

In Table 15, the 10-period variance decomposition results of the renewable variable are given. When the table is examined, a significant part (90.87%) of the error variance in the Renewable Energy Consumption variable is explained by itself, while the remaining 10% is explained by others (Gold, Dollar Index, S&P 500 Energy, DJ Oil & Gas and Crude Oil) variables. is explained.

Granger Causality Test Results

Granger Causality Test was conducted to determine the relationship between the variables. The Granger causality test is a test used to determine the direction of causality in the time-delayed relationship between the variables used in the analysis. According to the Granger (1996) test, if B's prediction is more successful when the past values of A are used than when the past values of A are not used, then A is the Granger cause of B (Sarıkovanlık et al., 2020).

Table 16: Granger Causality Test Results

null Hypothesis :	obs	F - Statistics	prob.
DLOGDOLARENDEX does not Granger Cause DLOGGOLD	144	0.24823	0.6191
DLOGALTIN does not Granger Cause DLOGDOLARENDEX		1.68462	0.1964
DLOGHAMPETROL does not Granger Cause DLOGGOLD	144	0.51710	0.4733
DLOGALTIN does not Granger Cause DLOGHAMPETROL		0.00025	0.9873
DLOGOILGAS does not Granger Cause DLOGGOLD	144	0.35487	0.5523

DLOGALTIN does not Granger Cause DLOGOILGAS		1.12267	0.2912
DLOGSP500 does not Granger Cause DLOGGOLD	144	0.25381	0.6152
DLOGALTIN does not Granger Cause DLOGSP500		1.12113	0.2915
DLOGEDGEABLE does not Granger Cause DLOGGOLD	144	0.12075	0.7287
DLOGALTIN does not Granger Cause DLOGREENABLE		2,56980	0.1112
DLOGHAMPETROL does not Granger Cause DLOGDOLARENDEX	144	0.03720	0.8473
DLOGDOLARENDEX does not Granger Cause DLOGHAMPETROL		0.45225	0.5024
DLOGOILGAS does not Granger Cause DLOGDOLARENDEX	144	1.96887	0.1628
DLOGDOLARENDEX does not Granger Cause DLOGOILGAS		0.53171	0.4671
DLOGSP500 does not Granger Cause DLOGDOLARENDEX	144	2.15935	0.1439
DLOGDOLARENDEX does not Granger Cause DLOGSP500		0.53821	0.4644
DLOGEDGEABLE does not Granger Cause DLOGDOLARENDEX	144	3.60995	0.0595
DLOGDOLARENDEX does not Granger Cause DLOGREENABLE		1.95346	0.1644

DLOGOILGAS does not Granger Cause DLOGHAMPETROL	**144**	**12.7787**	**0.0005**
DLOGHAMPETROL does not Granger Cause DLOGOILGAS		1.21228	0.2728
DLOGSP500 does not Granger Cause DLOGHAMPETROL	**144**	**11.8816**	**0.0007**
DLOGHAMPETROL does not Granger Cause DLOGSP500		1.35794	0.2459
DLOGEDGEABLE does not Granger Cause DLOGHAMPETROL	144	0.53226	0.4669
DLOGHAMPETROL does not Granger Cause DLOGREENABLE		0.76235	0.3841
DLOGSP500 does not Granger Cause DLOGOILGAS	144	0.04617	0.8302
DLOGOILGAS does not Granger Cause DLOGSP500		0.07345	0.7868
DLOGEDGEABLE does not Granger Cause DLOGOILGAS	144	0.92217	0.3385
DLOGOILGAS does not Granger Cause DLOGREENABLE		**5.59014**	**0.0194**
DLOGEDGEABLE does not Granger Cause DLOGSP500	144	1.06708	0.3034
DLOGSP500 does not Granger Cause DLOGREENABLE		**5.70608**	**0.0182**

Granger causality test, variable A is not the granger cause of variable B. The probe must be > 0.05 for the null hypothesis of H_0 to be accepted. Based on the probe values in Table 16, the null hypothesis will either be accepted or rejected. According to the results in Table 16, one-way Granger causality running from the DJ Oil & Gas Index to the crude oil variable was observed. Unidirectional Granger causality running from the S&P 500 Energy index to the crude oil variable was observed. Unidirectional causality was observed from DJ Oil & Gas Index to the Renewable Energy Consumption variable. Unidirectional Granger causality was observed from the S&P 500 Energy index to the Renewable Energy Consumption variable. According to the Granger causality test results; DJ Changes in Oil & Gas index affect crude oil, changes in S&P 500 Energy and DJ Oil & Gas indices affect crude oil variable, while changes in DJ Oil & Gas and S&P 500 Energy Index affect Renewable energy consumption variable.

Conclusion

No matter where you are in the world, energy input is needed to continue the flow of life. With the rapid development of technology, machinery, devices, motors, etc. are as important as the energy sources that will activate them. No matter how powerful a car or aircraft engine is produced, it will not make sense if there is no energy to power these engines. Today, oil is still the most important energy input. Petroleum and its derivatives have the most important share in total energy resources. Since few countries in the world have these important energy reserves, it has caused crises throughout history. The fluctuations in the price of this resource cause disruptions in the economy and financial structure of the most dependent countries. To reduce this dependency, the world states are in search of alternative energy sources. The most important of these alternative sources are renewable energy sources that do not have the risk of extinction, such as fossil sources.

In this study, the relationship between WTI crude oil price and the variables in which it interacts was analyzed. These variables are; Gold, Dollar Index, S&P 500 Energy, DJ Oil & Gas, and Renewable Energy Consumption. Among these variables, it has been examined whether the increase in Renewable Energy Consumption, in particular, affects crude oil prices. In the study, unit root tests of the series were made and the series was made stationary. Afterward, the appropriate number of delays was determined and the VAR model was created. After it was seen that the model met the assumptions, the impulse-response functions of the VAR model were calculated. The results of each variable were interpreted with variance decomposition analysis. The Granger causality test was performed for the status of the relationship between the variables. According to the Granger causality test results; Changes DJ in Oil & Gas index affect crude oil, changes in S&P 500 Energy and DJ Oil & Gas indices affect crude oil variable, while changes in DJ Oil & Gas and S&P 500 Energy Index affect the renewable energy consumption variable. In particular, no granger causality was found between the renewable energy consumption of crude oil and between renewable energy consumption and crude oil prices.

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CHAPTER 11

Determination of Optimal Security Measures in Nuclear Energy Investments: Strategy Recommendations for Emerging Markets

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1. Introduction

Energy investments have become essential for the economic development of countries. Since electricity is actively used in the production process, energy is considered as one of the most important raw materials of industrial production. In other words,

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the increase in energy prices also increases the cost of the production process (Sun et al., 2022). This situation causes inflation in the country. Since this problem will increase the uncertainty, it leads to deepening of the problems in the economy. On the other hand, industrial production will also shrink because of insufficient energy supply (Dinçer et al., 2022a,b,c). As a result, the profitability of the companies will decrease, and shrinkage will occur in the country's economy. In summary, for the economic development in the country to be sustainable, low cost and uninterrupted energy supply must be provided (Li et al., 2022; Wu et al., 2022).

Nuclear energy projects are also an important type of investment that serves this purpose. These projects have very important advantages compared to other types of energy. First, no carbon gas is emitted in nuclear energy investments (Ding et al., 2021). This is an important advantage especially compared to the use of coal. In addition, 24-hour electricity generation is possible in nuclear power projects. This is an important advantage for renewable energy types that are affected by climatic conditions (Yüksel et al., 2021). Finally, thanks to nuclear energy projects, countries can produce their own energy. In this way, external dependence on energy is eliminated. This contributes to minimizing the risks faced by energy importing countries. In summary, nuclear energy projects have a very important role in the economic development of countries (Meng et al., 2021).

On the other hand, there are some disadvantages in nuclear energy projects. A significant amount of radioactive waste is generated in the production of nuclear energy. Unless these wastes are disposed of correctly, they pose a danger to people's health (Li et al., 2022). There is no clear consensus in the literature on how these wastes can be managed in the most correct way. Another risk in nuclear power projects is the possibility of the plant's explosion. In the previous nuclear power plant accidents, very serious problems were experienced. In this context, it is vital to take the

right precautions to eliminate the explosion risk of nuclear power plants (Yüksel et al., 2022a,b,c).

Accordingly, in this study, it is aimed to identify optimal security measures in nuclear energy investments. Within this framework, four different criteria are selected with the help of analyzing similar studies in the literature. These selected criteria are weighted by considering decision-making trial and evaluation laboratory (DEMATEL) methodology. As a result of this analysis, it can be possible to generate specific and effective strategies to manage this dangerous problem.

There are mainly five different sections in this study. The second section includes necessary information about the explosion risk of nuclear power plants. The third section explains some previous accidents. In the fourth section, an analysis has been performed by using DEMATEL methodology. In this framework, the literature has been reviewed and four different criteria are selected. After that, by implementing the steps of DEMATEL, the weights of these items are computed. The final step gives information about the discussions and conclusions.

2. Explosion Risk of Nuclear Power Plants

Climate change worries those who have the greatest knowledge about it. Some of the most knowledgeable nuclear energy experts are the least worried. Renewable energy sources like wind, sun, and water cannot provide the necessary electrical energy. Nuclear energy has been a major energy source for the past 35-40 years because of its reliability and the fact that it provides all the electrical energy required by the world's population (Zhao et al., 2022). According to what the wastes of nuclear and coal are founded on, if one person's lifetime use of electrical energy was used to calculate how much waste nuclear energy would produce, the whole waste would be the size of a tiny coke bottle. This waste may be safely kept in reactor tanks since it poses no health or environmental risks

(Yüksel and Dinçer, 2022). In contrast, coal would provide this energy demand, but the quantity of carbon dioxide emissions and trash it would produce would be excessive (Amidu, et al., 2021).

The public has concerns over nuclear power plants not only because of the likelihood that they could cause accidents, but also regarding the management of radioactive wastes that will be created because of their operation (Basu, 2019). During the generation of nuclear power, a variety of radioactive wastes are produced, each of which must be disposed of or stored in accordance with specific regulations. If these procedures are followed precisely, the negative effects of nuclear waste on both human health and the natural environment may be kept to a bare minimum (Gharari et al., 2018). There are other sources of radioactive waste besides nuclear power plants. A wide variety of industries, including medicine, agriculture, and manufacturing, as well as nondestructive material testing and the generation of nuclear waste, all make use of radioactive elements (Zhang et al., 2019).

It is important to keep in mind, in relation to the potentially dangerous nature of nuclear power plants, that the most serious nuclear accident in the history of the world, the Chernobyl nuclear catastrophe, was brought about by human error (Aliyu et al., 2015). If we are to adopt the premise that accidents are the result of human error, then we need to persuade people not to drive because of the possibility that they would be involved in an accident (Shen et al., 2018). Nuclear energy sources, also known as nuclear energy, are a form of energy that is generated because of a process that occurs inside the nucleus of an atom (Ding et al., 2016). Electrical energy is now the most significant source of energy in the world. The production of this kind of energy likewise relies heavily on nuclear power facilities, making them the most significant source (Yamashita, & Suzuki, 2013).

Oil, coal, and natural gas are just a few examples of the non-renewable energy sources that may be utilized to generate electricity

(Saleh & Cummings, 2011). On the other hand, it is a well-known reality that the reserves of such energy sources will be depleted in the not-too-distant future, and it is also a well-known fact that such energy sources harm the environment far more than nuclear energy does (Mukhtarov et al., 2022). Nuclear power plants, which are an alternate energy source that is also more effective, are what the nations of the globe utilize to accomplish this goal. Nuclear power plants are the primary source of electricity generation in several nations throughout the globe at the present time (Keller & Modarres, 2005). The nation-state of France serves as the best illustration of this principle. These power plants provide around 80 percent of France's required electrical output, making them essential to the country's economy.

3. Nuclear Lives Worldwide in Last Year's Diseases and Their Consequences

Nuclear power plants are far safer than is often believed, and they are the only kind of power plant that can generate electrical energy nonstop for the whole 365 days and 24 hours of each year, regardless of the weather or any other external factors (Vitázková & Cazzoli, 2013). Obviously, in addition to all these occurrences, the effects of nuclear catastrophes are also quite significant and eye-catching in their scope and magnitude. The emission of radiation has a significant negative influence not only on human life but also on the surrounding environment (Denning & Budnitz, 2018). However, the fact that nuclear power facilities of the latest generation are inherently safer cannot be overlooked. In this piece of research, the effects that the catastrophe at the Chernobyl Nuclear Power Plant has had over the last four decades were investigated. In addition to that, some information on several other accidents is provided.

Because of advancements in technology, the use of radioactive materials in a variety of domains, including the military, medicine, the energy sector, and industry, has become more common. Nuclear

power facilities were one of the most notable developments of the 20th century. Since the construction of the first nuclear reactor in 1954, people have been concerned about the prospect of a nuclear disaster occurring. Although nuclear power is supposedly a risk-free source of energy, our planet has been subjected to significant harm as a result of catastrophic nuclear mishaps and radiation levels that have deviated significantly from the usual during the last century. To accurately assess the level of destruction inflicted by these nuclear accidents, several different scales were devised. When we look at the last 40-45 years, there are 4-5 accidents that have taken place.

3.1. Accident at the Chernobyl Nuclear Power Plant

The accident that happened at the Chernobyl nuclear power plant is recognized as the largest disaster in the history of the peaceful use of nuclear energy owing to the large region that it touches and the damages that it creates. This is because the event caused widespread radioactive contamination. In the case of the Chernobyl nuclear power plant, in addition to the environmental pollution that the accident caused, another factor that needs to be mentioned is the effects of nuclear power plant accidents on other countries, the necessary precautions taken, and international relations. This is because nuclear power plant accidents can have a significant impact on the environment. The nuclear radioactive fallout catastrophe caused by Chernobyl is not just a concern for public health, but it is also a problem on an international scale, having repercussions for the economies of nations as well as their foreign policies. The disaster that occurred at the Chernobyl nuclear power facility was caused by the lethal interaction of three factors: a flawed architectural design; an unlawful operation; and an unauthorized experiment (Denton, 1987).

The fact that the experiment is being carried out by illegal and unauthorized personnel is the most essential aspect of this situation. It is of the utmost importance that there be a nuclear

disaster caused by humans. The early opening of the reactor and the attempt to improve the reputation of the shift chief in the senior management at the time of the experiment may also be proven to be among the causes that contributed to the occurrence of this catastrophe. Considering that the Chernobyl nuclear power plant released significant doses of radiation for a period of ten days after the catastrophe, the radiation was able to travel over a very large region due to the effects of the weather.

To perform the necessary repairs, Unit 4 of the reactor was shut down. When the electrical power supply to the base station was turned off, a test was carried out to determine whether the reactor would still be able to provide sufficient electrical power to power its emergency devices and keep the core of its own hardware from overheating during the period of transition leading up to the activation of the emergency power supply. Employees began the test despite the lack of suitable safety procedures or operating systems that would advise the operator of the hazards associated with electrical testing. Because of this lack of understanding, operators have been taking activities that are not in accordance with safety protocols. As a consequence of this, the power surge led to the explosion, which in turn led to the destruction of practically the whole reactor. The reactor building was damaged, and as a result, the fire inside of it led to an excessive discharge of radioactive material.

3.2. Tomsk-7 Explosion

Accidents at the Tomsk-7 nuclear power station took place in the city of Tomsk, which is located in Siberia. During the process of cleaning a tank with nitric acid, an accident took place. Clouds of radioactive gas were produced as a direct consequence of the explosion that occurred in the tank. The severity of the collision was not as severe as one may have expected. The severity of the collision was graded as a 5.

3.3. Fukushima Incident

In 2011, an accident at the Fukushima nuclear power plant took place close to the city of Sendai in Japan. An earthquake measuring 9.0 on the Richter scale struck around 130 kilometers away from this city, which led to the disaster that took place. Because of the earthquake and the tsunami, the nuclear power plant that was affected by these natural disasters had the second worst accident in its entire existence. The rapid and effective shutting down of the reactors in the aftermath of the earthquake prevented a more severe nuclear accident. However, because of the Tsunami's influence, the increasing water level led the Turbine building to become flooded. In the days that followed, radioactivity leaked out of the power plants as a consequence of explosions and fires that occurred in a variety of locations inside the facilities. Additionally, a nuclear emergency was proclaimed by the Japanese government later that day. The order to evacuate the area was given to around one hundred thousand persons who lived in the surrounding area of the plant. There is also a significant danger in the nations that are nearby.

3.4. Tokaimura Accident

There are fifteen nuclear facilities in the town of Tokaimura, which is located northeast of Tokyo. One of them is the Japanese reprocessing plant. In 1999, a reactor known as Joyo performed a test run to create mixed oxide fuel for evaluation purposes. In the normal course of events, the uranium yellow paste dissolves in nitric acid. However, to expedite the procedure and save expenses, personnel at three different factories packed the tanker with 16.6 kilos of uranium, even though they were only allowed to load 2.4 kilograms. Following a chain reaction that lasted for twenty hours and resulted in the production of a significant number of neutrons and, therefore, gamma rays, critical mass was attained. Since the accident released radioactive particles into the atmosphere, including iodine 131, 161 people had to be removed from the

facility's ventilation system, and approximately 310 thousand people who lived within a 10-kilometer radius of the facility were told not to leave their homes.

4. Optimal Security Measures in Nuclear Energy Investments

In this study, it is aimed to determine optimal security measures in nuclear energy investments. For this purpose, selected criteria are weighted with the help of DEMATEL methodology. This approach is taken into consideration to find more significant weights in the process (Zhang et al., 2020; Dinçer et al., 2020). Additionally, the causal relationship among the items can be understood by using this technique (Gökalp et al., 2022). In the analysis process, firstly, important criteria are selected based on the literature evaluation. The details of these criteria are given in Table 1.

Table 1: Selected Criteria

Criteria	References
Financial Issues (FUE)	Dong et al. (2022); Wan et al. (2022)
Organizational Effectiveness (OIF)	Kou et al. (2022); Kostis et al. (2022)
Qualified Personnel (QRS)	Zhang et al. (2022); Qiu et al. (2020)
Technological Development (TGT)	Du et al. (2020); Cheng et al. (2020)

Financial issues may have an impact on the prevention of nuclear power plant accidents. In addition to this issue, organizational effectiveness of the nuclear energy investors can have a significant role in this regard. Thirdly, there is a strong need for qualified personnel to minimize the risks of the accidents. Finally, technological developments have a positive contribution to minimize the explosion risk in nuclear power plant.

After that, expert evaluations are collected for these four different factors. In the evaluation process, experts considered five different scales that are "no effect-0", "some effect-1", "normal effect-2", "high effect-4" and "very high effect-5". Table 2 gives information about the details of the evaluations.

