The Impact of Oil Price Volatility on Banking Stocks: Evidence from Iran

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ABSTRACT

This study analyzed how crude oil prices affect the stock prices of five major Iranian banks that invest in the oil and petrochemical industries. The exchange rate was also considered in our analysis. We used daily data from 2011 to 2020 and examined time-varying and fixed spillovers in banking stocks using the methods of Diebold and Yilmaz (2012). Our findings suggest that the exchange rate has the greatest impact on bank fluctuations due to the unprecedented sanctions faced by Iran during the study period. These sanctions limited Iran's access to global markets, reducing economic growth and investment opportunities. Consequently, the impact of oil price changes on banking stocks and other economic indicators decreased. To address these challenges, Iran can diversify its economy by investing in technology and production, strengthen the banking sector through improved regulations, transparency, and accountability, and improve exchange rate management. Additionally, Iran can monitor and reduce risks associated with oil price fluctuations through developing contingency plans, improving risk management systems, and increasing cooperation between the government and banking sector. Overall, this study emphasizes the importance of considering the potential effects of economic sanctions when analyzing the relationship between oil prices, bank stocks, and other economic indicators in Iran. Taking these steps can help Iran better manage the impact of oil price fluctuations and economic sanctions, and create a more stable and resilient economy.

Keywords: crude oil, stock prices, exchange rate, economic growth, risk management.

ÖZ

Bu çalışma, ham petrol fiyatlarının petrol ve petrokimya endüstrilerinde faaliyet gösteren beş büyük İran bankasının hisse senedi fiyatları üzerindeki etkisini incelemektedir. 2011'den 2020'ye günlük veriler ve Diebold ve Yılmaz (2012) yöntemleri kullanılarak yapılan çalışmada, döviz kuru dalgalanmalarının banka hisseleri üzerinde petrol fiyatlarına göre daha fazla etkiye sahip olduğu tespit edilmiştir. Bunun nedeni, çalışma döneminde İran'a uygulanan ve İran'ın küresel pazarlara erişimini kısıtlayan ve ekonomik büyüme ve yatırım fırsatlarını azaltan benzeri görülmemiş yaptırımlardır. Çalışma, İran'ın teknoloji ve üretime yatırım yaparak ekonomisini çeşitlendirmesini, döviz kuru yönetimini iyileştirmesini ve düzenlemeleri, şeffaflığı ve hesap verebilirliği iyileştirerek bankacılık sektörünü geliştirmesini tavsiye ediyor. Ayrıca İran'ın petrol fiyatlarındaki dalgalanmalar ve ekonomik yaptırımlarla ilgili riskleri izlemesi ve azaltması gerektiğini öne sürüyor. Bu tavsiyeler, İran'ın petrol fiyatlarındaki dalgalanmaların ve ekonomik yaptırımların etkisini yönetmesine ve daha istikrarlı ve dirençli bir ekonomi yaratmasına yardımcı olabilir. Sonuç olarak, bu çalışma, İran'da petrol fiyatları, banka hisseleri ve diğer ekonomik göstergeler arasındaki ilişkiyi analiz ederken ekonomik yaptırımların potansiyel etkilerini dikkate almanın önemini vurgulamaktadır. Önerilen stratejileri benimseyerek İran, petrol fiyatlarındaki dalgalanmaların ve ekonomik yaptırımların etkisini daha iyi yönetebilir ve daha istikrarlı ve esnek bir ekonomi yaratabilir.

Anahtar Kelimeler: ham petrol, hisse senedi fiyatları, döviz kuru, ekonomik büyüme, risk yönetimi.

DEDICATION

To my dear wife Mozhde,

and the best gift from God to my daughter Parinaz

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INTRODUCTION

1.1 Contextual background

Banks in oil-exporting nations have been put to the test by the dramatic swings in oil prices seen over the previous several decades (Miyajima, 2017; Khandelwal et al., 2016). After 2014, when oil prices began to drop, state-owned banks in developing nations were particularly vulnerable because of the strain this imposed on their budgets (Tuzova and Qayyum, 2016). The interconnected nature of the banking industry and the oil industry has left commercial banks exposed to the volatility of oil prices. Major European banks like Standard Chartered would lose less than $1.3 billion, according to a stress test performed by Jefferies. However, oil prices impact the economy indirectly. Declining oil prices reduce financial outlays in key developing oil-exporting countries, which might threaten the success of businesses and financial institutions in such nations. Furthermore, oil exporting nations are encouraged to increase their production capacity as a result of the high price of oil, which encourages both public and private investment. A rise in the CPI and a possible change in interest rates might have an effect on the banking sector in oil-importing nations if oil prices remain high. We set out to examine the dynamic between macroeconomic volatility, oil price returns, and banking sector performance across time in response to these economic events.

Above, we saw that the study's findings suggest a macroeconomic downturn is when the connection between oil price shocks and banking sector performance really begins to take shape. Hesse and Poghosyan (2016) conducted a study to investigate the correlation between prices of oil and the profitability of banks in key oil-supplier regions in MENA. Their panel study of 145 banks in 11 oil-supplier regions between 1994 and 2008 found that oil price shocks had an indirect effect on bank profitability. They also demonstrate that investment banks are much more vulnerable to oil price swings than commercial banks. This is because investment banks benefit the most from increased economic activity, such as fee revenue and the beginning of new investment projects, and because of how quickly and effectively they can react to changes in these factors.

1.2 Statement of the problem

Energy is currently the most urgent requirement worldwide since it is used in so many vital economic areas. National security and economic stability depend critically on reliable energy supplies as well (Ma et al., 2021; Bashir et al., 2015; Talbi et al., 2020; Hussain et al., 2021). Approximately one-third of the world's energy consumption is thought to come from oil. In addition to being the most widely used energy source, oil is a rare and valuable natural resource that may swing the balance of economic and political power in favor of a country that has much of it(Bashir et al., 2020, 2021). The economies of Europe and North America have reduced their energy needs in recent years, while those of Asia and other developing regions have increased theirs. According to Bashir et al. (2022), oil consumption in 2018 and 2019 reached 96.5 million barrels of oil per day, a significant increase from prior years. The United States accounts for 20.3% of the world total, followed by China (12.8%) and India (4.6%) (Xia et al., 2022). By 2040, the International Energy Agency projects that global oil

consumption will have increased to 103.5 million barrels per day. This is a 30% increase from 2010 levels, which were mostly driven by the economic policies of developing countries. Therefore, crude oil has become the most actively traded commodity. Nonetheless, it has an outsized impact on both developing and developed economies, since fluctuations in oil prices have a ripple effect on everything from government spending to the value of the stock market. The most important takeaway is that the financial markets are very sensitive to sudden changes in oil prices (Bashir et al., 2021). Because of the importance of hedging portfolio risks against quick market swings, it is essential to study the interplay between stock markets, oil prices, and the effects of these price movements. According to Bastianin et al. (2016), fluctuations in oil prices have an indirect influence on business cycles and stock market movements, especially for bank stocks. Oil futures and oil firm stock trading are strongly correlated, as discovered by Huang et al. (1996). He said that there was no material effect on the whole stock market's performance. According to Jones and kaul (1996), sudden increases or decreases in the price of oil have an adverse influence on the trading volume of global stock markets. It was shown by Sadorsky (1999) that oil prices significantly affect stock returns, and that oil price shocks have uneven effects on the U.S. economy. According to research conducted by Faf and Brailsford (1999) in Australia, there is a positive relationship between oil prices and stock returns in the fossil fuel business. Stock returns in the transportation and packaging sectors were said to be negatively correlated with oil prices, according to the study. Oil futures and S&P 500 index returns were shown to have a non-linear causal connection by Ciner (2001). Nomikos and Pouliasis (2011) used the GARCH model and obtained results similar to those found by Ciner (2001). Japanese, Canadian, and American data were utilized by Huang et al. (2005) to determine the non-linear threshold impacts of oil price volatility

and oil price fluctuations on real returns on stocks and industrial output levels. Macroeconomic factors are profoundly affected by shifts in volatility or oil prices, but only if the shift is large enough. Using a multivariate modeling method, Asteriou and Bashmakova (2013) shown in nations in Central and Eastern Europe that variations in oil prices are correlated negatively with stock returns (Ma et al. 2021). Asteriou et al. (2013) looked at the relationship between stock and crude prices and found that the latter were far more susceptible to swings in oil prices, regardless of whether a nation was an oil exporter or importer. Bouri (2015) used the variance causality technique to determine the risk spillover effects between increases in the Jordanian stock market and global crude oil prices, allowing him to draw comparisons between the financial crisis of the early 2000s and the crisis that began in 2008. These changes also highlighted the one-way causality between oil price swings and war.

Theoretically, the oil price shock can be transmitted to the macroeconomy through various channels (Barrow, 1983). Oil, as the most critical energy source in the world and one of the most essential factors in production, has always had a special place in the world economy (Bastianin et al., 2016). Especially after the big oil shocks in the 1970s, which led to economic stagnation in the western world. Hamilton (1983) shows that rising oil prices have caused all US economic recessions since World War II. Any increase or decrease in oil price leads to a change in oil revenues, which in turn affects the economy. Today, one of the most crucial basic elements in the financial markets is the price of oil, which the stock market plays a special role in (Bouri, 2015). Bjorland (2008) states that since the stock value is equivalent to the aggregation of discounted future-cash flows, macroeconomic events significantly impact these flows; as a result, they can also be affected by oil shocks. It seems logical to have state-owned bank

stocks absorb information related to the consequences of oil shocks and reflect them in stock prices (Chen et al., 2017). Crude oil is among the most important and influential factors in the global economy; political events and persistent instability in oil-exporting nations significantly affect the global oil price by disrupting oil supply (Hussain et al., 2021). In spite of these swings, it is projected that oil prices would be impacted by these shifts because of the aforementioned instability and uncertainty over the discovery of new resources. Fluctuations in oil prices reduce the planning horizon and make banks postpone irreversible business investments (Jones & Leiby, 2004). The price of oil might fluctuate at any moment. When prices have been reasonably constant for a long time, a single unexpected incident might suddenly upset the equilibrium and produce either an increase or a decrease in price (Jain & Biswal, 2016). Oil is one of the primary sources of revenue for oil-exporting nations, and the volatility of oil prices has an effect on the economy of a nation whose budget is dependent on oil prices. In addition, oil price fluctuations also have significant effects on bank stock returns (Filis, 2011). Capital, labor, and oil are the most important factors in producing most goods and services (Li et al., 2016). Any change in the price of these factors affects the cash flow (Lin B & Su T, 2020). Higher oil prices are an inflationary tax on consumers and producers, and they may be generated when rising demand exceeds supply without adequate compensation (Liu B, Ma B & Bashir, 2018). If there isn't a one-to-one replacement for oil, then a rise in oil prices will drive up production costs, which will in turn diminish cash flow and drive stock prices (Basher & Sadorsky, 2006). As a result, stock prices and investment are both severely impacted by oil price swings, which raise risk and uncertainty (Mao et al., 2015).

Countries have different effects on oil price changes depending on whether they are oil importers or exporters (Bot-Shekhan & Mohseni, 2017). Many economists believe that an increase in oil prices causes a decrease in economic growth and an increase in inflation in oil-importing countries (Zinaldini et al., 2019). In addition, an increase in the price of oil can cause a shortage of energy as raw materials for the production of enterprises. Therefore, it increases production costs, and this causes a decrease in cash flow and stock prices (Ebrahimi, 2018). Due to price fluctuations, these countries face higher costs and higher risks of oil; as a result, the stock prices of these countries are also affected by these fluctuations and cause a decrease in investment (Doodkanloy milan et al., 2017). As a result, the increase in the price of oil for the importing countries causes a decrease in the income of these countries and, consequently, a decrease in the stock price. (Basher & Sadorsky, 2006). The price of crude oil can be affected by an increase in supply, a reduction in demand, or both a fall in demand and an increase in supply (Fotros et al., 2015). A decrease in demand usually follows a decrease in economic growth in the region or the world or any economic recession in oil-consuming countries (Mirhashemi-Dehanvi, 2014). But the decline in oil prices is mostly attributable to an oversupplied global market. This is despite the fact that if the supply of oil on the global market increases, market confidence in supply security will increase, resulting in a fall in the worldwide price of crude oil. (Fadaei-Nejad & Farahani, 2016). Due to their economic structure, large oil-producing countries are forced to secure their foreign currency income, and when prices fall, they try to realize their country's foreign exchange income by increasing production (Elzami, 2014). In oil-exporting nations, every increase in oil prices is anticipated to result in a gain in income (Nazlioglu et al., 2020). The growth in the government's revenue and wealth has a beneficial impact on the capital market and, accordingly, on the banking stock

index. (Raza et al., 2016). Now, if these incomes are used to buy domestic products, this increase in income leads to an increase in production and economic growth and, consequently, an increase in investment, which leads to an increase in stock prices (Xu et al., 2018).

On the other hand, if the oil-exporting country is a developing country, it imports most of its oil products and derivatives due to the lack of ability and technology required to process crude oil; as a result, the increase in the price of oil has led to an increase in the products produced by industrialized countries, so the price of imports in these countries increases, it can be said that the production costs have increased, and it causes the stock price index to decrease. Thus, oil price fluctuations influence bank stock values in oil-exporting nations through many mechanisms (Xia et al., 2022). According to what was said, the main question of the current research is whether the changes and fluctuations in oil prices are effective on the banks' stock index.

1.3 The importance of research

In every country's economy, one of the most important and significant components of the financial industry is the stock market (Zhang et al., 2016). Banks are central to the accumulation of savings and liquidity of the private sector in order to finance long-term investment projects and are considered an official and reliable reference for the holders of stagnant savings (Karimzadeh, 2016). By nature, the capital market and banks reflect any country's economic situation because the capital collection and transfer to individuals and companies applying for funds take place there. As a result, banks are one of the crucial pillars for financing companies. Various factors can affect banks' stock returns (Bagirov & Mateus, 2019). The instability of these variables can cause problems in the decision-making of shareholders and investors, so the clarity of

any fluctuation in these variables can be a way for investors to plan for the future. One of the essential factors affecting bank stocks is oil price changes. Since oil is one of the critical resources of revenue for oil-supplier regions, oil price fluctuations impact the economy of a country whose budget relies on oil prices (Samadi & Bayani, 2018).

