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THE RELATIONSHIP BETWEEN BRENT OIL PRICES AND THE BIST 100 INDEX

Onur Çetinkaya
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BRENT PETROL FİYATLARI VE BİST 100 ENDEKSİ ARASINDAKİ İLİŞKİ

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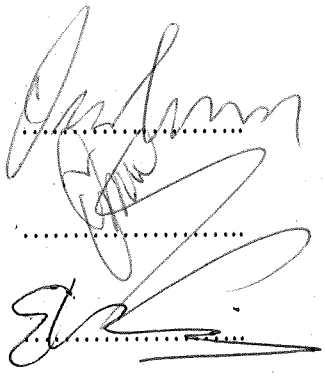

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Anahtar Kelimeler (Türkçe)	Anahtar Kelimeler (İngilizce)
1) Brent Petrol	1) Brent Oil
2) Borsa	2) Borsa
3) En Küçük Kareler Metodu	3) Ordiary Least Squares Method
4) Vektör Otoregresyon Modeli	4) Vector Autoregression Model
5) Bist 100 Endeksi	5) Bist 100 Index

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LIST OF ABBREVIATIONS

OP = Oil Price

SM = Stock Market

BIST = Borsa İstanbul

SV = Stock Value

BSP = Brent Oil Prices

IR = Interest Rate

ER = Exchange Rate

INF = Inflation

CPI = Consumer price index (Inflation)

DR = Discount Rate

BI = Borsa Index Price

DBI = Borsa Index Price (1st difference)

DBSP = Brent Oil Prices (1st difference)

DDR = Discount Rate (1st difference)

DER = Exchange Rate (1st difference)

DCPI = Consumer price index (1st difference)

ABSTRACT

The aim of this research is to determine the relationship between Brent oil prices and the stock market of Turkey. The past researchers have identified a significant negative relationship between the two variables while the very few studies have implied a positive association or insignificant linkage between the two. The methodology used for this purpose is quantitative with correlational research design and secondary data collection from authentic sources. The data has been analysed using various statistical tools, including descriptive statistics, Granger causality, VAR and OLS regression. The overall findings suggested that there is a positive but insignificant impact of Brent oil prices on the stock market of the country. In conclusion, the overall findings, limitations and recommendations from the study have been discussed in detail.

ÖZET

Bu araştırmanın amacı Brent petrol fiyatları ile Türkiye borsası arasındaki ilişkiyi belirlemektir. Geçmişteki araştırmacılar, iki değişken arasında anlamlı bir negatif ilişki tanımlarken, çok az sayıda çalışma, ikisi arasında pozitif bir ilişki veya önemsiz bir bağlantı olduğunu ima etmiştir. Veriler tanımlayıcı istatistikler, Granger nedensellik, VAR ve OLS regresyonu gibi çeşitli istatistiksel araçlar kullanılarak analiz edilmiştir. Genel bulgular Brent petrol fiyatlarının Bist 100 borsası üzerinde olumlu fakat önemsiz bir etkisi olduğunu ortaya koymaktadır. Sonuç olarak, çalışmanın genel bulguları, kısıtlamaları ve önerileri ayrıntılı olarak tartışılmıştır.

CHAPTER 1: INTRODUCTION

1.1. RESEARCH BACKGROUND

There is an increasing consideration among various market practitioners, policymakers and academics concerning the roots and impacts of fluctuations in oil prices (OPs) (Baffes et al. 2015; Arezki and Blanchard, 2015). Numerous determinants of supply and demand are recognised to impact OPs. Fluctuations and changes in OPs can dissimilarly impact the economy, relying on the determinants steering the change. The power to understand the particular driver has significant effects on the fitting policy response to varying macro-financial situations from domestic and international viewpoints (Fueki et al. 2018).

It is found in the study of Yoshino and Taghizadeh-Hesary (2014) and Hamilton (2009), that after the 1973 oil price shock, volatility in energy prices and its repercussions on the macroeconomy became a significant domain of investigation in the area of economics. The 1979 oil shock was triggered by the reduction in oil supply which underlined again the importance of instantaneous energy price variation. The attentiveness in fluctuations of OPs and their role in the economy were reintroduced yet again because of a considerable rise in OPs at the start of 2008 and saw a massive drop during the Lehman crisis in 2008.

Oil is a significant commodity and strategic in nature that impacts the global economy. The importers and exporters of the oil are probable to experience the impact of oil price changes (Moawad, 2016). Since 2014, there was a considerable decline in OPs ending a 4 year period of stability in prices. It was not unprecedented, but a significant decline in OPs in terms of speed and size. In the last 4 decades, a series of price decline around 30% were seen coinciding with significant geopolitical events in the Middle East; oil markets and international economy

(Moawad, 2016). The sharp declines of such levels led to the heated debates regarding the causes, consequences and appropriate policy to the drop in OPs.

The fluctuations in OPs surely impact economic activities in every country. For example, Alekhinna and Yoshino (2018) argued that usually the fluctuations in OPs considerably impact product costs of oil importers and hence, price levels, whereas, in countries with energy exports, OPs largely impact the revenues of energy export and as well as government budget. Crude oil is by far the key source of energy globally, primarily because of its easy extraction, refining and transportation and high energy density. The researchers, Alekhinna et al. (2018) examined the interrelationship between the key macroeconomic meters of global OPs and oil-exporting countries. The outcome of the research proposes that fluctuations in OPs have a considerable effect on real GDP, exchange rate, interest rate and CPI inflation rate of oil-exporting countries. In the context of Asian economies, instability in prices of crude oil also impacts the economy. As per the findings of Imran et al. (2012); Malik (2008); Kiani (2011); Nazir and Qayyum (2014) and Ahmad (2013), prices of crude oil adversely impacts economic growth, because of the increase in production cost, making the production process exorbitant and making end consumers to bear the burden.

According to Khan et al. (2017), changes in the prices of crude oil not only impact the production zone, but it also affects the energy sectors and other related sectors of a country's economy. It is found that high prices of crude oil have a direct impact on the cost of manufacturing, gasoline, power generation and home heating oil. The crude oil prices in relation to Pakistan adversely impact the economic growth and also directly affect the household consumers, urban centre transporters and farmers in rural areas. Due to the above-mentioned

factors, the rise or changes in OPs negatively impacts economic growth and are considered bad indicators for development and growth of the economy.

Other than the economy, changes in OPs also impact the financial and stock markets (SMs). In terms of the financial market, Hesse and Poghosyan (2016), highlighted that the significance of OPs is widely acknowledged for the economic development of countries exporting oil. Nevertheless, the consequences of oil price shock on financial institutions, i.e. banks, have so far lacked empirical analysis. It was noted in the study that the association between bank profitability and OP shocks has been misleading by the financial crisis of 2008, at the time when oil price shocks overlapped with falling bank profits. It was suggested in the research that the effects of global shocks apart from the developments of OP should be considered when analysing the association between bank profitability and OP shocks.

Previous research has discussed the lower prices of oil are conventionally viewed to be good for economies dealing in oil exports, for example, the U.S (Nguyen, Nguyen and Pham, 2014). However, the study found statistically insignificant but positive effects of OPs on SMs in the U.S. Nevertheless, the dramatic and swift drops in OPs recently and the associated movements in financial markets has become a matter of concern. Youssef and Mokni (2019), investigated that the oil market's role in developing the dynamic relationship between SMs of oil-importing and exporting countries. Largely the findings reveal that the reaction of the SM to shocks of OPs is time-varying and differs between negative and positive values, even though positive values succeed for oil-importing and exporting countries. In addition, the effect of OPs shock on returns of the SM for oil-exporting countries is relatively higher as compared to oil-importing countries. Hence, the outcome advocates that oil-exporting countries' SMs are more vulnerable to OP shocks.

Similarly, Basher, Haug and Sadorsky (2012) investigated the link between emerging SMs, exchange rates and OPs. The result of the study points out that in the short-term, OP shocks likely to reduces stock prices of emerging markets and exchange rates of US dollar. Furthermore, the study pointed out that the oil-production shock reduces the prices of oil while the prices are increases through positive economic activities. On the other hand, by using EGARCH Model, Filis, Degiannakis and Floros (2011), observed the relationship between OPs in Russia and SM. It was informed that when events such as the 9/11 attack, the 2003 Iraq war and the 2006 Iraqi civil war happened, a negative relationship was triggered between the Russian SM and OPs.

The aim of the present research is to study the relationship between Brent oil (BO) prices and BIST (Borsa Istanbul) 100 Index. Brent crude is also denoted as Brent blend which is one of the 3 main oil yardsticks used in oil contract trading. Dubai/Oman and WTI (West Texas Intermediate) are the other two key yardsticks (Mabro, 2006). According to Speight (2011), oil benchmarks give a convenient way for investors and oil traders to assess the type of oil to be traded. Oil from various fields differ in terms of value and is used in various industries and primarily for transportation purposes. Lorca-Susino (2016), discussed that Brent crude is highly traded out of all other oil benchmarks, and is largely drilled by the oilfields in the North Sea. This oil is largely used for being light and sweet, and it is easily refined into gasoline and diesel fuel. Also, it is easily transported because it is produced at sea, and is widely traded. According to the report of EIA (2019), in September 2018, the prices of Brent oil was $ 63 per barrel, it was $4 higher from August and $16 lower from the previous year. The spot price of Brent was $61/b and it rose to $68/b soon after the incident on key oil infrastructure in Saudi Arabia, disturbing the production of crude oil in KSA.

In the context of BIST-100 Index, Kaya and Bincini (2014), examined the association between OPs and share prices of the firms listed on the Istanbul Stock Exchange (BIST) indices. It was found that there was one-way causality association from BIST-100 Plastic, Oil and Chemistry index variable and BO prices. Similarly, Kendirli and Çankaya (2016) investigated the causality link between the Istanbul Stock Exchange Transportation (XULAS) and Istanbul Stock Exchange 100 index (BIST-100) for the period of 2000-2015 and instabilities in crude oil prices. As per the outcome of the analysis, it was recognised that BIST-100 was the cause of changes in crude oil prices and the İstanbul Stock Exchange Transportation index. Further, it was recognised that the İstanbul Stock Exchange Transportation index was the cause of crude oil prices. On the other hand, Özdemirvanlı (2014) recognised a perpetual association between BIST-100 index and OPs, and analysed the association between BIST-100 index and OPs for the period of 2003-2014. With the help of Granger causality test, it was found that there was a one-way causality association from closing prices of BIST-100 index to OPs.