Table 2: Evaluations of the Experts

E1				
	FUE	**OIF**	**QRS**	**TGT**
FUE	0	2	1	1
OIF	1	0	2	1
QRS	2	3	0	1
TGT	4	4	4	0
E2				
	FUE	**OIF**	**QRS**	**TGT**
FUE	0	1	2	1
OIF	2	0	1	1
QRS	2	3	0	1
TGT	4	4	4	0
E3				
	FUE	**OIF**	**QRS**	**TGT**
FUE	0	2	2	1
OIF	2	0	2	1
QRS	3	2	0	1
TGT	4	4	4	0

Next, the direct relation matrix is created by taking the average values of the expert evaluations. The details of this matrix are given in Table 3.

Table 3: Direct Relation Matrix

	FUE	**OIF**	**QRS**	**TGT**
FUE	0	1.66667	1.66667	1
OIF	1.66667	0	1.66667	1
QRS	2.33333	2.66667	0	1
TGT	4	4	4	0

After that, the normalization process has been implemented by dividing all values in direct relation matrix to the maximum row sum. Table 4 explains the details of the normalized matrix.

Table 4: Normalized Matrix

	FUE	**OIF**	**QRS**	**TGT**
FUE	0	0.13889	0.13889	0.08333
OIF	0.13889	0	0.13889	0.08333
QRS	0.19444	0.22222	0	0.08333
TGT	0.33333	0.33333	0.33333	0

In the following process, direct relation matrix is created as in Table 5.

Table 5: Direct Relation Matrix

	FUE	**OIF**	**QRS**	**TGT**
FUE	0.12617	0.25389	0.23658	0.13472
OIF	0.24812	0.13194	0.23658	0.13472
QRS	0.32121	0.3491	0.14348	0.15115
TGT	0.56517	0.57831	0.53888	0.1402

In the final step, the weights of the factors are calculated by considering the sums of the rows and columns. The details of the analysis results are demonstrated in Table 6.

Table 6: Weights of the Criteria

Criteria	Weights
Financial Issues (FUE)	0.23449
Organizational Effectiveness (OIF)	0.24062
Qualified Personnel (QRS)	0.24713
Technological Development (TGT)	0.27776

It is concluded that the technological development is the most essential factor to handle the risk of nuclear power plant explosion. The analysis results also show that the qualified employee also plays a critical role in this framework.

5. Discussions and Conclusions

This study aims to define optimal security measures in nuclear energy investments. Within this context, selected criteria are evaluated with DEMATEL. Within this framework, four different criteria are selected with the help of analyzing similar studies in the literature. Financial issues may have an impact on the prevention of nuclear power plant accidents. In addition to this issue, organizational effectiveness of the nuclear energy investors can have a significant role in this regard. Thirdly, there is a strong need for qualified personnel to minimize the risks of the accidents. Finally, technological developments have a positive contribution to minimize the explosion risk in nuclear power plant.

It has been identified that technological investments are the most critical strategy in managing the explosion risk in nuclear power plants. For this purpose, countries should especially focus on thorium-based nuclear power plants. In this regard,

it is recommended that countries make investments to acquire proton accelerator technology. In this way, both the explosion risk of nuclear power plants will be eliminated, and it will be possible to generate less harmful wastes. Unlike uranium, thorium is not a dangerous element. In other words, this element does not cause explosion in nuclear power plants.

Energy policies are very important for the development of sustainable development goals of countries. Nuclear energy projects also help countries to increase their energy independence. On the other hand, nuclear power generation is not affected by different climatic events. This also contributes to uninterrupted energy use. In summary, nuclear energy projects have a very important role in increasing the investments of countries. On the other hand, there are some risks in nuclear energy investments. The most important risk is the possibility of explosion of the nuclear power plant. Nuclear power plant accidents have also caused some negativities. Therefore, it is necessary to take effective measures against the explosion risk in nuclear power plants.

Because the power plant is the location where energy production takes place, it is of utmost significance in this supply chain; hence, the other links in this chain are often disregarded. Nevertheless, every location must be a safe facility that is managed by knowledgeable professionals. Building all the facilities near one another is one way to tackle the transportation issue; this may need more expenditure. The theory behind the operation of the power plant is essentially the same as that of the steam boiler: The heat that is released by nuclear fuel causes water or another material of a similar kind to get heated. The material that has been heated evaporates, which ultimately turns a propeller. In addition to that, this produces electrical current. When stated in this manner, it could seem to be a simple task; nevertheless, when you consider how hazardous the heat source is, it becomes clear that a great deal of care must be taken to ensure the safety of the workers. When all these systems are linked, the reactor ultimately becomes useful.

These systems include thick walls, systems that prevent leakage, systems that offer emergency cooling of the reactor, and many more systems.

Technicians and management are responsible for maintaining every system designed to avoid accidents. An incompetent technician or a boss who wants to be liked by someone else might quickly sabotage these systems' advantages. That country's stability might even have an impact on the security of these systems: Technicians' educational standards may decline with time, the resources allotted to the plant may deteriorate, or these factories may be actively sabotaged/attacked in places where political stability is lacking. To summarize, there is no one-size-fits-all solution to the problem of system security.

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CHAPTER 12

A Study on Emissions Pricing in Maritime Transport and a Model Proposal

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INTRODUCTION

Maritime transport is the mode of transportation that freight is carried at the lowest cost. With the effect of cost advantage, the demand for maritime transport in world trade has increased, and the world merchant fleet has started to grow. However, as the merchant fleet multiplied, ships became a source of emissions, and the environmental damage of maritime transport began to increase.

The maritime authority IMO, a participant in the Kyoto Protocol as a UN expert agency, directs the process as an essential part of

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the international struggle to reduce greenhouse gas emissions from maritime transport.

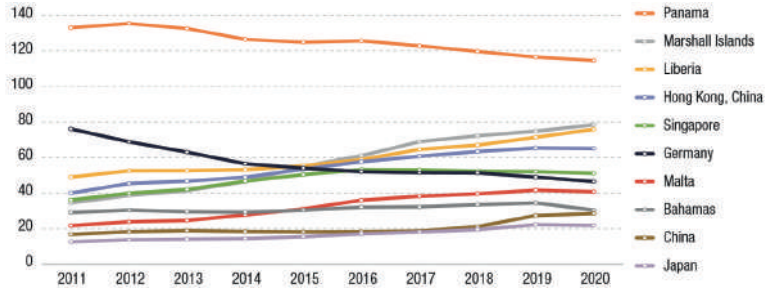
IMO and other authorities have enacted sanctions based on environmental benefit and protection to build a more ecological world fleet of ships. Since the Kyoto Protocol is valid until 2020, the Paris Climate Agreement, which has similar aims to the protocol, has gained priority on the global platform. In particular, IMO and the EU Commission have accelerated the research with the effect of the Paris Climate Agreement to reduce ship-sourced environmental damage. Thus, essential studies regarding the decarbonization process in maritime transport have begun over the years.

This study examines financial offers for pricing carbon emissions from maritime transport. For this reason, firstly, we explained the importance of carbon emissions in marine transportation, then "Market Based Measures"-MBMs were mentioned, and lastly, we examined financial offers for the pricing of carbon emissions from maritime transport.

1. The Importance of Carbon Emissions in Maritime Transport

The share of maritime transport in global air pollution; varies depending on the fuel and energy consumption of the ships. In other words, a ship causes air pollution in direct proportion to the energy and fuel consumed. In maritime transport, there isn't a widely used yet other option other than fossil fuel-consuming and similar systems to provide the power needed for medium and large-scale commercial ships. Therefore, zeroing the emissions caused by maritime transport, which carries approximately %90 of the world trade, can't be foreseen in the short term. However, the research for solutions on the subject has continued for a long time. Also, they have been continued advanced engineering studies for technologies and approaches that will increase energy efficiency and reduce carbon intensity in ships (Ölçer, 2021: 48 – 49).

In scientific studies about maritime transport, it has been suggested that emissions can be reduced by about % 80 by using "alternative fuels such as hydrogen, ammonia, biofuels, and electrification from renewable sources." (IMEAK DTO, Circular No: 1179, 2021: 1). Carbon emissions caused by ships belonging to flag states between 2011 and 2021 are shown in Graph 1.



Graph 1. Carbon Emissions by Flag State 2011-2021 Period (Annual/ Million Tons)

Source: (UNCTAD, 2021: 106)

The UN, which carbon emission has frequently revived to its global agenda in recent years, emphasized that one of the essential solutions in the fight against global warming is to reduce fossil fuel consumption. In this context, as an expert organization, the IMO affiliated with the UN has initiated various action plans to reduce carbon emissions in maritime transport and to "zero" them by the end of the century. Also, the international marine industry attaches great importance to achieving the "zero carbon emission" target by 2050. In this context, by 2030, we should build thousands of zero-carbon ships. Furthermore, the majority of ships should achieve zero carbon emissions by 2050. But on the other hand, the maritime industry participants have claimed that current technologies aren't sufficient to reach the 2050 targets (IMEAK DTO, Circular No: 1179, 2021: 1-2).

Research regarding reducing and pricing emissions from maritime transport continues at the MEPC meetings within the scope of IMO. Furthermore, the negotiation process on alternative financial model proposals to finance the decarbonization process continues.

On the other hand, IMO has followed developments regarding the EU Green Deal and the extension of the ETS, including the maritime industry (IMEAK DTO, Circular No: 1149, 2021: 1).

3.Market Based Measures-MBMs

Market-Based Measures (MBMs) that have been developed to reduce the greenhouse gas from international shipping have been evaluated since MEPC 56 took place in 2006. Subsequently, "*MEPC 55 work plan ceased at MEPC 59 (July 2009), where the Committee recognized that technical and operational measures would not be sufficient to satisfactorily reduce the amount of greenhouse gas emissions from international shipping in view of the growth projections of world trade."* MBMs serves to two main purposes (https://www.imo.org (01.06.2022)).

- providing an economic incentive for the maritime industry to reduce its fuel consumption by investing in more fuel-efficient ships and technologies and to operate ships in a more energy efficient-manner (in-sector reductions); and
- offsetting in other sectors of growing ship emissions (out-of-sector reductions)

Governments and observer organizations propose MBMs to date. These can be expressed with the help of Table 1.

Table 1. MBMs

International Fund for GHG emissions from ships (GHG Fund) (Cyprus, Denmark, the Marshall Islands, Nigeria and IPTA (MEPC 60/4/8))	Establishes a global reduction target for international shipping, set by either UNFCCC or IMO. Emissions above the target line would be offset largely by purchasing approved emission reduction credits. The offsetting activities would be financed by a contribution paid by ships on every tonne of bunker fuel purchased.
Leveraged Incentive Scheme (LIS) (Japan (MEPC 60/4/37))	Greenhouse Gas Fund contributions are collected on marine bunker. Part thereof is refunded to ships meeting or exceeding agreed efficiency benchmarks and labelled as "good performance ships".
Port State Levy (Jamaica (MEPC 60/4/40))	Levies a uniform emissions charge on all vessels calling at their respective ports based on the amount of fuel consumed by the respective vessel on its voyage to that port (not bunker suppliers).
Ship Efficiency and Credit Trading (SECT) (United Sates (MEPC 60/4/12)	Subjects all ships to mandatory energy efficiency standards. As one means of complying with the standard, an efficiency-credit trading programme would be established. These standards would become more stringent over time,
Vessel Efficiency System (VES) (World Shipping Council (MEPC 60/4/39))	Establishes mandatory efficiency standards for new and existing ships. Each vessel would be judged against a requirement to improve its efficiency by X% below the average efficiency (baseline) for the specific vessel class and size. Standards would be tiered over time with increasing stringency. Existing ships failing to meet the required standard through technical modifications would be subject to a fee applied to each tonne of fuel consumed.
Global Emission Trading System (ETS) for international shipping (Norway (MEPC 61/4/22))	Sets a sector-wide cap on net emissions from international shipping. A number of allowances (Ship Emission Units) corresponding to the cap would be released into the market each year via a global auctioning process. The units could then be traded.

Global Emissions Trading System (ETS) for international shipping (United Kingdom (MEPC 60/4/26))	Differs from the Norwegian ETS proposal in two aspects: the method of allocating emissions allowances (national instead of global auctioning) and the approach for setting the emissions cap (set with a long-term declining trajectory).
Emissions Trading System (ETS) for International Shipping (France (MEPC 60/4/41))	Sets out additional details on auction design under a shipping ETS. In all other aspects the proposal is similar to the Norwegian ETS proposal.
Market-Based Instruments: a penalty on trade and development (Bahamas (MEPC 60/4/10))	Insists that the imposition of any costs should be proportionate to the contribution by international shipping to global CO2 emissions.
Rebate Mechanism (RM) for a market-based instrument for international shipping (IUCN (MEPC 60/4/55))	Compensate developing countries for the financial impact of a MBM. It could be applied to any maritime MBM which generates revenue.

Source: (https://www.imo.org/ (01.06.2022))

While there are no valid MBMs on a global or industry scale, national or regional carbon pricing initiatives exist. EU ETS or various national carbon taxes can be contextualized in this context (Hughes, 2020: 46). Although there are opposing views on MBMs in the IMO, there have been positive developments regarding MBMs in Europe. In a statement made in 2019, the President of the European Commission stated that maritime transport would be included in the ETS as part of the Green Deal. This approach of the EU Commission is essentially an MBM proposal (Psaraftis et al., 2021: 2). At this point, a new discussion has emerged regarding the preference of tax or ETS on carbon pricing in the maritime industry.

3. Financial Offers Regarding Carbon Emissions in Maritime Transport

Maritime associations have made some offers regarding the pricing of maritime transport emissions**.** However, proposals have still been evaluated. Offers to price of ship emissions consist of "EU Commission EU ETS Approach, ICS - Global Carbon Tax Approach, IMO - Maritime Research Fund and ECSA Evaluations".

3.1. EU Commission – EU ETS Approach

To reduce emissions from maritime transport, the EU Commission developed a three-step strategy in 2013 (https://ec.europa.eu (08.12.2021)).

- "Monitoring, reporting and verification of CO_2 emissions from large ships using EU ports
- Greenhouse gas reduction targets for the maritime transport sector
- Further measures, including market-based measures, in the medium to long term."

The European Parliament and the Council highlighted to the need for action on ship emissions with the latest amendment on the EU-ETS Directive by the Directive (EU) 2018/410. They have been started to action and calls to examine transport emissions from IMO or the EU from 2023, including preparatory work and stakeholder consultations. (https://ec.europa.eu (08.12.2021)).

On 14 July 2021, the EU Commission aimed to reduce by at least % 55 by 2030 compared to 1990 levels to greenhouse gas emissions and for this reason, they presented the "Fit for 55 Package" (FIT 55) (IMEAK DTO Environment Unit, 2021: 60).

According to offer;

"The ETS will affect both intra-EU and extra-EU voyages. A ship travelling strictly within the EU will pay for all of the carbon dioxide it emits, whereas a ship that crosses into or out of the EU will pay for 50% of the carbon dioxide it emits (regardless of how much of that journey lies inside or outside the EU). All emissions from port stays at EU ports are included, but ships under 5,000 GT will be excluded from the scheme." (https://www.napa.fi (09.07.2022)).

If IMO develops an offer on the subject, the EU Commission has stated that it will evaluate the possible situation regarding the EU ETS of maritime transport (https://www.verifavia-shipping.com (30.12.2021)).

It is planned to be utilized from the gradual system when including emissions from maritime transport to the ETS. This system is as follows (https://www.europarl.europa.eu (09.07.2022)).

The requirement to surrender allowances would be gradually phased in during 2023-2025,

- 20% of verified emissions for 2023,
- 45% for 2024,
- 70 % for 2025,
- and 100 % from 2026 onwards.

Who will be responsible for the ship's carbon emissions, which is included in the ETS, is also a topic of discussion. The responsible party will gain rights that will provide economic benefits and the obligations brought by the new technic. The responsible party will be able to generate revenue from the sale of reserve emissions allowances while facing increasing operational and reporting requirements. The EU voted to change the definition of a firm to include time charter and other parties responsible for providing and paying for ship fuel. Thus, the EU signaled that the EU's

emission measures would target companies operating commercial ships. In this context, determining the responsible party is one of the current debates in the maritime industry in the short term. According to parties following the EU Commission's negotiations, if the emissions from maritime transport are included in the ETS, the new system to be experienced in the marine industry can be expressed as follows. (IMEAK DTO Enviorment Unit, 2021: 65):

- Shipowners will pay emission permit allowances to be able to trade under the ETS."
- Earned revenues coming from the ETS won't be allocated to all participants for the development of alternative fuels or technologies.

These statements stem from the expectations of the parties who follow the negotiation process closely. There are essential details that need to be explained about the new system and included in the ETS of carbon emissions from maritime transport. The new system should clearly state the identity of the addressee, the limits of rights and obligations, and assurances regarding fund management and supervision. ETS is criticized generally because of its legal gap by other participants, especially EPSO. Because, with the entry into force of the ETS offer, shipping companies that don't want to be sanctioned will be able to find various ways to get rid of this obligation by changing their routes to reduce their costs. For this, it is enough for them to enter the ports that don't have a coast to the EU. For this reason, EPSO emphasizes the need for harmonization between the EU ETS and MBMs for ship emissions (https://www.denizticaretodasi.org.tr/ ((08.04.2022)).

The EU Commission continues to study reducing greenhouse gas emissions from maritime transport to achieve the global temperature target, which is accepted in the Paris Climate Agreement.

3.2. ECSA's Approach

ECSA was established in 1965 to provide international competitiveness in European maritime as one of the essential blocks of maritime. ECSA member states consist of "Belgium, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Lithuania, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovenia, Spain, and Sweden." (https://www.ecsa.eu (25.12.2021)).

ECSA, accepted to be one of the biggest economic and environmental challenges facing societies in the global climate crisis, announced that it supports FIT 55 and a special fund to be established under the EU ETS to stabilize carbon pricing in its statement on November 2nd, 2021(Shipowners' Association E-Bulletin, 2021: 6).

ECSA argued that all revenues from the EU-ETS should be used to finance research and development projects and close the price gap between cleaner and standard fuels. In addition, this EU ETS offer referred to the decarbonization of the sector and the financing of different contracts within the scope of the innovation fund. (IMEAK DTO, Circular Nr: 1239, 2021: 1).

ECSA argues that the EU ETS offers efficiency measures to be taken, and the use of clean fuel in the maritime industry is a significant development, and the cost to be incurred by the EU ETS should be paid by the commercial operators. According to European shipowners, the provisions in the EU ETS offer should be legally enforceable ((IMEAK DTO, Circular Nr. 1239, 2021: 1)

3.3. International Chamber of Shipping (ICS) – The Global Carbon Tax Approach for Maritime Transport

ICS, a global trade association of ship owners and operators representing more than 80% of the world's trade fleet, has been operating since 1922. (https://www.ics-shipping.org (25.12.2021)).

ICS has offered a global tax approach in maritime transport by targeting carbon emissions from ships. This offer, submitted to accelerate the use and deployment of zero-carbon fuels to the UN on September 3rd, 2021 by ICS, can be considered an internationally recognized market-based call for action. (IMEAK DTO, Circular Nr. 964, 2021: 1).