Stock prices are based on the discounted value of future cash flows, which is influenced by macroeconomic events. This means that oil prices may be considered as a fundamental component in the study of bank stocks. In oil-exporting countries, one of the main economic factors that affect the state of the macroeconomy and, ultimately, bank stocks is oil price changes (Khatib-Semnani et al., 2013). One of the requirements of moving towards continuous economic development is to acquire the necessary resources for the set of economic activities by equipping the savings resources available in the economy. Fluctuation in bank shares plays a vital role in allocating resources and income distribution. Therefore, the financial markets, mainly the stock exchange, have a significant effect on the growth and development of developing countries (Shakeri, 2017). Creating a suitable platform for the stock market's development can positively affect macroeconomic variables and improve the country's well-being. The role and positive performance of the stock market in attracting domestic and foreign capital to create production and consequently employment and then achieving economic growth shows the importance of this market. Since oil and its price variations have an impact on the economy of a country like Iran, it's necessary to analyze how the performance of the Iranian stock market and its contribution to economic development are affected by oil price fluctuations. Investors may be certain that they will be able to plan for appropriate pricing and acceptable returns in this market if they understand the influence of macroeconomic factors on bank stock

returns. Therefore, it is important to seek out means through which macroeconomic factors may be assessed.

1.4 The relationship between research variables

1.4.1 Oil price fluctuations and bank stock price index

Theoretically, the oil price shock can be transmitted to the macroeconomics through various channels (Barrow, 1983). Oil, a vital energy source and one of the most important production variables, will always occupy a unique position in the global economy. (Bastianin et al., 2016). Especially after the big oil shocks in the 1970s, which led to economic stagnation in the western world. Hamilton (1983) shows that rising oil prices have caused all US economic recessions since World War II. Any increase or decrease in oil prices leads to a change in oil revenues, affecting the economy. Today, the oil price is one of the most important fundamental components in the financial markets, among which the stock market has a unique position (Bouri, 2015). Bjorland (2008) states that since the stock value is equivalent to the aggregation of discounted future-cash flows, macroeconomic events significantly impact these flows; as a result, they can also be affected by oil shocks., so it seems pretty logical that It should be stated that bank stocks absorb information related to the consequences of oil shocks and reflect them in stock prices (Chen et al., 2017). Crude oil is one of the critical and practical factors in the global economy; political events and continuous instability in oil-exporting countries disrupt the oil supply and strongly impact the global oil price (Hussain et al., 2021). The price of oil is projected to be influenced by market instability and skepticism regarding the discovery of new resources. Volatility in oil prices reduces the planning horizon and causes banks to postpone irreversible business investments (Jones & Leiby, 2004). A drop-in oil prices might happen at any moment. Even if prices have been reasonably consistent for a long time, a new,

unrelated incident might produce a shift in the market that could lead to either an increase or a decrease in the price (Jain & Biswal, 2016). Oil is one of the primary resources of revenue for oil-supplier nations, and the volatility of oil prices has an effect on the economy of a nation whose budget is dependent on oil prices. Further, changes in the price of oil have a major effect on the profitability of banking stocks (Filis, 2011). Capital, labour, and oil are the most important factors in producing most goods and services (Li et al., 2016). Any change in the price of these factors affects the cash flow (Lin & Su, 2020). Higher oil prices are an inflationary tax on consumers and producers, and they may be generated when rising demand exceeds supply without adequate compensation (Liu, Ma & Bashir, 2018). If there isn't a one-to-one replacement for oil, then a rise in oil prices will drive up production costs, which will in turn diminish cash flow and drive stock prices (Basher & Sadorsky, 2006). As a result, stock prices and investment are both severely impacted by oil price swings, which raise risk and uncertainty (Mao et al., 2015).

1.4.2 Exchange rate and stock price index of banks

Among the important parts of the economy that are affected by exchange rate fluctuations is the stock market, especially bank stocks, because companies from various industries are present in the stock market which are sensitive to exchange rate changes. As a result of fluctuations in the exchange rate, the production and income of companies change, and as a result, their stock prices also change. Changes in the stock prices of companies cause fluctuations in the total stock market index, which is a set of stock prices for companies (Poorabadalhan Kavich et al., 2013). The PPP theory states that the overall level of relative pricing between two nations is what drives fluctuations in the value of their respective currencies. This relation always holds if the quantity of basket goods is considered fixed. Therefore, it can be said that the only

way to change the price of the market basket is to change the price of goods. Therefore, the change in the price level indicates inflation. As a result of changes in inflation, based on the theory of purchasing power parity, it causes changes in the exchange rate. The purchasing power parity hypothesis states that stock market investments and the cost of products are both sensitive to fluctuations in exchange rates. In addition, since the exchange rate, along with cash, bank deposits, and stocks, is a component of the investor's asset portfolio, its effect the bank stock price index may be analyzed in the context of owning assets. (Najjarzadeh et al., 2008).

1.5 Methodology and data

Throughout the years 2011-2020, the methodology developed by Diebold and Yilmaz (2012) has been used on a daily basis for the thesis. The whole banking stock index was obtained from the Asa Trading website, while the crude oil prices came from the International Monetary Fund (IMF). In addition, the USD/IRR exchange rate for the entire day was taken from the Rahavard website and afterward converted to IRR/USD in Excel. Log transformations have been applied to all the data pertaining to variables and are being utilized in calculations. In light of the fact that the YD technique is founded on the generalized forecast error variance decomposition (GFEVD) of a vector autoregressive (VAR) model, we will first use Eviews in order to establish the VAR lag order. In the first phase, it was determined that the ideal lag length for a vector autoregressive (VAR) model with no constraints that meets the stability criterion is 8. In the last stage of the YD approach, we will first discover volatility spillovers that have been communicated from other markets to market I. After that, we will employ directional volatility spillovers to study volatility spillovers transmitted from market I to other markets.

1.5.1 Society and statistical sample of the research

The statistical sample of this study encompass is all the banks listed in the Iran stock exchange, sample selection is based on screening, which must meet the following conditions:

1. Their financial period should end on 12/29 every year so the data can be put together and used in tabular or consolidated formats.

2. In order to be capable of comparing financial performance result, financial period has been kept identical during research analysis.

3. The banks in the sample should be considered as active banks, meaning the bank caries financial activities, including investment banks and financial institutions. Due to the diverse nature of these institutions' activities, their principal source of revenue is investment income, which is dependent on the operations of other companies.

4. The required data for the research variables should be accessible from 2011 to 2020 so that the computations may be performed as accurately as feasible.

5. Do not stop trading for more than six months during the financial year. Since the stoppage in transactions causes the inability to estimate the market value, this inability causes the lack of variables required for research.

Table 1: Screening of the research sample

Description	Number
The number of banks admitted to the Tehran Stock Exchange until the end of 2020	541
Exclusion of banks whose fiscal year end does not end in March	-198
Companies that have altered their fiscal year during through out the considered period	-117
Removal of the remaining companies including financial mediation, holding companies, insurance and leasing	-58

Companies whose symbols have been removed or stopped operating	-47
The remaining companies in the statistical sample of the research	121

1.6 The structure of the thesis chapters

In the first chapter of this study, the issue is introduced along with its significance, objectives, and research methodology. In the second chapter, the theoretical underpinning of the study is presented first, followed by a summary of prior research on the issue. In addition to introducing independent and dependent hypotheses, the third chapter explains the processes of research and the method for testing hypotheses. In the fourth chapter, the hypothesis outcomes are examined. In the fifth and last chapter, the conclusion and recommendations for further study are offered.

Chapter 2

THEORETICAL FOUNDATIONS AND RESEARCH BACKGROUND

Stock prices and the price of crude oil have become inextricably linked in recent years for two main reasons: first, the production of many industries is highly dependent on the price of crude oil (both directly and indirectly), and second, the market value of companies in the petrochemical, refining, chemical, and other oil-related industries accounts for a sizable chunk of the total market value. Therefore, it is expected that the fluctuation of crude oil prices will have a considerable impact on the financial sector. Hamilton (1983) argues that the change in crude oil prices leads to an increase in uncertainty in the operating costs of durable goods, reducing investment demand. As a result of a drop in the productivity of capital and labour force, crude oil price shocks have led to a decline in oil consumption, ultimately impacting household income and decreasing consumption expenditures in the economy. Price shocks in oil-exporting countries such as the Islamic Republic of Iran increase national income, public spending, and investment. Positive oil shocks, according to the interpretation of the Dutch disease in oil-dependent economies, can increase the value of the domestic currency, decrease the price of tradable goods (importable goods), and increase the cost of non-tradable goods (services and housing). The introduction of consumer goods due to the native currency's appreciation has led to low-yield investments and the expansion of rent-seeking, which undermines the economy's long-term efficiency. Some contend that the Dutch disease phenomenon results from resource mobility and

the inability of oil-rich nations to control the rise of their oil earnings, which directly contributes to industrial stagnation and drives up the price of non-tradable commodities (Corden, 1984). Some also believe that the price of oil does not significantly affect other markets because monetary and financial policies are effective on inflation and macroeconomic variables that include the price of oil (Apergis & Miller, 2009).

2.1 The concept of the risk of decreasing stock prices

When investors have their expectations about a company's shares drastically lowered, a precipitous decline in the stock price happens. There are three main features of decreasing stock prices:

A- To put it another way, a stock market crash is a sudden and dramatic decline in stock values that does not coincide with any particularly dire economic news.

B- These major shifts are undesirable.

C- A significant market phenomena is a decline in stock values.

In other words, the decline in stock prices affects every stock in the market and is not particular to any one security (Chen et al., 2001). Facts, evidence, and careful analysis underpin the aforementioned three qualities. According to Hong and Stein (2003), news events did not trigger the large fluctuations in the P & 500s index after World War II, including the market crash in 1987, which they attribute to the first feature. The difficulty of explaining stock price swings by the disclosure of information connected to a single occurrence is further emphasized by French and Roll (1986). The second aspect of the previously defined term is the consequence of an empirically substantial asymmetry in the changes in market return. This indicates that the market yield has been more susceptible to drop and less susceptible to grow as a result of large

price changes that were mostly of the decreasing kind. There are two methods to establish this imbalance. Firstly, this disparity is readily seen by examining the past performance of market returns. When looking at the statistics presented previously, it becomes clear that nine out of the ten biggest changes to the p&500s index after 1947 were drops. Falling stock returns over time are often interpreted as evidence of negative skewness or asymmetric volatility, according to a substantial body of stock market research (Chen et al., 2001). One measure of the imbalance in the distribution of market rewards is the stock option value. While the Bleck sholdse stock option pricing model emphasizes the regularity of prices over the long term, this price trend runs counter to this premise (1973). Thus, stock option price movement suggests a negative yield bias for this investment (Hong & Stein, 2003). The third defining feature of a stock market collapse is that it is an event experienced by the whole market. This trend affects the market as a whole, including all stock categories. According to Duffee (1995), this issue emerges due to an increase in the correlation between the various stock types on the market during the phenomenon of market collapse. Kelly (1994) showed that a decrease in the stock option price index is associated with a rise in the correlation between various stock options. Kim and Zhang (2016). The economic mechanism that results in negative asymmetry or negative skewness in stock market returns has not been fully understood, despite the fact that all experts agree that it occurs (Hutten et al., 2009). The negative net present value of a project might lead managers to overinvest or delay its completion, as stated by Jensen (1986). Recent research has looked at the correlation between a decline in stock prices and management's propensity to make riskier investments or to keep unpopular projects running for an extended length of time. Bleck and Liu (2007), in their analysis of the issues surrounding historical cost accounting, state that this practice aids managers in

hiding the truth about unproductive projects and keeping them for as long as possible. As a result, the cumulative bad performance of such initiatives manifests in the ultimate maturity, resulting in a drop-in stock price (Bleck & Liu, 2007).

A stock market collapse occurs when the price of equities experiences a sharp and rapid decline (Hutton et al., 2009). There are two types of abrupt movements in stock prices: drops and increases (Foroghi & Ghasemzadeh, 2014). In general, if a company's share price has fallen sharply in the period under review, that company's share price has fallen in that period (Kim et al., 2011). A stock price crash is an extreme and atypical decline in stock prices that happens in the absence of a significant economic event and is seen as a phenomenon associated with negative skewness in stock returns (Hutton et al., 2009). Especially after the financial and economic crisis of 2008, declining stock prices have garnered a lot of attention in recent years. Stock prices may either go up or down, but these shifts are rather common. Researchers have paid greater attention to the phenomena of dropping stock prices, which results in a rapid decrease in returns, than to the increase of stock prices. This is because investors place a higher value on their stock returns than on their capital (Dianati Deilami, Moradzadeh, and Mahmoudi, 2013). In the lack of full openness in financial reporting, Hutton and his coworkers (2009) argue, managers will be tempted to conceal some of the losses in order to preserve their employment. Before the manager's arrival, the corporation followed this practice of covering up its true losses. The stock price usually drops once a management departs a business since all the hidden losses become public knowledge (Rezaei et al., 2016).

Studies by Chen et al. (2001) and Hutton et al. (2009), among others, use the following statistical definition of falling stock prices as a phenomenon associated with negative

skewness of return of stocks. When the net monthly return of a firm over a certain time period is more than 2.3 standard deviations below the average monthly return of the company during that time period, an unusual occurrence in the capital market is signaled. This definition is based on the statistical concept that, assuming the company's monthly net return distribution is expected, the fluctuations that fall between the mean plus 2/3 standard deviations and the mean minus 2/3 standard deviations are considered normal fluctuations. Outside this distance, they are considered non-conductive. Considering that the stock price fall is an abnormal fluctuation, the number 2/3 is considered as the boundary between normal and abnormal fluctuations (Foroghi et al., 2010; Hutton et al., 2009; Hosseini & Amjadian, 2016).

2.2 The causes and origin of the drop in stock prices

To comprehend the causes and origins of the decline in stock prices, some scholars have concentrated on the financial market processes and the behaviour of investors, proposing ideas that may be referred to the theory of leverage effects, reverse fluctuations, and differences of opinion (Chen and colleagues, 2001). Some other experts also interpret the cause of falling stock prices in the agency theory framework. According this theory managers tend to avoid spreading adverse news and withhold it inside the firm since their personal motivation and interest such as bonus contracts and job positions, will be affected negatively in case the news spread. The practice of withhold negative news from senior managers piles up to a certain threshold. When it reaches a certain level of prominence, the management will be compelled to reveal it since continuing to withhold the information would be both difficult and expensive. After then, a flood of unfavorable news hits the market, causing stock values to drop (Jin & Myers, 2006; Hutton et al., 2009; Benmelech et al., 2010).

Also, distortion of information, such as profit management derived from managerial motives, leads to a lack of transparency in financial reporting and prevents shareholders and the board of directors from taking timely measures to identify and liquidate loss-making projects. Therefore, the negative performance of these projects is accumulated within the company over time. When the information about it arrives in the market at once, it causes the stock price to drop sharply (Bleck & Liu, 2007).