1.2. RESEARCH AIM AND QUESTION

This research aims to establish a link between BO prices and SM performance. The stock market index selected for this purpose is the BIST 100 Index price. Following is the research question of the study:

Do Brent oil prices and BIST 100 index returns correlate?

The sub-question of the study is:

What is the direction of causality between Brent oil prices and BIST 100 index returns?

1.3. SIGNIFICANCE OF THE RESEARCH

The present study emphasises on BO prices, which is relatively not a highly debated subject in the recent literature. It is found that there are limited empirical studies on the subject of BO prices (Zavadska, Morales and Coughlan, 2018; Ewing and Harter, 2000). Therefore, this research becomes significant in a sense that focuses on the relationship between BO prices and BIST-100 index, covering the past and recent fluctuations in OPs and its impact on SMs, particular that of Turkey. In addition, valuable insights will be available from the study for policymakers and researchers to proceed with further work on this subject.

1.4. PROBLEM STATEMENT

The relationship between OPs and the SM has been considerably discussed in a number of empirical researches, i.e. Nguyen, Nguyen and Pham (2014); Youssef and Mokni (2019); Haug and Sadorsky (2012) and Filis, Degiannakis and Floros (2011). Similarly, much of the work has also been done on the subject of BIST-100 index and OPs (Kaya and Bincini (2014; Kendirli and Çankaya, 2016). However, in the context of the link between Brent oil prices and BIST 100 index performance, previous research lacks empirical evidence. Thus, the present research contributes to the scholarship by further extending the findings of the earlier researches and attempting to provide new information in relation to BO prices and SMs in Turkey.

1.5. STRUCTURE OF THE RESEARCH

The following is the structure of the five chapters on which the present research is based:

1. **Introduction:** In this chapter, a short background and overview of the research topic are presented. It is for a purpose to introduce the topic, highlighting previous studies in this regard and elucidating the aims and objectives of the research. Further, the structure of the research is also presented in the introductory chapter.
2. **Literature Review:** This chapter comprehensively discusses the previous empirical studies on the research topics. It also covers relevant theories related to the subject area. Further, elucidates the key objectives of the research with the support of past researches, and thus laying the foundations of subsequent chapter of the research.
3. **Research Methodology:** The appropriate and relevant research methods to be used in the study are discussed in this chapter which is necessary to accomplish the desired aim and objectives of the research.
4. **Results and Discussions:** In this section of the research, the results derived from using relevant research methods, including statistical analyses are discussed in detail and supported by other empirical findings.
5. **Conclusion and Recommendations:** This is the last and concluding part of the research, in which the key findings and overall discussion is summarised. Further, necessary recommendations for academics and policymakers are also highlighted along with future research that can be done in this domain.

CHAPTER 2: LITERATURE REVIEW

2.1. THEORATICAL FRAMEWORK

Theoretically speaking, a number of ways exist through which stock returns (SRs) can be affected by the oil price (OP) movements. As per the technique of DCF (Discounted Cash Flows), the stock value (SV) is equivalent to the amount of discounted estimated cash flows. All of the cash flows rely directly or indirectly on the OPs. For example, if there is an exceptional rise in the OP, the cost of energy for various firms would rise (supposing that these firms do not evade the OP risks). The earnings could drop as a result of this, and also the existing cash flows. Nevertheless, the basic value of the stock would rely on the cash flows of the future. Although estimating a stock, the analysts and the investors would forecast more OP increases and assess lesser projected cash flows for the future, consequential in a lower SV. There can also be an indirect effect of OP on the SRs. For instance, if the inflation is triggered by the OP shock, the production cost (overheads, labour cost and material costs) may rise for many of the firms and as a result, the basic SV would be low because of lower cash flows. The stock prices (SPs) should drop if the SMs reflect the core SVs in the SPs, and therefore lead to the decline in SRs (Talukdar and Sunyaeva, 2011).

According to Taiwo, Abayomi and Damilare (2012), OPs traditionally have been unpredictable as compared to other asset prices of commodities. In the global economy, the trend of supply and demand together with the OPEC activities constantly affects the OPs. This prompt rise is a matter of concern for the policymakers and as well as for academics due to the fact that it has not transformed to fluctuations in domestic end-user prices of diesel, petrol, gasoline and Kerosene. Sequentially, the prime emphasis of Development Economists is the utilisation of

resources from investment and national saving for economic growth. In order to support the growth, the SM supports efficacy in capital formation and distribution from surplus to discrepancy areas.

The association between OPs and SMs can also be elucidated with the help of theories. For example, as per the economic theory, a commodity or an asset's price should be set on by the discounted value of estimated cash flows of the future. Hence, it is anticipated that any determinant that could impact the cash flows' discounted value of commodities may have a substantial impact on the prices of commodities. In relation to this, any rise in OPs should lead to a drop in SPs. This is for the reason that higher OPs would enhance the production costs, which can decrease the earnings of the firm, and as a result, it will adversely impact the firm's value. In reference to this, any increase in the OP would result in a drop in equity prices. Nevertheless, the impact of OPs on SPs can be contrary to countries exporting oil. To be specific, an increase in OP would not only enhance the revenues of the firms that are producing oil but will also enhance the income of the country. The rise in income leads to the rise in investment and consumer spending, and therefore employment level and productivity, which as a result, increases the performance of the SMs (Bjørnland, 2009; Naser and Ahmed, 2016).

On the other hand, it is discoursed by Aylward and Glen (2000) that the overall economic growth relies on the efficient performance of the SM and its function of capital. Once the SM organises savings, simultaneously it gives a significant percentage of it to the companies with comparatively high projections as specified by its risk level and rate of returns. This is made possible by the supply and demand mechanism. Hamilton (1983) in his pioneering work established the presence of a negative association increase in OP and economic activities.

Rodriquez and Sanchez (2005); Hamilton (2003) and Hooker (2002), also confirmed this submission in their studies.

Taiwo et al. (2012) in their research used OLS and MA method to assess the association between macroeconomic variables and SPs effect on 4 emerging countries; China, Brazil, India and Russia. As explanatory variables, moving average lag, exchange rate and OP were used; however, the outcomes were insignificant and reveal the market inefficiency. It was concluded by the researchers that these countries are developing hence domestic elements are more affected by the exchange rate and OP. On other hand, scholars such as Wang, Wu and Yang, (2013); Mendoza and Vera (2010); Degiannakis, Filis and Arora (2017); Arouri and Rault (2012); Bjornland (2009); Bashar (2006); Lescaroux and Mignon (2008); Korhonen and Ledyaeva (2010) and Park and Ratti (2008) support this theory that the SM of oil-exporting countries incline to positively respond to OP increases.

Besides, a number of researchers, have identified that the responses of SM return to OP fluctuations are time-varying and asymmetric (Zhang and Li 2016; Chang and Yu 2013; Miller and Ratti 2009; Reboredo and Rivera-Castro 2014; Reboredo and Rivera-Castro 2014; Filis, Degiannakis and Floros 2011). In a similar context, Choi and Mammoudeh (2010) used a Dynamic Conditional Correlation (DDC) model to assess the correlation between and oil and stock markets from the time of the 2003 Iraq war. It was found that correlations decreased over time and is negatives. Likewise, Bhar and Nikolova (2010) investigated the oil market and Russian SM correlation and found proof of a perpetual negative correlation between Russian SM and oil during the 12-year period (1995-2007).

A Baba, Engle, Kraft and Kroner (BEKK) model was employed by Broadstock, Cao and Zhang (2012) to assess the time-varying relationship between OP and energy-associated equities in China. It was found from the results that the relationship significantly increased at the time of the 2008 financial crisis. In the context of the U.S and China, a scalar-BEKK model was used by Broadstock and Filis (2013) to assess the dynamic association between SMs and OPs. With the same methodology, co-movements between oil importing and exporting countries and OPs were investigated by Filis (2014), and there were similar findings, signifying that the U.S SM has a higher relationship with OPs over time as related to other oil-importing countries. In addition, it was revealed that relationship varies between positive and negative values. Aydogan, Tunç and Yelkenci (2017) in their study used the DCC-GARCH model for assessing the effect of OP changes on SM in oil-importing and exporting countries. The researchers found that the time-deferring relationship between SPs and oil for oil-importing countries are noticeable as compared to those of oil-exporting countries. The outcome of the research endorses that the relationships between OP returns and volatilities of the SM vary relying on the position of the country in the international oil market.

2.2. The RELATION BETWEEN OIL PRICE AND STOCK MARKETS

Nations, both developed and developing, are highly dependent upon non-renewable energy sources such as Brent Crude Oil to run their economies, in terms of, industries along with households. Any changes in the price of this commodity have country-wide monetary consequences. Fueki et al., (2018), identify demand and supply elements that can cause prices of oil to fluctuate and hence impact the economy. This includes deliberate oil supply shocks caused to inflate prices necessarily, deliberate demand shocks, predicted demand shocks in future, predicted supply shocks in future, and other oil-price-relevant shocks. Consequently, Arouri and

Fouquau (2009), study oil price fluctuations, due to these shocks, in relation to its impact on economies' capital-equity markets. In theory, the valuations of stock are a direct result of discounted amounts from predicted future cash-flows of listed companies. As these cash-flows, such as profitability, are affected due to changes in the price of valuable inputs like oil and other macro-economic events, studies gain interest to evaluate the degree of impact the two variables have on one another.