ICS that published the PRESS (15)25" circular on September 22nd, 2015, argued relatively to be an effective use of efficient fuel for ships more than the carbon balancing approach related to maritime emissions. ICS expects that it can contribute to reduced carbon emissions through improvement in ship engines and more effective speed management. In addition, ICS put forward that it would cause to %50 fewer emissions of the world fleet in 2050 with the use of cleaner fuels such as mostly LNG in ships (ICS, 2015: 1).

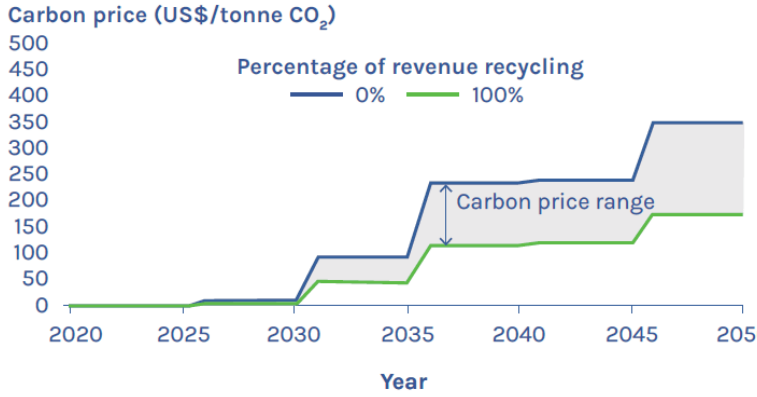
The ICS's recommendation is supported by INTERCARGO and the $5 billion R&D funding proposed by the maritime industry and governments (IMEAK DTO, Circular Nr. 964, 2021: 1 - 2).

The negotiation process regarding the ICS's offer continues at the MEPC sessions organized by the IMO. On the other hand, "Trafigura" one of the largest charter companies in the world, has another proposal for this process. Trafigura offered that " by the IMO must be introduced a carbon tax of between $250 and $300 per metric ton (mt) carbon equivalent on transport fuels." (https://www.offshore-energy.biz(25.12.2021)).

Marshall and Solomon Islands submitted a separate offer for taxation of $100 per tonne for carbon emissions from ships until 2025. According to Lloyd's List, taxation of $100 per tonne is sufficient for the initial step and must be revised every five years. It is thought that may collect the tax at bunkers or emission points. On the other hand, there is a consensus that the best collection method is bunker-based. The offer especially emphasizes that no ship should be privileged. Regardless of the ships' flag, it suggested that the carbon tax is taken equally at the bunker points in this system. This

value is valid for the initial stage only. Also, Marshall and Solomon Islands emphasized that $100 tax to be collected for technical financing needs will not be sufficient, so it should be increased to 250 or 300 $ gradually. The carbon tax has been aimed to accelerate of decarbonization process in the maritime industry. This approach parallels the ICS's offer and the first market-based maritime transport tax offer since the 2018 Greenhouse Gas Strategy announced by the IMO (https://armatorlerbirligi.org.tr (04.01.2022)).

Another approach parallel to ICS has been proposed by the "Getting to Zero Coalition" as a gradual carbon tax. The Coalition is a strong unit established with the participation of governments and more than 150 companies in the maritime, energy, infrastructure, and finance sectors. The Coalition has suggested a final carbon pricing approach of $200 per tonne of carbon emissions by 2050. Claiming to have developed an effective model for the decarbonization process in shipping, the Coalition stated that it would carry out the first application in 2025. It plans to price a carbon tonne at $11 at this date and increase that value to $100 by the 2030s. Carbon price offers between the first year of implementation of the Coalition and 2050 are presented in the graph below (https://www.denizhaber.com (05.03.2022)).



Graph 2. Getting to Zero Coalition – Carbon Tax Tariffs Source: (https://www.denizhaber.com (05.03.2022)).

The prominent ETS and Carbon Tax Offers for pricing the ship-sourced carbon emissions are approaching the nature of MBMs. At IMO, financial proposals related to emissions are evaluated, and the reviews continue in line with the needs of the maritime industry.

Maritime associations and relevant governments to achieve a decarbonization target in maritime transport have also been offered another approach in addition to the ETS or carbon tax. This approach is a new fund formation planned to be managed by IMO to finance green technologies in shipping.

3.3. The IMO Maritime Research Fund (IMRF) and The Global Fuel Tax Approach for Maritime Transport

The IMO Maritime Research Fund (IMRF), managed by the International Maritime Research Board (IMRB) and supervised by the IMO, has been offered for the first time in 2019 to accelerate the R&D studies to have zero emission technologies in the maritime industry. The IMRF is planned to be valued at $5 billion (IMEAK DTO, Circular No: 693, 2021: 1).

Representing the majority of international maritime transport; major maritime countries such as Denmark, Greece, Japan, Panama, Singapore, and the United Kingdom and developing countries such as Liberia, Nigeria, and Palau support the IMRF (IMEAK DTO, Circular No: 1226, 2021: 1).

The maritime associations, which correspond to more than 90% of the world's trade fleet and support the IMRF, consist of "*The Baltic and International Maritime Council, the International Association of Cruise Companies, INTERCARGO, the International Ferry Operators Association, ICS, the International Association of Independent Tanker Owners, the International Association of Partial Cargo Tankers and the World Maritime Council.*" (IMEAK DTO, Circular No: 693, 2021: 1)

According to the latest MEPC 77 report, states are that explained a positive opinion on the IMRB are "Australia, Bangladesh,

Southern Cyprus, Finland, Indonesia, Italy, Jamaica, Malaysia, Mexico, Panama, Poland, South Korea, Trinidad & Tobago, Turkey[3] and Ukraine" In total, approximately 30 countries seem to support the IMRF. "At IMO MEPC 77, it was decided to continue the negotiation process on medium-term measures, including MBMs and the IMRB-IMRF proposal, and to be discussed at the 12th Session of the IMRF Intersessional Working Group on Reduction of GHG Emissions (ISWG-GHG). On the other hand, while its uncertainty of some delegates continues, some states such as; Argentina, Brazil and some Pacific Island States have expressed opposition to the IMRB. It is understood that China, Russia, Norway, Germany and other EU countries are also against the offer. India, the Bahamas and the United Kingdom didn't comment. Although Saudi Arabia didn't express a dissenting opinion to IMRB, it brought to the fore "CARES", which is a joint venture with IMO (IMEAK DTO, Circular No: 1304, 2021: 5).

"At IMO MEPC 77, it decided to continue the negotiation process on medium-term measures by including MBMs and the IMRB-IMRF. Furthermore, IMRF was agreed to discuss at the 12th Session of the IMRF Intersessional Working Group on Reduction of GHG Emissions (ISWG-GHG). (IMEAK DTO, Sirküler No: 1304, 2021: 5).

The IMRB plans to finance the industry for research and development programs and to create a contribution of $2 per tonne of consumed fuel by each ship. It is claimed that the IMRF will collect in 10 years and have a value of approximately 5 billion dollars. The fund will be financed by the shipowners' mandatory research and development contributions (IMEAK DTO, Circular Nr. 693, 2021: 2; IMEAK DTO, Circular Nr. 1197, 2021: 1).

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3 Turkey and some countries stated that this offer contains deficiencies and there are uncertainties regarding some administrative issues. The IMRB-IMRF proposal has been postponed for discussion at the ISWG-GHG 12th Session. (IMEAK DTO, Circular No: 1267, 2021: 1).

IMRB (IMRF) is offered to research and develop low-carbon and zero-carbon fuels, energy sources, propulsion systems, and other new greenhouse gas reduction technologies." The IMRB (IMRF) is a significant development to accelerate the decarbonization process and achieve the IMO 2050 target to the maritime (IMEAK DTO, Circular Nr. 693, 2021: 2).

The "fuel tax application" has been adopted to finance the IMRF. This type of tax to be collected per ton of fuel coincides with the carbon tax of ICS. The two tax models are a "type of base" in accounting. While calculating the tax by targeting carbon emissions in the ICS's offer, the fuel consumption is the determinant of the tax amount in the financing of the IMRF. Therefore, it should state that the two models aren't the same or alternative to each other; they are only designed to contribute to the decarbonization process and financing of green technology investments in maritime.

4. Compare Offers in the Maritime Transport and Examine Potential Approaches

While the EU Commission aims to be the neutral climate first continent by 2050 of the EU, IMO has developed a strategy to zero maritime emissions by the end of the century. Therefore, a maturity mismatch corresponds to half a century between the two approaches. Moreover, this maturity mismatch affects the importance of studies to determine the financing model and speed of the decision to be taken. These recommendations for financing the decarbonization process in the maritime industry are presented in Table 3.

Table 3. Comparison of Offers

The Method	*Scale*	*Financial Instrument*	*Financing*
EU ETS	Regional	Emission Allowances	EU ETS
Carbon Tax	Global Scale	Carbon Tax Per Ton of Carbon Emissions	The Climate Fund
Fuel Tax	Global Scale	Fuel Tax per Ton of Fuel Consumption	IMRF

Greenhouse gas emissions are the most crucial trigger of global warming. Therefore, "zero" greenhouse gas emissions for ecological and economic sustainability is an ultimate goal. However, global awareness requires beyond a continent's environmental interests and a more comprehensive understanding. Therefore, zero emissions in the EU continent with the "polluter pays" principle is insufficient globally, although it is effective for the continent.

Industry participants regarding the negotiation process argue that the EU ETS's offer is more likely to enter into force than the other alternatives, as the EU will exert political pressure and veto non-compliance parties to the EU's decision. In addition, non-EU parties have continued to explain their concerns regarding the management and fair distribution of the funds to be collected. In this context, possible approaches to reducing and zero greenhouse gas emissions should target international market participants. Therefore, a similar approach to priced emissions from international maritime transport should focus on environmental benefits. Except for EU ETS, recommendation models can be based on lean or hybrid principles. At this point, the potential financing models for maritime transport are as follows.

- Global ETS Model: It is based on the adoption of the global ETS approach and the management of the fund by the IMO or the new association, which consists of representatives of participating states or associations.
- Global Tax Model: It is based on adopting the ICS approach and is not included in the basis of maritime emissions to the ETS. Thus, the fund should be managed by an organization similar to the IMRB.
- Regional ETS Model: The establishment of regional ETSs such as the EU ETS is based on the fact that participants are involved in country-based ETS transactions.

- Hybrid Model: It is based on including the EU ETS of ship emissions within borders of the EU continent and the adoption of the tax model to be offered by ICS regarding emissions in ports outside the EU continent and be taxable to this tax of EU ships.

It should do some reviews regarding potential models. These can be expressed as follows.

- **Global ETS Model:** It is recommended to be focused on global benefits with the Global ETS Model targeting ship's carbon emissions and to be transferred to the global union the management of the collected fund. Therefore, it can establish a transparent and auditable fund management union regarding fundraising and fund sharing.
- **Global Tax Model:** It provides global benefits like the Global ETS Model. The proposal to include marine carbon emissions in the ETS will be rejected, and the IMRB or a similar association will jointly control the maritime financing. This model provides a transparent and auditable under
- **Regional ETS Model:** If the continent, region, or country-based ETSs are established, such as the EU ETS, effective development can be recorded in the strategic struggle to reduce greenhouse gas emissions. Variations in the price of carbon certificates can cause carbon leakage. In addition, global income inequality can significantly affect the ETS. In other words, stronger ETSs will be established in developed countries. Ultimately, there will be delays in targets regarding global greenhouse gas emissions due to developing and underdeveloped countries. The purpose of carbon financing is to create a fund to reduce and, if possible, to zeroed global carbon emissions.
- **Hybrid Model:** It is the most challenging model to be formed and managed. ETS and tax can prefer this approach.

Collecting and managing this system is complex and difficult. The possible carbon leakage problem is also valid in this offer.

CONCLUSION

IMO has developed strategies as part of the international struggle to reduce greenhouse gas emissions from ships extensively over the years. The final output of this process, supported by new regulations at various times, is the "Greenhouse Gas Strategy" published by IMO in 2018, targeting international shipping. This first strategic plan to reduce greenhouse gas emissions in shipping aimed to reduce greenhouse gas emissions by at least 50% by 2050 compared to 2008 and zeroed greenhouse gas emissions in the long term. Meanwhile, the EU Commission announced its goal of being the first climate-neutral continent by 2050, with the EU Green Deal announced in 2019. Furthermore, the commission explained that it plans to include emissions from maritime transport to the EU-ETS according to the information shared in the Directive under the FIT 55 Package.

Although the approaches of the two authorities are parallel, they include maturity mismatches. The EU focuses only on regional environmental benefits. IMO and the maritime industry argue that the new financing model targeting maritime transport should price all maritime emissions. Therefore, alternative approaches regarding maritime transport continue to be examined on the scale of international. At this point, regional-based ETS, global-based carbon tax, and fuel tax as three basic approaches have been submitted for pricing ship-sourced emissions.

The main concern of the participants in the maritime industry is that the EU will put political pressure on the decarbonization process and will introduce a financing model that can't finance maritime transport needs.

On the other hand, the parties advocating the tax approach, the EU ETS's policy criticized as that targets the emissions of the EU continent, of the collected funds and the distribution principles aren't clearly defined, the emission credit certificates will constantly change in line with the equilibrium price, and the system carries a risk of carbon leakage. On the other hand, the parties advocating the tax approach, the EU's proposal; criticized for reasons such as targeting the emissions of the EU continent, the fact that the taxpayer and distribution principles of the collected funds are not clearly defined, the emission credit certificates will constantly change in line with the equilibrium price, and the system carries a risk of carbon leakage. However, tax approaches haven't given enough explanation about who will be the taxpayer. Furthermore, the most critical criticism regarding the IMRF is a copyright issue. The tax of $100 per ton of carbon and $2 per ton of fuel to come into effect in these approaches will create huge costs for the maritime industry.

It is considered that all approaches will include carbon costs in the sales prices offered to customers to the extent that competitive conditions allow. In other words, the indirect financial of the decarbonization process in maritime in the new order will be the customer (consumer) group of the maritime transport. However, financially strong companies can finance some of their carbon costs to gain a competitive advantage. Therefore, differences in freight transport prices between rival ships are expected to share some ships in world maritime transport. It can argue that the most significant effect of financing approaches targeting ship emissions will be on "shipowners and taxpayers" relatively and having weak financial strength.

It will benefit from examining Turkey's situation regarding the financing models offered in maritime transport. Therefore, Turkey, a crucial important maritime country in the world, should be completed to prepare for potential approaches in the new order.

For the preparation of the EU ETS, to protect the expedience against new environmental reforms, to establish an MRV System in Turkey's ports, and to monitor all emissions and to be included by establishing the ETS in Turkey may be a practical solution. According to the information obtained from the interviews with the sector, it is foreseen that the collective carbon fund to be collected through the ETS and MRV System will contribute to be neutralized the carbon cost that Turkey will play in the EU ETS. Furthermore, in case the offers of IMO come into force, Turkey as an IMO participant, should initiate the legal process for projects and proposals regarding the decarbonization process and protect its copyrights. Copyrights, which is one of the most discussed issues in IMO meetings, will be able to provide significant economic gains to the inventor participant in the new order.

Decisions on an international scale are more beneficial in eliminating ship-related environmental damage and building an ecological world fleet. In the negotiation process, more emphasis should be placed on consultation with accounting and finance disciplines, where approaches are evaluated from a financial perspective. Thus, the new financing model, which is planned to enter into force, is anticipated to provide significant contributions to the financing of environmental investments.

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CHAPTER 13

Katılım ve Konvansiyonel Sigortacılığının Belirleyicileri

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Giriş

Günümüzde finans sistemi, ülke ekonomilerinin tamamlayıcısı ve vazgeçilemez bir aktörü haline gelmiştir. Finans sistemi içerisinde yer alan sigortacılık sektörü özellikle gelişmiş ülkelerde önemli bir yere sahiptir. Gelişmekte olan ülkelerde ise sigortacılık yüksek bir büyüme ivmesi sergilemektedir. Bu büyüme ivmesi Swiss Re'nin 2022 yılında hazırlamış olduğu raporlarda da görülmektedir. İlgili rapora göre 2022 yılında tüm dünyada sigorta sektörünün üretmiş olduğu prim hacminin 7 trilyon doları aşarak rekor kıracağı belirtilmektedir (Sigma, 2022). Bu denli büyüme potansiyeline sahip sektöre yönelik yatırımcıların ilgisi artarken araştırmacılar

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ve akademisyenler de sigortacılığa yönelik çok yönlü çalışmalar yapmaktadır.

Sigorta sektörü, bireylerin ve işletmelerin tasarruflarını sermaye piyasasına ve reel sektöre aktararak ekonomik kalkınma ve büyümede önemli rol oynamaktadır. Her geçen gün finansal piyasalarda sigorta sektörünün önemi artmakla birlikte çeşitli zorlukların olduğu da göz ardı edilmemelidir. Bu anlamda sigortacılığın gelişimini etkileyen faktörlerin analizi sektörün gelişimi ve beklenilen potansiyeline ulaşabilmesi için önem arz etmektedir. Bu çalışma, Türkiye'deki katılım ve konvansiyonel sigorta sektörünün gelişimini etkileyen faktörlerin incelenmesine odaklanmıştır. 2009Q4-2022Q2 dönemine ait verilerinin ele alındığı çalışmada panel veri analizi yöntemi kullanılmıştır. Sigorta sektörü üzerinde etkili olan değişkenler literatürdeki çalışmalar dikkate alınarak (Brokešová vd., 2014; Guérineau ve Sawadogo, 2015; Zerriaa ve Noubbigh, 2016; Mathew ve Sivaraman, 2017; Lee vd., 2018; Polat ve Akın, 2021; Kabrt, 2022; Kolapo vd., 2022; Kaya vd., 2022; Dragotă vd., 2022) Gsyh (Gayrı Safi Yurtiçi Hasıla), bankacılık sektörü, dış ticaret hacmi, enflasyon, faiz oranı ve sosyal güvenlik harcamalarından oluşturulmuştur. Ayrıca bu çalışmada COVID-19 salgının da sigorta primleri üzerindeki etkisi araştırılmıştır. İlgili veriler Türkiye Sigorta Birliği (TSB), Türkiye İstatistik Kurumu (TÜİK) ve Türkiye Cumhuriyet Merkez Bankası (TCMB) web sitelerinden temin edilmiştir.

Araştırma bulgularına göre sigorta sektörü üzerinde gsyh, bankacılık, dış ticaret hacmi, faiz oranı ve sosyal güvenlik harcamalarının pozitif bir etkiye sahip olduğu, COVID-19 salgınının ise negatif etkilediği görülmüştür. Enflasyon değişkeninin ise sigorta sektörünü hem pozitif hem de negatif etkilediği tespit edilmiştir. Katılım ve konvansiyonel sigorta sektörünün gelişimi elde edilen bu bulguların derinlemesine analizi ile önem kazanacaktır. Analiz sonuçları çerçevesinde sektördeki uygulayıcılar, müşteriler, kamu otoritesi ve araştırmacılar gibi birçok paydaşının sigorta sektörünün belirleyicilerinin etkilerine

yönelik kapsamlı analizler yaparak sigortacılık hakkında fikir sahibi olmaları mümkün olacaktır. Literatürde katılım ve konvansiyonel sigortacılığın belirleyicilerinin birlikte ele alındığı herhangi bir çalışmaya rastlanılmamış olması, bu çalışmayı mevcut çalışmalardan ayrıştırmakta ve literatüre katkı sağlamayı hedeflemektedir.