In order to explain the cause for the decline in asset values using agency theory, it is assumed that managers can always make right and logical assessments about the intrinsic worth of the firm and investment operations. In other words, the conflict of interests and motivations makes managers keep unprofitable projects and accumulate negative news (Bleck & Liu, 2007). However, economics and psychology literature has shown that economic indicators and rationality do not only influence investment decisions, but psychological categories can have a significant impact on people's behaviour and the types of decisions they make (Baker et al., 2012; Shahrabadi & Yousefi, 2017). In this regard, Kim et al. (2014) discuss that the behaviour of management in keeping bad news, in addition to personal motives, can also originate from a behavioural trait called overconfidence in management (Foroghi & Ghasemzad, 2014).

2.3 Theories related to the causes of falling stock prices

In connection with explaining the causes of stock price fall, some researchers have focused their attention on financial market mechanisms and investors' behaviour and have put forward theories such as the theory of leverage effects, inverse fluctuations, the random bubble of stock prices, and agency theory.

1- Responses to the idea of leverage effects as proposed by Black and Cheristie (2007), which seeks to explain the phenomena of dropping stock prices. According to this hypothesis, the financial and operational leverage of a firm responds symmetrically to changes in its stock price by increasing (decreasing) its stock price, which in turn causes fluctuations in stock returns and unfavorable skewness of stock returns.

2- Blanchard and Vastson (1982) presented the stochastic bubble model for stock prices to account for the unfavorable skewness of stock returns. Based on current financial theory, a stock's worth is calculated as its present discounted value of all cash flows anticipated to be produced by the stock in the future. Furthermore, the efficient market hypothesis states that the stock price moves symmetrically around its intrinsic value in a well-functioning market. However, stock prices may rise dramatically for no apparent economic or fundamental reason (a "shock") when unexpected information is released. The financial literature uses the term "price bubble" to describe this phenomenon. It is the opinion of Blanchard and Watson that the bursting of price bubbles is responsible for the unfavorable skewness of stock returns and the subsequent decline in stock prices (Paknejad & Garkaz, 2017).

3- Both French et al. (1987) and Campbell and Hentschel (1992) hypothesized the mechanism of inverse volatility to describe the occurrence of decreasing stock prices or unfavorable skewness of stock returns. As a result of the entry of fresh news (information) in the market, both positive and negative, market volatility and, by extension, risk, rise due to the process of reversal volatility. Although the beneficial impact of good news is mitigated by this rise in risk expenditure, the detrimental impact of bad news is amplified. The stock market will react more negatively to the introduction of bad news than it would to the introduction of good news, meaning that

the decrease in price will be larger. This mechanism leads to a negative skewness of stock returns or a fall in stock prices. Poterba and Somers (2010) criticized this mechanism. They argue that market fluctuations are short-term and, therefore, cannot be expected to affect risk significantly.

4- According to the idea of incentive contracts and job positions, it is suggested that managers are motivated to keep unpleasant news to themselves and build it up inside the organization. This paradigm is known as "agency theory." Managers will be kept on until they reach a predetermined breaking point. At that point, it would be too difficult and expensive for the management to continue trying to keep quiet, so they would be compelled to come clean. Then, a flood of unfavorable information hits the market, causing the value of stocks to drop (Paknejad & Garkaz, 2017).

2.4 Examination of the connection between external oversight and the likelihood of declining stock prices

Social norms are believed to tremendously impact people's behaviour (Kialdini & Goldstein, 2004). Social trust, as one of the social norms, in addition to shaping informal institutions, also changes the behaviour of senior managers of companies. According to the research conducted in the field of social trust and organizational behaviour (Wu et al., 2014), managers of companies that have a high level of social trust show more ethical behaviours due to the existence of ethical norms governing the environment of these companies. Therefore, they tend to disclose financial information promptly (Gaisuet et al., 2004; Ha & Chen, 2015). The occurrence of such behaviours by managers causes timely disclosure of good and bad news to the market and reduces the possibility of hiding bad news in these companies. Stock price drops are less likely to occur in firms that have greater levels of societal trust, according to this theory. This

line of thinking is the basis for the research presented by Kao and coworkers (2016) that shows a negative correlation between public confidence in institutions and the probability of a company's stock price declining. Lee and coworkers (2017) came to a similar conclusion, namely, that higher levels of trust in the community mitigate the danger of a stock price decline for businesses.

Existing empirical evidence shows that external solid regulatory mechanisms limit managers' abilities and opportunities to maintain and prevent the disclosure of negative news and affect the fall in stock prices (Desai & Dharmapala, 2009; Hanlon & Selmord, 2009). Institutional investors are among the external monitoring mechanisms widely used in the literature (Vadii Nougabi & Rostami, 2013). The presence of institutional investors limits the opportunistic and biased behaviour of managers and delays the recognition of profits, resulting in an understatement of net assets and profits. The timely identification of losses and the clarity of their potential conditions for shareholders and creditors will make them react faster to prevent further losses (Dianti and Dilmi et al., 2011). Thus, institutional investors might be seen as a useful mechanism that mitigates the danger of declining stock prices and modifies the connection between public confidence and this danger (Cullen & Fang, 2013; Li et al., 2017).

Regarding the effect of institutional investors' ownership on the relationship between social trust and companies' risk of falling stock prices, two competing theories (theories of substitution and complementarity) have been proposed in the financial and accounting literature. According to the substitution theory, institutional investors and social trust are two alternative regulatory mechanisms to control managers' opportunistic behavior; therefore, in companies owned by more institutional investors,

where adequate supervision is applied to managers' opportunistic behaviour, the supervisory role of social trust has diminished, and increasing social trust in these companies has less of an effect on reducing the risk of stock prices drop (Lee et al., 2017). Most of the empirical research has also provided evidence in support of this theory. According to research by Cao et al. (2016), for instance, the negative dissociation between social trust and the probability of corporate stock price collapses is mitigated when institutional investors are the owners of the company. There is less of a negative influence of social trust on the odds of decreasing stock prices in businesses where institutional investors own a larger stake, as demonstrated by Lee and his colleagues (2017). Based on the complementing theory employed by institutional investors, which supplements the supervisory function of social trust, we should expect the negative association between social trust and the danger of decreasing stock prices to be higher in businesses with more institutional investor ownership. It is expected that institutional investor ownership would influence the link between social faith and the likelihood of a decrease in a company's stock price, since institutional investors' regulatory function may be an alternative to the complimentary role of social trust (Rezaei et al., 2016).

2.5 Competition in the product market and its impact on the risk of falling stock prices

Shleifer and Vishny (1977) claim that product market competition is the most potent force driving the economy in the world toward efficiency. Competition is one of the most central and important economic concepts. In today's world, "competition" has emerged as an inherent phenomenon in financial and commercial activities. In economic activities, it is one of the important determining factors in the fate of organizations and commercial institutions. Also, Baggs and Bettignies (2007) claim

that product market competition is a crucial criterion for evaluating the degree of success of countries, industries and companies in political, economic and commercial competitive fields. Any nation, industry, or business with a high level of competitiveness in a competitive market can have a greater level of competitiveness. Therefore, companies show behavioural characteristics according to the level of competition in their industry. It means that competition causes the existence of strong corporate governance and the reduction of representation problems between managers and shareholders. On the other side, intense product market rivalry lowers information asymmetry and controls costs.

The results of past studies have shown that product market competition can act as a corporate governance mechanism to reduce agency problems between managers and investors. Because company managers in competitive industries, to maintain their position and avoid liquidation, they should avoid wasting company resources on useless projects and invest less in non-value-added activities to maximize value (Wang, 2010). Therefore, market competition by coordinating interests between managers and shareholders helps to make the leadership role of companies and its effects an effective mechanism to reduce representation problems between shareholders and managers. Firms with agency problems are less likely to engage in opportunistic earnings management, and fraud in these industries is rare due to market mechanisms (Marciukaityte & Park, 2010). Because of this, the danger of a decline in stock prices is mitigated by the fact that intense product market rivalry lessens both the lack of transparency and the asymmetry of financial information. In addition to the traditional arguments presented above, there are other statements through which strong competition in the product market may affect the risk of a future fall in stock prices;

Strong competition in the product market can reduce the risk of collapse by reducing disagreement among investors (Xin et al., 2015). Hong and Stein (2003) and Hutton et al. (2009) show that the risk of a future fall in stock prices can result from disagreement among investors. With a high level of variance, stock prices may change even without any new fundamental information (Porter, 1992). A price change, especially when it is an adverse reaction from uninformed investors, can lead to additional price changes and, thus, the risk of a stock price crash. In general, intense product market competition can reduce such effects by reducing disagreement among investors. In conclusion, the preceding discussion demonstrates a negative association between product market competitiveness and the likelihood of dropping stock prices (Xin et al., 2015)

To summarize, it is suggested that competition as an external corporate governance mechanism lowers agency costs and better aligns the interests of managers and investors, which in turn mitigates the negative impact of product market rivalry on the risk of declining stock prices. It also reduces managers' violations, improves operational decisions, and increases the quality of financial reporting. In this case, the risk of the future fall of the stock price is reduced. However, suppose the competition in the product market is weak (the monopoly of the company's product market). In that case, it will increase the issues and problems of representation caused by the conflict of interests between the manager and the investor. Therefore, companies that operate in monopolistic markets and industries have a more ambiguous information environment. As a result, there is more information asymmetry between managers and investors in such companies. In other words, the management can manage the profit by using the internal control's weakness and using the shareholders' interests for their

own benefit, and reducing the company's value. As a result, it increases the risk of the future fall in the stock price; on the other hand, the regulatory role of competition in the product market increases the quality of company management, which ultimately leads to an increase in the quality of profit and the quality of financial reporting. Increasing the quality of profit and the quality of financial reporting will make the information environment more transparent and reduce information asymmetry about the company's shares in the market (Tao, 2012); finally, it will reduce the risk of the future fall of stock prices (Ahmadi et al., 2016).

2.6 Uncertainty of economic policy

The word uncertainty means doubt about the validity of the result. The measurement uncertainty gives us information about the quality of the measurement. The answer is simply an approximation of the real number and is only complete when accompanied with a comment regarding uncertainty (Arbabian & Soltani-Nejad, 2011).

Measurement uncertainty is the doubt that always exists about the result of a measurement. You might think high-quality rulers, clocks, and thermometers should be reliable and show accurate results. However, for any measurement-even, the most accurate-there is always a margin of error (Bali et al., 2017).

The causes of fluctuations related to the results of repeated measurements are the significant quantities that can affect the measurement result. It is only possible to determine some of the quantities influencing the measurement result. Those with the most impact can be identified, and their impact can be estimated as a result of the measurement. In many cases, their impact on the measurement result can be mathematically modeled (Bhattacharya et al., 2012).

Expressing the measurement result with the estimated measurement uncertainty is complete and meaningful. In many cases, two technicians in the same laboratory reach different results, or different laboratories announce different results, or in some cases, the customer and the supplier do not agree. When the result of the measurement of a physical quantity is reported, it is necessary to provide some quantitative indication of the quality of the result so that the person using it can assess its reliability. The word "uncertainty" is generally related to the general hypothesis of "doubt." The uncertainty of measurement does not indicate doubt about the validity of the measurement. However, the existence of knowledge about the uncertainty indicates more confidence in the validity of the measurement result (Baghomian et al., 2015).

Any analysis of uncertainty must begin with a precise definition of the measure. However, this step may seem very simple. In fact, it is the most important and perhaps the most challenging stage. Without a correct understanding of the purpose of measurement and the factors influencing the result, we cannot estimate the uncertainty of measurement (Sharifi & Qasimian, 2013).

Economic policy is one of the terms of economics, which means a set of conscious government interventions in some economic affairs in order to achieve a specific economic goal. The economic policies of a country include various policies such as monetary policy, financial policy, income policy, commercial policy, stabilization policy and currency policy. Each of these policies pursues its own goals so that society can achieve macroeconomic goals, that is, growth, development, and social welfare (Choi, 2010).

2.7 The prevalence of economic uncertainty

Identifying economic uncertainties and their impact on the country's economic conditions requires categorizing these uncertainties as well as the transfer mechanism of these uncertainties to other economic variables. Due to its enormous financial dimensions, the government budget in Iran's economy has an essential effect on other economic variables, primarily monetary and banking variables, as well as economic performance. The main sources of the government budget can be classified under three groups: tax revenues, oil revenues, and financial revenues. In this note, focusing on the government budget, especially its resource side, the severity of economic uncertainties affected by the budget and the mechanism of its effect on other economic sectors are discussed (Kamyabi et al., 2015).

2.7.1 Tax revenues

In the current situation, tax revenues are still being determined from two directions. The first path is the reduction in the tax base and, as a result, the reduction in tax revenues due to economic recession. At the end of 2016, the tax on legal entities, caused by the tax on government or non-government companies, accounted for more than 30% of the total tax revenues. The occurrence of an economic recession will cause the economic performance of these companies and, consequently, the tax revenues collected from them to decrease. While between the years 2006 and 2011, the tax of legal entities experienced an average annual growth of 17%, between the years 2012 and 2013, affected by the conditions of inflationary stagnation, it registered a growth of seven and six percent, which indicates a drop of about 10% in the average annual growth of this type of income. Is. There is also a decrease in tax revenues due to a drop in the tax base and changes in the rules related to importing goods for import tax. The average growth of tax revenues from imports between 2006-2011 was about 14.6

percent annually, while this tax item grew by an average of 0.9 percent annually in 2012 and 2013. Considering the share of about 20% of import tax from the total tax revenues, it seems that about 50% of tax revenues in the current situation are facing high uncertainty in the collection, and therefore the amount of government resources will be affected in this direction (Kamyabi et al., 2015).

In general, tax revenues from law firms and import taxes grew slightly. At the same time, the growth percentage of payroll tax and tax on goods and services did not decrease significantly due to the effect of the increase in the general level of prices during the previous inflationary recession period. Specifically, the income tax, which is affected by the incomes of public and private sector employees, has experienced higher growth than the tax on legal companies and the import tax because salaries and wages are adjusted based on inflation estimates. While the income tax increased 20% annually on average throughout the five years from 2006 to 2011, it increased by 26.2% and 21.4% in 2012 and 2013, respectively. Taxes on goods and services faced high growth during the previous recession period. Specifically, while the average growth of tax on goods and services between 2006-2011 was about 33%, in the two-year inflationary period of 2012–2013, this item grew by 50% annually. This increase was partly due to a two percent increase in the value-added tax rate between 2011 and 2013. Therefore, in the components of the government's tax revenues, the two components of corporate tax and import tax are facing uncertainty in the amount of collection. In comparison, the tax on goods and services and the tax on salaries and wages can be better adjusted to the existing conditions due to the effectiveness of inflation. In fact, for the last two components mentioned, the inflationary conditions will act as an automatic mechanism to adjust the effect of the recession. For about 50%

of the tax revenues, there is an automatic mechanism to adjust for the effect of the recession, which can cause the adjustment of the effect of current conditions on the amount of government tax revenues (Kamyabi et al., 2015).