As per the theory, when prices of oil rise, economic growth rate tends to fall as the business cycle slows down. In shorter horizons, this impact holds the potential to spike inflation within economies as demand exceeds supply. Companies' future earnings to slow down as economic growth prospects cease causing a dampening impact over stock prices and returns. A rise in input prices further squeezes the profit margins of firms following lower returns for shareholders and weaker activity in equity markets. As prices of oil and other commodities continue to increase, investors, speculators and, market-practices become uncertain about their returns on an organization's earnings deriving a greater equity risk dilemma, exerting supplementary downward constraints overstock prices (ECB, 2004). However, while some literature proves results that run parallel to this theory, other findings in various country's state otherwise. All these are discussed as follows.

In order to study both the direct and indirect impact of oil price fluctuation, Degiannakis, Filis and Arora (2018) examine the theoretical mechanisms through which stock markets behaviour can be altered. These as discussed as follows:

Stock Valuation Channel: This is a direct medium by which the varying prices of oil disrupt stock market patterns. In this, as oil prices increase, future earnings can either be impacted positively if the firm is an oil-producer or negatively if the firm is an oil-consumer. For oil-consumer firms, increases in prices can add substantially to costs of production, if the availability of other substitutes is scarce. Not only will this compress profits, but returns provided to shareholders will decline resulting in low buying activity for such firms in stock markets. As for oil-producing firms, bearish behaviour will be expected in the equity markets when prices roar (Mohanty and Nandha, 2011).

Monetary Channel: As discussed above, increased production costs can sometimes be passed onto consumers through higher retail prices. This manner of rising prices and inflation can encourage banks and policy-makers to spark interest rates in the short-term in attempts to promote savings. This rise in interest surges the cost of borrowing for firms causing reluctance among corporations to invest and benefit from positive NPV operations. Ultimately, the scenario reflects in a fall in stock prices of relevant firms.

Output Channel: When oil prices rise, it constitutes a production and income effect within oil-importing firms. Because oil can be classified as a necessary commodity for households, a rise in its price lowers income in real terms. When seen from an economic perspective, for oil-importing nations, terms-of-trade worsen magnifying negative impacts on wealth, consumption and aggregate demand levels. Such developments cause the stock exchanges to respond unfavourably. However, this principle only holds true for countries importing oil.

Fiscal Channel: This course is concerned with oil-exporting economies. A substantial hike in oil prices results in capital transfer from oil-importing to oil-exporting regions which then can be used to fund social, human and physical infrastructures. Also, high and positive cash-flows for oil-producing firms can shoot up their stock valuations, displaying bullish behaviour in stock markets (Emami and Adibpour, 2012). However, the opposite might happen if prices of oil suffer from a sharp decline.

Uncertainty Channel: This chain of transmission, suggested by Brown and Yucel (2002), states that rising oil prices cause uncertainty, impacting consumption levels, output and investments, and price levels. This uncertainty is evident through reluctance to invest by firms along with a reduction in consumption to save by individual households. Hence, as consumption and investment decisions are delayed, economic growth outcomes dampen resulting in lower stock market returns.

The literature presented by Kayalar, Kucukozmen, and Selcuk-Kestel (2017) highlight that fluctuations in oil prices can affect the economy through inflation, the balance of payments for oil-importing economies, and exchange rates. However, the immediate consequences of changes in prices can be evidently shown in financial sectors within economies. It states that because the prices of crude oil are expressed in US dollars, not only these hold the potential to fluctuate exchange rates but also have an impact on stock markets through a series of expectations. For example, a spike in the price of oil tends to shift the cost of production and hence influence the prices of relevant stocks. Moreover, as changes in oil prices have an impact on investment and consumption extents, it ultimately results in rising or fall in stock prices via expected earnings and speculations. The study concludes that these factors intensify in the case of oil-importing regions including Turkey.

Akgun, Sahin, and Yilmaz (2013) provide empirical evidence by evaluating the long-term relationship between oil prices and stock indices, with concentration provided to the BIST 100 index. It states that capital markets consider oil as a value stock and its fluctuations in terms of prices can have severe direct and indirect effects. Long-term movements of the BIST 100 Index and oil prices were observed that concluded a positive association between the two. This means that when prices of oil rose, the index increased. Hence a rise in oil prices reflected growth in the overall Turkish economy.

Tuna, Golec, and Tuna (2017) conducted a meta-analysis to distinguish the impact of oil price volatility and stock market performances with respect to 23 developed and 17 developing countries (total 40). Employing a Padroni Panel Cointegration Test, several results came to light. This included that a long-term relationship was exhibited among the two highlighted variables in the case of fully developed economies. In the case of emerging nations, the same relationship was observed but stronger. In addition to this, interesting information was concluded. That is, a one-way relationship was perceived from stock prices to prices of Brent oil within developed economies and not the other way around as the other literature entails. Hence, prices of shares and investor return determined the prices to be charged for Brent oil.

Alqattan and Alhayky (2016), study stocks markets of GCC countries as they lead as primary exporters of oil all over the globe. It employs the ARDL model to determine the existence of a significant relationship among oil price volatility and stock markets of GCC between the ten-year period from 2006 to 2015. Findings revealed that although no long-term relation existed between the two variables with the exception of Oman, in shorter time periods fluctuations in prices do impact equity markets. It concluded a positive relationship as all countries are exporting oil meaning the profit margins for these countries expanded. Similarly,

Basher, Haug, and Sadorsky (2018), asses the type of oil shocks and the degree of their influence over stock market prices in oil-exporting nations. Results exposed that stock exchange markets belonging to Canada, Russia, Kingdom of Saudi Arabia, UAE and Norway were affected by aggregate demand shocks in oil prices while Kuwait, Russia, UAE, and Canada were also subjected to speculative oil-shocks impacting returns from stock markets. This made Mexico the only economy that remains uninfluenced by oil shocks affects in terms of stock indices.

Siddiqui, Mashkoor, and Muhammad (2013) examine the relationship between oil prices and stock performances in the case of Pakistan's KSE-100 Index. The study evaluates that while internal firm determinants such as cash flows, earning streams, market share and market reputations influence stock prices, external macro-economic factors to play a significant role affecting not only stock indices but internal determinants as well. Hence, macro-economic determinants such as oil prices can effectively be used to judge fluctuations in equity market index along with valuations of an individual stock. However, oil price volatility affects the oil-importing country's index differently than those exporting ones. In the case of the KSE 100 Index, the study conflicts with literature as it reveals that oil prices share a positive association with the equity market index instead of dampening it. In a similar context, Kang, Ratti, and Yoon (2015), inspect oil price shocks with respect to USA's stock-market returns. Unlike other literature a simple positive or negative relationship with evident, this literature examines the effect in percentages. It draws a conclusion that while oil shocks (in terms of prices) contribute to 25.7% stock returns variations in longer horizons a fall in oil-supply-shocks was observed from 17% in 1973 to 5% in 2012.

2.3. BRENT OIL AND THE BIST-100 INDEX

OP is a significant determinant that has the prospect to determine fluctuations in SM. The impact of crude oil prices on the stock exchange draws the attention of researchers along with the impact on the industrial production index. Therefore, a vast literature attempt to project the effect of OPs on SM indexes, i.e. BIST (Göncü, 2015). For example, Karabayir and Barut (2017) in their study have investigated the correlation between BIST 100 stock returns (SRs) and BO prices, by using the data from the period of 1986-2016. On the basis of the research analysis it was determined that there exists is perpetual association between BIST 100 SRs and BO prices, similar to what has been reported by other scholars such as Zortuk and Bayrak (2016); Güler et al. (2010); Kılıç, Bayar and Özcan (2014); Şener, Yilanci and Tiraşoğlu, (2013); Chittedi (2012) and Narayan and Narayan (2009). Further, the causality analysis pointed out a one-way causality between BO prices and BIST 100 SRs. In other words, fluctuations in SPs impact the OPs.

Gencer and Demiralay (2012) aimed to probe the relationship between the BIST sub-index returns and oil. The data of the study comprises of BO prices and 18 sub-sector indices from Istanbul. The researchers analysed long-terms and short-term associations between OPs and 18 sub-sector indices from the period of 2002 to 2013. The outcome of the analyses points out that selected sector indices positively responded to OP shocks. Furthermore, it was observed that the Turkish companies have an exposure to oil risk and in this regard, they need to apply effective and robust hedging strategies. On the other hand, Berk and Aydogan (2012), intended to investigate the effects of crude oil price fluctuations of the SM returns in Turkey. The researchers applied the Vector Auto-regression Model and used the Istanbul Stock Exchange National Index returns and Brent crude oil prices from the period (1990-2011). On the basis of the variance decomposition test, it was suggested that insignificant evidence is found about crude

oil price shocks being rationally examined in SM of Turkey. Relatively, global liquidity conditions were identified to have a great difference in SM returns.

Demir (2019) aimed to investigate the impacts a few of the noticeable macroeconomic determinants on the Turkish SM index, BIST 100. Being an energy-importing economy, Turkey's economy largely relies on energy prices. Hence, the researcher used Brent crude oil price as a key global indicator which is also a potential factor. The results gained from the weekly data from the Autoregressive-Distributed Lag (ARDL) Bounds Test proposed that foreign direct investment (FDI), portfolio investment, economic growth and value of the domestic currency increase the SM index whereas prices of crude oil and interest rates adversely impact it. The outcomes of the study briefly point out that the stock exchange market of Istanbul requires, lowers costs of energy and investment, higher capital inflows and a stronger local currency. Similarly, Rad (2013) researched about an empirical association between OPs and SRs in the textile industry. With respect to this, Borsa Istanbul (BIST) was selected. The findings of the researcher established that OPs have a long-term view in the entire BIST index; nevertheless, the effect is lower in textiles. In addition, it was also pointed out that textile SR is parallel to OP increase in the long-term.

Akgün, Şahin and Yilmaz (2013) in their study attempts to examine the effects of gold and OPs on the BIST 100 index in relation to the economic dimension. From the results it was found that there exists is a positive association between BIST 100 index and OPs and on the contrary, a negative association is found between the BIST 100 index and gold prices. To be specific, when OPs rise, simultaneously the BIST 100 index also rises; and when prices of gold increase, then BIST 100 index drop accordingly. On the basis of these associations, it can be

asserted that an increase in the OPs shows growth in the international economies; and the prices of gold negatively impacts the BIST 100 as it constitutes a substitute investment.