Çalışma beş kısımdan oluşmaktadır. Giriş kısmının devamında ikinci kısımda Türkiye'de katılım ve konvansiyonel sigortacılığa dair teorik bilgilere yer verilerek üçüncü kısımda literatür çalışmaları ele alınmıştır. Dördüncü kısımda metodoloji ve uygulama yer almaktadır. Son kısımda ise genel değerlendirme yapılmıştır.

Türkiye'de Katılım ve Konvansiyonel Sigortacılık

Türk Dil Kurumuna göre "sicurta" kelimesinden türeyen sigortacılık belirli bir prim karşılığında ilerde karşılaşabilecek risklerin zararlarına karşı kendini güvende hissetmek için sigorta şirketi ile yapılan sözleşmeyi ifade etmektedir (Tdk). Türk Ticaret Kanunu'nun 1401. Maddesin de ise sigortacılık daha geniş bir şekilde tanımlanmıştır.

"Sigorta sözleşmesi, sigortacının bir prim karşılığında, kişinin para ile ölçülebilir bir menfaatini zarara uğratan tehlikenin, rizikonun, meydana gelmesi hâlinde bunu tazmin etmeyi ya da bir veya birkaç kişinin hayat süreleri sebebiyle ya da hayatlarında gerçekleşen bazı olaylar dolayısıyla bir para ödemeyi veya diğer edimlerde bulunmayı yükümlendiği sözleşmedir." (Türk Ticaret Kanunu).

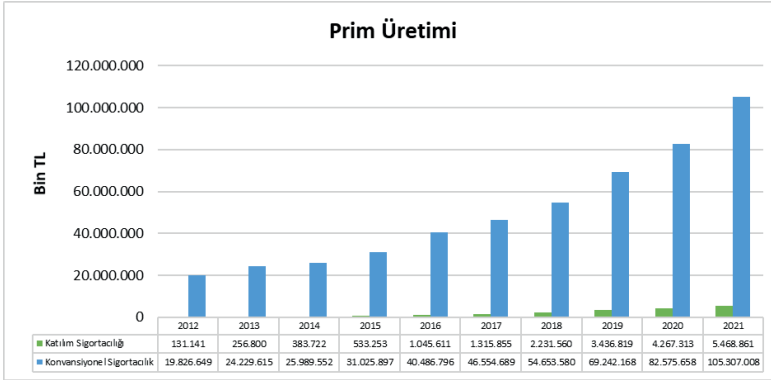
Sigortacılık ile ilgili literatürde birçok tanım yapılmıştır. Genel manada sigortacılığın riske maruz kalanların kendilerini güvende hissetmelerini sağlayan bir sistem olduğu söylenebilir (Aydın, 2012, ss. 141-142). Sigortacılık sayesinde bireyler, işletmeler ve devletler maruz kalacakları risklere karşı tedbirler almaktadırlar (Çipil, 2019; s. 1). Sigorta sistemi ile risklerin zararları sistemde yer alan her bir fert arasında paylaşılarak hasarın boyutu minimum düzeyde tutulmaktadır (Güvel & Güvel, 2018; s. 28).

İnsanları ve işletmeleri tehlikelere karşı koruma fikrinin ilk örnekleri M.Ö. MÖ 4500 civarında Mısır'da bulunmaktadır. Mısır'daki esnafların kendi aralarında kurdukları yardım fonları ile ölen esnafın ailelerine yardım ettiklerine dair örnekler var. (Özbolat, 2017, s. 34). Bir başka örneğe ise M.Ö. 4000'de Babil İmparatorluğu döneminde rastlanılmıştır. Bu dönemde sermaye sahipleri, tüccarları ticari faaliyetlerinde karşılaşacakları haydutlar tarafından soyulma tehlikelerine karşı nüfuzları sayesinde güvence altına almışlardır. Daha sonra bu uygulama Hammurabi kanunları ile hukuki zemine kavuşmuştur. Sonraki yıllarda ve medeniyetlerde deniz ticaretinin yaygınlaşmasıyla birlikte sigortacılık daha geniş bir uygulama alanı bulmuştur. Modern anlamda ilk poliçe 1347 yılında İtalya'nın Cenova limanında Santa Clara isimli gemiye düzenlenmiştir (Yaslıdağ, 2017, ss. 15–16).

Mevcut finansal sistemde yoğun bir şekilde uygulanan konvansiyonel sigorta sisteminin yanı sıra 1979 yılından itibaren İslami finans piyasalarında katılım sigortacılığı alternatif bir sigorta türü olarak yer almıştır (Ayub, 2007, s. 428; Billah, 2019, s. 3). Katılım sigortacılığı faiz, garar ve kumar uygulamalarının görüldüğü konvansiyonel sigortacılığın aksine İslami prensiplere uygun bir şekilde faaliyetlerini yürüten bir sigortacılıktır (Aslan, 2015; s. 93). İslami finansta katılım sigortacılığı ilk defa İbn-i Abidin tarafından "sevkere" kelimesi ile literatürde yer almıştır (Dalgın, 2009; s. 159). Katılım sigortacılığı gerek ulusal gerekse uluslararası terminolojide İslami sigortacılık ve tekâfül sigorta sistemi olarak bilinmektedir (Billah, 2019; s. 6). Katılım sigorta şirketlerinin tüm sigortacılık süreçlerinde İslami finans ilkelerine bağlı kalması açısından danışma kurullarının denetimindedir (Canbaz, 2019; s. 188).

Grafik 1'de katılım ve konvansiyonel sigorta şirketlerinin 2012-2021 yılları arasındaki prim üretimleri yer almaktadır. Grafik incelenecek olursa hem katılım hem de sektörde sürekli bir büyümenin olduğu görülmektedir. 2012 yılında 131 milyon TL prim üreten katılım sigortacılığı 2021 yılında 5.4 milyar TL hacme

ulaşmıştır. Konvansiyonel sigortacılık sektörü ise 2012 yılında 19 milyar TL üretmiş olduğu prim hacmini 2021 yılında 105 milyar TL'ye çıkartmıştır. Katılım sigortacılığının konvansiyonel sigortacılık sektöründeki payı ise %5 civarlarındadır. Grafik 1'de katılım ve konvansiyonel sigorta sektörünün 2012-2021 yıllarına ait üretmiş oldukları primler yer almaktadır.



	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Katılım Sigortacılığı	131.141	256.800	383.722	533.253	1.045.611	1.315.855	2.231.560	3.436.819	4.267.313	5.468.861
Konvansiyonel Sigortacılık	19.826.649	24.229.615	25.989.552	31.025.897	40.486.796	46.554.689	54.653.580	69.242.168	82.575.658	105.307.008

Grafik 1: Katılım ve Konvansiyonel Sigorta Prim Üretimleri

Kaynak: Türkiye Sigorta Birliği ve Şirket web sitesindeki verilerden yararlanılarak yazar tarafından oluşturulmuştur.

Literatür Araştırması

Literatürde sigorta sektörünün gelişimine ve büyümesine yönelik teorik ve ampirik çalışmalar bulunmaktadır. Ampirik çalışmalar ağırlıklı olarak uluslararası çalışmalarda göze çarparken ulusal düzeyde yeterli çalışmanın olmadığı görülmüştür.

Brokešová vd., (2014), Orta Avrupa'daki dört ülkenin (Çek Cumhuriyeti, Macaristan, Polonya Cumhuriyeti ve Slovakya) 1995-2010 yıllarına ait verilerini kullanarak panel yöntemi ile sigorta sektörünün belirleyicilerini araştırmışlardır. Bulgulara göre gsyh, dış ticaret oranı, motorlu taşıt sayısı, nüfus, yaşam

süresi, eğitim oranı, kentleşme ve hukuki düzenlemelerin sigorta sektörünü pozitif etkilediği; yaş bağımlılık oranı (bağımlı kişiler) ve sigorta sektörü pazar yoğunluğunun sektörü negatif etkilediği tespit edilmiştir. Ayrıca enflasyon, sosyal güvenlik ve suçluluk oranlarının da analizlerde anlamlı olmadığı görülmüştür.

Guérineau ve Sawadogo (2015), Sahra altı Afrika'da 20 ülkenin 1996-2011 yıllarına ait verilerini kullanarak panel yöntemi ile sigorta sektörünün belirleyicilerini araştırmışlardır. Bulgulara göre gsyh ve yaş bağımlılık oranının (bağımlı kişiler) sigortacılığı pozitif, yaşam süresinin ise negatif etkilediği tespit edilmiştir.

Zerriaa ve Noubbigh (2016), 2000-2012 yılları arasındaki verileri kullanarak Orta Doğu ve Kuzey Afrika (MENA) bölgesindeki hayat sigortası tüketiminin belirleyicilerini incelemişlerdir. Panel veri analizi yönteminin kullanıldığı bulgulara göre gsyh, enflasyon, faiz oranı, finansal gelişmişlik, yaş bağımlılık oranı (bağımlı kişiler), yaşam süresi ve eğitimin hayat sigorta taleplerini olumlu etkilediği; sosyal güvenlik ve dini inançların hayat sigortasını negatif yönde etkilediği tespit edilmiştir. Kentleşmenin ise hayat sigortası talebine herhangi bir etkisinin olmadığı görülmüştür.

Mathew ve Sivaraman (2017), 1980-2014 yıllarına ait verileri kullanarak Hindistan'daki hayat sigortasına olan talebi etkileyen faktörleri Johansen eşbütünleşme ve Granger nedensellik testi ile incelmişlerdir. Bulgulara göre gsyh ve enflasyonun hayat sigortası taleplerini olumlu etkilediği; faiz oranı ve gelirin hayat sigortası taleplerini olumsuz etkilediği görülmüştür. Ayrıca sosyal güvenlik harcamaların hayat sigortası talepleri üzerinde herhangi bir etkiye sahip olmadığı tespit edilmiştir.

Lee vd., (2018), ASEAN (Güneydoğu Asya Uluslar Birliği) ülkelerinde hayat sigorta primleri üzerindeki belirleyicileri araştırmışlardır. 1990-2013 yıllarına ait verilerin kullanıldığı panel veri analizi sonuçlarına göre gsyh, yaşam süresi ve ortaöğretim eğitimi hayat sigortalarını pozitif etkilediği; enflasyon, reel faiz

oranları, kentleşme, yaş bağımlılık oranı (bağımlı kişiler) ve yüksek öğretimin negatif etkilediği tespit edilmiştir.

Polat ve Akın (2021), Türkiye'deki hayat sigortası talebinin belirleyicilerini araştırmışlardır. 2009-2019 yıllarına ait çeyreklik verilerinin kullanıldığı zaman serisi analizi sonuçlarına göre gelir ve finansal derinleşmenin hayat sigortası talebini pozitif etkilediği; enflasyon, reel faiz oranı ve finansal yapının karmaşıklığı hayat sigortası talebini negatif etkilediği tespit edilmiştir. Yaş bağımlılık oranı (bağımlı kişiler) değişkeninin ise anlamlı bir etkiye sahip olmadığı belirlenmiştir.

Stefan (2021), finansal derinleşmenin sigorta sektörü üzerindeki etkisini panel veri analizi ile araştırmıştır. Gelişmekte olan ülkelerinin 2009-2020 yıllarına ait verilerin kullanıldığı analiz sonuçlarına göre finansal derinleşmenin sigorta sektörünü pozitif etkilediği tespit edilmiştir.

Kabrt (2022), V4 (Vişegrad Grubu) ülkelerinin (Çek Cumhuriyeti, Macaristan, Polonya, Slovakya) 1993-2017 yıllarına ait verilerini kullanarak hayat sigortalarının belirleyicilerini araştırmışlardır. Panel veri analizi sonuçlarına göre gsyh ve yaşam süresi hayat sigortalarını olumlu etkilediği; işsizlik ve eğitimin hayat sigortalarını olumsuz etkilediği tespit edilmiştir.

Kolapo vd., (2022), 1987-2020 yıllarına ait verileri kullanarak Nijerya'daki sigorta sektörünün belirleyicilerini araştırmışlardır. Ardl sınır testi analizi sonuçlarına göre dış ticaret hacmi, finansal gelişme, reel faiz oranları ve nüfus artışının sigorta sektörünü olumlu etkilediği; enflasyon, eğitim düzeyi ve yaşam süresinin sigortacılık sektörünü negatif etkilediği gözlemlenmiştir.

Kaya vd., (2022), sigorta ve emeklilik hizmetleri ihracatının belirleyicilerini araştırmışlardır. 2005-2018 yıllarına ait 82 ülke için panel veri analizi yöntemi ile yapmış oldukları araştırma sonuçlarına göre gsyh ve finansal kurumların derinliğinin sigorta ve emeklilik hizmetleri ihracatını olumlu etkilediğini tespit etmişlerdir.

Dragotă vd., (2022), 2005-2017 yıllarına ait 29 OECD (Ekonomik Kalkınma ve İşbirliği Örgütü) ülkesindeki verileri kullanarak hayat sigorta sektörünün belirleyicilerini panel veri yöntemi ile araştırmışlardır. Analiz sonuçlarına göre gsyh, doğrudan yabancı yatırım ve bankacılık sektörünün hayat sigortalarını pozitif; enflasyon ve faiz oranının ise negatif etkilediğini tespit etmişlerdir.

Sahoo vd., (2022), hayat sigortasının belirleyicilerine odaklanan bibliyometrik analiz yapmışlardır. Literatürde yapılan çalışmaları demografik parametreler, piyasa ve ekonomik parametreler şeklinde sınıflandırarak özet halinde sunmuşlardır.

Yukarıda ele alınan literatür incelemesinde en sık incelenen belirleyiciler üzerine odaklanılmıştır. Literatür çalışmasında sigorta sektörünün belirleyicileri hususunda ülkelere ve analizlerde kullanılan parametrelere göre farklı sonuçların elde edildiği görülmektedir. Çalışmaların büyük kısmında gsyh, dış ticaret hacmi, bankacılık sektörü, enflasyon, faiz oranı, sosyal güvenlik harcamaları, eğitim, nüfus ve benzeri faktörlerin sigorta sektörü üzerindeki olumlu ve olumsuz etkileri ele alınarak değerlendirilmiştir.

Veri Seti, Metodoloji ve Bulgular

Çalışmada sigorta sektörünü etkileyen faktörlerin analizi, panel veri analizi rassal etkiler modeli kapsamında araştırılmıştır. 2009Q1-2022Q2 dönemine ait veriler TSB, TÜİK ve TCMB web sitelerinden temin edilmiştir. Değişkenler literatürde yer alan çalışmalar dikkate alınarak oluşturulmuştur (Mathew & Sivaraman, 2017; Kabrt, 2022; Kolapo vd., 2022; Kaya vd., 2022; Dragotă vd., 2022; Brokešová vd., 2014). Değişkenlere ait detaylı bilgiler Tablo 1'de yer almaktadır.

Tablo 1: Değişkenlerin Tanımlayıcı Açıklamaları

Kısaltma	Tanım	Ölçümü	Kaynak
prim	Katılım ve konvansiyonel sigorta primleri	Katılım ve konvansiyonel sigorta şirketlerinin üretmiş olduğu primler	TSB
gsyh	Gayri safi yurtiçi hasıla	Ülkenin büyüme rakamları	TCMB
bankalar	Bankacılık sektörü aktif büyüklüğü	Bankacılık sektörünün aktif büyüklüğünü	TCMB
Covid	COVID-19	COVID-19 pandemisi kukla değişkeni	YAZAR
dışticaret	Dış ticaret hacmi	Dış ticaret hacmi	TCMB
enf	Enflasyon	Tüketici fiyatlarında önceki döneme göre meydana gelen fiyat artışları	TCMB
faiz	Faiz Oranı	Faiz oranları	EVDS
sg	Sosyal güvenlik harcamaları	Kamu tarafından yapılan sosyal güvenlik harcamalarının gsyh içindeki payı	TUİK

Modeldeki değişkenler arasında doğrusal bir ilişkinin varlığı ve çarpıklık/basıklıktaki uç değerleri normalleştirmek için bazı değişkenler logaritmik dönüşüme tabi tutulmuştur. Logaritmik dönüşümden sonra, katsayılar değişkenlerin esnekliklerini karakterize etmektedir. Bu sebeple sigorta prim üretimi, GSYİH, banka aktifleri ve dış ticaret değişkenleri logaritmik değişkenlere dönüştürülmüştür (Lee vd., 2018, s. 7) Logaritmik dönüşüm sonrası Tablo 2'de değişkenlerin tanımlayıcı istatistikleri özetlenmiştir. Gözlem sayısı, örnek ortalama, standart sapmalar, minimum ve maksimum değerlerin tümü Tablo 2'de yer almaktadır.

Tablo 2: Özet İstatistikler

Değiş.	Gözlem	Ort.	Standart Hata	Min	Max
Prim	102	21.70061	2.555459	12.48495	25.38015
Gsyh	100	20.31324	.5749381	19.3966	21.71227
bankalar	102	21.62476	.7120486	20.46854	23.18404
covid	102	.1764706	.3831026	0	1
dışticaret	102	16.64242	3.105049	11.07401	18.86778
enf	102	13.08941	11.48128	3.99	64.42
faiz	102	15.36098	5.190588	8.54	30.56
sg	102	16.14118	.6519359	15.4	17.6

Çalışmada, sigortacılığı etkileyen faktörlerinin tespitine yönelik panel veri analizi yönteminden faydalanılmıştır. Bu yöntemin tercih sebebi hem kesit hem de zaman boyutunun olması ve gözlem sayılarını artırarak elde edilecek regresyon sonuçlarının daha güvenilir olmasından kaynaklanmaktadır. Panel veri analizi ile yapılan regresyon analizlerinde çok az kısıtlayıcı varsayımlar söz konusudur. Örneğin bu varsayımlardan bir tanesi panel veri ile doğrusal bağlantı sorunu asgari düzeyde olmakta ve analizler başarılı sonuçlar vermektedir (Baltagi, 2005, ss. 3-5). Bu analizde ulusal ve uluslararası çalışmaların analiz yöntemleri referans alınarak rassal etkiler (random effects) panel veri yöntemi ile analiz edilmiştir. Rassal etkiler (tesadüfi etkiler) modelinde bağımsız değişkenler ile açıklayıcı değişkenlerin ilişkisiz ve rastgele oldukları varsayımı söz konusudur. Yani hata terimlerinin zamanla değişmeyen diğer parametreler ile ilişkisiz olduğu bir modeldir. Rassal etkiler modelinin sabit etkiler modelinden temel farkı, gözlemlenmemiş bireysel etkilerin birbiriyle ilişkili açıklayıcı değişkenlerden mi kaynaklandığı, yoksa bu etkilerin tesadüfi mi olduğuyla ilgilidir. Rassal etkiler modeli analizinin en büyük avantajı zamanla değişmeyen değişkenlerin modele dâhil edilmesidir. Genel olarak

rassal etkiler modelleri yapılan analizlerde kullanılan örneklemin ötesinde sonuç çıkartmak için en elverişli analiz yöntemleridir (Tatoğlu, 2020, ss. 79-125).