2.7.2 Oil revenues

In the current situation, the primary source of inflationary stagnation is the decrease in foreign exchange earnings from the export of crude oil and a significant decrease in the actual growth of the oil sector. A decrease in export earnings due to a decrease in foreign exchange resources will cause a significant increase in the exchange rate. The exchange rate will cause inflation by increasing the price of goods and services. In the current situation, the amount of oil exports in the coming year is facing high uncertainty. In the current situation, temporary exemptions have been given to eight major exporting countries of Iran up to a maximum of 50,000 barrels, so the extension or non-extension of these exemptions will bring uncertainty of 400,000 barrels in Iran's oil exports for the coming year. Suppose Iran's base oil export is about one million barrels for the coming year. In that case, this uncertainty in oil exports will mean an uncertainty of about 40% for the country's oil exports. Considering the average oil price of $60, uncertainty in collecting oil revenues will be 8.7 billion dollars. An increase in the exchange rate can compensate for the uncertainty in oil revenues. An increase in the exchange rate can act as a compensatory mechanism for reducing oil exports. However, it seems that the government's policy for welfare support and provision of essential goods at the government rate of 4200 Tomans will severely limit the effectiveness of the increase in the exchange rate to reduce oil exports. By changing its welfare policy, by transferring this policy from the side of companies to the side of households and limiting its provision to vulnerable and deprived households, the government should at least create for itself the possibility of influencing the exchange

rate on the reduction of foreign exchange earnings from oil exports (Kamyabi et al., 2015).

2.7.3 Financial income

The financial income of the government, except the withdrawal from the National Development Fund, is affected by the issuance of government securities. Most of the government securities in the past years have been treasury bills. In the current situation, an increase in the level of inflation causes the interest rate of government bonds to increase in the absence of an effective monetary policy to control the interest rate. It will create a problem if the government wants to avoid adjusting the supply of government bonds with higher rates. Adjusting the nominal value of government bonds to maintain their purchasing power will increase the government's financial expenses in the coming years. The current conditions directly affect this part of the government's income. The government can adjust its effect on expenses only through proper planning for its release in the coming years (Kamiabi et al., 2015).

2.8 Uncertainties in Iran's economy, its roots and consequences

Uncertainty is a situation in which the possible events that will happen in the future are unknown, or if they are known, the probability of their occurrence is uncertain with the probability distribution function. Making judgments regarding the future in such a circumstance is complex and confusing with the existence of each of the states mentioned above, and the "uncertain environment" has dominated the decisions (Aflatouni, 2012).

Keynes first proposed the concept of uncertainty in modern economics. He believed that due to the uncertainty regarding the future demand situation, the economy would be fundamentally unstable. According to Keynes, adjusting and stimulating the

demand side plays a significant role in eliminating this uncertainty. Keynes also states that if the uncertainty about future economic activities is too intense, monetary policies become ineffective (Donelson et al., 2010).

Naight (1921) states that there is a major difference between risk and uncertainty caused by the ability to measure the risk distribution function versus the inability to measure the uncertainty distribution function. Risk is characterized by its stochastic nature that can be precisely measured. If the risk is the only aspect of randomness, well-organized financial institutions can price and trade it. Nevertheless, uncertainty creates frictions that financial and investment institutions cannot adapt to its characteristics and conditions (Francis et al., 2014).

At the same time, uncertainty and risk are different characteristics of a random environment that can affect different people differently. Uncertainty can lead to two deviations from standard risk-sharing behaviour in expected utility models. When uncertainty is prevalent, some insurance markets must collapse. At the same time, uncertainty arises in this state, which can produce predictions sensitive to infinitesimally minor measurement errors and cause considerable price changes in equilibrium receipts (Habib et al., 2011).

Alsberg's definition of uncertainty is relatively precise. He calls uncertainty an event whose probability is unknown. Knight also believes risk can be insured through the exchange, but uncertainty needs to include such a feature. By definition, the risk is calculated as follows. Risk is equal to the probability of an adverse event multiplied by the loss in the event of an adverse event. The desired position is the risk if both

equation components are known and measurable. The situation will be uncertain if one or both are unclear or unmeasurable (Stein & Wang, 2017).

Koykerman presented the first systematic model of uncertainty. He states that risk-averse companies reduce their investment level in high uncertainty conditions. Also, in the developed state of this model, risk-taking companies reduce their irrecoverable capital with an increase in uncertainty. One of the most critical signs of uncertainty in an economic system is high and severe fluctuations in economic variables. In developing countries, including Iran, one of the reasons why the private sector is less willing to enter the economy is the fluctuations of economic variables. Such fluctuations lead to uncertainty in both profitability and investment costs (Samaei & Shariat-Panahi, 2013).

Investment costs are irreversible to a large extent, and the costs cannot be recovered after the investment is made and are considered accumulated costs. On the other hand, the investment can be postponed until new information about costs, prices and other market conditions is received. This irreversibility and waiting for new information investments in the industrial sector react to uncertainty about prices and other economic variables, as well as the timing of investment. Bernank (1983) argues that although uncertainty may increase profitability in all investment projects, it depends on the degree of uncertainty. It shows that companies avoid doing things with a high irreversible error.

Li and Shin emphasize that the larger the share of variable inputs from the output, the stronger the convexity of the profit function and the possibility of increasing investment due to increased uncertainty. In the recent literature, investment was

developed with Friedman's works and with the invention of related statistical and econometric models. In addition to traditional variables, investment is affected by various uncertainties caused by economic variables. In the framework of cost-benefit analysis, the risk of an innovation or business is the product of the probability of failure and the amount lost in case of failure. But uncertainty is a completely different matter that, for example, a person takes a risk when he enters a game without feeling faint and knows the probability of any incident. On the other hand, if he is uncertain about the game being safe or the possibility of incidents related to it, he is in an uncertain situation (Tomy, 2012).

2.9 Economic uncertainty

One of the prominent features of any economic environment is environmental uncertainty. Therefore, correct and rational decisions are made on the basis of information that explains the risk and conditions of assurance or at least helps to understand it. And in fact, what exists in our real environment today is that we may only have an environment with complete certainty in a vacuum, and the environment around us is an environment with uncertainty. Therefore, it is necessary that we know more about the word uncertainty and its effect on the information based on which we make decisions. Uncertainty is an environment where the decisions of economic actors, including households, companies and the government sector, are accompanied by uncertainty in various fields. In expressing the concept of uncertainty, it can be said, a situation where future events or the possibility of their occurrence are not predicted. Uncertainty exists when either the future events are not clear or known, or even though the future events are known, their probability cannot be predicted. In other words, the main cause of uncertainty is the lack of predictive knowledge (Money and Bank Research Institute, 2017).

In fact, uncertainty is a state in which people's knowledge is limited and it is not possible to fully explain the state or the result that has been or will be obtained. Based on this, uncertainty in macroeconomics can be explained by agents' inability to accurately predict the results of their decisions (Jafari, 2011). Therefore, uncertainty implies that, in a given circumstance, a person cannot arrange information quantitatively and qualitatively in a manner acceptable for explaining, forecasting, and delivering a decision in a specific way and quantitative (numerical) form. Lack of information is the most common cause of uncertainty (Arbabian, 2011). Various definitions have been provided in the field of environmental uncertainty. Sloocam et al. (1975) state that environmental uncertainty is an inability to predict the possible results of a decision. Organizations adjust their framework in response to environmental uncertainty, which is a state of affairs brought on by environmental factors within the organization. Environmental uncertainty includes unpredictability concerning the actions of customers, suppliers, competitors, and legal entities.

2.10 Oil price fluctuations and bank stock price index

Theoretically, the oil price shock can be transmitted to the macroeconomics through various channels (Barrow, 1983). Oil, an essential energy source in the world and one of the critical factors of production, always has a special place in the world economy (Bastianin et al., 2016). Especially after the big oil shocks in the 1970s, which led to economic stagnation in the western world. Hamilton (1983) shows that rising oil prices have caused all US economic recessions since World War II. When oil prices fluctuate, so do the earnings generated from selling oil, which in turn affects the economy. Today, the oil price is one of the most important fundamental components in the financial markets, among which the stock market has a special position (Bouri, 2015). Bjorland (2008) the stock value is equivalent to the total of discounted future cash

flows, and these flows are impacted by macroeconomic events and may also be affected by oil shocks. Bank stocks absorb information related to the consequences of oil shocks and reflect them in stock prices (Chen et al., 2017). Crude oil is one of the critical and influential factors in the global economy. Political events and continuous instability in oil-exporting countries disrupt the oil supply and substantially impact the global oil price (Hussain et al., 2021).

The price of oil is projected to be influenced by market instability and skepticism regarding the discovery of new resources. Fluctuations in oil prices reduce the planning horizon and make banks postpone irreversible business investments (Jones & Leiby, 2004). The price of oil might fluctuate at any moment. An unexpected external incident might cause prices to alter even if they have been generally constant for a long time if they are in equilibrium (Jain & Biswal, 2016). Oil is one of the important resources of income for oil-supplier regions. Fluctuations in oil prices affect the economy of a country whose budget depends on oil prices. In addition, oil price fluctuations also have significant effects on bank stock returns (Filis, 2011). Capital, labour, and oil are the most important factors in producing most goods and services (Li et al., 2016). Any change in the price of these factors affects the cash flow (Lin & Su, 2020). The ascent in oil prices can be due to the rise in oil consuming without compensation for its supply. Higher oil prices act like an inflationary tax on consumers and producers (Lin, Ma and Bashir, 2018). If there isn't a one-to-one replacement for oil, then a rise in oil prices will drive up production costs, which will in turn diminish cash flow and drive stock prices (Basher & Sadorsky, 2006). As a result, stock prices and investment are both severely impacted by oil price swings, which raise risk and uncertainty (Mao et al., 2015).

2.11 Exchange rate and stock price index of banks

The stock market is among the important parts of the economy that are affected by exchange rate fluctuations, especially bank stocks. Because in the stock market, companies from various industries are sensitive to exchange rate changes. The output and income of firms fluctuate as a result of changes in the exchange rate, which has an impact on their stock values as well. Changes in companies' stock prices cause fluctuations in the total stock market index, which is a set of companies' stock prices (Pourebadollahan Covich et al., 2013). Purchasing power parity (PPP) suggests that the overall level of comparable prices between two nations is the primary determinant of exchange rate fluctuations. This relation always holds if the quantity of basket goods is considered fixed. Therefore, the only way to change the price of the market basket is to change the price of goods. Therefore, the change in the price level indicates inflation. As a result of changes in inflation, based on the theory of purchasing power parity, causes changes in the exchange rate. The Purchasing Power Parity theory states that changes in exchange rates have an effect on the cost of commodities and the investments of stock market-approved institutions. Because currency exchange rates are considered an asset alongside cash, bank deposits, and stocks, studying their impact on the bank stock price index may be done within the context of a broader study of the impacts of having a diversified portfolio of securities (Najjarzadeh et al., 2018).

2.12 Stock market index correlation with oil price

Research findings in developed countries show the impact of stock price fluctuations on macroeconomic variables. Based on this, the stock price index is related to macroeconomic variables. The theoretical reason for such a relationship is that the stock price can be considered discounted future cash flow. This relationship can be formulated as follows:

$$P_0 = \sum_{n=1}^{0}[E(D_n/1+i)n] \quad (1)$$

In equation (2-1), P_0 represents the stock price, E represents the expected value, i is the appropriate discount rate, and D_n is the cash payment at the end of period t. Any economic factor that influences the predicted cash flow or discount rate will likewise impact the stock price (Kong, Wei, Xiao and Fan, 2008).

The stock price index is a key factor influencing investors' decisions in the stock market. Therefore, it is essential to know the factors affecting the stock price. It's important to keep in mind that a number of elements contribute to the aggregation of market participants' knowledge and opinions, as well as the pricing of firms' shares. Some of these factors come from inside the economy, while others are caused by external influences. From this, we may identify "internal causes" and "external factors" that affect stock prices, respectively. The activities and choices made by the firm itself are examples of internal forces. Earnings per share (EPS), dividends per share (DPS), the price to earnings ratio (P/E), capital growth, and other internal firm characteristics are all examples of such external indicators.

External factors include factors beyond the authority of the company's management. In general, these factors can be divided into two parts.

1) War, peace, the breaking of political and economic relationships with other nations, the rise and fall of political leaders, and the emergence of new political parties are all examples of political variables.

2) economic factors such as economic prosperity and recession, so that in the period of economic prosperity, with the increase of investment in the stocks of growing

companies, their stock prices will increase; And in a recession, it will result in a decrease in the prices of the companies' shares; Because in this situation, investing in financial assets with fixed income is superior to investing in common stocks.

Among the economic indicators, the world price of oil is a critical indicator affecting each country's economic and political factors. The stock market index is only one of several macroeconomic indicators that may be affected by the worldwide price of oil, another crucial exogenous variable. Explaining such a connection helps policymakers choose appropriate monetary and exchange rate strategies (Samadi, Shirvani-Mofard and Davarzadeh, 2016). In general, oil price fluctuations affect stock prices in oil-exporting countries differently.

The first method is creating liquidity (increasing the amount of money). Revenue from oil sales goes into the country's foreign currency reserve when the price of oil rises. If there isn't enough interest for currency at the intended price, the central bank will have to step in and purchase it, converting it into Iranian Rial funds for the government's budget. By taking this action, the central bank will enhance both its net overseas assets and the monetary base. A budget deficit will be generated if the authority does not cut spending in response to a drop in the price of oil, forcing it to borrow money from the central bank. As a result, the country's net debt to the Fed has increased, which has helped to expand the money supply. Therefore, the government's financial policy may enhance the amount of money in the event of a rise or drop in the price of oil (Ebrahimi & Shokri, 2013).

The increase in money can affect the stock price index as a policy variable at the macro level and as part of an individual asset portfolio. People have more disposable income

to make stock market investments as the money supply grows. As a consequence, the stock's price rises due to the surge in investor interest. To restate, financially stable families utilize their extra wealth to buy stocks and other assets in the capital market to boost returns and protect themselves from inflation.