According to Avcı (2016), there are considerable numbers of researches that have examined the correlation between macroeconomic activity and OPs; however, there are limited studies that have examined the correlation between OPs and SMs. In this study, the researcher has attempted to create different by examining the association from sector indices perspective (BIST-Industrial, BIST Services, BIST-Technology and BIST- Financial) and other sub-sector indices such as (BIST-Electricity, BIST-Plastic Petroleum Chemical). From the findings, it a co-integration relation was observed between all indices and OPs. Nevertheless, the causality link is spotted for industries only in which oil is used, i.e. services, industrial and technology.

On the other hand, Dincergok (2016) in his study have investigated the association between 5 explanatory variables such as; world equity index, exchange rates, OPs, industrial production, interest rates and return of 4 national indices (i.e. BIST National Technology Sector Return Index, BIST National Service Sector Return Index, BIST, BIST National Industry Sector Return Index, BIST National Financial Sector Return Index) in Istanbul for the period of 8 years (2000-2008) using OLS method. Except for oil, the macroeconomic variables have a positive impact on sector indices. Hence, it was proposed that to develop the SMs, it is advised to policymakers to consider the potential consequences of their decisions concerning the SMs.

Eryiğit (2009) conducted the study in Turkey with an aim to analyse the effect of OP movements on the Istanbul Stock Exchange sectoral indices. As per the findings of the research, OP fluctuations significant effects wholesale, paper, wood, non-metal and mineral production, retail trade, electricity, printing, investment, holding, insurance and basic metal indices. It was

revealed that OP movements have a significantly positive impact on BIST returns. In the context of Turkey, Yacouba and Altintas (2019) also explored the association between macroeconomic variables such as the world equity index, crude oil price, exchange rate, consumer price index, industrial production and interest rate and Turkish SRs using multiple regression models. The researchers found that world market returns, interest rates and exchange rate look to impact portfolio returns; the however rate of inflation is substantial for only three. Nevertheless, OPs, money supply and industrial production did not have any significant impact on SRs.

To sum up, after reviewing the empirical researches it was found that there are limited numbers of studies carried out with regards to BO prices and BIST 100 index. More emphasises of the earlier studies is on the stock markets, oil prices and stock returns in Turkey. Nevertheless, the present study intended to provide new findings in relation to BO prices and BIST 100 and will positively contribute to extending the findings of the existing studies.

CHAPTER 3: RESEARCH METHODOLOGY

3.1. INTRODUCTION

The present chapter incorporates a detailed discussion on the research methodology that has been used by the researcher for studying the relationship between the Brent oil prices and BIST (Borsa Istanbul) 100 Index. A research methodology is considered as a significant part of the study that is based on the process of selecting, analysing, and examining the research problem in order to deduce desired results. In order to gain in-depth insight into the relationship between Brent Oil Prices and BIST 100 Index, certain methodological approaches are selected that are thoroughly discussed in the following sections. In particular, the design, approach, purpose, and regression model of the research are discussed in this section. In addition to this, the section also demonstrates the data sources, sample size, statistical techniques, description of the variables, model hypotheses and ethical considerations of the research.

3.2. RESEARCH APPROACH

Research approach can be understood as the procedure or plan that covers all steps of the research including gathering, analysis, and final presentation and interpretation of data. The research approach is categorised into three most common types which include quantitative, qualitative and mixed approach (a combination of the previous two methods). Qualitative research is a holistic approach that comprises of discovery and is characterized by the use of unstructured and semi-structured data collection methods. It is mainly conducted in a poststructuralist paradigm that includes five areas: ethnography study, content analysis, grounded theory study, case study, and phenomenological study (Williams, 2007). On the other hand, the quantitative research approach deals with gathering the numerical data accompanied by different

statistical analysis techniques. Apuke (2017) has stated that a quantitative research approach is based on explaining the relationship between two or more variables while identifying certain patterns within the collected data for the sake of getting the desired results. In the current research study, for understanding the relationship between the Brent oil prices and BIST (Borsa Istanbul) 100 Index, a "quantitative research approach" is adopted. The rationale of selecting this research approach is that with the aid of previous literature review, quantitative research approach has helped in understanding the cause and effect of these particular variables i.e. Brent oil prices and BIST 100 Index using the financial data.

3.3. RESEARCH PURPOSE

As per Qu and Dumay (2011), the research purpose varies on the basis of the fields and disciplines and is considered as the most basic step that identifies the main reason for conducting particular research. There are mainly three research purposes that include descriptive, exploratory, and explanatory. The exploratory purpose is characterised by indicating a new theme and showing that limited researches have been conducted on that particular theme. Resultantly, it requires undertaking extensive initial research in order to explore the underlying problem that has not been investigated so far by the previous researchers. Therefore, it requires the formulation of hypotheses which will eventually offer direction for future research studies. Whereas, descriptive research purpose is used for describing a particular situation on which certain information is already available. In other words, it can be affirmed that the researches having descriptive purpose further elaborates the idea and tend to provide additional information on a particular topic/theme (Williamson & Johansson, 2017). The explanatory research purpose, in contrast, is used for explanation of the underlying situational patterns and eventually for the

resolution of the problem. It also involves the formulation of the hypotheses which are tested for understanding the relationship between the two variables. It has been established that the relationship between Brent oil prices and BIST 100 Index has been widely discussed in the existing literature. Therefore, the purpose of this study is "explanatory" in nature and for this purpose, further analysis on the relationship between the identified variables is carried out; thus, making a contribution to the existing literature.

3.4. RESEARCH DESIGN

As per Bryman and Bell (2007), a research design is considered to be the overall plan for executing the research study. Jalil (2013) has defined research design is the strategy of gathering required information in order to draw desired conclusions. Research design is categorised into various types that involve experimental, review-based, semi-experimental, meta-analytic, descriptive, and correlational design. In this particular research, the correlational design is adopted for analysing the relationship between Brent oil prices and BIST 100 Index. The purpose of selecting this research design is that it does not only assist in explaining the relationship between the selected variables, but it also helps in assessing the extent of this relationship. This aspect eventually has helped the researcher in covering both the past and recent variations in oil prices and its impact on the stock market, particularly in the context of Turkey.

3.5. DATA SOURCE

There are mainly two types of data sources that are commonly used by researchers. These include secondary and primary data sources. Primary data sources are regarded as the ones that offer first-hand information to the researcher. Some of the prominent sources of collecting primary data include observations, surveys, interviews, etc. In contrast, secondary data collection method is characterized by collecting the existing literature available in the journals, company

reports, textbooks, authentic websites, and pertinent articles (Johnston, 2017). In this research study, the data of Brent oil prices and BIST (Borsa Istanbul) 100 Index has been taken from the secondary sources. The sources include EIA (US Energy Information Administration), Investing.com and FRED Database. Data of Europe Brent Spot Price is collected from EIA; data of BIST 100 index price was extracted from Investing.com; while the control variables' (interest rates, inflation, exchange rate) data is sourced from FRED database.

3.6. SAMPLE SIZE

Sampling is regarded as taking the specific segment of the target population to collect the desired data. In more precise words, it can be affirmed that the sample of the research is the subset of the target population. The purpose of selecting a certain sample is that it is usually not possible for a researcher to gather data and examine the entire target population, because of various constraints (Schönbrodt and Perugini, 2013). These might include financial, time, and geographic constraints. In the present research work, the study is based on monthly econometric data, which is collected from the period Jan 2000 to Aug 2019 to study this specific period. The total numbers of observations are 236.

3.7. STATISTICAL TECHNIQUES

As previously discussed, the quantitative research approach has opted for the research study for quantifying the findings using the financial data collected from the secondary sources. This approach involves using statistical methods and techniques for investigating the research problem. The statistical methods used for the research are descriptive statistics, Granger causality, vector autoregression (VAR) and ordinary least square (OLS) method. Descriptive statistics is selected because it tends to provide the summary of the data through mean, median,

mode, standard deviation, percentage analysis, range, minimum and maximum values (Ali and Bhaskar, 2016). Granger causality is a technique that helps to determine the direction of causation between two variables i.e. whether a variable impacts the other or not. In this case, it is important to determine what is the direction of the relationship between oil price and index performance. On the other hand, the vector autoregression (VAR) model is a flexible and successful model that is used for the study of certain subjects within a multivariate time series. It is considered to be highly useful for understanding the dynamic behaviour and internal dependencies among multiple time series (Bayracı, Ari, and Yildirim, 2011). Finally, OLS is applied to examine the impact of oil price and control variables over the BIST index prices.

3.8. VARIABLE DESCRIPTION

This research study makes the use of certain variables that have been described in the following table.

Table 1: Variables Description

Variable (s)	Description
BIST 100 Index	It is the index portraying the stock performance. It is the abbreviation of Turkey's main stock exchange: Borsa Istanbul Stock Exchange. Here, the index price is measured in Turkish Lira.
Brent Oil Prices (BSP)	It is the prices of the benchmark against which 100m crude oil's barrels are traded. In this study, it is measured as Europe Brent Spot Price (BSP) FOB ($ per barrel)
Interest Rates (IR)	Interest rates are measured as the discount rate for Turkey in per cent per annum.
Inflation (INF)	Inflation in Turkey is measured by the consumer price index (Index 2015 =100)
Exchange Rates (ER)	It is measured as Turkish real broad effective exchange rate (Index 2010 = 100)

3.9. REGRESSION MODEL

The study mainly adopts two regression models having different independent and dependent variables. The first regression model contains the BIST 100 index as the dependent variable and Brent oil prices as an independent variable. Whereas, the second regression model contains Brent oil prices as the dependent variable and BIST 100 index as an independent variable.

$$BIST = \alpha + \beta_1 BSP \text{ ----- } (1)$$

$$BSP = \alpha + \beta_1 BIST \text{ ----- } (2)$$

Moreover, the study also tests a multiple regression model, considering a number of control variables:

$$BIST = \alpha + \beta_1 BSP + \beta_1 DR + \beta_1 INF + \beta_1 CPI + \beta_1 ER + e \text{ ----- } (3)$$

The BIST, BSP, DR, CPI and ER represent BIST Index Price, Brent Oil Price, Discount (interest) Rate, Inflation Rate (consumer price index), and Real Effective Exchange Rate respectively.