Panel veri analizleri için elde edilen veriler düzenli aralıklarla yapılan gözlemler sonucunda oluşmaktadır. Fakat elde edilen bu veriler düzenli ya da düzensiz olabilmektedir. Bu yüzden verilerin tüm gözlemlerinin eşit uzunlukta ya da sayıda olduğu ve gözlemlendiği durumda dengeli panel söz konusudur. Fakat zaman içerisinde kimi gözlemlerin değişmesi ya da kaybolması durumu da söz konusu olabilmektedir ve bu durumda da dengesiz panel oluşmaktadır. Yapılan analizlerde dengeli panel ile çalışılması daha uygun olsa bile verilerin tamamını temin etmek zor olduğundan dolayı genellikle dengesiz panel verisi ile çalışılmaktadır (Brooks, 2014: 529; Cameron ve Triverdi, 2009: 230).

Analizlerde katılım ve konvansiyonel sigortacılık sektörünün 2009Q4-2022Q2 dönemi arasındaki verileri kullanılmıştır. Naudé ve Saayman (2005)'ı takiben, aşağıdaki ekonometrik model kurulmuş ve farklı varyasyonları tahminlenmiştir (Yüksel vd., 2018, s. 10):

$$Y_{it} = \alpha + \sum_{k=1}^{K} \beta_k X_{kit} + \varepsilon_{it} \quad (1)$$

Denklemde Y, bağımlı değişkeni temsil ederken, X ise X_1'den X_k'ya kadar olan bağımsız değişkenleri temsil etmektedir. Denklemde α sabit terimi, β bağımsız değişkenlere ait katsayıları ve ε ise hata terimini ifade etmektedir. Ek olarak, i yatay kesit birimlerini (sigorta şirketleri) ve t ise zamanı (yıl) ifade etmektedir. Denklem (1)'deki bağımlı değişken Y_{it} ve $\sum_{k=1}^{K} \beta_k X_{kit}$ ifadeleri yerine modelde kullanılacak değişkenler eklendiğinde oluşturulan model, aşağıdaki belirtildiği gibidir:

$$prim_{it} = \alpha + \beta_1 gsyh_{it} + \beta_2 bankalar_{it} + \beta_3 covid_{it} + \beta_4 dışticaret_{it} + \beta_6 enf_{it} + \beta_7 faiz_{it} + \beta_8 sg_{it} \quad (2)$$

Denklemde her t yılı ve i sigorta şirketleri için, *prim* prim hacmini, *gsyh* gayri safi milli hasılayı, *bankalar* banka aktiflerini, *covid*

COVID-19 salgınını, *dışticaret* dış ticaret hacmini, *enf* enflasyon oranını, *faiz* faiz oranını ve *sg* sosyal güvenlik harcamalarının gsyh içindeki oranını göstermektedir.

Tablo 3'te değişkenler arasındaki ikili korelasyonlar yer almaktadır. Tablo 3'te sigorta prim üretimleri ile analizlerde kullanılan parametreler arasındaki ilişkiler yer almaktadır. Katılım ve konvansiyonel sigorta şirketleri tarafından üretilen primler ile diğer değişkenler arasında pozitif ve anlamlı bir ilişkinin olduğu görülmektedir.

Tablo 3: Korelasyon Katsayıları

	prim	gsyh	bankalar	covid	dışticaret	enf	faiz	sg
prim	1.0000							
gsyh	0.4501*	1.0000						
bankalar	0.4651*	0.9957*	1.0000					
covid	0.2908*	0.6992*	0.7151*	1.0000				
dışticaret	0.3700*	0.7192*	0.7405*	0.2921*	1.0000			
enf	0.2663*	0.6945*	0.6778*	0.6127*	0.2986*	1.0000		
faiz	0.3312*	0.6864*	0.6940*	0.2928*	0.4931*	0.5794*	1.0000	
sg	0.1952	0.4020*	0.3601*	0.1530	0.2453	-0.1074	0.1506	1.0000

%5 seviyesinde anlamlı korelasyon katsayıları * ile gösterilmiştir (* p<0.1).

Panel veri analizlerinde mevsimselliğin olmadığı ve sadece birim etkinin olduğu tespit edilmiştir. Dolayısıyla analizlerde sadece tek yönlü birim etki analizleri yapılmıştır. Ayrıca analizlerde çoklu doğrusal bağlantı sorunun olmadığı (VIF) her bir modelde tespit edilmiştir. Tablo 4'te tahmin sonuçları yer almaktadır.

Panel veri analizlerini yapmadan önce analizlerde mevsimselliğin olmadığı tespit edilmiştir. Akabinde zaman ve birim etkisi araştırılmıştır. Bunun için F testi, Breusch-Pagan LM testi, En Çok Olabilirlik testi ve Score testi kullanılmış ve sadece tek yönlü birim etkinin olduğu görülmüştür. Dolayısıyla analizlerde F ve LM test

sonuçları POLS tahmincisinin geçerli olmadığı ve birim etkinin olmadığı tespit edilmiştir.

Analizlerde kullanılacak regresyon tahminleri için gerekli düzeltmeler yapılarak uygun tahminci seçilmiştir. Modellerdeki otokorelasyon, heteroskedasite ve birimler arası korelasyon gibi sorunları gidermek için dirençli standart hatalar kullanılmıştır. Yapılan nihai analiz sonuçları ile katılım bankaları ve mevduat bankalarının kredi takip oranlarında bir farklılaşma olup olmadığını test etmek için rassal etkiler panel veri analizi ile Tablo 3.6 ve Tablo 3.7'deki tahminler gerçekleştirilmiştir.

Tablo 4: Analiz Sonuçları Bağımlı Değişken: Sigorta primleri

Değişkenler	**1**	**2**	**3**	**4**
gsyh	2.001**		2.266***	1.736***
	(0.951)		(0.216)	(0.223)
bankalar		1.669**		
		(0.777)		
covid			-0.593*	
			(0.338)	
dışticaret				0.0678*
				(0.0411)
enf				
faiz				
sg				
sabit terim	-18.98***	-14.39***	-24.28***	-14.73***
	(21.43)	(18.90)	(4.833)	(4.574)
gözlem sayısı	100	102	100	100
p	0.0355	0.0318	0.000	0.000
x^2	4.422	4.610	170.4	169.4
R2	0.203	0.216	0.206	0.206
VIF	1.00	1.00	1.96	2.07

Düzeltilmiş (robust) standart hatalar parantez içinde verilmiştir. *** p<0.01, ** p<0.05, * p<0.1

Bağımlı Değişken: Sigorta primleri

Değişkenler	**5**	**6**	**7**	**8**
gsyh				2.836***
				(0.247)
bankalar				1.815***
				(0.190)
covid			-1.208***	
			(0.370)	
dışticaret	0.223***			
	(0.0381)			
enf	0.0238**	0.0368***	0.00683	-0.0218**
	(0.0110)	(0.0122)	(0.0148)	(0.0104)
faiz	0.0668**	0.102***	0.118***	0.0182
	(0.0267)	(0.0271)	(0.0263)	(0.0235)
sg		0.712***	0.528***	
		(0.177)	(0.178)	
sabit terim	16.65***	8.155**	11.06***	-17.55***
	(2.154)	(3.496)	(3.506)	(4.388)
gözlem sayısı	102	102	102	102
p	0.000	0.000	0.000	0.000
x^2	107.3	78.93	97.49	196.4
R2	0.174	0.148	0.167	0.321
VIF	1.55	1.43	1.82	2.14

Düzeltilmiş (robust) standart hatalar parantez içinde verilmiştir. *** p<0.01, ** p<0.05, * p<0.1

Analizlerde toplam 8 model tahmin edilmiştir. Analiz sonuçlarına göre gsyh'nin 1, 3 ve 4. ve 8. modellerde pozitif ve istatistiksel olarak anlamlı olduğu görülmektedir. Bu sonuçlar mevcut literatürdeki çalışmalar ile örtüşmektedir (Brokešová vd., 2014; Guérineau ve Sawadogo, 2015; Zerriaa ve Noubbigh, 2016; Mathew ve Sivaraman, 2017; Lee vd., 2018; Polat ve Akın, 2021; Kabrt, 2022; Kaya vd., 2022; Dragotă vd., 2022). Bir ülkenin gsyh'nin artması sigorta prim ücretlerinin daha uygun hale geleceğini göstermektedir. Ayrıca ülke ekonomisinin gelişmesi

sigorta taleplerinde de artışa yol açacaktır. Bu durumda ülkenin gsyh artması sigorta sektörünün gelişimine de olumlu katkı sağlamaktadır.

Ülkenin bankacılık sektörünün gelişimi, sigortacılığa olan talebi önemli ölçüde etkilemektedir. Özellikle sigorta şirketlerinin en büyük acenteleri arasında yer alan bankaların sigorta poliçe satışlarındaki rolü çok büyüktür. Dolayısıyla bankacılık sektörünün büyümesi sigortacılık sektöründeki satış hacmini pozitif yönde etkilemektedir. Analizlerde de 2 ve 3 nolu modelde bankacılık sektörünün sigorta sektörünü pozitif yönde etkilediği görülmektedir. Literatürdeki (Kolapo vd., 2022; Dragotă vd., 2022) çalışmalarda da bu sonuca ulaşmıştır.

COVID-19 salgınının finansal piyasaları olumsuz etkilediğine dair literatürde birçok çalışma bulunmaktadır (Albulescu, 2021; Ali vd., 2020; Cao, 2022; Zhang vd., 2020). Bu çalışmada da yapılan analizlerde 3 ve 7 nolu modelde COVID-19 salgınının sigorta primlerini negatif etkilediği görülmektedir.

Analizlerde kullanılan dış ticaret değişkeninin sigorta primleri üzerinde 4 ve 5 nolu modelde istatistiksel olarak anlamlı ve pozitif olduğu yer almaktadır. Dış ticaretin geliştiği ülkelerde ekonominin geliştiği ve sigortacılık sektörüne dış ticaret hacminin katkı sağladığı söylenebilir. Bu minvalde literatürdeki (Brokešová vd., 2014; Kolapo vd., 2022) çalışmalarda da benzer sonuçlara ulaşılmıştır.

Enflasyonun sigorta primleri üzerinde istatistiksel olarak anlamlı etkiye sahip olduğu 5, 6 ve 8. modellerde görülmektedir. Ancak enflasyonun sigorta primleri üzerinde analizdeki modellere göre hem pozitif hem de negatif etkiye sahip olduğu görülmektedir. Enflasyonun finansal piyasaları ve yatırımları olumsuz yönde etkilediği bilinen bir gerçektir (Cherif & Gazdar, 2010, s. 148). Bunun yanında müşteriler enflasyonist ortamlarda sigorta primlerinin gelecekteki olası fiyat artışlarından etkilenmemek için sigorta poliçelerine olan taleplerini arttırarak sigorta sektörünü olumlu yönde etkileyebilmektedir. Enflasyon ve sigorta primleri

arasında negatif bir ilişki olduğuna dair Lee vd., 2018; Polat ve Akın, 2021; Kolapo vd., 2022; Dragotă vd., 2022 çalışmaları; pozitif bir ilişkiye sahip olduğu Zerriaa ve Noubbigh, 2016; Mathew ve Sivaraman, 2017 çalışmaları; anlamlı bir ilişkinin olmadığını gösteren Brokešová vd., 2014 çalışması literatürde görülmektedir.

Faiz oranın sigorta primleri üzerinde 5, 6 ve 7. modellerde pozitif ve anlamlı bir etkiye sahip olduğu yer almaktadır. Bu durum Zerriaa ve Noubbigh, 2016; Kolapo vd., 2022 çalışmalarındaki bulguları doğrulamaktadır. Faiz oranlarının yüksek olduğu durumlarda yatırımcılar daha yüksek getiri sağlayan alternatif ürünler aramakta ve sigorta fonlarına yatırım yapabilmektedir.

Sosyal güvenlik harcamalarının 6 ve 7. modellerde istatistiksel olarak anlamlı ve pozitif etkiye sahip olduğu tespit edilmiştir. Bireyler ve işletmelerin sigorta poliçelerini satın alma kararlarındaki en büyük motivasyon kaynaklarından birisi devlet tarafından sağlanan sosyal güvenlik hizmetleri ve sosyal güvenliğin kapsamıdır. Ülkenin sosyal güvenlik harcamalarındaki artışı, özel sigorta primlerine olan talepleri de artırmaktadır. Sosyal güvenlik harcamaları bir ülkenin yüksek refah seviyesini yansıtmakta ve bu nedenle sigorta primlerine daha fazla talep olmaktadır. Literatürde Li vd., 2007 çalışmalarında benzer sonuçlara ulaşmışlardır.

Sonuç

Finansal piyasaların önemli aktörlerinden olan sigortacılık sektörü ülke ekonomileri için önemli bir tasarruf kaynağıdır. Bireylerden ve işletmelerden toplanılan sigorta primleri, finansal ekonominin derinleşmesine katkı sağlamaktadır. Özellikle Türkiye gibi gelişmekte olan ülkeler için sigortacılık potansiyeli çok yüksek bir sektördür. Bu potansiyelin farkında olan ulusal ve uluslararası sigorta şirketleri, sektöre yönelik yatırımlarını hızlı bir şekilde arttırmaktadır. Bu yüzden sigorta primlerini etkileyen belirleyicilerin neler olduğu önem arz etmektedir. Dolayısıyla bu

çalışmada son yıllarda hızlı bir büyüme ivmesi yakalayan katılım ve konvansiyonel sigorta sektörünün belirleyicileri tespit edilmiştir.

Analiz sonucunda elde edilen bulguların literatürdeki çalışmalarla uyumlu olduğu gözlemlenmiştir (Brokešová vd., 2014; Guérineau ve Sawadogo, 2015; Zerriaa ve Noubbigh, 2016; Mathew ve Sivaraman, 2017; Lee vd., 2018; Polat ve Akın, 2021; Kabrt, 2022; Kolapo vd., 2022; Kaya vd., 2022; Dragotă vd., 2022; Li vd., 2007). Buna göre gsyh, bankalar, dış ticaret hacmi, faiz oranı ve sosyal güvenlik harcamalarının katılım ve konvansiyonel sigorta primlerini pozitif yönde, COVID-19 salgınının ise negatif yönde etkilediği görülmüştür. Enflasyon değişkenin ise sigorta sektörünü çift taraflı olarak etkilediği tespit edilmiştir.

Katılım ve konvansiyonel sigorta sektörünü etkileyen faktörlerin derinlemesine analiz edilmesi bu pazarların daha fazla büyümesine yol açacaktır. Aynı zamanda ilgili değişkenlerin sigortacılık sektörü üzerindeki etkileri, gelecekteki sigorta sektörüne yönelik eğilimleri tahmin etmeye yardımcı olacaktır. Dolayısıyla sektörün gelişmesinde ana aktör olan kamu otoritesinin uygun ve şeffaf düzenlemeler gibi sektörü desteklemesi; sigorta piyasasının büyümesi için hem sigortalılar hem de işverenler için tasarruf etmeye yönelik teşvikler sağlaması mühimdir. Yine sektör önündeki talep yönlü engelleri kaldırmak ve şirketlerin piyasadaki daha fazla güvenin sağlanması için muhasebe ve iyi yönetişim standartlarının uygulanması gerekmektedir. Ulusal ve uluslararası düzeyde ülke ekonomisinin kalkınmasında önemli kurumlardan olan sigorta şirketlerinin büyümesi tüm bu bilgiler çerçevesinde mümkün olacaktır. Ayrıca ulusal ve uluslararası şirketler büyüme potansiyeli çok yüksek olan sigorta şirketlerine yatırım yapmakta daha çok istekli davranacaklardır.

Çalışma, sigorta sektörünün belirleyicileri konusunda mevcut literatürü zenginleştirmeyi hedeflemiştir. Sigortacılığın belirleyicileri literatürde belirli değişkenler üzerine odaklanmıştır. Bu nedenle sigorta sektörünü etkileyen bütün belirleyiciler

bu çalışmada ele alınmamıştır. Mevcut çalışmalarda sadece konvansiyonel ya da katılım sigortacılığını etkileyen faktörler ele alınırken bu çalışmada her iki sigorta türünü etkileyen faktörler ele alınarak literatürden ayrışmış ve çalışmayı farklılaştırmıştır. Araştırmacıların yapacakları çalışmalar ile siyasi, ekonomik ve kriz dönemlerinden de oluşan daha fazla belirleyiciler ile literatüre katkı sağlaması beklenilmektedir.

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CHAPTER 14

Elderly Services Policies of Emerging Markets withinside the Context of Silver Economy (The Case of the Ministry of Family and Social Services of the Republic of Turkiye)

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INTRODUCTION

There are a few monetary and social variations that distinguish nations that occupy a separate role amongst growing nations and are called rising economies from different nations. Some

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worldwide companies classify rising marketplace economies in line with their personal criteria. Although those establishments have specific numbers and specific nations on this ranking, a complete of 36 nations are particular as rising economies (Taş and İspiroğlu, 2017). Population getting older is an unavoidable fact of growing situation for all nations. Birth rate, boom in predicted lifestyles expectancy and migration. The getting older of the populace brings monetary possibilities, however additionally a few problems. In phrases of content, the Silver Economy idea takes a holistic angle on getting older and the possibilities that getting older offers. In this context, the silver economic system, developing an surroundings for the aged, developing employment possibilities for human beings over 50, lifelong learning, enhancing their skills, developing a healthful paintings surroundings and insurance, enhancing the diploma of adaptation of older and disabled workers to converting operating situations consists of measures inclusive of anti-discrimination and fitness care. The precedence withinside the silver economic system is the inclusion of the getting older populace in society and monetary activities. To make sure the nice of lifestyles of older human beings, the intention is to increase revolutionary strategies, services and products that meet their desires and make sure lively getting older. It is essential to offer older human beings extra possibilities to take an lively function in operating lifestyles, live healthful and preserve to make contributions to society. Therefore, the idea of being lively consists of now no longer best bodily fitness and hobby and participation in operating lifestyles, however additionally social and cultural participation (Demirbilek and Öktem Özgür, 2017). As one of the essential political troubles of the twenty first century, populace getting older brings with it various demanding situations and possibilities for all societies. Keeping human beings lively and healthful is essential to maximize the capability contribution of the aged populace and combine paintings into social and monetary lifestyles and be capable of deal successfully with rising problems.

1. EMERGING MARKETS

The universe of rising markets is numerous and defies a one-size-fits-all narrative. Although there may be no formal definition, rising markets are frequently described via way of means of attributes along with sustainable marketplace access, development toward middle-profits degrees and more worldwide monetary viability. Nevertheless, those economies vary from every different and the difference among rising markets and different rising markets isn't always clear (Duttagupta and Pazarbasioglu, 2021). In its 2008 Emerging Economies Report, the Center for Knowledge Societies defines rising marketplace economies as "economies present process speedy transition to the records society below situations of restrained or incomplete industrialization". There are essential factors on this definition that serve to differentiate rising marketplace economies from evolved economies.