Money and prices may also be understood via the lens of a person's asset allocation. The investor aims to optimize profits by diversifying assets over a large number of asset classes, with the belief that the safety of the money market is an advantage. If a person's cash and stock holdings both grow in value, the latter will drop due to the substitution impact of these two assets. If demand for shares falls but supply stays the same, share prices will fall. Stock prices and money supply are positively correlated in the first scenario, and negatively inverse in the second. Therefore, it is hard to state with certainty how changes in the quantity of money will ultimately affect stock values (Hassanzadeh & Kiavand, 2013).

Oil price fluctuations may also have an impact on stock prices due to the exchange effect. Since oil earnings are paid in dollars, a rise in the price of oil boosts both domestic revenues and foreign currency reserves which in turn boosts the value of the local currency. If the demand for an exchange rate rises, exporting firms will earn more money, and their stock prices will rise. However, if the supply of an exchange rate rises, importers of intermediate inputs will earn less money, and their stock prices would fall (Morley & Pentecost, 2000).

Investors consider factors other than dividends when purchasing stocks, such as the change in the company's intrinsic value. Industries whose start-up or ongoing operations depend on importing equipment are susceptible to fluctuations in the value

of the dollar due to fluctuations in the exchange rate. A rise in the exchange rate will boost the worth of a firm if it has imported necessary equipment at a low exchange rate price. When starting a comparable business elsewhere is hard owing to the country's high exchange rate, the inevitable cost rise is exacerbated. If a company's goods are the only ones of their kind on the market, demand will rise, and the company's bottom line will benefit. On this basis, there may be a greater demand for shares of these firms, leading to a rise in their share prices. Conversely, a gradual decline in the currency rate might have the opposite effect (Ibrahim, 1998).

Another significant factor is the country's composition of foreign currency assets and liabilities. Let us just say a corporation has more foreign cash holdings than foreign cash liabilities and the exchange rate rises. In such instance, the firms' share prices would rise as a result of the favorable effect of the present currency exchange rate on their profits. A company's share price will fall if its foreign currency obligations exceed its foreign currency assets because of the loss caused by the exchange rate to the company's earnings per share (Mosaei, Mehrgan and Amiri, 2019).

Changes in oil prices, as transmitted via the currency exchange rate, may have either a positive or a negative impact on the stock market.

The third approach is through the influence of positive feedback predictions. With the increase in oil prices and incomes in oil-supplier region, favorable forecasts are formed regarding economic achievements. The construction of such hopes for currently listed firms and the hope of increased profitability will lead to an increase in the present value of future cash stream and, by extension, the stock index will rise (Miller & Show Fang, 2001). When the price of oil increases, so do the costs of production for

companies in the oil sector. As a consequence of this happening, investors' anticipations may change, causing a drop-in demand and, in turn, stock prices.

Fourthly, we may use the income impact. The wealth of nations that import oil will be transferred to those that export it as oil prices rise. What the government does with the resulting revenue is what will determine the ultimate impact of this price adjustment. This may be positive for the economy as a whole if the extra money is spent on American-made products and services. Since companies will need more workers and money, there will be plenty of chances to put your money to work. Consequently, it has a positive effect on businesses' prospective cash flows. However, a rise in the price of oil as a production input will lead to a rise in costs and a drop-in company profits; It will hurt future cash flow and drive down stock values (Hassanzadeh & Kiavand, 2013).

The return effect is the fifth means of influence. That's because a rise in the global price of oil has a multiplicative effect on the cost of goods produced in industrialized nations, which in turn impacts the stock price of oil-exporting nations. However, owing to a lack of infrastructure and expertise, most oil-exporting nations must rely on importing refined petroleum products and derivatives. Stock prices in oil-exporting nations may fall as a consequence of a rise in the cost of imports and the potential impact on cash flow (Rault & Arouri, 2009).

2.13 Research background

2.13.1 Foreign background

Using the vector autoregression model, Maghyereh (2004) examined time series data for crude oil prices and stock returns in 22 developing nations from 1998 to 2004. The

results demonstrated that shocks to the price of oil do not significantly affect returns on stock indexes.

Bashar (2006) conducted research on the impact of fluctuating oil prices on the stock markets of Arab countries bordering the Persian Gulf using the vector autoregression model. The outputs revealed that only the stock markets of Saudi Arabia and Oman have a significant and positive relationship with the price of oil, and this feature makes it possible to predict the price between the two markets.

Arouri and Fouquau (2009), in their research, have examined the short-term relationship between oil prices and the stock market of Arab countries in the Persian Gulf. This paper employs a non-parametric kernel regression technique using a Gaussian kernel shape to demonstrate the non-linearity of the link between stock returns and oil prices in Qatar, Oman, and the United Arab Emirates. In these countries, changes in oil prices have a little effect on stock market performance. They could not find any evidence of serious connections between people in the other Arab nations of the Persian Gulf.

Stock market responses in Arab nations in the Persian Gulf area have been studied by Arouri, Lahiani, and Bellalah (2010) in light of changes in oil prices. They demonstrated that the stock market returns in Qatar, Oman, Saudi Arabia, and the United Arab Emirates are highly sensitive to changes in oil prices. Additionally, the oil price determines the direction of the stock market's movement in these nations, and this link is non-linear. Meanwhile, in the nations of Bahrain and Kuwait, there were no statistically significant associations between the aforementioned factors.

Chittedi (2012) investigated the long-term relationship between oil prices and Indian stock prices using the auto-regression distribution time lag model from April 2000 to June 2011. This research showed that the fluctuation of Indian capital market prices has a substantial effect on the fluctuation of oil prices. However, the alteration in oil prices has no effect on stock prices.

Abhynkar, Xu and Wang (2013) have investigated the relationship between oil price shocks and the Japanese capital market using a structural vector autoregression model. The findings showed that the oil price shocks resulting from the increase in global demand had a positive effect on the Japanese stock market.

Abounoori and Ziyaoddin (2017) investigated the relationship between oil prices and the stock index in Iran using the VARX-DCC-GARCH model. To estimate the model, they used the monthly oil price data and the total index of the stock exchange during the years 2004-2016. Long-term, the oil price variable was shown to be positively associated with the stock market index, but oil price shocks were found to have a more significant impact on the market.

Conditional variance of stock index and price of crude oil returns was used by Joo and Park (2017) to examine the link between crude prices, the equity markets, and uncertainty effects. From 1996-2015, American, Japanese, Korean, and Hong Kong stock markets were analyzed in this study. Dynamic bivariate GARCH (DDC) modeling has been used to examine how uncertainty in oil prices affects stock indexes. Over long periods of time and in some quite brief ones, the data showed a negative and statistically significant correlation.

Algia and Abdelfatteh (2018) have compared the response of emerging stock markets to oil price shocks compared to the markets of developed countries. The results showed that the stocks of developed countries were more resistant to the oil price shock in the period of 1998-2014.

The relationship between oil prices and the stock market has been assessed by Filis and Arora (2019) using both theoretical and empirical data. The primary focus of the study has been to determine whether the oil price and the stock market move in the same direction or in opposite ways. The results showed that fluctuations in oil prices cause swings in the stock market, indicating that the two do not move in tandem.

The relationship between oil prices and stock market performance was studied by Alamgir and Bin Amin (2021). We used a nonlinear autoregressive distributed lag model to examine the dynamic between oil prices and stock markets in four representative South Asian nations from 1997 to 2018. Positive and statistically significant correlation was found between the global oil price and the stock market index, with different reactions to upward and downward oil price shocks. The findings also demonstrate that the stock market responds positively to increases in global oil prices, suggesting that the efficient market theory does not hold true in South Asian economies.

In research, Le and Do (2022) investigated the effects of crude oil market structure on stock market growth: evidence from Asian countries during the years 2008 to 2017. To accomplish the study goal, network analysis and the SGMM estimate approach were combined. Network study was performed on 43 Asian nations, while examination of the influence of crude oil market structure on stock markets was performed on 19

nations. These findings indicate that the stock market contributes positively to economic development in nations with strong export capacities and negatively in those with big import volumes. In addition, studies have shown that nations with a dominant position in the crude oil market see more stock market growth.

2.14 Domestic background

Keshavarz-Haddad and Manavi (2005), investigated the short-term dynamic relationships between the stock market and currency with oil impulses using the vector autoregression model and the Granger causality test in 2005-2015. The results showed that in normal conditions and the upward trend of oil prices, oil shocks have an effect on stock prices and their transfer to the currency market; But in the case of a downward trend in oil prices, no clear relationship can be observed.

Abu Noori and Abdullahi (2013), by evaluating the nature of the interaction between the returns of the stock markets of the four countries of Iran, the United States of America, Turkey and Malaysia, have shown that the positive and significant effects of the returns of the United States of America stock market have been imposed on these markets with the exception of Iran.

Salimifar and Fallahi (2014) investigated tthe connection between the price of oil and how it fluctuated with the overall stock price index of the Iranian Stock Exchange from July 2019 to December 2019.To achieve this, VAR vector autoregression method, shock reaction functions and forecast error variance analysis were used with three liquidity control variables, housing price index and coin price. In this research, the asymmetric effects of oil price fluctuations on the stock price index were also investigated using Mork (1989) and Hamilton (1996) definitions. It was found that oil

price fluctuations have asymmetric effects on the stock price index, and in both definitions, the decrease in oil price compared to the increase in oil price has a greater contribution in explaining the variance of the prediction error of the total stock price index of Tehran Stock Exchange.

Abu Nouri and Moshrefi (2015) investigated the effect of macroeconomic indicators on the stock price index of the petrochemical industry in Iran using the linear multivariate least squares econometric regression model. The results indicated a long-term equilibrium relationship between inflation, exchange rate and oil price with the stock price index of the petrochemical industry. Among macroeconomic variables, inflation, oil price, and exchange rate have had a significant and positive effect on the stock index of the petrochemical industry, respectively.

Memarzadeh and Khiabani (2016), using seasonal data from 1998-2014 and applying a dynamic factor model, investigated the results of various oil price spikes on the expenditure variables of Iran's private and public sectors. This study showed that the positive momentum of global economic demand increases private sector consumption and total investment and causes an immediate and temporary decrease in government spending. However, the impulse of demand specific to the oil market only affects government spending, which is positive and temporary.

In their research, Samadi et al. (2017) investigated the effect of oil shocks on Iran's economy. In this study, using the non-linear VAR model, they have shown that oil price shocks in two regimes of high and low fluctuations have different and asymmetric effects on interest rates and economic growth.

Zaruki et al. (2017), in research using daily data from 1387-1396 and a self-explanatory approach with non-linear distribution breaks (NARDL), tested the existence of asymmetry in the effect of oil price on the value of petrochemical industries. According to the results, these sectors may act as a transmission mechanism for the transfer of worldwide oil price variations to the entire index of the Tehran stock market. In the short term, the asymmetry in the impact of oil prices on the value of petrochemical industries is confirmed. When the price of oil goes down, the value of shares in petrochemical companies goes down, but when the price of oil goes up, there is no rise in the value of petrochemical companies. Even though, in the long term, the oil price has a symmetrical effect on the index of petrochemical industries. Therefore, when oil price decreases long-term, there is no false support for the petrochemical index. Secondly, like the international companies active in the energy field, Iranian petrochemical companies are symmetrically affected by the global oil price. Factors such as government interventions and speculation in the stock market have not prevented the different effects of this channel.

Between 2008 and 2016, researchers Tak Roosta and Mohajeri (2018) analyzed the effect of oil price shocks on key economic indicators in OPEC nations, disaggregating the data by shock origin. The results showed that oil supply shocks could cause a slight increase in economic growth and inflation in OPEC countries, Although these increases are not significant. When oil prices spiked before, it slowed economic growth in OPEC countries but ultimately helped fuel inflation.

Abonouri and Zia-al-Din (2019), in their research, investigated the correlation between stock market return and oil price return in the form of a multivariate GARCH model. For this purpose, the correlation between these two variables and the amount of

spillover (contagion), the conditional average (return) and its volatility between the oil price and the stock market index of ten OPEC member countries (Algeria, Iran, Iraq, Kuwait, Nigeria, Qatar, Venezuela, Saudi Arabia, United Arab Emirates and Ecuador) are evaluated as monthly time series during the period 2014-2019. The results showed that oil price changes positively correlate with stock market returns in OPEC member countries. Also, the degree of correlation between oil price fluctuations and stock returns in countries where oil income has a higher share of their GDP is greater. The turbulence caused by oil price changes overflows into the turbulence of stock returns.

Chapter 3

DATA AND METHODOLOGY

In this chapter, an effort has been made to examine and define the data used in the thesis.

The empirical model is presented, followed by a description of the econometric methodology employed in the study. Also discussed are the data and sources used for their extraction.

3.1 Definition of data

Table 2: Definition of data

Variable	Measure	Definition	Source
Oil	Crude Oil	Crude oil, also called petroleum or just "oil," is a raw natural resource that is taken from the ground and processed into gasoline, jet fuel, and other petroleum products.	Datastream
Exchange Rate	Exchange Rate IRR/USD	The exchange rate indicates how many units of one currency must be exchanged for one unit of another currency. IRR/USD is used in this study to indicate the value of each Iranian Rial relative to the US dollar.	Rahavard
Ghadir	Ghadir Investment Company	Ghadir Investment Company was founded in Iran in 1991 and listed on the "Tehran Stock Exchange (TSE)" in 1995. With a market valuation of 97,416 billion Iranian Rials in 2017, GHADIR	Asa Trading

		is one of the largest holding investment companies.	
Mellat	Bank Mellat	Bank Mellat is an Iranian private bank that was founded in 1980. The bank has a current capitalization of 262 billion Rial and is one of the major commercial banks in the Islamic Republic of Iran.	Asa Trading
Melli	Bank Melli Development Group Investment Company	The Bank Melli Development Group Investment Company is an Iranian holding company founded in 1992. This company's assets are now at 28,459 billion Rials.	Asa Trading
Saderat	Bank Saderat	Bank Saderat Iran is a global Iranian banking and financial services corporation with headquarters in Tehran, Iran. It is the biggest bank in Iran. It was created in 1952 in Tehran. The value of this bank's assets till 2020 was equivalent to 5,326,909 billion Rials.	Asa Trading
Tejarat	Bank Tejarat	Bank Tejarat Iran, which was founded in 1979, is the biggest bank in Iran and invests in a variety of industries both inside and outside Iran. By 2021, this bank's total assets were at 4 quadrillion 287 trillion 354 billion Rials.	Asa Trading

This thesis focuses on the daily data of the variables from 22 March 2011 to 20 March 2020. Table 2 contains the definitions of the research variables. Every day, crude oil prices are taken from the IMF. The daily exchange rate between U.S. dollars and Iranian Rials was collected from the Rahvard website and then translated into IRR/USD using Excel. Additionally, the daily price of the total bank stock index for Saderat, Tejarat, Mellat banks, Ghadir, and Melli financial and investment institutions has been extracted from the Asa Trading website. All of the analysis's data are in

logarithmic form. Also, the return of the data is calculated first, followed by the absolute value of all returns for use in the analysis.