3.10. MODEL HYPOTHESIS

As previously discussed, certain hypotheses are formulated for the research study. 'Null hypothesis' and "alternate hypothesis", developed for the present research is:

Hypothesis 1

H0: There is an insignificant impact of the BSP on the BIST 100 index

H1: There is a significant impact of the BSP on the BIST 100 index.

For Granger Causality, another hypothesis is formulated:

Hypothesis 2

H0: There is an insignificant impact of the BIST 100 index on the BSP.

H1: There is a significant impact of the BIST 100 index on the BSP.

3.11. ETHICAL CONSIDERATIONS

Several ethical concerns are associated with secondary researches, which are mainly associated with the storage and utilisation of the data (Tripathy, 2013). Therefore, in the present research work, the collected data was stored in password-protected computer systems that were only allowed to be accessed by the authorised personnel. In addition to this, for ascertaining the accuracy of the research findings, the collected data were double-checked to avoid any error. Moreover, to avoid plagiarism related issues all the references were properly cited in the research and authors were duly acknowledged.

3.12. METHODOLOGY SUMMARY

Following table summarizes the methodology of the research study.

Table 2: Summary of the Research Methodology

Research Approach	Quantitative
Research Purpose	Explanatory
Research Design	Correlational
Data Source	Secondary
Sample Size	Jan 2000 to Aug 2019 (Monthly Data)
Statistical Techniques	Descriptive Statistics, regression analysis (OLS), Granger causality and vector autoregression (VAR) model

CHAPTER 4: FINDINGS AND ANALYSIS

4.1. INTRODUCTION

In this section, the researcher has provided the reader with detailed insight into each of the research variables of the current study. These variables include the Europe Brent oil prices, interest rates, exchange rates, inflation, and the BIST100 index. For each of these variables, the data represents the figures from the period Jan 2000 to Aug 2019, reflecting monthly data and a total of 236 observations. In addition to this, this chapter discusses the different characteristics of the data including descriptive analysis and the individual discussion related to each of the five variables. With an aim to investigate the impact of Brent oil prices on the BIST100 index, the current research particularly uses causality and vector autoregression modelling. The result from the same has been presented in this section.

4.2. DESCRIPTION ANALYSIS

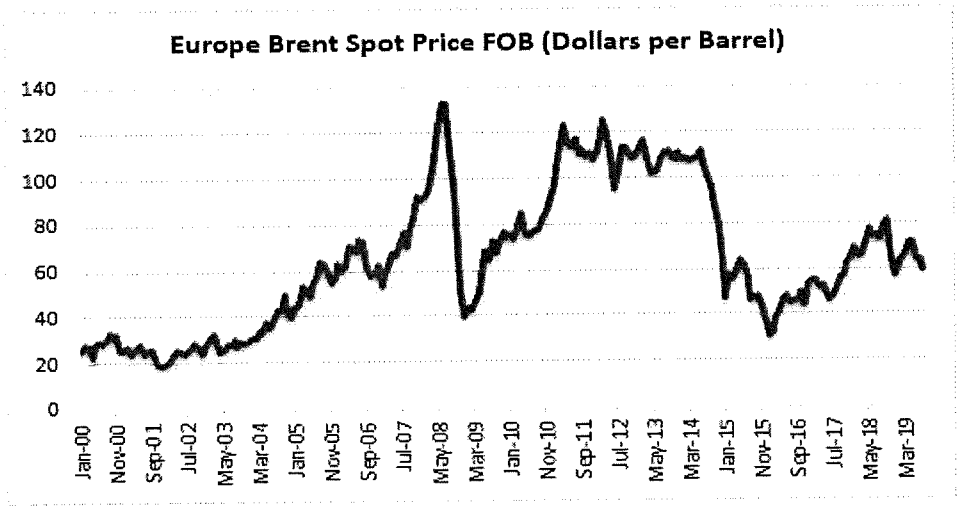
In order to understand the characteristics of the collected data, descriptive statistics have been performed. The results from the same indicate that mean BIST100 in between the year 2000 to 2019 is TRY 52165.29 while the variability in its data trend is TRY 30597.87. The positively skewed and leptokurtic behaviour of BI has also been confirmed. Moreover, in the case of BSP (Brent oil spot prices), the results reflect a mean of $64.58 per barrel with a standard deviation of 30.22. In addition, the mean CPI, DR, and ER of Turkey for the same period reflect a value of $ 70.62, $ 25.99 and $ 83.32.

Table – 3: Descriptive Statistics

	BI	BSP	CPI	DR	ER
Mean	52165.29	64.58	70.62	25.99	83.32
Median	53385.55	61.72	64.83	18.50	85.26
Maximum	119528.80	132.72	162.27	60.00	103.92
Minimum	7625.87	18.71	12.23	8.75	51.05
Std. Dev.	30597.87	30.22	36.37	17.58	11.55
Skewness	0.16	0.38	0.58	0.92	-0.61
Kurtosis	1.89	2.04	2.72	2.43	2.84
Jarque-Bera	13.16	14.92	13.85	36.58	15.06
Probability	0.00	0.00	0.00	0.00	0.00
Sum	12311010	15239.81	16665.54	6133.00	19663.95
Sum Sq. Dev.	220000000000	214681.20	310855.00	72664.59	31369.34
Observations	236	236	236	236	236

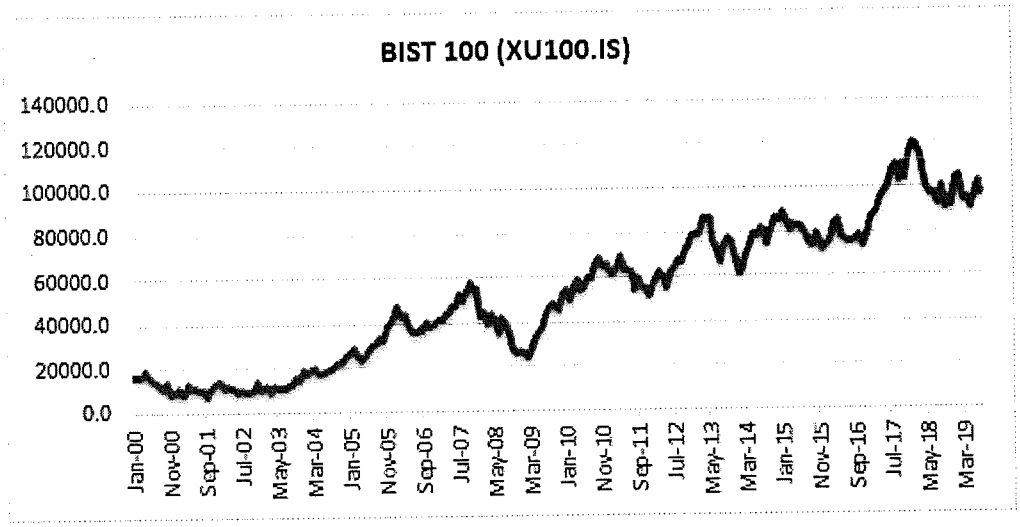
4.2.1. Europe Brent Spot Price

Although the Brent oil prices are found to be broadly increasing over the years till the beginning of the year 2008, these soon drop drastically until the start of 2009 subject to the aftereffect of the global financial crisis. Moreover, since then, the spot price for Brent oil is seen to have been increasing again at fluctuating rates. On account of sluggish growth in global demand for oil and the rising production, it is seen that the oil prices have continues to increase over the years. The figure below reflects an overall fluctuating trend in the prices of Brent oil in the world.



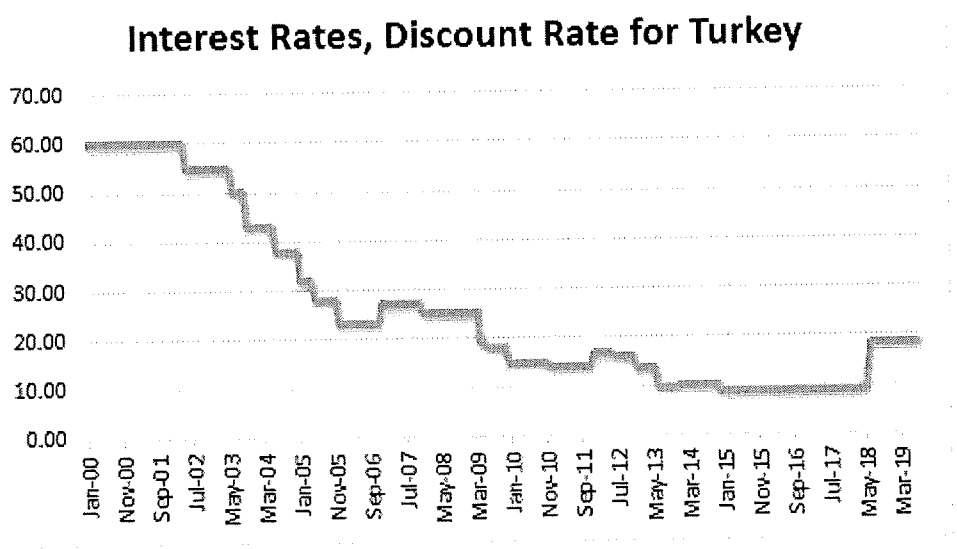
4.2.2. BIST100

In relation to the BIST100 index, the following graph indicates a highly fluctuating trend during the period of 2000 to 2019. The chart reflects that this index has also been greatly impacted by the global financial crisis and has improved and grown a lot since then. In addition to this, the graph also depicts that towards the mid of 2010 (July 2010), the stock market of Turkey is seen to have grown to the highest level during the given period.