According to the first, rising economies have now no longer but finished their industrialization for lots reasons, consisting of inadequate capital accumulation, incomplete monetary infrastructure, incomplete prison framework, and unprotected monetary and social rights. According to the second, they're making massive strides alongside this direction via many channels, attracting advances in records and communique technologies. Against this background, the maximum fundamental feature of rising markets is the transformation method they're present process. This transformation is monetary, social, cultural, politics etc. it keeps in lots of areas (Karasu, 2008).

15-two decades ago, corporations of nations had been mentioned: evolved international locations and underdeveloped international locations. Later, as a courtesy, the idea of growing international locations started for use rather than underdeveloped international locations.

However, this categorization appears to be very inadequate. Today there are numerous groupings along with D-20, G-24,

G-7. In the meantime, it must be cited that Turkiye, following the trend, pioneered a soundless D-eight grouping nowadays. Another difference this is significant in exercise nowadays is expressed via way of means of the idea of nations in transition to represent the international locations that emerged with the fall apart of socialism ;(13) international locations that open to the arena in phrases of goods-offerings and capital actions also are characterised via way of means of the idea of rising markets. The international locations that went into disaster withinside the Nineties are usually rising marketplace international locations on this final category (Toprak, 2001).Countries are differentiated amongst themselves in keeping with their stage of improvement and the diploma to which they discover an area withinside the global economy. This category is usually withinside the shape of evolved and growing international locations. Countries outdoor of those classifications are defined as underdeveloped or 0.33 global international locations. Among the growing international locations, international locations with excessive overall performance and increase charges are proven as a special institution inside this class, along with rising economies or rising marketplace economies (Taş & İspiroğlu, 2017).

There isn't anyt any usually typical consensus for rising marketplace economies, neither is there a whole consensus on which international locations are blanketed on this category. For this reason, there are special groups that classify and institution rising marketplace economies (Taş & İspiroğlu, 2017).

In the literature, it's miles regularly encountered with naming research for nations decided on from some of the growing nations and defined as "rising" after the 80s. In precise, the classification/ score of the nations that offer buyers with better profit-making possibilities and that diverge of their organization in line with financial signs is vital each on the way to apprehend the subjective performances of the nations and to take gain of the possibilities through following their improvement paths. Although many standards may be counted on the way to explicit a growing

financial system amongst growing nations, it's miles vital at this factor that the extent and composition are exclusive, whilst it's miles above the arena average, in particular with a strong growth discovered in GDP. In this context; dynamic demographic shape, reformist approaches, that specialize in overseas trade, the shape and traits of the change price and openness to overseas capital are emphasized. There are exclusive definitions of rising marketplace economies (BRICS, N11 et al.) created through thinking about those and comparable variables which have turn out to be good sized withinside the worldwide financial system. The evaluation of whether or not the performances of those nations diverge from the ones of growing nations is of precise importance. In the study, it turned into concluded that the positions of the cited nations withinside the literature withinside the overall performance scores have a exclusive appearance (Ekren et al., 2021).

According to Kuepper (2011) we will listing the capabilities that ought to be taken into consideration earlier than making an investment in rising marketplace economies as follows (referred to in Yardimcioglu, 2015);

Transition Economy: Emerging marketplace economies are typically withinside the system of transitioning from a closed financial system to an open financial system. While anybody thinks this final results is suitable policy, there may be an multiplied hazard of political and economic policy.

Young and Increasing Population: Emerging marketplace economies frequently have younger populations with the ability to preserve sturdy long-time period increase fees to complement getting older people and patron goods. However, the younger populace can also additionally growth the hazard of political stability.

Underdeveloped Infrastructure: Emerging marketplace economies are frequently withinside the infancy of constructing infrastructures. Since authorities costs aren't directed to this

funding, the price of those investments for the personal area is excessive and their performance is low.

Foreign Capital Investments: Emerging marketplace economies frequently face a big quantity of overseas funding which could make a contribution to predicted destiny financial increase. However, an excessive amount of capital influx can also additionally reason the marketplace to overheat (Kuepper, 2011). Emerging markets have made tremendous development in reinforcing their macroeconomic rules because the flip of the century, which has helped greater than double according to capita earnings on average. In sixty five percentage of the nations we've got diagnosed as rising markets, economic rules observe forward-searching inflation focused on regimes, and maximum of the inflation is decreased and stabilized. In many nations, public price range are ruled through economic rules. Many have embraced massive banking (Duttagupta & Pazarbasioglu, 2021).

2. SILVER ECONOMY

Decreasing delivery rates, growing life expectancy and immigration are the various maximum critical reasons of populace getting old. Population projections display that the sector populace will age gradually, in different words, the proportion of the aged populace withinside the general populace will boom. The getting old of the populace will convey with it numerous issues. At the start of those issues are the lower withinside the lively populace, the boom withinside the expenses of care offerings, the boom in social safety prices and the lower in production, etc. is coming. It is not unusualplace for the aged populace to be dealt with as a 'problem'. In latest years, there were tries to show the getting old of the populace into an opportunity (Korkmaz & Korkut, 2018).

The transformation withinside the own circle of relatives shape with modernization and urbanization has modified the attitude of societies in the direction of the aged. In the conventional own

circle of relatives shape, the aged had roles together with care offerings and getting to know social values of the brand new generations. They had been additionally visible and revered as reassets of wisdom. In the nuclear households that emerged with the urbanization, the care offerings of the brand new generations began out to be fulfilled via way of means of specific establishments and the jobs of the aged had been taken farfar from them. The speedy technological trends and differing fee judgments skilled after the commercial revolution have devalued the skills of the aged. As a result, the aged have misplaced their social status. In fact, in line with a few modernization theories, there may be an inverse dating among the positions of the aged and technological trends. The aged, who can't hold up with speedy technological changes, are excluded from society via way of means of being in the back of the times (Çataloğlu, 2018).

Social exclusion is described because the deprivation of cultural, social, monetary and mental helps that permit the person to socialize. Social exclusion stems from motives together with poverty, disability, loss of training and vintage age. Inadequacy, deprivation and losses in bodily pastime on account of getting old motive the aged to be excluded from social, monetary and cultural lifestyles. Elderly people's reluctance to take part in cultural sports together with cinema, theater and concerts, and their publicity to poor reactions from the ones round them because of their gradual motion at the same time as assembly their day by day intake needs, are examples of the social exclusion and forget about of the aged (Cankuş et al., 2019).

3. ELDERLY SERVICES IN TURKİYE

Aging is described as all the irreversible, structural and useful adjustments at a positive stage with the development of time (Barcın Güzeldere & Aksoy, 2021). Changes withinside the lifestyles state of affairs have an effect on the subjective studies of individuals, their family members with different generations,

and the social structure. Therefore, further to monetary and cloth situations in vintage age, own circle of relatives, relatives, social networks and particularly fitness, cultural-normative traits are vital for the subjective situations of the character in vintage age (Pamuk and Efe, 2021: 28).

Care offerings are a provider shipping technique wherein the social, cultural, monetary, housing, fitness and rehabilitation wishes of folks who want long-time period or brief care offerings with acute or continual sicknesses, particularly disabled and aged individuals, are met. The growth withinside the want for care and rehabilitation offerings with the growth in getting older and continual sicknesses and the diversification of care provider expectancies have improved the significance of the fine development research to be carried out on this discipline and feature resulted withinside the diversification of the methods, strategies and gear to be carried out. It is an inevitable requirement that fine development research, that have already commenced in different provider regions including fitness and education, must be carried out to care offerings as well. The Ministry of Family and Social Services, General Directorate of Services for the Disabled and Elderly, pursuits to enhance the fine of care offerings for the disabled and the aged, control the provider shipping processes, degree the overall performance of the offerings furnished and the establishments presenting the provider, defend the privateness of the character receiving provider, and degree the pride of these receiving and presenting care offerings. Care Services Quality Standards were established. These requirements have been posted on sixteen December 2019 with the Ministry's approval of the "Directive at the Development and Evaluation of Quality in Care Services for the Disabled and Elderly" of the Ministry of Family and Social Services (ASHB, 2022: 3).

The maximum vital goal of the first Council on Aging, with the principle subject of "assisting energetic getting older" and "strengthening the rights of the aged", wherein many critiques and tips on an global and country wide scale, prepared through

the Ministry, are expressed, is the maximum vital aim of a greater energetic and effective society withinside the international and in Turkiye. on getting older and the getting older technique; intergenerational solidarity, energetic getting older, lifelong learning, age discrimination, the rights of the aged, forget and abuse of the aged, the cost of the aged withinside the converting own circle of relatives and society structure, the monetary measurement of getting older, aged care and tourism for the aged, schooling and employment of certified employees for aged care, populace To create recognition and sensitivity on troubles including policies.

As the General Directorate of Services for the Disabled and Elderly, the maximum primary aim for the aged is to guide their lives in fitness, peace and protection with their households and cherished ones, to be self-enough and self-enough, to guide a glad and effective lifestyles withinside the surroundings they want, primarily. (ASHB, 2018: 89). Policies concerning getting older applied through the General Directorate; It consists of a social knowledge that emphasizes social rights, does now no longer discriminate, pursuits at powerful and effective getting older through which includes the own circle of relatives and family withinside the social system, foresees guidelines to growth the capability of the aged, and evaluates our aged humans as an entire with their social surroundings. Policies advanced withinside the discipline of vintage age aren't restrained to the framework of social help only, however it's miles viable through setting up an recognition all through the society that permits the problem to be evaluated with all its dimensions. First of all, it's miles vital to make sure the energetic participation of the aged in social lifestyles with out discrimination, and to decide and enhance the fine of lifestyles in making sure the welfare of the aged (ASHB, 2018: 89).

In Turkiye, retirement (income and coverage) has been visible because the maximum critical country aid and warranty for the aged for an extended time. Until 1999, ladies should retire on the age of 38 and guys on the age of 43, furnished that they meet the

essential operating and top rate conditions, to be able to qualify for retirement, that's visible as an critical purpose in antique age. However, 1999 Services for the Elderly, Institutional Elderly Care and the Situation of Provinces in Turkiye. The retirement age become steadily extended beginning from 1999, and ultimately it become extended to sixty five as of January 1, 2048 for brand spanking new hires. One of the maximum critical, powerful and significant helps in antique age is the pensions that personnel begin to acquire on the stop in their operating existence because of the charges they pay. Those who acquire pensions additionally have medical health insurance and on this context, additionally they gain from fitness services. Due to the low retirement age in our usa, now no longer all retirees fall into the antique age class, however a few retire in antique age, at the same time as others input the antique age class withinside the process. There are aged folks that acquire their personal pensions, and there also are aged human beings amongst spouses, mothers, fathers and youngsters who enjoy the pension of the deceased beneficiary. Previously, civil servants obtained pensions from the pension fund, employees from the social coverage institution, and self-hired or self-hired from Bağ-Kur, those 3 establishments had been blended beneathneath the umbrella of the Social Security Institution in 2006 (ASHB, 2018: 89-90).

One of the oldest and maximum everyday social advantages for the disabled and the aged in our usa is the pensions paid withinside the scope of the Regulation on Pensions to the Needy, Powerless and Lonely Turkish Citizens Over sixty five, and to the Disabled and Needy Turkish Citizens, dated 10/7/1976 and numbered 15642. With this regulation, individuals who do now no longer gain from any earnings or pension from any of the social protection establishments or who do now no longer paintings in a process that calls for obligatory coverage, alimony or alimony, excluding individuals who paid pocket cash according with the provisions of the Social Services Law No. 2828 of 24/5/1983 On the idea of

all styles of earning for individuals who aren't capable of earn, the ones whose common month-to-month earnings in keeping with man or woman withinside the family is much less than 1/three of the month-to-month internet quantity of the minimal salary and people who can't earn greater than the identical quantity of earnings are decided to be needy through the Social Assistance and Solidarity Foundations (ASHB, 2018: 94-95);

1- Turkish residents who've reached the age of sixty five; Turkish residents who've finished the age of 18 and feature established that they're disabled in the sort of manner that they can't keep their existence with out the assist of a person else, through figuring out that they're at the least 70% disabled in overall, with a fitness board record to be acquired from legal hospitals withinside the framework of the applicable legislation, further to being beneathneath the age of sixty five,

2- Turkish residents who've now no longer finished the age of sixty five, have proved that they're disabled among 40% and 69% in overall with the fitness board record to be acquired from legal hospitals withinside the framework of the applicable legislation, have became 18 and feature now no longer been capable of be positioned in a process through the Turkish Employment Agency notwithstanding their request,

three- Those who're entitled to or are capable of acquire alimony, and people who gain from an earnings or pension proper beneathneath any call from any of the social protection establishments, or who've a relative who's obliged to appearance after them withinside the case of operating in a process that calls for obligatory coverage in phrases of long-time period coverage branches Turkish residents, apart from disabled youngsters, who're Turkish residents, who've now no longer finished the age of 18, and who're established to be at the least 40% disabled in overall, with the fitness board record to be acquired from legal hospitals

withinside the framework of the applicable legislation, who honestly contend with their disabled relatives,

4- Monthly help in numerous quantities is furnished to the ones whose month-to-month or earnings overall quantity is decrease than the month-to-month quantity to be paid withinside the scope of this Regulation, in step with the whole incapacity ratios, of the disabled youngsters who acquire pensions or earnings from social protection establishments as orphans.

In this context, so long as the country of want continues, the aged over the age of sixty five are granted a pension in the quantity to be observed through multiplying the indicator figure (2.332) with the civil servant pension coefficient. Salaries paid withinside the scope of the Law No. 2022 are paid in advance, quarterly in March, June, September and December of every year.

Social assistance and solidarity foundations established in all provinces and districts with the Social Assistance and Solidarity Encouragement Law No. 3294 of 29 May 1986 have their own unique structures and are legal entities of private law. . In this context, as of the end of 2016, the most prominent provinces in the distribution by provinces of a total of 449,231 elderly people over the age of 65 (the number of the elderly and the annual average amount of the aid given) who regularly or instantly benefit from the above-mentioned aids of social assistance and solidarity foundations are as follows: Annual average of 619 TL for 18,122 elderly people, 511 TL for 17,621 elderly people in Hatay, 605 TL for 15,555 elderly people in Kahramanmaraş, 620 TL for 14,594 elderly people in Manisa, 446 TL annually for 14,307 elderly people in Adana, Konya An annual average of 835 TL was given to 13,593 elderly people. In other provinces, the number of elderly people benefiting from these benefits is less than 13 thousand. Despite the size of the elderly population, Istanbul was not among the provinces with the highest number of elderly people benefiting from benefits, and an annual average of 762 TL

was given to 11,658 elderly people in Istanbul. As of the end of 2016, the most prominent provinces and the number of elderly people, respectively, in the distribution of the aid given to the elderly over 65 years of age, who regularly or instantly benefit from the above-mentioned other aids of social assistance and solidarity foundations, are as follows: In Tunceli, an average of 1,757 TL was given to 1,623 elderly people, 1,539 TL to 1,087 elderly people in Bilecik, 1,525 TL to 1,719 elderly people in Gümüşhane, and 1,449 TL to 781 elderly people in Bayburt. In other provinces, the annual average of these aids is below 1,400. As of the end of 2016, the last provinces and the number of elderly people in the distribution of the aid given to the elderly over the age of 65, who regularly or instantly benefit from the above-mentioned other aids of social assistance and solidarity foundations, are as follows: In Hatay, an annual average of 511 TL was given to 17,621 elderly people, an annual average of 558 TL was given to 11,491 elderly people in Mersin, and an annual average of 559 TL was given to 8,217 elderly people in Aydın. The annual average of these aids in other provinces is over 600 (ASHB, 2018: 98-99).

General health insurance refers to the insurance that primarily protects the health of people and finances the expenditures incurred in case they encounter health risks. Everyone residing in Turkiye is covered by general health insurance, with the exception of a small group such as members of bank funds, convicted prisoners, and those who are entitled to receive health care services from abroad. Insured employees, self-employed, civil servants, optionally insured, receiving salary and income from SGK, 65 years old, honorary pension, trainee lawyers, unemployment and short-time working allowance are covered by general health insurance. As a result of the above-mentioned transactions, the total number of elderly people over the age of 65 who benefit from the services covered by the General Health Insurance free of charge, among those whose per capita income in our country is less than one third (1/3) of the minimum wage, is 685,522 as of the end of 2016. The

addresses of 4,052 of these elderly people are uncertain, and the most prominent provinces in the distribution of the other 681,470 elderly people are respectively; İstanbul with 42,287 elderly, Diyarbakır with 30,376 elderly, Şanlıurfa with 28,447 elderly, İzmir with 22,963 elderly, Hatay with 22,741 elderly, Mersin with 22,082 elderly and Adana with 21,805 elderly. In other provinces, the number of elderly people who benefit from GSS free of charge is less than 20 thousand. It is seen that the elderly, who benefit from the services within the scope of GSS free of charge, are mostly concentrated in the big cities of the Eastern Mediterranean and Southeast, along with Istanbul and Izmir. As of the end of 2016, the provinces with the lowest number of elderly people over the age of 65, who benefit from the services covered by the General Health Insurance free of charge, are respectively; Bayburt with 1,140 elderly, Yalova with 1,248 elderly, Çankırı with 1,338 elderly, Bilecik with 1,382 elderly, Karabük with 1,387 elderly and Rize with 1,446 elderly. In other provinces, the number of elderly people who benefit from GSS free of charge is over 1,500 (ASHB, 2018: 100-101).

According to the "Regulation on Free or Discounted Travel Cards" published in the Official Gazette dated March 4, 2014 and numbered 28931, elderly individuals, disabled and their companions, relatives of veterans and martyrs, disabled people, athletes, etc. Transportation means such as city, intercity, bus, metro, tram, ferry, train and plane are discounted or free for individuals. With its social inclusion approach, this practice aims to support these groups, including the elderly, to participate in society in a manner worthy of human dignity. According to this regulation, in accordance with the second paragraph of Article 1 of the Law No. 4736, urban and intercity lines of railways and seaways, urban public transportation services belonging to municipalities, companies established by municipalities, unions, institutions and businesses or private individuals or companies authorized by municipalities. It is stated that they will benefit from

free of charge. Accordingly, veterans, relatives of martyrs, disabled, athletes, 40% or more disabled, severely disabled companions, etc. Free travel and discount rights are provided for the elderly as well as persons within the scope of the following issues. While the beneficiaries must obtain a travel card from the Ministry of Family and Social Policies in order to travel for free or at a discount, this is not required for the elderly and their identity card is sufficient. In order to determine the procedures and principles regarding the income support payment to be made through municipalities to the operators of each transportation vehicle and private sea transportation vehicle that provides urban public transportation services belonging to private individuals or companies authorized by the municipalities in the provision of services within this scope, With the "Regulation on the Procedures and Principles Regarding the Income Support Payment to be Made within the Scope of Free Travel" published in the Official Gazette No. 29585, the following matters are processed (ASHB, 2018: 101-102).