In this study, the control variables have been chosen and adjusted based on the available data from the existing literature. The effects of oil on the economy might be either direct or indirect. Higher oil-related lending, greater business activity, or surplus liquidity in the banking system are all potential channels via which oil price shocks might have a direct influence on bank profitability (Hesse & Poghosyan, 2016).

Oil revenues affect fiscal expenditure, which affects the profitability of corporations and banks through lending to the private sector, which in turn affects Iran's foreign and government income. Expectations and business attitude are a second indirect approach. A rise in oil prices might increase domestic demand, bank confidence, lending, and nonperforming loans (Hesse & Poghosyan, 2016).

Since unforeseen changes in exchange rates can directly influence banks by creating trading gains or losses based on net foreign holdings, exchange risk can also play a substantial role in determining banks' stock returns.

Grammatikos et al. (1986) showed in their research that U.S. banks are susceptible to exchange rate risk. Using daily and monthly data, they evaluated the sensitiveness of U.S. and Japanese banks to exchange rate fluctuations. They discovered that the stock returns of a considerable proportion of U.S. banking enterprises appear to be sensitive to exchange rate fluctuations, but only a tiny proportion of Japanese bank stock returns are affected by exchange rate fluctuations.

3.2 Descriptive statistics

Table 3: Descriptive statistics of volatility series

Variable	No. Observations	Mean	Max	Min	S.D	Skewness	Kurtosis	JB
OIL	2262	4.202286	4.7308	2.9693	0.338392	-0.174	1.9906	107.57***
EXCHANGE	2262	4.24E-05	0.0001	3.14E-06	3.25E-05	0.7150	2.0579	276.40***
GHADIR	2262	-2.347268	-0.2786	-4.4615	1.083913	0.2430	1.5977	207.59***
SADERAT	2262	-3.358094	-1.7653	-5.5480	0.904420	0.0649	2.1341	72.241***
TEJARAT	2262	-3.306777	-1.664	-5.9214	1.183091	-0.4155	2.1974	125.81***
MELLI	2262	-2.169275	-0.4732	-3.7809	0.816072	0.2857	1.8538	154.60***
MELLAT	2262	-2.726601	-1.4240	-4.4484	0.741609	-0.0138	2.1066	75.289***

NOTE: *** demonstrates the null hypotheses of normal distribution at the 1% significance level of rejection for the JB test.

Table 3 is provided below and highlights the key elements of the data. In logarithmic form, the mean values of the Oil (US$), Exchange rate (US$), and all Ghadir, Saderat, Tejarat, Melli, and Mellat banks (US$) are $4.20, $4.24E-05, $-2.34, $-3.35, $-3.30, $-2.16 and $-2.72 respectively.

Standard deviation (or σ) is a statistical measure of the dispersion of data relative to the mean. A small standard deviation means that the data are concentrated around the mean, while a large standard deviation shows that the data are more scattered. When the standard deviation is close to zero, it means that the data points are close to the mean. Table 3 shows the standard deviation calculated from the data. Clearly, the standard deviation of all variables is much less than the mean. The exchange rate data

with 0.0000325 exhibit the least variation, which indicates that they are most consistently near to their mean value.

Regarding the data distribution, the probability values of the JB test statistic for all variables are less than 1%. Therefore, at a significance level of 1%, we reject the null hypothesis that the data are not normally distributed for all variables. The high frequency of the data is one of the reasons why the data does not have a normal distribution, and based on the given data, it is evident that the data does not have a normal distribution.

3.3 Methodology

In the literature, many different methodologies have been used to examine the effect of natural resources on financial development. For example, Maghyereh (2004); and Bashar (2006) applied the vector autoregression model in their study, while Chittedi (2012); Alamgir and Bin Amin (2021); used nonlinear autoregressive distributed lag model. Also, Abounoori and Ziyaoddin (2017); Joo and Park (2017) applied the VARX-DCC-GARCH model in their study.

Based on Diebold and Yilmaz's (2012) methodology, this study will analyze the volatility spillovers between Iranian bank stocks and crude oil prices in the time domain.

3.3.1 Diebold and Yilmaz methodology

The spillover paradigm of Diebold and Yilmaz (2012) serves as the basis for our analysis here. The generalized vector autoregressive (VAR) model developed by (Koop et al. (1996); see also Pesaran and Shin 1998) serves as the basis for the (DY) method (1998). The amount of connection or link between the different variables may

be described using this framework's four forms of spillovers, which are referred to as Total Spillovers, Directional Spillovers, Net Spillovers, and Net Pairwise Spillovers. In order to accomplish this, we first build the basic stationary VAR(K) model with N variables as follows:

$$W_t = \sum_{i=1}^{K} л_i W_{t-i} + u_t \quad (2)$$

where W_t is Vector of endogenous variables at time t with N dimensions, which can be demonstrated as $W_t = (W_{1t}, W_{2t}, W_{3t}, \dots, W_{Nt})$. л is a matrix with N×N parameters, u_t is the error vector for disturbances that are spread identically and independently. The moving average for the equation (2) can be shown as follows:

$$W_t = \sum_{n=0}^{\infty} Z_n u_{t-n} \quad (3)$$

where Z is considered to comply with the recursion $Z_n = \left(\theta_1 Z_{n-1}, \theta_2 Z_{n-2}, \theta_3 Z_{n-3}, \dots, \theta_g Z_{i-p}\right)$, and Z_0 is an N×N identity matrix, Z_n=0 and i<0. Understanding the dynamic process required to determine spillover indices is based on the moving average's coefficients in Equation (3). Nonetheless, prior to giving the representation for the different indices, there are a number of essential basic considerations.

First, own variance shares are defined as the proportions of the H-step-ahead error variances in predicting W_i that are caused by shocks to W_i for $i = 1, 2, 3, \dots, N$. Second, the portions of the H-step-ahead error variances in predicting W_i that are attributable to shocks to W_j are known as cross variance shares or spillovers for $i, j = 1, 2, 3, \dots, N$, and $i \neq j$. Third, with the generalized VAR framework provided by KPPS, the H-step-ahead forecast error variance decompositions are represented by θ_{nm}^{g} and are expressed as follows:

$$\theta_{nm}^{g}(H) = \frac{\partial_{mm}^{-1}\sum_{h=0}^{H-1}\left(e_n' F_h \sum e_m\right)^2}{\sum_{h=0}^{H-1}\left(e_n' F_h \sum F_h' e_n\right)} \quad (4)$$

where ∂_{mm} is the standard deviation of the error term for the m-th equation. The variance matrix of the error vector was denoted by the Σ, and the selection vector was denoted by the e_n'. The number one served as the n-th element in this case, while zeros were used in all other cases. The variance decomposition table's sum of the items that were substituted in each row, however, does not equal one, $\sum_{j=1}^{N}\theta_{nm}^{g}(H) \neq 1$; In order to make use of the whole amount of information included inside the matrix, Diebold and Yilmaz (2012) normalized each element of the variance decomposition matrix by the row sum. $\tilde{\theta}_{nm}^{g}(H)$ depicts the variance decompositions of the KPPS H-step-ahead prediction error that has been normalized.

$$\tilde{\emptyset}_{nm}^{g}(H) = \frac{\emptyset_{nm}^{g}(H)}{\sum_{m=1}^{N}\emptyset_{nm}^{g}(H)} \quad (5)$$

where $\sum_{m=1}^{N}\ \emptyset_{nm}^{g}(H) = 1$ and $\sum_{n,m=1}^{N}\widetilde{\emptyset}_{nm}^{g}(H) = N$ by construction.

In light of these preliminary considerations, the formula for calculating the total spillover index is as follows:

$$S(H) = \frac{\sum_{nm=1(n\neq m)}^{N}\tilde{\emptyset}_{nm}^{g}(H)}{\sum_{nm=1}^{N}\tilde{\emptyset}_{nm}^{g}(H)} \cdot 100 = \frac{\sum_{nm=1(n\neq m)}^{N}\tilde{\emptyset}_{nm}^{g}(H)}{N}, 100 \quad (6)$$

The values of all the parameters in equation (6) have already been determined in advance. Equation (6) provides a total estimate of the impact of return/volatility shock spillovers on the banking stock index, which is the focus of this analysis. In our hypothetical situation, the total spillover index quantifies the contribution of return/volatility shock spillovers among the five (5) Iranian banks to the overall prediction error variance.

Additionally, the Diebold and Yilmaz (2012) technique may be used to quantitatively analyze the direction of spillovers between Iran's five banks, crude oil, and the exchange rate. This evaluation can be performed by using the method. As with "Directional Spillover From," the phrase "Directional Spillover To" describes one of two types of directional spillovers. While the latter investigates how the price of oil and the exchange rate affect the return or volatility that market *i* receives from all of the other markets *j*; The former measures the directional spillovers, which can be either return or volatility transmitted by market *i* to all of the other markets *j* while taking into account the influence of those markets. The following is the index that should be used when computing "Directional Spillover To," which is denoted by $S^i_{n.}$

$$S^i_{n.}(H) = \frac{\sum^N_{nm=1(n\neq m)} \tilde{\emptyset}^i_{nm}(H)}{\sum^N_{nm=1} \tilde{\emptyset}^i_{nm}(H)} \cdot 100 = \frac{\sum^N_{nm=1(n\neq m)} \tilde{\emptyset}^i_{nm}(H)}{N}, 100 \quad (7)$$

Using directional volatility spillovers, we can also identify volatility spillovers that spread from market I to other markets as:

$$S^i_{n.}(H) = \frac{\sum^N_{n,m=1(n\neq m)} \tilde{\emptyset}^i_{nm}(H)}{\sum^N_{n,m=1} \tilde{\emptyset}^i_{nm}(H)} \cdot 100 = \frac{\sum^N_{n,m=1(n\neq m)} \tilde{\emptyset}^i_{nm}(H)}{N}, 100 \quad (8)$$

Similarly, the Net Spillovers may be calculated using the following index:

$$Si(H) = S^i_a(H) - S^i_{a,}(H) \quad (9)$$
$$S^i_{ab}(H) = \left(\frac{\tilde{\emptyset}^i_{ba}(H)}{\sum^N_{ap=1} \Phi^i_{ap}(H)} - \frac{\tilde{\emptyset}^i_{ab}(H)}{\sum^N_{b,p=1} \tilde{\emptyset}^i_{bp}(H)}\right) \cdot 100 = \left(\frac{\tilde{\emptyset}^i_{ba}(H) - \tilde{\emptyset}^i_{ab}(H)}{N}\right) \cdot 100$$

The difference in the gross return and volatility shocks that are transmitted to and received from all of the other markets is represented by the equation (8). To rephrase, the net spillovers reveal how much individual markets have influenced the return or volatility of the whole market. In addition, relevant diagnostics are presented here in order to substantiate the conclusions we have drawn.

3.3.2 Stationary of unit root test

Unit root tests are statistical tools used to determine whether a time series process is static or dynamic. It's like a scientific litmus test to identify whether a series has a unit root, a mathematical property that indicates non-stationarity.

A stationary time series is a statistical process that retains an unchanging mean and variance over time. It is like a constant beacon of stability amidst the ebb and flow of time. This is crucial in statistical analysis, as it allows for a more precise modeling and prediction of the series. Conversely, non-stationary time series are akin to a constantly shifting kaleidoscope, with statistical properties that morph and change over time, making them more challenging to analyze and model accurately. Therefore, a stationary time series is a steadfast foundation upon which to build an accurate statistical analysis.

The null hypothesis of a unit root test posits that the time series is non-stationary, with a unit root present. The alternative hypothesis, on the other hand, is that the time series is stationary, with no unit root present. Unit root tests employ sophisticated statistical techniques such as the augmented Dickey-Fuller (ADF) test and Phillips-Perron (PP) test.

If the null hypothesis is rejected, then the time series is considered stationary, and the statistical properties of the series remain unchanged over time. On the other hand, if the null hypothesis is not rejected, then the time series is non-stationary, and the statistical properties of the series are assumed to change over time. Therefore, unit root tests are crucial in determining the stationarity of a time series process, a fundamental assumption that is vital in accurate statistical modeling and prediction.

Chapter 4

RESULTS AND ANALYSES

In this chapter, the results are provided together with their respective analyses. First, based on the graphs of the variables, a priori expectations, also known as research hypotheses, are established. After that, a discussion of the empirical data and a comparison to the a priori predictions follow (research hypotheses).

4.1 Evidence from the outset and research hypotheses

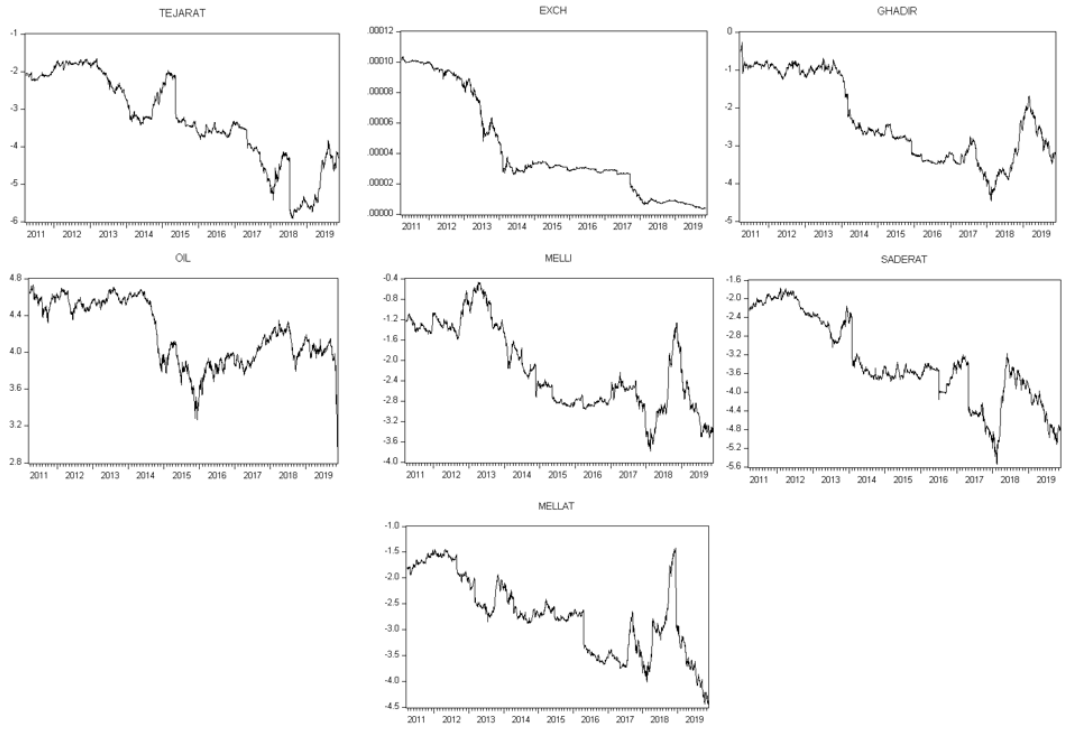

Figure 1: Line graph of all the variables extracted from Eviews.