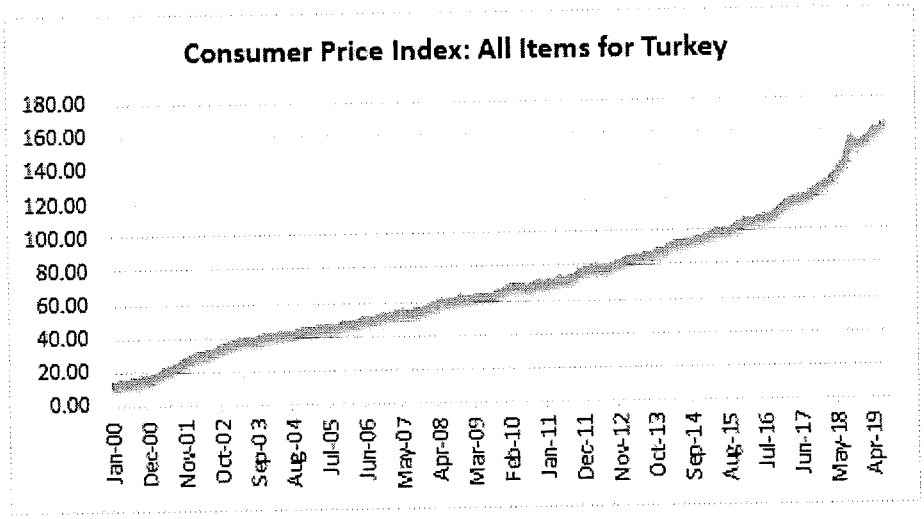
4.2.3. Interest Rates

The discount rates are been used as the interest rates for Turkey's economy. The graphical representation below indicates a declining trend with the rate remaining constant over some time before changing. The highest level of 60% is seen at the beginning of the year 2000 while the lowest and the most promising rate for the economy is seen at the end of the May 2018 fiscal year showing the level of improvement Turkey's economy has gone through over the years. However, the recent discount rates in the year 2019 indicate a risen value.



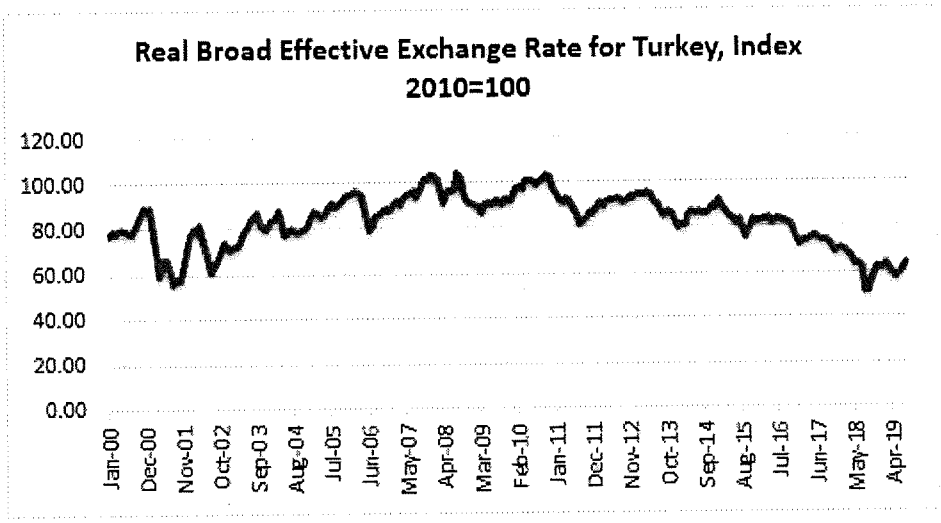
4.2.4. CPI

Consumer price index or CPI of Turkey reflects an increasing trend during the period of 2000 to 2019. The graph below shows that inflation in the country has gone worse towards the end of the year 2010 showing how much the economy and the consumers are suffering in terms of the high level of commodities prices in the country. In August 2019, the CPI of the country was seen to be as high as 162.27.



4.2.5. Exchange Rate

With regard to the real broad effective exchange rate for Turkey, the following graph indicates that the exchange rate has been showing no single direction as it has been increasing and declining over the years. The graph also shows that the exchange rate has remained between the rate of $ 51 and $104 between 2000 to 2019. It also shows that no significant change or impact could be graphically seen on the exchange rate of the country by the global financial crisis.



4.3. UNIT ROOT TEST

Prior to actually testing the variables for the analysis, it is important that the stationarity of each of the five variables is determined. For this purpose, the Augmented Dickey-Fuller test has been performed at a level which indicated insignificant test values for BI, BSP, CPI, ER and DR. This means that the data for these variable follows a trend. In order to remove this trend, the first difference has been taken and the stationarity of the same is checked. The new results than revealed stationary data set for all of these variables at the first difference. Based on this finding, all of the five variables are converted into the first difference.

Table – 4: Unit Root

Augmented Dickey-Fuller test			
Variables		At Level	1st Difference
BI	T-statistics	-0.808	-16.303
	P-value	0.815	0.000
BSP	T-statistics	-1.720	-10.451
	P-value	0.420	0.000
CPI	T-statistics	5.072	-9.970
	P-value	1.000	0.000
DR	T-statistics	-2.166	-15.522
	P-value	0.219	0.000
ER	T-statistics	-1.665	-10.782
	P-value	0.448	0.000

4.4. ANALYSIS

In order to analyse the impact of Brent oil prices on the stock index of Turkey (BIST100), the granger causality, vector autoregression, and the OLS regression analysis have been performed.

4.4.1. Granger Causality

This causality test mainly helps in the investigation of the cause and effect relationship between two or more variables, particularly in time-series data. The granger causality test particularly helps in determining whether or not the one-time series variable is significant in predicting other (Granger, 1969). On the basis of the current scenario, all of the five variables have been entered in the test variables, mainly for investigating the possibilities of a two-way relationship between the first difference independent and dependent variables of the study at lag 1. The results from the same are shown in Table below.

Table -5: Granger Causality (1)

Pairwise Granger Causality Tests
Sample: 2000M01 2019M08
Lags: 1

Null Hypothesis:	Obs	F-Statistic	Prob.
DBSP does not Granger Cause DBI	234	0.0700	0.7916
DBI does not Granger Cause DBSP		2.1158	0.1471
DCPI does not Granger Cause DBI	234	3.2552	0.0725
DBI does not Granger Cause DCPI		0.2655	0.6069
DDR does not Granger Cause DBI	234	0.0001	0.9923
DBI does not Granger Cause DDR		1.0262	0.3121
DER does not Granger Cause DBI	234	0.6282	0.4288
DBI does not Granger Cause DER		10.5315	0.0013
DCPI does not Granger Cause DBSP	234	0.5182	0.4723
DBSP does not Granger Cause DCPI			0.2347
DDR does not Granger Cause DBSP	234	1.8965	0.1698
DBSP does not Granger Cause DDR			0.2208
DER does not Granger Cause DBSP	234	1.3447	0.2474
DBSP does not Granger Cause DER		0.0058	0.9392
DDR does not Granger Cause DCPI	234	0.0242	0.8766
DCPI does not Granger Cause DDR		2.7971	0.0958
DER does not Granger Cause DCPI	234	24.1163	0.0000
DCPI does not Granger Cause DER		7.0992	0.0083
DER does not Granger Cause DDR	234	0.1876	0.6653
DDR does not Granger Cause DER		0.3286	0.5670

Based on this result, it can be observed that the majority of the relationships are found insignificant. Only the impact of DCPI on DBI, DBI on DER, DCPI on DDR, DER on DCPI, and DCPI on DER is found significant. This means that no two-way relationship between the main variables has been found except between DCPI and DER. In relation to the main variables, at first difference and lag 1, DBSP does not cause the prices of DBI. DBI also does not also cause BSP.

Moreover, in order to see the causality at lag 2, Table below shows the found results. At lag 2, the results seem to have remained the same with only DBI causing DER and DER causing DCPI. Rest of the variables does not show any kind of two-way causal relationship between them.

Table – 6: Granger Causality (2)

Pairwise Granger Causality Tests
Sample: 2000M01 2019M08
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
DBSP does not Granger Cause DBI	233	0.06457	0.9375
DBI does not Granger Cause DBSP		1.31075	0.2716
DCPI does not Granger Cause DBI	233	1.82158	0.1641
DBI does not Granger Cause DCPI		3.4915	0.0321
DDR does not Granger Cause DBI	233	0.06765	0.9346
DBI does not Granger Cause DDR		1.38638	0.2521
DER does not Granger Cause DBI	233	0.98328	0.3757
DBI does not Granger Cause DER		4.10888	0.0177
DCPI does not Granger Cause DBSP	233	4.65567	0.0104
DBSP does not Granger Cause DCPI			0.22329
DDR does not Granger Cause DBSP	233	1.73685	0.1784
DBSP does not Granger Cause DDR			0.28746
DER does not Granger Cause DBSP	233	0.98179	0.3762
DBSP does not Granger Cause DER		0.82181	0.4409
DDR does not Granger Cause DCPI	233	4.98256	0.0076
DCPI does not Granger Cause DDR		2.30542	0.102
DER does not Granger Cause DCPI	233	10.2643	5.00E-05
DCPI does not Granger Cause DER		1.68106	0.1885
DER does not Granger Cause DDR	233	0.25521	0.775
DDR does not Granger Cause DER		0.35112	0.7043

4.4.2. Vector Autoregression (VAR)

According to Zivot and Wang (2006), the VAR model is considered to be one of the most flexible and easy to use linear regression models for multivariate time series analysis. This particular model is regarded as a natural extension for the univariate autoregressive model for determining a rather more dynamic multivariate analysis of the time series data set. Further, in relation to the data description and the forecasting, the VAR model is often used for policy analysis and structural interference analysis. Moreover, this model is found to be useful for capturing and determining the dynamic behaviour of both financial and economic time series (Xu, 2012).

In the context of the current scenario, the following table shows the individual coefficient for each of the five variables entered in this model. The results indicate that the coefficient of DBSP (-1) in the DBI equation is -8.734058 with a standard error of 51.420900 and corresponding t-value of -0.16985. This indicates that the negative influence of BIST index prices is seen on Brent oil prices. However, the influence is insignificant at 0.05 level of significance. Moreover, in the case of lag 2, the DBSP still shows insignificant results with DBI coefficient decreases to -0.808485 with the standard error of 50.723400 and corresponding t-statistics at -0.01594.