Although the General Directorate of Foundations, which is a general directorate affiliated to the Prime Ministry, does not have a direct aid arrangement for the elderly, in accordance with the provisions of the "Foundations Regulation" published in the Official Gazette dated 27.09.2008 and numbered 27010, in order to fulfill the charitable conditions in the foundation charters, pension is paid. In this context, within the scope of the assistance provided to the disabled people who are 40% or more disabled and do not have social security, pensions are also provided to the needy elderly who meet these conditions. The amount of pension to be paid is the amount to be obtained by multiplying the base pension coefficient (400) applied to civil servants' base salaries and specified in the Civil Servants Law No. 657 dated 14/7/1965, by the four hundred indicator figures. The disability pension in need is 601.43 TL as of 01.01.2017 (ASHB, 2018: 103).

The General Directorate of Social Services and Child Protection Agency, within the scope of the Regulation on Cash in Kind Aid,

which is an arrangement that primarily provides for the support of children in the family environment, in order to support the lives of the elderly who need social and economic support and who are waiting in line to be placed in institutional care, in their own environment and with their families, instead of institutional care. The elderly who will be given economic support are determined in subparagraph d) of article 6 of the Social Services and Child Protection Agency In-kind and Cash Assistance Regulation published in the Official Gazette dated 9/9/1986 and numbered 19235: "d) Social and/or economic deprivation is in; The elderly, who are over 60 years old and under 65 years old, who need protection, care and help, who want to continue their lives in their homes without being away from their social environment, and who cannot benefit from the Law No. The name of the said regulation was changed as "Social Services and Child Protection Agency Social and Economic Support Regulation" in 2011. The Regulation on Social and Economic Support Services published in the Official Gazette No. 29284 and the "Social Services and Child Protection Agency Social and Economic Support Regulation published in the Official Gazette dated 28/9/1986 and numbered 19235" were repealed, and in the new regulation, economic aid is only available. No regulation has been made regarding the elderly, limited to children and their families. Although no new social or economic support services were provided for the elderly after the change in the regulation, there are few elderly people who have been entitled to this service and whose social and economic support continues. In this framework, as of December 2016, within the scope of the Regulation on Cash in Kind Aid, there are 27 elderly people who have completed the age of 60 and under the age of 65, whose transactions are carried out by the MoFSP Child Services General Directorate, and who continue to provide cash assistance, which is equivalent to 40% of the highest civil servant salary per elderly person, including the additional indicator. A monthly payment of 354.38 TL is made (from January 2017 it has been 365.02 TL) (ASHB, 2018: 104-105).

In recent years in Turkiye, awareness about the elderly has started to increase in almost all segments, although it is not yet at a sufficient level. It is expected that this awareness will also be reflected in aging studies and services for the elderly. In this context, besides public institutions and organizations, there has been an increase in the studies of universities, private sector and non-governmental organizations on aging and aging. In this context, national and international congresses, workshops, meetings, research and projects on the elderly and the elderly have become more visible. It is certain that these studies will support and improve services for the elderly. Some of the other financial advantages and services provided for the elderly in our country are as follows. Those who receive pensions from social security institutions, if they do not have any other income apart from these pensions, have the right not to pay property tax or to pay a discount on the basis of other criteria, provided that they have a single house of their own not exceeding 200 m2. Citizens of the Republic of Turkiye aged 65 and over can enter museums and historical sites with a free ticket, by presenting their ID. Social assistance and solidarity foundations (SYDV) within the district governorships in provinces and districts can provide winter/coal aid to the elderly with the decisions of the board of trustees. There is no regulation on general electricity, water or natural gas discounts and exemptions for the elderly. However, municipalities, in line with the decisions taken in the municipal councils, water etc. to the elderly. can benefit from its services free of charge or at a discount. Fixed phone, mobile phone, ADSL, TV etc. There is no general discount in communication fees, and communication companies can make various discounts (ASHB, 2018: 105-106).

Today, performing duties related to social services, including services for the elderly, of local governments (municipalities, special provincial administrations) have become their legal duties/ responsibilities, rather than a choice. With the regulations made after the 2000s in Turkiye, social services and social assistance have

been gathered under the umbrella of the Ministry of Family and Social Policies, and local governments have been given important duties and responsibilities in the field of social services and social assistance. Regulations related to this, besides different legislation, directly or indirectly, "Metropolitan Municipality Law No. 5216 published in the Official Gazette dated 3.7.2004 and numbered 25531", "Municipal Law No. 5393 published in the Official Gazette dated 13.07.2005 and numbered 25874" and "4.3. It was clearly stated in the Law No. 5302 on Special Provincial Administration, published in the Official Gazette dated 2005 and numbered 25745, and even the transfer of social services to local administrations was envisaged (however, this has not been implemented). Although there is no general standard despite the legal infrastructure, in order to meet the needs of the society, whose demand for social services and social assistance is increasing, by municipalities in our country, besides various social services and social assistance, daytime support services for the elderly and disabled, vocational and skill courses, social and Services such as the organization of cultural events are provided. As can be seen in Annex 2, according to the information received by the ASPB, some services are provided for the elderly by 59 provinces and some district municipalities in these provinces in our country. These services are; in-kind-cash assistance, home health care, home technical service, house cleaning, personal cleaning, food services, shopping service, companion assignment, social support, social-cultural activity, psychological support, guidance service, transportation services. Municipalities that do not provide residential care services for children and the disabled have partially opened boarding care institutions for women and the elderly, but mostly by trying to stay away from residential care services especially for the elderly who require special care, by transferring even the residential care centers established by them to the central administration (ASPB). they preferred/prefer that it be given by the central administration. There are a total of 22 municipal nursing homes in only 13

provinces in our country. There are no elderly care institutions in most of our metropolitan cities, provinces and districts, including Ankara Metropolitan Municipality, which is our 2nd largest city. Despite many opinions regarding the necessity of providing social services in general, and especially services for the elderly, by local governments, it is understood that local governments in our country do not take enough responsibility, especially in elderly care services, even though they provide some services for the elderly (ASHB, 2018: 106-107).

In order to support and strengthen the services of local governments for the elderly, which are provided by a limited number of municipalities in our country, in a limited way, to ensure standardization and to expand elderly services, the ASPB aims to ensure that care and support services for the elderly are provided by being supported by their families, without being separated from their social environment, based on international developments. The Elderly Support Program (YADES) was put into practice in 2016 by the General Directorate of Disabled and Elderly Services. With YADES, the appropriation determined by the budget every year, to be used in studies to be carried out in order to develop and expand support services for day and home care, rather than inpatient care in general, as an alternative to long-term institutional care and in line with the needs of the elderly, 65-year-olds residing in Turkiye and in need of service. Projects to be prepared by metropolitan municipalities within the framework of the procedures and principles to be determined by the Ministry of Family and Social Policies, within the scope of the Elderly Support Program (YADES), in order to protect and support the elderly who are older and to facilitate the lives of those who need bio-psycho-social care in the places where they live, and to be proposed by the governorships. intended for use. The Elderly Support Program (YADES), which is a high-budget project support program in the field of old age with funds transferred from the general budget, is a project-based support program that aims to raise awareness

about old age by activating local dynamics, to support the elderly in their own home environment and to prevent their isolation from social life. In this context, 4,125,000 TL was allocated in 2016 and 5 metropolitan municipalities (Trabzon, Sakarya, Kayseri, Kahramanmaraş, Şanlıurfa) whose projects were accepted benefited from this support. An appropriation of 11,461,000 TL has been planned for 2017, and it is aimed that at least 6 new metropolitan municipalities will benefit from this support, and the process initiated in this context continues. For 2018, it is aimed to increase the number of metropolitan municipalities benefiting from the support by transferring 25.000.000 TL of resources. Within the scope of the Support Program for the Elderly (YADES), projects to be carried out by municipalities under the authority and responsibility of governorships in provinces with metropolitan municipalities are supported. In order for the YADES program to be carried out in a healthy way, the program is promoted and informative studies are carried out, YADES program and project preparation trainings are given to metropolitan municipalities, and the program is tried to be disseminated. It is planned that the work, which will continue as a project implementation for 3 years, will be transferred to the general legislation and spread throughout the country with the appropriation to be allocated to the municipal budgets. Within the scope of YADES, projects are supported within the framework of the creation and operation of a service model in which services aimed at facilitating their daily lives can be provided, including the protection and support of the elderly over the age of 65, and the support of their independent lives by providing the necessary care in the places where they live and/or in day centers, in need of biopsychosocial care. The Elderly Support Program (YADES) aims to protect and support the elderly over the age of 65 residing in Turkiye and in need of services, and to facilitate the lives of those in need of bio-psychosocial care by providing the necessary care in the places where they live, and to make these services widespread throughout the country. It is a

program that supports field practices that aim to prevent waste of resources and other potential negative problems by standardizing them (ASHB, 2018: 107-108).

Subparagraphs (f) and (g) of Article 10 of the Decree Law on the Organization and Duties of the Ministry of Family and Social Policies No. 633 and line 75 of the table marked (E) attached to the 2016 Central Government Budget Law and numbered 5442. The Elderly Support Program (YADES) Project Implementation Procedures and Principles regarding the studies to be carried out on the subject, based on Article 9 of the Administration Law, have been prepared, and the services that are planned to be included in the projects to be carried out within this scope are as follows (ASHB, 2018: 108-109):

a) Home care support and home care services for the elderly: In cases where the household is insufficient in relation to the care of the elderly, alone or despite other support elements such as neighbors and relatives, it is offered to improve the living environment for the elderly to continue their lives at home, and to help with their daily living activities. social, physical and psychological support services.

b) Psychosocial support services: Psychosocial support activities needed by the elderly and the people who take care of the elderly or the people they live with.

c) Technical support services at home: Taking spare parts and other materials from the elderly in matters such as electrical household appliances, plumbing, paint, minor repairs that fall under the jurisdiction of the relevant technician, performing maintenance and repairs, and providing guidance when necessary.

d) Creating a mobile team: Providing the mobility of the personnel, tools and equipment that will provide transportation to the residence address and place of service of the elderly in order to provide the service, and ensuring the transportation of the elderly

who need home health support to the relevant institutions and services within the scope of the project.

e) Establishment of a coordination center: Establishing a center affiliated to the relevant municipality or the relevant unit of the municipality, where call tools or direct applications are met and recorded, service delivery is organized for demands and needs, and necessary guidance and coordination are provided.

Other supporting activities and services that can be included in the project are:

a) Establishment of a call center under the control of the coordination center.

b) Daytime solidarity, awareness/awareness services, social cultural activities, training and course services, consultancy and guidance services.

c) Day care services.

d) Establishing an elderly database, which includes data on elderly care needs, including the need for home care for the elderly, throughout the province.

e) Services for increasing the quality and prevalence of protective and preventive services.

CONCLUSION

In the process of demographic transformation, the phenomenon of aging has begun to affect all countries of the world, albeit at varying speeds. In addition to the health problems that arise with the aging process, the fact that other problems constantly increase the social and economic burden of countries causes the issue of elderly care to come to the fore in societies and an increase in efforts to improve elderly care services. With the aging of the population, it has become important to provide sustainable care services sensitive to the needs of the elderly population. Parallel

to the increase in the number of the elderly, the old age area is multidimensional; In this context, elderly care needs and services are also growing in all aspects. Although home care is a priority at the point reached today, institutional care services such as home care and day care needs and services continue to develop (ASPB, 2018).

Aging, the aging process, meeting the needs brought by this process and adapting to changes is a subject that needs to be fed by different disciplines. Elderly care for our rapidly aging population is also an area where necessary arrangements and interventions should be carried out in cooperation with the relevant fields in order to be developed by considering it in a multidisciplinary framework and to adapt to the changing demographic structure. "Population aging", which is one of the important social developments in the last fifty years all over the world; With the increase in the share of the elderly population in the society, the importance of social policy and social work practices for the elderly has increased even more. In response to the rapid increase in the elderly population, it is important to provide elderly care services. In developing countries such as Turkiye, the needs for care services differ, since the rate of increase in the elderly population does not occur at the same time.

As people's life expectancy gets longer, issues related to aging have begun to be discussed and talked about more. The concept of active aging is one of them. With this concept, it is aimed to maximize the opportunities of the elderly, who have completed their long working life and retired with their own income, in terms of health, security and participation in social life.

The Turkish government transfers a share of its budget to the elderly in terms of services and aids. In addition, thanks to the social policies implemented by local governments for the elderly, elderly citizens benefit from all services, especially transportation. Thanks to these services, elderly people continue their lives without being separated from the society.

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CHAPTER 15

Digital Transformation in Logistics: Lights-Out Logistics

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1. INTRODUCTION

From the past to the present, people's activities and behaviors have changed with social, economic, environmental, and technological developments. Changes in the environment, economy, and technology have also affected production and distribution activities and pushed them to innovation. As a result of innovation efforts in production and distribution, autonomous communication technologies and tools have started to be used

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(Maslarić et al., 2016). With digital technologies, radical changes have occurred in processes, operations, and all business models. These changes have been effective in many areas. One of the sectors experiencing digital change is the logistics sector (Wei et al., 2019).

Developments in many different areas, including production, supply, and logistics, have contributed to the progress of robotic science, along with the idea of digitalization. Even though the concept of intelligence is accepted as one of the most important differences between humans and machines, today, thanks to the developments in robotic science, the difference between humans and machines is gradually closing. In addition to many disciplines such as psychology, engineering, and computer science, many technological factors such as artificial intelligence, machine learning, and big data have contributed to robotics science (Hacioğlu, 2020). The development of robotics has also affected the logistics industry because the need for industrial robots is very high. In logistics activities, robots should allow the differentiation of products, distinguish various parts from an infinite number of possible combinations, act by perceiving the environment, and interact with the environment (Mikušová et al., 2017). Smart logistics is a topic of discussion due to the increasing prevalence of robots in the logistics industry. Logistics operations can be made more efficient with the help of the Internet of Things, information and communication technologies, and artificial intelligence, among other applications. Increased study in logistics and the emergence of new "smart" logistics applications are both results of these advancements (Feng and Ye, 2021).

Recent technological advancements have resulted in extensive changes within the logistics industry, and in response, the term Logistics 4.0 has emerged. The Logistics 4.0 paradigm in Industry 4.0 shares many characteristics with its constituent parts. This idea is a byproduct of the evolution of logistics into intelligent logistics, which entails a shift from a focus on hardware to one

on software. Autonomous systems and their subsystems are what constitute smart logistics and are required for its realization. Faster information dissemination and stakeholder coordination are two benefits of autonomous systems. Therefore, systems can pick the best optimization automatically in a crisis.

For this reason, Logistics 4.0., smart logistics, and the concept of Lights-Out logistics, a related concept, is a revolution for technology-oriented logistics applications (Timm and Lorig, 2015). Lights-Out logistics is a new concept brought to the literature with the technologies in question. This concept is essentially derived from the "Lights-Out factory" approach. The Lights-Out factory is a production facility where production activities are carried out utterly unmanned without the need for workforce, light, and windows, thanks to robotic technologies, artificial intelligence, and internet technologies (Erdoğan, 2019). Therefore, Lights-Out logistics can be expressed as the carrying out of logistics tasks without the presence of a human being.

Today, the logistics industry has started to automate its activities by using various business robots while doing its activities manually with digitalization. The logistics sector has started to carry out logistics activities with minimum or zero human intervention with technology. These developments have revealed the concept of Lights-Out logistics. However, when the literature is examined, there are very few studies on this concept. Therefore, this research has attempted to clarify the meaning of "Lights-Out logistics" by examining its connections to "Logistics 4.0" and "autonomous logistics."

2. DIGITALIZATION IN THE LOGISTICS SECTOR

Logistics has been an important issue since the earliest times of history. Today, logistics is a process carried out to meet the high level of customer service by responding to competitive price, quality, and market demands more quickly. In this process,

businesses should be able to provide a competitive advantage against their competitors (Slats et al., 1995).

Logistics aims to satisfy customer demands and wishes by controlling the flow of services and goods from the point of origin to the final destination. Handling, production, packaging, transportation, inventory management, and storage are all part of logistics. Delivering the right product or service at the right price, to the right store, in the correct quantity, and to the right customer at the right time is crucial to the success of the logistics industry (Soysal and Bloemhof-Ruwaard, 2017). There is a direct correlation between logistics and business success in the supply chain (Qaiser et al., 2017). Digitalization is crucial for the logistics industry to succeed.

The rapid growth of technology from antiquity to the present day is mainly responsible for the emergence of the digital age. The creation of long-lasting value is sped up by technological advances enabled by digitalization. The advent of digital technologies has resulted in profound shifts in every facet of the business. Overall, the effects of these adjustments have been positive. The logistics industry is undergoing digital transformation (Wei et al., 2019). The dramatic changes in society and industry brought on by the advent and proliferation of digital technologies have resulted in the concept of digital transformation becoming used and discussed in the academic community. In the wake of the Fourth Industrial Revolution, a digital transformation has begun in the logistics and supply chain, with sensors, networks, and complete automation across all industries (Kern, 2021). For businesses to ensure continuity, logistics activities must act in an integrated manner with digitalization. Companies have prioritized and heavily invested in digitalization across the board, including the logistics sector, to take advantage of the many benefits it brings to business generally. Optimizing production and transportation services through digitalization has also elevated the prominence of production and distribution technologies (Bardakç, 2020).

Changes in the logistics sector are divided into various periods, and there are four stages in the historical process, just like in the industry. These stages range from logistics 1.0 to logistics 4.0. With this change, the logistics sector's technological, social, demographic structure, and market conditions have also changed (Radivojević and Milosavljević, 2019).

3. LOGISTICS 4.0

Regarding production technologies, there are four fundamental revolutions in human history. In these revolutions, the steam locomotive was used in freight and passenger transportation, converting steam power to kinetic energy. Steam power is not limited to this but is also used in production processes (Kaya and Özcan, 2020). The second revolution is the discovery and use of electricity. This discovery has gained a quality that changes not only the production processes but also the whole way of life of human beings. The products produced with mass production have been delivered to people in a cheaper, faster, and more efficient way. In the 1970s, import-substituting production policies encouraged value-added production, and scientific innovations and automation technologies were developed (Gunay, 2002). Today, "Industry 4.0", which can communicate with each other through networks and focuses on production based on continuous learning with artificial intelligence technologies, has entered our lives. The term "Industry 4.0", accepted as the beginning of the transformation phase of smart factories from idea to reality, was first announced by the German Federal Government in 2011 as one of the main initiatives of high technology strategy (Hermann et al., 2015).

Logistics has also experienced a constant change from past to present. The logistics sector has developed and renewed this change by following all the changes made in the social, industrial, and technological fields and keeping up with the innovations. Logistics 4.0 has developed in line with technological developments as a

result of developments in the 21st century and continues to develop (Radivojević and Milosavljević, 2019).