A brief glance at the graphs demonstrates unequivocally that the trend of all variables analyzed in the study from 2011 to 2020 has been decreasing. It is clear that the

exchange rate between rials and dollars was the primary variables in the most significant decline that occurred over the course of the examined time period. In comparison to the value of one dollar, one rial in 2011 was worth 1.01×10^{-4}, while in 2020, one rial will be equivalent to 3.94×10^{-5}.

Evidently, a downward trajectory was seen at each of the four banks (Tejarat, Saderat, Ghadir, Mellat, and Melli) that were subjected to the investigation from the beginning of the evaluation period until 2018. As a direct consequence of this, the total dollar value of the stock held by these organizations has dropped to a new all-time low. However, beginning in 2018, and continuing until the completion of the assessment period, each and every one of them saw a gain in price, followed by a decrease in the value of their stocks.

As can be seen from the chart of crude oil prices in figure (1), the price of crude oil fluctuated around an average price between 2011 and 2014. This is the situation even though the price of oil had a structural break at the beginning of 2015, which resulted in a drop in the average amount of volatility. The works of Narayan and Liu (2011) (Arouri et al., 2012; Narayan & Liu, 2011) and Arouri et al. (2012) (Arouri et al., 2012) provide a current overview of research on the modeling of energy price volatility with structural breaks and its importance.

The graphs show that the relationship between the exchange rate and banking stock is positive over the long run. The value of all banks' dollars has generally been declining from 2011 to 2020 due to the depreciating rial versus the dollar. These findings are in line with numerous studies in the literature that found a positive relationship between stock prices and exchange rates using monthly data on U.S. stock prices (Ibrahim and

Aziz, 2003(Ibrahim & Aziz, 2003); Kim, 2003(Kim, 2003); Hatemi-J and Irandoust, 2002(Hatemi–J & Irandoust, 2002); Ajayi and Mougoue, 1996(Ajayi & Mougouė, 1996); Oguzhan and Demirhan, 2009(Aydemir & Demirhan, 2009); Aggarwal, 1981(Aggarwal, 2003)).

4.2 Empirical findings

4.2.1 Unit root and stationarity tests

Table 4 displays the outcomes of the unit root and stationarity tests that were conducted to see if the variables were stationary and in the correct sequence of integration. The null hypothesis for the non-stationarity (unit root) tests (ADF and PP) is that the variable has a unit root (variable is non-stationary).

Table 4: Results of unit root test

Test	OIL	Exchange	Ghadir	Saderat	Tejarat	Melli	Mellat
ADF-Level	-0.96	-0.88	-1.42	-2.55	-2.26	-1.98	-2.48
ADF-1st-Difference	-32.89***	-35.84***	-44.26***	-45.26***	-45.72***	-43.45***	-45.60***
PP-Level	-1.46	-0.90	-1.43	-2.84	-2.47	-2.13	-2.67
PP-1st-Difference	-52.22***	-45.63***	-44.28***	-45.42***	-45.81***	-43.75***	-45.62***

Note: Augmented Dickey-Fuller (ADF), and Phillips-Perron (PP) are unit root test; All the tests are for intercept and trend model; *** represent the rejection of the H_0 (null) at the 1% level.

Table 4 shows that according to ADF and PP test results, when we assume an intercept and a deterministic trend for crude oil's data generating process, we cannot reject the persistence of shocks at level. Since we are not able to reject the null hypothesis of non-stationarity at the 5% level of significance, so we are not able to reject the null hypothesis at level form. However, both Augmented Dickey-Fuller and Phillips-Perron unit root tests show that based on the intercept and trend model, the null hypothesis

for crude oil has a unit root at its first difference, then the null is rejected at the 5% significance level.

For the exchange rate, both Augmented Dickey-Fuller and Phillips-Perron unit root tests show that the intercept and trend model at its level form is non-stationary. Since we are not able to reject the null hypothesis of non-stationarity at the 5% level of significance, so we are not able to reject the null hypothesis at level form. However, both Augmented Dickey-Fuller and Phillips-Perron unit root tests show that based on the intercept and trend model, the null hypothesis for exchange rate has a unit root at its first difference, then the null is rejected at the 5% significance level.

Also, both Augmented Dickey-Fuller and Phillips-Perron unit root tests for all the banking stocks are non-stationary for the intercept and trend model at their level form. Since we are not able to reject the null hypothesis of non-stationarity at the 5% level of significance, so we are not able to reject the null hypothesis at level form. However, both Augmented Dickey-Fuller and Phillips-Perron unit root tests show that based on the intercept and trend model, the null hypothesis for banking stocks has a unit root at their first difference, then the null is rejected at the 5% significance level.

Generally, all the variables are I (1). Therefore, we estimate standard vector autoregressive (VAR) model. Since, Diebold and Yilmaz (2012) approach are based on the VAR model.

4.2.2Vector Autoregressive (VAR) model

In accordance with methodology (YD), a vector autoregressive (VAR) model is initially estimated using Eviews to determine the optimal lag length. The lag specification includes eight lags for the purpose of determining the optimal lag length.

Table 5 details the determination of the optimal lag length based on a variety of informational criteria.

Table 5: Optimal lag length

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-38520.81	NA	1683187.	34.20134	34.21911	34.20783
1	-38151.50	735.9864	1266622.	33.91700	34.05918*	33.96889
2	-38016.16	268.8791	1173170.	33.84036	34.10694	33.93765*
3	-37958.34	114.5163	1164021.	33.83253	34.22351	33.97522
4	-37923.65	68.48186	1178911.	33.84523	34.36062	34.03333
5	-37853.32	138.4180	1156807.	33.82629	34.46608	34.05980
6	-37813.18	78.74788	1165957.	33.83416	34.59835	34.11307
7	-37768.98	86.43432	1170959.	33.83842	34.72702	34.16273
8	-37637.64	256.0413*	1088446.*	33.76533*	34.77832	34.13504

NOTE: * shows the selected lag order.

As can be seen from Table 5, the lag order is based on LR to be 8, the lag order is based on FPE to be 8, the lag order is based on AIC to be 8, the lag order is based on SC to be 1, and the lag order is based on HQ to be 2. Not only does the AIC choose lag order 8, but it also receives the maximum amount of votes from the LR and FPE, as well as the most votes from any of the other 5 criteria. As a result, the optimal period of time between lags is 8.

Now that the optimal lag length has been determined, we check the autoregressive roots (AR) graph and table to make sure the VAR is stable enough to accept. The data is shown in Figure 2 and Table 6.

Table 6: Moduli of AR roots

Root	Modulus
0.999308 - 0.001617i	0.999309

0.999308 + 0.001617i	0.999309
0.995215	0.995215
0.994639 - 0.002774i	0.994643
0.994639 + 0.002774i	0.994643
0.992532 - 0.005005i	0.992545
0.992532 + 0.005005i	0.992545
-0.111784	0.111784
0.095770 - 0.003651i	0.095839
0.095770 + 0.003651i	0.095839
0.061271	0.061271
0.021618 - 0.005771i	0.022375
0.021618 + 0.005771i	0.022375
-0.013264	0.013264

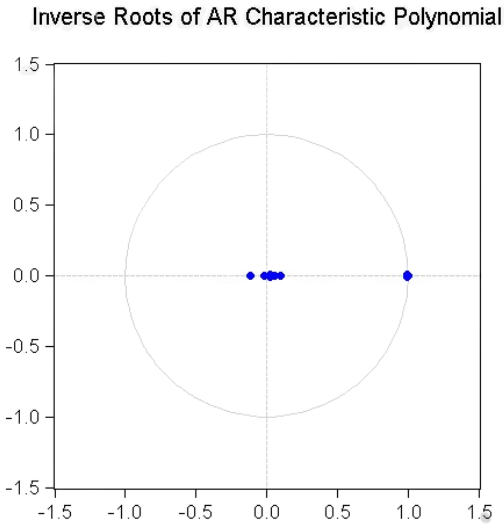

Figure 2: AR roots graph.

Figure 2 depicts a graph of AR roots in which each root is contained inside the unit circle. In addition, based on the AR roots table (Table 6), the moduli of all roots are smaller than one. Thus, the VAR meets the criterion of stability.

4.2.3 Diebold and Yilmaz (2012) results

4.2.3.1 Static analysis

We began by using static analysis in order to study the time-invariant volatility transmission between the price of crude oil, five banking stocks (Tejarat, Saderat, Ghadir, Melli, and Mellat), and the exchange rate. On the basis of the static analysis,

we received several helpful discoveries, which are detailed in Table 7. This table's information is based on the VAR model.

Table 7: Volatility spillovers among banking stocks, crude oil price, and exchange rate.

	OIL	EXCH	GHADIR	SADERAT	TEJARAT	MELLI	MELLAT	From	Net spillovers
OIL	98.92	0.20	0.25	0.10	0.20	0.18	0.14	1.1	0.8
EXCH	0.32	56.49	9.83	9.17	7.62	11.58	4.99	43.5	19.4
GHADIR	0.37	14.94	71.57	2.85	2.46	5.64	2.16	28.4	3.3
SADERAT	0.18	11.10	2.69	80.00	1.65	3.29	1.10	20.0	1.2
TEJARAT	0.24	12.56	2.95	3.87	76.18	3.09	1.10	23.8	-8.7
MELLI	0.42	15.93	4.81	3.44	2.10	66.90	6.40	33.1	-6.6
MELLAT	0.35	8.15	2.78	1.75	1.08	2.68	83.21	16.8	-0.9
To	1.9	62.9	23.3	21.2	15.1	26.5	15.9	166.7	
include own	100.8	119.4	94.9	101.2	91.3	93.4	99.1	**Total volatility index** =23.8%	

Each column's value reflects the volatility spillover transmitted to other markets. Consequently, the figures included inside each column indicate the volatility spillover received from various markets, including its own. Calculating these differences allows one to establish the number of net volatility spillovers (TO - FROM).

The total number of variables is 700, and the sum of the row (TO) and the column (FROM) is equal to 166.7 (100 per variable). The result of this calculation is 23.8%, and it is obtained by dividing 166.7 by 700. Overall, the spillover index comes in at 23.8%. As a summation of all contributions TO others and FROM others, the overall spillover index (23.8%) can be seen in the right corner of the table. Second, spillovers account for an average of 23.8% of the variation in volatility prediction error across these eight markets, whereas the remaining 76.2% may reflect idiosyncratic shocks.

Total connectivity between our variables indicates that oil, exchange rate, and all banks (Tejarat, Saderat, Ghadir, Melli, and Mellat) are connected. Nevertheless, their

volatility is associated by 23.8%, which is not the law nor a large number, but it demonstrates that they are related. The interconnection of the country's banks has significant repercussions because, since their volatility is related, if anything occurs in one bank, the uncertainty risk or volatility will be conveyed to the other banks, and they will be affected.

Check the table to identify which variable is the volatility receiver and which is the volatility transmitter that distributes the highest volatility. The results show that the variables are split into two categories based on whether they are net transmitters or net receivers of spillovers, according to the return spillover index. While the latter includes Tejarat, Melli, and Mellat, the former includes Oil, Exchange rate, Ghadir, and Saderat. Oil, for instance, provides 98% of the volatility by itself but not to the volatility of other variables since the volatility of oil that is transmitted is extremely little, approximately zero. The exchange rate is mainly affecting the banks. So, the exchange rate is a more essential determinant of volatility for the banks other than oil. The volatility of exchange rate transmitted to the Ghadir, Saderat, Tejarat, Melli, and Mellat is 9.83%, 9.17%, 7.62%, 11.58%, and 4.99%, respectively. Exchange rate spillovers have the greatest impact on banks.

To determine the net spillover, we subtract the values of row TO from the values of column FROM and show the result in a column labeled net spillover. Positive numbers in the net spillover column represent transmitters, while negative values represent receivers. The highest directional net volatility spillovers are from the exchange rate (EXCH) to other markets (62.9–43.5 = 19.4%), followed by GHADIR, SADERAT, and OIL, 3.3%, 1.2%, and 0.8%, respectively.

It is very clear that Bank Saderat and Ghadir are the transmitters of the spillover, and as the table (2) demonstrates, and Bank Saderat is one of the biggest banks in Iran. According to the "too big to fail" (TBTF) theory of banking and finance, Some organizations, especially financial firms, are so massive and interdependent that their collapse would be catastrophic for the economy as a whole. As a result, governments are required to support these corporations when they are at risk of failing (Lin, 2012). Due to their connection and the fact that it acts as a transmitter, if it bankrupt, other banks could follow suit.

Since the early 1990s, many economic sanctions have been imposed against Iran. These sanctions have intensified since 2010 and have included almost all Iranian banks, oil and petrochemical industries, and Iran's export sector. For this reason, Iran's banking system is not connected to the global banking system. The Iranian government and banks are facing enormous problems with receipts and payments, and they must bypass many sanctions. Therefore, as seen in the table (7), crude oil as an influential variable in oil-exporting countries has a minimal spillover on banks that invest in oil industries. Also, even though large banks such as Tejarat and Saderat have significant investments in Iran's oil and petrochemical industries, Iranian banks and the Iranian government cannot influence oil pricing due to sanctions. All these factors have caused Iran's government to live in isolation and play a minor role in the macro-equations of global markets. All this while Iran has the world's third-largest oil reserves and the second-largest natural gas reserves.

4.2.3.2 Dynamic analysis

Figure 3 depicts the dynamics of total volatility connectivity between five banking stocks, the price of crude oil, and the exchange rate from 2011 to 2020. The overall

volatility spillovers fluctuate from 20% to 80% across time, with a static total spillover index estimate of 23.8%.