Table – 7: VAR Estimates (1)

Vector Autoregression Estimates
Sample (adjusted): 2000M04 2019M08
Standard errors in () & t-statistics in [ ]

	DBI	DBSP	DCPI	DDR	DER
DBI (-1)	-0.028385	0.000099	0.000001	-0.000022	0.000132
	(0.071590)	(0.000093)	(0.000014)	(0.000023)	(0.000049)
	[-0.39652]	[1.06267]	[0.03977]	[-0.93509]	[2.70112]
DBI (-2)	0.070024	-0.000054	-0.000018	-0.000030	-0.000041
	(0.072030)	(0.000093)	(0.000014)	(0.000023)	(0.000049)
	[0.97215]	[-0.57490]	[-1.29229]	[-1.28420]	[-0.83375]
DBSP (-1)	-8.734058	0.337628	0.010615	0.005380	-0.035085
	(51.420900)	(0.066680)	(0.009950)	(0.016580)	(0.035130)
	[-0.16985]	[5.06308]	[1.06729]	[0.32451]	[-0.99878]
DBSP (-2)	-0.808485	0.023575	-0.005892	0.006855	0.049245
	(50.723400)	(0.065780)	(0.009810)	(0.016360)	(0.034650)
	[-0.01594]	[0.35839]	[-0.60056]	[0.41915]	[1.42116]
DCPI (-1)	-633.973600	0.133078	0.462661	0.102953	0.468584
	(340.7440)	(0.4419)	(0.0659)	(0.1099)	(0.2328)
	[-1.86056]	[0.30116]	[7.02017]	[0.93704]	[2.01301]
DCPI (-2)	353.173300	-1.041580	-0.187588	0.125100	-0.043991
	(337.7460)	(0.4380)	(0.0653)	(0.1089)	(0.2307)
	[1.04568]	[-2.37804]	[-2.87164]	[1.14872]	[-0.19066]
DDR (-1)	90.888140	-0.304023	0.002323	-0.055505	-0.129670
	(210.9230)	(0.2735)	(0.0408)	(0.0680)	(0.1441)
	[0.43091]	[-1.11147]	[0.05695]	[-0.81613]	[-0.89992]
DDR (-2)	-99.385110	-0.236100	0.117032	-0.031834	-0.114052
	(211.2140)	(0.2739)	(0.0409)	(0.0681)	(0.1443)
	[-0.47054]	[-0.86197]	[2.86480]	[-0.46743]	[-0.79044]
DER (-1)	-144.222200	-0.069758	-0.074672	0.000930	0.357821
	(102.3490)	(0.1327)	(0.0198)	(0.0330)	(0.0699)
	[-1.40912]	[-0.52556]	[-3.77211]	[0.02819]	[5.11761]
DER (-2)	39.422510	-0.093187	0.020987	-0.000235	-0.140043
	(100.2960)	(0.1301)	(0.0194)	(0.0323)	(0.0685)
	[0.39306]	[-0.71645]	[1.08187]	[-0.00727]	[-2.04393]
C	507.041500	0.522600	0.486835	-0.321547	-0.400412
	(372.2370)	(0.4827)	(0.0720)	(0.1200)	(0.2543)
	[1.36215]	[1.08259]	[6.76200]	[-2.67899]	[-1.57461]

Furthermore, this vector autoregression also presents the summary statistics for each of the above equations, along with generalized VAR results for all variables collectively. These results are represented in the table below.

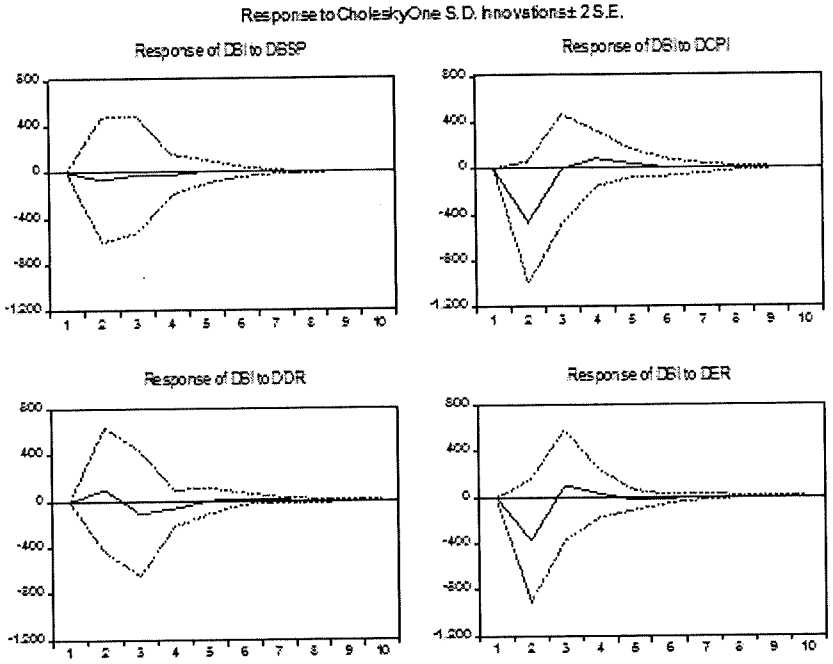
The following results indicate that all of the five-model equation is statistically significant with high F-statistics values suggesting that the models are good fit models. Moreover, DBI, DBSP, DCPI, DDR and the DER equations reflect an R-square value of 0.033117, 0.181625, 0.296194, 0.032660, and 0.207311 respectively. Akaike Information Criterion is used for analysing the quality of the overall model in relation to other models. Based on this model, the AIC estimates reflect very low values for all of the five equations confirming a high quality of the fitted models.

Table – 8: VAR Estimates (2)

Vector Autoregression Estimates
Sample (adjusted): 2000M04 2019M08
Standard errors in () & t-statistics in [ ]

	DBI	DBSP	DCPI	DDR	ER
R-squared	0.033117	0.181625	0.296194	0.032660	0.207311
Adj. R-squared	-0.010436	0.144761	0.264491	-0.010914	0.171604
Sum sq. resids	3630000000	6104.1	135.8	377.4	1693.9
S.E. equation	4043.454	5.244	0.782	1.304	2.762
F-statistic	0.760385	4.926931	9.342772	0.749534	5.805924
Log likelihood	-2260.010000	-711.064900	-267.701100	-386.786700	-561.718600
Akaike AIC	19.493650	6.197982	2.392284	3.414478	4.916039
Schwarz SC	19.6566	6.3609	2.5552	3.5774	5.0790
Mean dependent	346.7742	0.1354	0.6404	-0.1781	-0.0641
S.D. dependent	4023	6	1	1	3
Determinant resid covariance (dof adj.)				2930000000	
Determinant resid covariance				2300000000	
Log-likelihood				-4164.41	
Akaike information criterion				36.22	
Schwarz criterion				37.03	

The following chart presents the impulsive response graph for the model under study.



Impulse Response Function is mainly presented to assess the impulse of shocks in one variable to another (Lu & Xin, 2010). Generally speaking, an impulse response mainly depicts the reaction of any system in response to external changes. Since the performed VAR has five variables, the above figure depicts the multiple graphs for representing the impulse response of DBI to changes in DER, DDR, DCPI and DBSP.

The graphical representation from the same indicates that the response of DBI to DSP has remained close to 0 after period 3. Moving from period 1 to 2 and 2 to 3, the impulse shows a decline in DBI. Moreover, in the case of the response of DBI to DCPI, the second graph depicts declining impulse from period 1 to 2 while a rising response has been recorded until period 4 which stabilizes at 0 for the following periods. Furthermore, the third and fourth graph indicates the response of DBI to changes in DDR and DER. Strong impulses could be seen in the first few years while after period 5, very minute impulse movements have been recorded.

4.4.3. OLS regression

Dependent Variable: DBI
Method: Least Squares
Sample (adjusted): 2000M02 2019M08

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DBSP	53.28542	45.32943	1.175515	0.241
DCPI	17.74012	287.1807	0.061773	0.9508
DDR	-330.0247	200.6498	-1.64478	0.1014
DER	317.6196	84.16582	3.773736	0.0002
C	282.8552	318.3793	0.888422	0.3752
R-squared	0.074283	**Mean dependent var**		340.4406
Adjusted R-squared	0.058183	**S.D. dependent var**		4006.025
S.E. of regression	3887.736	**Akaike info criterion**		19.39009
Sum squared resid	3.48E+09	**Schwarz criterion**		19.4637
Log-likelihood	-2273.335	**Hannan-Quinn criter.**		19.41976
F-statistic	4.614002	**Durbin-Watson stat**		2.228526
Prob(F-statistic)	0.001333			

An OLS regression model is also applied in this study to further examine the influence of DBSP on DBI. The multiple OLS model is found statistically significant in predicting BIST index at 0.05 level. The overall model is able to explain 7.43% of the variance in the dependent variable. Moreover, individually, the impact of DBSP is insignificant at the 0.05 level, when controlled by DCPI, DDR, and ER. Only DER is seen to have a significant impact on BIST index while indicating positive influence.

4.5. DISCUSSION

The aim of this paper is to analyse the relationship between Brent oil prices and BIST 100 index prices. For this purpose, the current research tested the relationship between five macro-economic variables including 1 independent 3 control and 1 dependent variable. Firstly, with the help of the descriptive statistics and unit root test (ADF), it has been found that their lies trend among all the variables. Hence, BI, BSP, CPI, ER and DR, all have been converted into first difference variables prior to actually testing different models. At first difference, all of these variables are found to be stationary. Hence, proceeding with these new variables, three kinds of models have been formulated. When assessing the Granger causality between the variables, the two-way relationship between all the variables has not been found except between DCPI and DER. The results from the OLS regression, however, was found to be significant overall. While the VAR model for DBI indicated an R-square value of 3.311% which reflected the combined impact of DBSP, DCPI, DDR, and ER.