There have been four significant changes in logistics since the 1980s. The introduction of water and steam-powered machines in the late 19th and early 20th centuries marked the beginning of the first wave of technological advancements in logistics, often referred to as "Logistics 1.0." Transportation of large quantities of containers and cargo over great distances has historically relied on steam-powered ships and trains rather than on human or animal labor. The heavily used highway has been replaced by the railway and seaway, and the carrying capacity has been significantly increased. The second innovation, Logistics 2.0, emerged in the 1960s as the automation of the transport system, thanks to electric power and mass production. Machines powered by electric motors can now perform the bulk of logistical work thanks to the widespread adoption of technologies like automated storage and retrieval systems and loading and unloading mechanisms. The port's use of container ships has increased, and the reliance on manually operated machinery in warehouses has given way to the employment of electrical workers. The third innovation, Logistics 3.0, came to the fore in the 1980s with the development of computer and information technologies and was called the systematization of logistics management. Logistics information technology systems, such as Warehouse Management and Transport Management, have greatly improved the automation and efficiency of logistics management, inventory, and shipments. Logistics 4.0, the fourth industrial revolution, is still evolving and expanding today, particularly in areas related to the Internet of Things and the digitalization of logistics procedures (Wang, 2016). Logistics 4.0 is seen as one of the spillover effects of Industry 4.0 (Oleśków-Szłapka et al., 2019). The first emergence of the concept of Logistics 4.0 was in 2011. This concept is a concept that emerged to support industry 4.0. Today, concepts such as supply chain, marketing, distribution, inventory, and

order management are also in their fourth stage—logistics 4.0. The concept develops concerning the industrial revolution and technological developments (Radivojević & Milosavljević, 2019). Logistics 4.0 is an idea that seeks to eliminate the need for human labor in the logistics sector altogether (Poli et al., 2018). The concept of Logistics 4.0 is a concept that develops technologies and applications for the improvement of logistics stages. Logistics 4.0 integrates previously separate logistics processes, such as storage and shipping, to address issues with a more streamlined flow of both physical and digital data (Pawlak et al., 2020). Logistics 4.0 can boast of other vital functions: data mining, auxiliary decision-making systems, networking and integration, decentralization and cohesion, self-organization, and autonomy (Prinz et al., 2016).

According to Hofman and Rüsch (2017), two dimensions explain how logistics is affected by Industry 4.0. The first is the physical aspect of the supply chain, which may involve autonomous logistics subsystems like autonomous picking robots or order processing via smart contracts in blockchain technology. The second dimension is the digital supply chain, which includes the Internet of Things (IoT) and other technologies. The second model is called the digital data value chain, which incorporates information gathered with the help of object-assisted technologies.

Logistics 4.0 (Oleśków-Szłapka and Stachowiak, 2018; Tang and Veelenturf, 2019):

- Harmonizes the real and virtual worlds
- Improves supply chain processes
- Reduces the design cost of the products
- Enables the products and services produced to meet consumer needs to reach the consumer more quickly.
- Reduces the risk of errors in the operation of processes
- Provides advanced technology for unlimited data analysis

- Allows all system users to make decisions autonomously
- Makes the supply chain visible and flexible
- Delivery services run by drones or delivery robots speed up delivery
- Provides high reliability in warehouse processes with the use of robot warehousing
- Provides efficiency increase in container loading and transportation with blockchain technology
- Saves labor as autonomous machines and robots do the work.

4. AUTONOMOUS LOGISTICS

Today, where automation and technologies are so important, businesses need to be able to use automation and technologies well in order to exist in a competitive environment both inside and outside. Automation and technological innovations contribute to the automation of enterprises by directing them to innovations in how companies do business (Hacioğlu, 2020). Companies gain the ability to remotely control machines by eliminating complexity with automation. Therefore, with proper planning, the machines can be operated for a long time without supervision. This way, the company can continue its activities by minimizing or completely zeroing its workforce (Noël et al., 2007).

Autonomous logistics includes activities related to the automation, placement, and inventory of all physical assets (Fink et al., 2017). In autonomous logistics, algorithms that define the decision-making behavior of each object and autonomous control methods are essential factors that ensure success in the independent implementation of control in logistics systems (Windt et al., 2010).

According to Roser (2016), the use of robots in production processes was rarely encountered in the middle of industrial

evolution. During this period, the use of robots was more concentrated in dangerous or labor-intensive jobs. However, in the 1980s, the American automotive industry, which entered into a transformation with the pressures of the political environment, implemented a strategy based on completely robotizing its production processes against the Japanese production philosophy based on lean production. This transformation process, led by the American automotive manufacturer General Motors, was owned by the company's top manager, Roger Smith. Smith thus aimed to minimize the human factor and gain a competitive advantage over the superior productivity of its Japanese competitors. The definition of a lights-out factory was first encountered in this period. However, despite the investment of 45 billion dollars, the desired efficiency could not be achieved, and even General Motor was ridiculed at that time by saying that robots painted themselves instead of cars and closed doors designed to be opened with welding (Business Strategy Review, 2003; Null & Caulfield, 2003). As can be understood from the example, technological maturity in production systems must be sufficiently advanced for a disruptive innovation such as the lights-out factory. At the point we have reached today, with the developing technologies in production systems, many sectors have been highly automated, even if they are not entirely lights-out factories, and the share of labor in production factors has gradually decreased. Robots are widely used to boost business output and progress. Today, robots are one of the most critical applications used in the industry. By producing a wide variety of robots, many jobs done by humans have begun to be done by robots. As technology has advanced, robots have found widespread application in fields as diverse as agriculture, the automotive industry, supply chain management, and logistics. Economic productivity has increased with the use of robots and automation. These positive developments have also increased the competitiveness of enterprises. The increase in robotic applications is an essential economic indicator in the development and progress of the country (Tyurina et al., 2019).

The use of robots in modern logistics applications is a crucial factor in determining the success or failure of businesses today (Wang and Du, 2016). Today, robots are essential in closing workforce gaps and increasing efficiency, productivity, and product quality. The development of the logistics industry requires a lot of robot technology. The vast majority of the logistics industry uses artificial distribution routes. As the logistics industry has grown, so have labor costs and the prevalence of mistakes made during the distribution phase. In addition, as the economy has evolved, logistics jobs have become increasingly crucial. The logistics industry, realizing the need to invest in technology to sustain its growth, has begun to do so, primarily by deploying computers and robotics (Wang and Du, 2016).

Robotic transport systems have become an application being used more and more in logistics activities. Robotic handling systems have some benefits. These benefits are (Azadeh et al., 2019; Østergaard , 2018):

- Since they have a flexible structure in meeting changing demands, they are more advantageous than other applications.
- They have the opportunity to work 24/7.
- They are very convenient and valuable for e-commerce transactions.
- They facilitate the integration of subsystems and bring them to a more advantageous position.
- Develop new solutions to operational challenges.
- Robots meet demands for higher quality products at lower costs. It also improves the product's quality and the production line's flow rate.
- Robots reduce costs and help to reconsider activities such as production and logistics.

- They save employees from repetitive tasks and tedious and dangerous tasks.

Robots analyze shipments of different sizes and help optimize operations such as loading and unloading. Today, with the creation and development of new generation technologies, faster computer technologies and more extensive and accurate data analysis have enabled acceleration and development in logistics. The increased use and number of new technologies in many sectors have improved robots' use and application capabilities (Mikušová et al., 2017).

Until recently, robots were machines without much mobility and intelligence. These robots only could simply repeat the task. This feature of robots was seen as sufficient for businesses in production processes, but these features of robots are not sufficient for logistics activities (Landi et al., 2018). The use of robots in logistics activities has become a vital necessity. The automation that emerged with the use of robots has allowed businesses to become more flexible, reduce costs and facilitate many logistics activities. Although most logistics activities are done manually, this situation has become the opposite with increasing technology and automation today (Mikušová et al., 2017).

5. LIGHTS-OUT LOGISTICS

Lights-out logistics is a new concept in the literature. Therefore, an adequate flow of information about the components of lights-out logistics is not yet available in academic applications. Despite this, a future perspective has emerged on some issues, such as autonomous delivery (Figliozzi and Jennings, 2020) and warehouse management, which are some logistics components. The autonomous warehouse market will be predicted to double by 2025 (Material Handling Systems, 2020).

Today, some important new concepts and technological innovations are partially used in the Planning, Transport,

Processing, Storage, and Distribution processes (Lambert et al., 1998), which are among the logistics activity processes. These innovations are the pieces that will complete the puzzle in the lights-out logistics transformation process. Artificial intelligence and Radio Frequency Recognition Technology (RFID) are the most important new concepts and technologies frequently used in the logistics process in recent years. Artificial intelligence is a continuously learning, software-based organism that can perform human-specific cognitive functions such as perception, reasoning, learning, and problem-solving (Iyer, 2021). Artificial intelligence (AI) and machine learning (ML) are two areas that have seen significant progress in recent years. Artificial intelligence and machine learning are two examples of cutting-edge technologies that have helped us begin to find solutions to long-standing problems in different industries. These technologies have many applications and have benefited many fields already, including the medical, automotive, financial, and logistics fields. Companies of all sizes and sectors of the economy need to implement cutting-edge technological strategies to compete in today's global market (Haciolu, 2020).

RFID is an automatic identification technology that provides contactless access to the desired data by using the signals created by radio frequencies. RFID enables object identification to be done accurately and quickly in various challenging environments without requiring manual intervention (Sun, 2012). RFID is one of the crucial technologies in logistics, the use of which is becoming more and more common day by day. Many solutions, such as product identification, tracking of product movements, and real-time data sharing, can be produced using RFID in the entire supply chain. RFID can be used in various ways, but all require two main components: an antenna and a tag with a microchip. The serial number and other information specific to a given object are kept in the tag.

On the other hand, the antenna allows the information embedded in the tag to be transmitted to a reader, which converts the information on the RFID tag into a format that computers can understand (Casella et al., 2022). As an Internet of Things (IoT) component, RFID is one of the leading technologies that will contribute to transparency in logistics. Iot refers to a network of physical objects connected to the Internet that can interact automatically and promptly (Wu et al., 2022). With its emphasis on standardized and interoperable communication protocols, IoT is an integral part of the future Internet. In this framework, real-world and digital "objects" are endowed with unique identities, characteristics, and personalities, capable of configuring themselves and interacting with one another through intelligent interfaces and sharing data in real time. It could be thought of as the framework for a network (Sundmaeker et al., 2010). The Internet of Things (IoT) is a driving force behind Industry 4.0 because it will allow for sophisticated automation, data collection, analytics, and optimizing workflows and processes. Likewise, the Internet of Things will aid producers in comprehending real-time information from the supply chain (Shrouf et al., 2014).

Digitalization applications are used in order to automate logistics activities fully. Digitalization in logistics reveals intelligent logistics applications, namely lights-out logistics (Windt et al., 2010).

Smart logistics is identical to lights-out logistics in terms of definition and characteristics. By leveraging the Internet of Things (IoT) and other forms of intelligent information technology, smart logistics work to make all processes fully autonomous and facilitate the widespread integration and application of the logistics value chain. According to the sophistication of the underlying technologies and the predominant logistics management strategies, the idea of smart logistics can be broken down into four distinct phases (Feng and Ye, 2021). In the first phase of smart logistics, all logistics-related intelligence is concentrated

on a single task. At this point, real-time data-based forecasting, intelligent algorithm-based facility planning, and optimizing transport routes and storage facilities have become the norm. The second phase of smart logistics is where all that logistical operation intelligence comes together. The third phase of smart logistics plans to optimize the entire logistics procedure from a supply chain viewpoint. Intelligent technologies allow supply chain partners to work together more effectively and efficiently. Realizing logistics integration of a cross-supply chain through smart technologies and novel forms of cooperation is smart logistics' fourth and final phase. The most critical logistics management task at this point is optimizing resource allocation between parallel homogeneous and heterogeneous supply chains (Feng and Ye, 2021).

As a result of the concepts and literature review to explain lights-out logistics, it is seen that lights-out logistics are smart logistics activities. Lights-out logistics can be defined as logistics activities in which all logistics activities are carried out automatically without the need for physical effort. Lights-out logistics can also be expressed as the complete automation of the logistics process and the provision of technologies that will not require a workforce.

6. SUSTAINABLE LOGISTICS

Digitalization, automation, and robotic technology will contribute significantly to sustainable logistics activities. In recent years, besides the economic effects of logistics, its social and environmental effects also have an important place. As the effects of logistics activities on the environment have gained importance, logistics and environmental factors have gained importance to researchers, and the concepts of "green logistics, sustainable logistics" have emerged (Qaiser et al., 2017).

Logistics and transportation activities are the centers of global trade and an essential point in global competition. Logistics, as a term, has evolved. Sustainable logistics practices have replaced

conventional ones. Developing environmentally responsible modes of transportation is a critical social issue. Sustainability in logistics encompasses environmental, economic, and social goals. Advanced logistics and supply chain practices significantly contribute to establishing a sustainable transportation system by affecting all sectors, making them more efficient, cost-effective, reliable, measurable, and able to provide a competitive advantage (Lu and De Bock, 2016).

The most crucial aim of the sustainable logistics system is to minimize the environmental effects by increasing profitability and providing long-term performance. Before purchasing products or services, consumers need to have information about product quality, green product production, and businesses' environmental and social responsibilities. For this reason, it is necessary to implement a logistics system that considers long-term improvement for the sustainability of the enterprises. A sustainable logistics system creates a distribution and management system that integrates a logistics system while improving business performance in the long term, ensuring sustainable development (Wichaisri and Sopadang, 2013).

Sustainable logistics help identify sustainable logistics initiatives that are effective in strategic decision-making. Businesses do not have much information about the problems and problems they will experience. For this reason, businesses can make the right decision by using sustainable logistics practices when making decisions or developing strategies (Björklund and Forslund, 2019).

The warnings made by scientists in the past years and considered utopian are experienced with all their reality today. This situation also caused pressure on countries to make environmentalist decisions and brought about radical policy changes. With the Paris Agreement signed in 2015, the most significant reflection of this change occurred in the European Union, and the Green Deal was one of the main policy commitments in the 2019 elections. To

combat climate change, the European Union (EU) has mandated a drastic reduction of greenhouse gas emissions by at least 55 percent by 2030. (European Commission, 2019). Soon, it is expected that various sanctions and obstacles will be imposed on international trade under the name of carbon pricing by countries to consume investments in cleaner and more sustainable ways (World Bank, 2020).

7. CONCLUSION

The most essential and fundamental factor in logistics processes is digitalization. For the business to survive, it must be integrated with digitalization. The significant contribution of digitalization to business pushes businesses to invest more in this area. In the globalizing world, the most critical factor for businesses to survive and gain a competitive advantage is to invest in digitalization and implement it (Bardakçı, 2020). Digitalization activities help to provide a long-term competitive advantage in logistics activities by providing advantages such as improving logistics performance and reducing logistics costs (Woschank et al., 2021). According to research by Dudukalov et al. (2021), businesses that invest in and utilize emerging technologies gain a competitive edge because of enhancements in information availability, cost savings, quality of products, ability to respond, and teamwork. The use of technology in logistics has a positive effect on business performance, according to research by Aslan et al. (2018). These technological advances also contribute to the issue of trust in the logistics sector. Products can be followed more easily by all parties involved in the supply chain with the help of traceability and visibility tools. Technologies like blockchain will soon put the issue of trust between actors on a firmer ground while guaranteeing transparency in the procurement process. It is predicted that all these developments will increase the service quality and provide a competitive advantage to the companies in terms of customer satisfaction (Yıldız, 2020). Automation, robot, and computer technologies should increase

consumption and make it more flexible. This situation puts significant pressure on the logistics industry because automation and robots are two critical factors in increasing profitability and reducing production costs (Patricio and Mendes, 2020).

Supply chain management is also significantly impacted by Industry 4.0, which helps lower costs, increase productivity, efficiency, and flexibility, and enhance product customization within Industry 4.0. As a result, the supply chain is rapidly adopting digitalization, automation, and flexible management practices. When it comes to the production system as a whole, everything from the infrastructure and organizational structure to the products, services, and business models will be impacted by Industry 4.0. Companies that do not invest in pilot projects and educate themselves about these new technologies will lose their competitive advantage and the chance to take the lead in the transformation currently spanning the manufacturing sector. Throughout history, the field of logistics has developed and constantly adapted to the needs of the population, current technological trends, and challenges. The concept of logistics 4.0 imposes requirements on companies, such as significant financial investments, implementation risks, stringent infrastructure requirements, new levels of training, and qualified personnel. Meeting these requirements and meet potential challenges will be possible through the entire company's commitment to change, improving technology and processes, and developing its intellectual resources to support the changes.

From a review of the relevant literature, it is clear that digitalization has resulted in technological advancements in various fields. Logistics is one industry that is undergoing technological changes. As a result of the rise of digitalization, the logistics sector has begun to manually automate its processes by deploying a wide range of business robots. The logistics sector has started to carry out logistics activities with minimum or zero human intervention with technology. These developments have revealed the concept

of lights-out logistics. From the explanation of lights-out logistics provided by the concepts and literature review, it can be deduced that lights-out logistics is an example of smart logistics. Lights-out logistics can be defined as logistics activities in which all logistics activities are carried out automatically without the need for physical effort. Lights-out logistics is the complete automation of the logistics process and the provision of technologies that will not require human hands. The concept of lights-out logistics will become a phenomenon that we will frequently hear about with the technological advances we will experience in the hardware and software sectors in the coming period. For this reason, it has become more critical than ever to facilitate companies' integration into processes and improve the quality of technology, communication, and human resources. States, on the other hand, need to prepare the necessary infrastructure, raise awareness to realize the necessary legal transformations and take social policy measures by considering the positive and negative externalities that may be experienced in the labor markets.

With the development of lights-out logistics, it is expected that many factors, such as shortening processing times, energy efficiency, and more effective resource planning, will contribute to sustainability in the logistics sector. Technological advances are undoubtedly possible by equipping human resources with advanced competencies. It can be predicted that the lights-out logistics applications will bring about the replacement of blue-collar employees employed in the logistics sector with employees with more qualified digital competencies.

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Financial and Economic Issues in Emerging Markets

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The world is experiencing a severe change and transformation in every field with the effect of globalization that emerged in the last quarter of the 20th century. These changes make themselves felt primarily in the economic area. In particular, the globalization and liberalization of financial markets bring along a series of changes, opportunities, and risks in both economies and financial systems worldwide. Owing to the effect of economic globalization, and the emergence of complex and dynamic financial transactions that significantly redound the uncertainties, notedly in emerging markets, have gradually increased market participants' financial risks.

This process has augmented the efforts of banks, non-bank financial institutions, institutional investors, and companies to search for methods and tools to better control the risks they face by applying complex strategies to hedging. To this end, parallel to the development of new financial instruments and markets that led to the emergence of complex and dynamic financial transactions, risk measurement and management techniques have also significantly changed.

The global risks that have recently arisen from different sources like health, energy, food, climate, military, politics, etc., are more evident in the economic area. Many studies have been conducted in the academic literature to measure and understand the economic impacts of these global risks based on different sources and to develop solutions. This study, titled "Economic and Financial Issues in Emerging Markets," is the product of such an effort. This study contains fifteen chapters written by twenty-nine academicians and experts in their fields. The book includes mainly theoretical and applied studies on risk, return, exchange rate, stock market, emerging markets, economic growth, energy, and logistics.

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