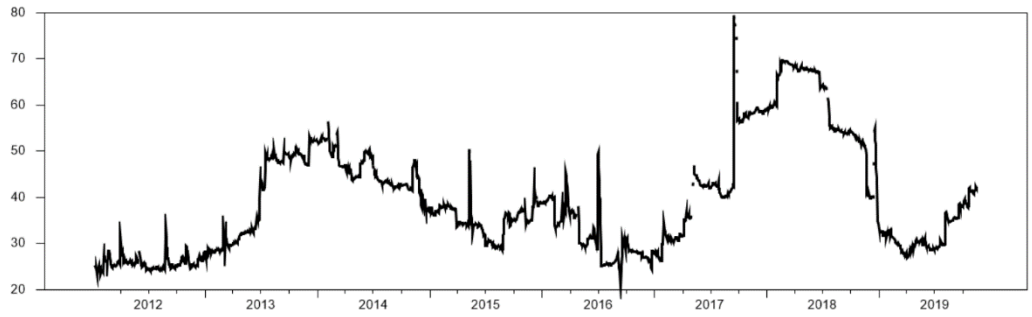

Figure 3: Total volatility spillovers

This is a noteworthy signal that the time-varying technique delivers more information than static research on the volatility relationship between banking stock, crude oil, and exchange rate. As a result of variations in the price of crude oil, the exchange rate, and extraordinary occurrences, we see a number of fluctuations and rapid rises and reductions.

As it is obvious from the figure 3, volatility spillover between bank stocks, crude oil and exchange rate has been varying between 20% and 80%. This level of variation is rather remarkable. In 2017 and 2018, it was revealed that there was a significant amount of volatility spillover between banking stocks, crude oil, and the currency rate. During the campaign for the presidency in 2016, then-candidate Trump made the pledge to withdraw from the JCPOA. In May 2018, the United States withdrew from the JCPOA. In two separate actions, in August 2018 and November 2018, President Trump reimposed the sanctions that had been temporarily lifted (Ghasemi-Nejad and Jahan-Parvar, 2021) (Ghasseminejad & Jahan-Parvar, 2021). In May of 2019, the Trump administration implemented a blanket restriction on oil exports, which, when

coupled with the COVID-19 epidemic, reduced Iran's shipments to fewer than 200,000 barrels per day (bpd) within a few months. As a result of these sanctions, Iran's economy instantly entered a recession, and inflation skyrocketed. The Iranian economy grew little in 2016 and 2017, according to IMF projections (Ghasemi-Nejad and Jahan-Parvar, 2021).

As can be seen in table 7, this study establishes without a reasonable doubt that the total volatility spillover had already reached 20% prior to 2017, which may be attributed to the lifting of different sanctions. despite the fact that by the middle of 2017, the level of total volatility spillover had reached 80% as a result of the United States withdrawing from the Joint Comprehensive Plan of Action (JCPOA), the re-application of previous sanctions, and the introduction of additional penalties. In addition to these features, we found that there were major quick changes, such as a significant increase at the tail end of 2012 and in the middle of 2015. The Arab Spring, which included political upheavals in Libya, Bahrain, Egypt, and Yemen, as well as the continuation of the civil war in Syria, are also potential factors for these events that occurred towards the end of 2012. In addition, the swings that occurred in the middle of 2015 may have been caused by the oil crisis that occurred between 2014 and 2015, which resulted in a steep drop in oil prices. This graph also reveals that there has been a spike in the overall volatility spillover since the beginning of 2019, which may be attributed to the beginnings of the Covid-19 epidemic.

In Figure 4, we depict the volatility spillovers from crude oil and the exchange rate to banking stocks and vice versa. According to panel (a), the periods of late 2012 through the middle of 2014 and early 2017 through late 2018 had the most significant volatility spillovers from the exchange rate to other markets, with these levels reaching almost

65% and 80%, respectively. During the times in question, Iran was hit with severe sanctions, and the list of sanctioned entities comprised a significant number of banks and other financial institutions, in addition to eight petrochemical companies, for the first time in 2013. In panel (b), you can see how the volatility of other markets has spilled over into the exchange rate. The exchange rate, on the other hand, is the most significant volatility transmitter to other markets.

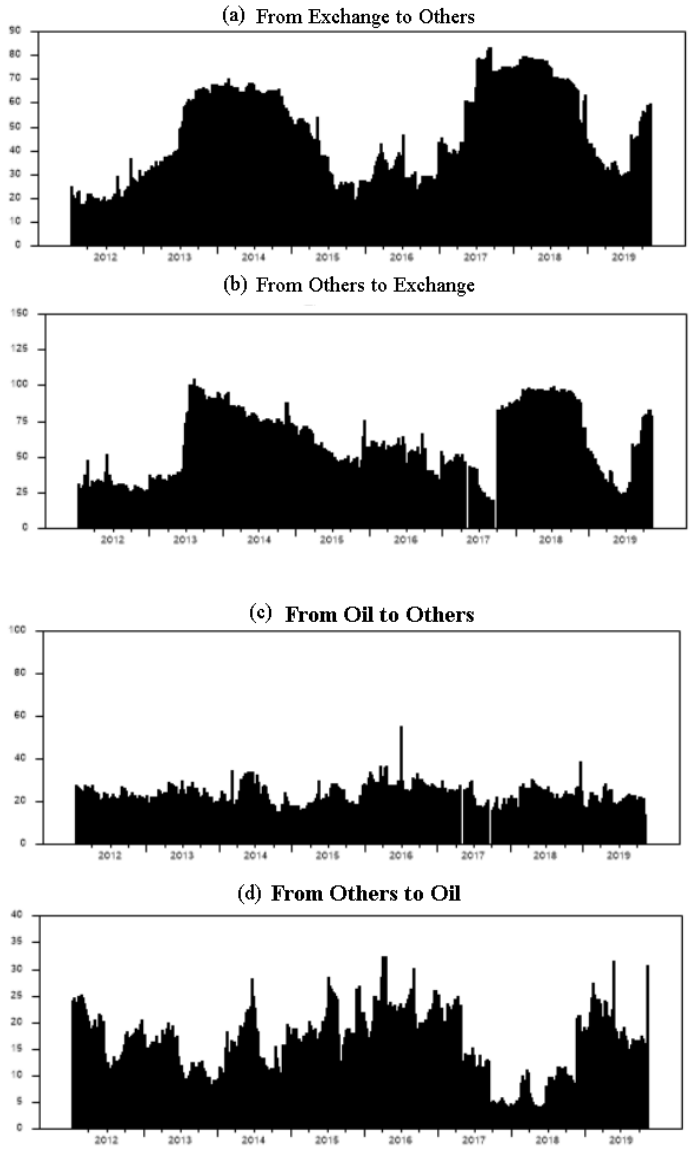

Figure 4: Directional volatility spillovers from (to) fossil crude oil and exchange rate to (from) banking stocks.

The data shown in panels (C) and (D) make it abundantly evident that the price of oil does not have a significant impact on bank stocks, and that the volatility spillover is approximately in the range of 20% to 25%. The existence of sanctions, the lowering of Iran's oil exports, and the loss of Iran's participation in OPEC are some of the reasons why oil has relatively little influence on bank stocks and vice versa. The efficacy and influence of investment banks in the oil and petrochemical sector on the price of oil have been significantly reduced as a result of all of the cases that have been discussed. However, due to sanctions and the devaluation of the Rial against the Dollar, the exchange rate has become the most influential factor in the price of bank stocks.

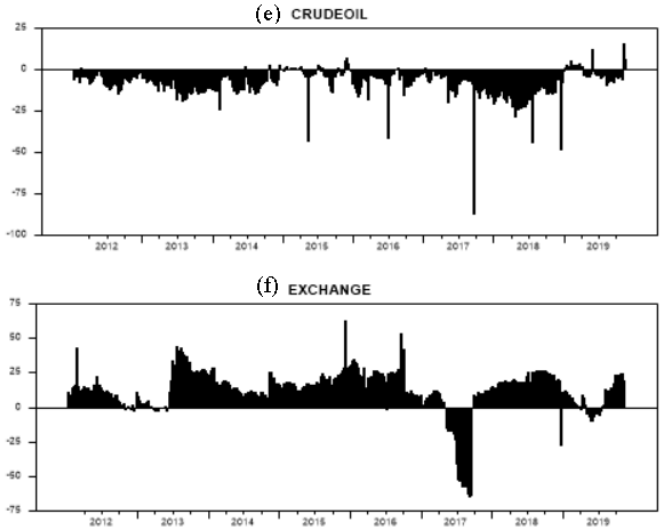

Figure 5: Net volatility spillover

The net directional stress spillovers are discussed in figure 5, which is presented immediately. Each point in Figure 5 corresponds to the equation (9) and represents the difference between the sum of the "directional to" column and the total of the "directional from" row.

The volatility of crude oil may be observed over time in panel (C), and Table 7 shows that this volatility is the norm. This indicates that the volatility of crude oil has an effect on the exchange rate as well as all banks (Tejarat, Saderat, Ghadir, Melli, and Mellat), as well as the spillover effect of volatility. In general, the volatility of crude oil varies from one point in time to the next.

It is possible to see in panel (F) that the duty of the exchange rate as a transmitter of volatility is very visually appealing and that it has a lot of volatility according to table number 7 on our variables. This is significant when taking into consideration the effective role that the exchange rate played in this research and its surprising effect on the banks that were examined in the research.

Chapter 5

CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS

5.1 Conclusion

The main goal of this thesis was to investigate the effect of oil price volatility on banking stocks between 2011 and 2020. For this purpose, daily oil price data, exchange rate as an auxiliary variable, and five major banks (Ghadir, Saderat, Tejarat, Melli, Mellat) are investors in the oil and petrochemical industry from 22/03/2011 to 20/03/2020. All prices used in the research have been converted to US dollars for easy comparison. Also, the influence of vital events such as this period, banking and oil sanctions, JCPOA, oil crisis, Arab Spring and Covid-19 were considered in the analysis. In this research, we used the approach of Diebold and Yilmaz 2012.

Numerous studies have been conducted on the effect of oil and commodity price fluctuations on the stock market and bank stocks. We analyzed a few of them in the literature study. The research used variables and different methods to investigate the effect of oil price volatility on the stock market. However, we faced many challenges in this research, all caused by the need for more transparency of the Iranian government in publishing financial reports.

In this research, significant findings were obtained, which we mention. First, we found a total volatility spillover index of 23.8% in the static analysis, which indicates the

interdependence between volatilities. However, the noteworthy point is that banking stocks are most affected by the exchange rate, and the price of oil does not have much effect on their stocks. There are many reasons to confirm this issue, which we will briefly state. Since the beginning of the 90s, numerous sanctions against Iran have been approved by the United Nations Security Council, the European Union, and the United States. These sanctions became more severe from 2010 onwards, and the UN Security Council approved four resolutions against Iran. In 2018, the United States withdrew from the Joint Comprehensive Plan of Action (JCPOA), fresh sanctions were placed on Iran, and penalties that had been previously suspended were brought back into effect. Many Iranian banks and financial institutions were added to the sanctions list during this period. Eight important Iranian petrochemical companies were included in the sanctions list for the first time.

On the other hand, other significant events happened from 2011 to 2020. Other events that took place during the time period under consideration include the continuation of the civil war in Syria and its impact on the countries in the region, the Arab Spring in the countries of Libya, Bahrain, Egypt, and Yemen, as well as the onset of an oil crisis and a significant decline in the price of OPEC oil. These are just some of the many things that took place. Another important event during this period was the outbreak of the Covid-19 pandemic. During the periods when the mentioned events happened, we see more severe volatility spillovers and a significant increase in the level of volatility spillovers. These fluctuations ranged from 20% to 80%. Most of this volatility spillover is related to the time of the US withdrawal from the JCPOA, about 80%.

Nevertheless, in the years when the international tensions were less for Iran or several sanctions were lifted, these fluctuations were less. The lowest fluctuation is around 20%, related to 2016, the Iran nuclear agreement, and the signing of the JCPOA.

The imposition of international sanctions against Iran has caused the Iranian rial to fall to its lowest level against the dollar in recent years. The decrease in the value of the rial against the dollar, along with other factors, causes inflation, which causes the nominal value of bank shares to decrease. Therefore, the market mechanism causes bank stocks to start fluctuating and increasing under the influence of the exchange rate decrease.

While banks, especially major banks, should be the receivers of volatility, it was discovered that two large banks, Ghadir and Saderat, are the transmitters of volatility. According to the "Too Big To Fail" theory, if banks and financial institutions are transmitters of volatility and are interconnected, their bankruptcy or failure can be disastrous for the more extensive economic system; Therefore, when their effects and the possibility of bankruptcy are revealed, they are forced to be supported by the government because any financial crisis or bankruptcy in these banks is transferred to other banks and has adverse effects on other banks.

One of the other reasons that caused oil price volatility to have a negligible effect on bank stocks is Iran's closed economy. Because of the sanctions, Iran's imports and exports face many problems. This challenge has caused Iran's economy to shrink, and the financial and stock markets are affected by it.

Another big problem is that Iran has a mandated economy, and this mandated pricing, especially in the feed of refineries, has caused the entire economy to be affected, especially in the case we are investigating, namely banking stocks.

5.2 Limitations

One of the most important limitations for researchers in the field of financial markets in Iran is the lack of access to accurate data from the government. Because the government needs more transparency to reflect financial reports and provide reports on the status of banks, companies, and financial institutions, data related to economic variables is not reflected in reliable global databases.

5.3 Recommendations

For the country's investors and policymakers, we have offered proposals. Oil exporting nations undoubtedly experience Dutch disease because of their extreme reliance on resources. Due to the extensive, thoroughly described sanctions imposed on Iran, its economy is currently experiencing several problems. However, the government's most essential step for the country's economic prosperity and its impact on global equations, especially in oil and gas, is to try to resolve international tensions and remove sanctions altogether. To achieve this right, in the first step, holding a free election with the presence of all parties and groups and choosing a government based on the people's vote should be on the agenda. In addition, the Iranian government should move towards the free market as soon as possible and abandon the mandated pricing that creates vast rents. The establishment of openness in all facets of the government, particularly in the economic sectors, is a crucial action that the government should take seriously. The creation of transparency should eventually result in the reform of the nation's economic system and bring about good economic development for the country since it offers economists a better understanding of the present situation of the

economic sector. In this situation, local and international investors confidently engage in a variety of economic sectors, particularly the country's banking sector and the oil and petrochemical industries, which both promise economic success.

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