These findings are found to not aligned with the findings from Hamilton (1983) Rodriquez and Sanchez (2005), Hamilton (2003), and Hooker (2002), and several other authors, who suggested there lies a significant negative association between OPs and SPs. On the other hand, in the case of oil-importing countries like Turkey, past studies found no relationship between the two variables (AlFayoumi, 2009). Other researchers such as Nordhaus (2007), Blanchard and Gali (2007), Bernanke et al. (1997), and Hooker (2002) indicated that the overall impact of oil prices on the stock markets of different economies have been insignificant. Another highlighted that the oil price bubbles in early 2000, may have resulted in no influence on stock markets, after 1999. Various other studies have also concluded no impact (Apergis and Miller, 2009; Jammazi and Aloui, 2010).

The positive (but insignificant) impact of the Brent oil prices on the stock prices of Turkey as indicated by OLS regression model shows that the rise in prices of Brent oil mainly increases the stock prices of BIST 100 Index. Though the results seem to be quite unexpected as most of the past studies have implied that the rise in stock prices main be subject to the indirect impact of the changes in the oil prices. According to Jimenez Rodriguez and Sanchez (2005) and Bjornland (2009), the rise in oil prices may have a positive impact on the oil-exporting economies whereby the overall income of the country may rise. Consequently, the rising income may increase the expenditure and investments, which is expected to raise overall productivity and lower the unemployment level of such economies. Due to this, in an oil-exporting firm, such a rise in stock prices due to changes in oil prices is justified.

However, in the current scenario, Turkey is known to be an oil-importing economy with larger oil imports than oil exports over the year, whereby the country must be exposed to the negative influence of rise in oil prices (LeBlanc and Chinno, 2004) subject to increasing the production cost (Arouri and Nguyen, 2010). Which is then transferred to the end consumers by lowering the demand and increasing the consumer spending (Abel and Bernanke, 2001; Bernanke, 2006; Barro, 1984). This decline in consumption may lead to lowering of the overall production and hence declining employments (Lardic and Mignon, 2006; Davis and Haltiwanger, 2001), and hence negative influence on the stock market overall (Jones and Kaul, 1996; Sadorsky, 1999).

However, the current findings suggest the results with the positive influence of OP changes on the stock market of Turkey via OLS. According to Filis, Degiannakis and Floros (2011), one must not ignore the nature of the OP shock may have different influence on the SM overall. In this case, the demand side OP shock might respond positively on the SM and negatively if the shock originates from a supply side.

According to Kilian and Park (2009), the demand side shocks have a more significant impact on the SPs than the supply-side shocks. These demand-side oil shocks are although seen to have a negative influence on the SPs because of the precautionary demand for the oil, reflecting upon the risks of the future supply of oil. However, if this demand-side price shocks on oil are mainly driven by global expansion, then the rise in oil prices may have a positive influence on the stock market of the country. It can be said that the positive innovation and expansion in the global market of different Turkish companies (Erciş and Ünalan, 2016) over the period of 2000 to 2010 have stimulated the overall Turkish economy directly, while also influencing the prices of oil and thereby indirectly decreasing the economic activities of the country.

Hence stimulating influence of the OP shocks may have dominated in the short run, but in the long run, the economy of Turkey has strived to raise its growth levels despite the rise in OPs. Though it can be justified that the rise in the SM due to changes in the price of Brent oil is justified because of the global rise in demand for industrial commodities. Turkey is often classified as an industrial economy (Guillén, 2003; Waugh, 2000; Mankiw, 2007) reflect that the rise in oil prices due to global expansion will only have a positive influence on the SM of the country subject to a rise in global demand.

All in all, the high dependence on the energy of Turkey and the deficit current account balance all have an adverse impact on the financial and economic outlook of the country. The fluctuations in the prices of oil are seen to have a negative impact on the balance of payments since the imports of oil by the country are higher than its exports. This, in turn, pressurises the current account deficit of the country even more and the inflation could be seen This finding of a negative relationship between CPI and the oil prices can be found from the VAR model. Finally, the higher prices of oil are mainly driven by the unanticipated global expansion done by Turkish industry that has a positive influence on the stock prices of the BIST 100 index.

CHAPTER 5: CONCLUSION

Various policymakers, practitioners, and academics have started shifting their attention towards the fluctuation of oil prices (OPs), its impact on the economy, and factors that are associated with rapid change in OPs. In 1979, a significant change in OPs was observed and it became a major domain for investigation (Taghizadeh-Hesary, 2014). Oil has the potential to impact the overall global economy and the change in OP may lead to adverse effects. Moawad (2016) mentioned that the last 4 decades have seen a 30% decline in oil prices, which leads to heated debates regarding its causes and consequences. Moreover, economic activities in any country are influenced by OPs, as the fluctuation in OPs can impact product costs of oil importers.

In addition, OPs can influence energy export revenues while impacting the government budget. Fluctuation in OPs has a significant effect on the CPI inflation rate, interest rate, exchange rate, and GDP of oil-exporting countries (Alekhinna et al., 2018). Change in the OPs can increase the cost of production that can impact the growth of the economy. In addition, since crude oil is a global energy source due to its easy extraction and refining, the change in OPs can affect the energy sectors of a country. Basher, Haug and Sadorsky (2012) suggested that OPs shocks are likely to reduce exchange rates and stock prices of the US dollar. In addition, the prices of oil are reduced by oil-production shocks while positive economic activities do it otherwise.

As compared to other commodities, the OPs have been very unpredictable. In the context of the global economy, OPEC activities combined with supply and demand trend affects the OPs. This is a matter of concern for economists and policymakers as it has yet to be transformed into domestic end-user prices of kerosene, gasoline, petrol, and diesel. In addition, higher OPs would

increase the cost of production due to a drop in SPs. As a result, the firm's value and earning can decrease. However, the increase in the OPs will lead to a substantial decrease in equity prices. In other words, the rise in the OPs is directly linked to high revenues which ultimately enhances the country's income. Moreover, this rise in income further leads to a rise in consumer spending and investment which will positively impact productivity, employment levels, and SMs performance (Naser and Ahmed, 2016). Thus, it is evident that the growth of the economy is dependent on the overall performance of the SM.

OP is an important determinant that has the potential to determine SM fluctuations. Karabayir and Barut (2017) investigated the correlation between BO prices and BIST 100 stock returns (SRs) observed the ever-lasting association between the two factors. In addition, the analysis of short- and long-term associations between 18 sub-sector indices and OPs showed that the selected 18 sub-sector indices responded to the OP shocks positively. However, Turkish companies need to apply robust and effective hedging strategies in order to tackle oil risks. In addition, the Vector Auto-regression model, Istanbul Stock Exchange National Index returns, and Brent crude oil prices from the years 1990 to 2011 were used to investigate the impact of fluctuations in crude oil prices on SM returns in Turkey. Tukey is an energy-importing economy, and therefore, largely depends on energy prices.

In order to gain in-depth insight, the present research studied the relationship between the BIST 100 index and Brent oil prices. In addition, as a part of the research objectives, the paper focused on establishing a relationship between SM performance and BO prices. The research has the utmost significance as finding a relationship between BO prices and BIST-100 indexes can provide valuable insight for researchers to continue the future work on this subject. In order to accomplish this research objective, explanatory research purpose and quantitative approach have

been selected. In addition to this, the correlational design has been adopted to analyse the relationship between Brent oil prices and BIST 100 index. Since the credibility of the analysis is heavily dependent on the quality of the data, it was collected from secondary sources, specifically monthly econometric data, which is obtained from Jan 2000 to August 2019. In order to analyse the collected data, statistical methods were used, specifically ordinary least square (OLS), vector Auto-regression (VAR), Granger causality, and descriptive statistics method.

Chapter four of this literature aims to provide evidence and hence answer the research question that whether oil prices and BIST 100 index returns and fluctuations correlate with one another. To generate appropriate findings several variables were considered collected from the period of 2000 to 2019 due to availability. These variables included rates of interests, inflation rates, exchange rates, BIST100 index and lastly Brent oil prices in Europe. With a total of 236 observations, the evidence is exhibited in the form of a descriptive analysis, a Granger Causality Test, OLS and a Vector Autoregression (VAR) model.

The Descriptive Analysis exhibits a detailed trend and pattern of growth for each separate variable. Here Brent oil prices in Europe show a sharp drop in 2009 caused by worldwide crises before which prices were slowly rising. After the 2009 drop, prices have begun to rise steadily. This pattern is to a certain extent similar to BIST100 index. The Turkish Stock Market too was growing in an upwards direction and fell during 2009-2010 as a result of financial crises. Coming forward to interest rates, they have a subject of constant yet stable decline. In terms of prices of goods, CPI reflected continuously rising prices settling at its all-time highest in 2019. Lastly, exchange rates or external values of currency has remained subject to fluctuations with highest points reaching up to $104 and lowest points found at $51. However, these exhibit no significant pattern.

The Granger Causality test outcomes showed no significant relationship between Brent oil prices and BIST100 index. The results from this test showed no two-way relationship between stock prices and Brent oil prices. Moreover, the results from VAR suggested an insignificant overall model with the individual negative influence of the oil price changes on the stock market while the negative impact of CPI could be seen.

Furthermore, the OLS model was found to be highly significant with the inclusion of first difference variables of DBSP, DCPI and DDR as a predictor of DBI. Even though the individual impact of Brent oil prices on stock prices of turkey was still found insignificant, the discussion and final conclusion have been given on the basis of the significance of this particular model. Hence the positive influence of DBSP on DBI has been justified by the fact that Turkey is an industrial economy whereby the rise in global expansion may have a positive influence on the economy overall.

Even though the overall study seems to have reflected significant findings and results, there are certain limitations to the research. The study is limited to finding the relationship between stock prices and oil prices and not actually researches the possible reasons for such a relationship. The relationship between the main research variables of the country is found to be insignificant with the use of a limited number of models and statistical tools.

Hence, on the basis of the aforementioned findings and underlying limitations, the following recommendations have been made. Future researches have suggested the inclusion of other similar economies for comparative analysis is also recommended. Moreover, a detailed study on demand and supply-side shocks to the oil prices and their relative impact on the stock market of Turkey is highly recommendable. Lastly, other models such as ARIMA and GARCH

model for multivariate analysis and time-varying correlation between oil prices and stock market of different economies can be done by future researchers.

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