Evaluating the effects of oil price shocks on the emergence of anomalies in asset portfolios in the oil industry

Davoud Keshavarz Hedayati,
Ph.D. student in financial engineering, Shahr-Qods branch of Azad University, Iran

Artin Beytari
Assistant Professor, Member of the Faculty of Accounting, Islamic Azad University, Qods Branch, Iran
(Corresponding Author)
Beytari@Gmail.Com

Mohammad Reza Ghorbanian
Assistant Professor, Member of the Faculty of Accounting, Islamic Azad University, Qods Branch, Iran

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ABSTRACT

One of the most significant aspects to consider when discussing investing is the anomaly of returns and asset portfolios. In this method, the return more than the expected return and higher than the risk premium is regarded as part of the portfolio components, and the correlation of the portfolio components is studied so that an optimum portfolio can be built. Oil price shocks have been investigated in the current study on the emergence of asset portfolio anomalies in the oil industry from 2012 to 2022. The findings of the study indicate that both oil price shock and risk have an adverse and significant relationship with portfolio anomaly returns. According to the findings, while oil shocks might have a negative impact on the stock market owing to the uncertainty they cause in financial markets, this issue is dependent on the form of the shock (demand side or supply side). If the shock is on the demand side, the market may respond positively; if the shock is on the supply side, the market may respond negatively.

Keywords: oil price shock, oil price risk, asset portfolio anomaly.

1. Introduction

The significance of oil in the economy is critical not just for macroeconomic indices but also for financial markets. Oil price shocks have an impact on stock markets via cash flows and interest rates, which are used to discount firms' future cash flows (Kerkulak and Safarzadeh, 2018). Many recent studies have focused on the influence of oil price shocks on stock market performance (Kilian and Park, 2009; Degiankis et al., 2013; Boldanoff et al., 2016; Fourney et al., 2017; Reddy, 2018; Swaimi et al., 2018). Economic theories state that there are two supply and demand channels via which alterations in the price of crude oil may impact the economy. The impact of the supply side may be an indication that oil is used as a raw ingredient in a variety of goods. As a result, as oil costs rise, fewer people need to buy it. Through consumption and investment, the demand side also has an impact on the economy (Kilian, 2009). The price of oil and its variations is one of the elements influencing the stock price index. The most significant source of energy for manufacturing processes worldwide is oil and its products; hence, changes in the price of oil can have an impact on production costs and the success of manufacturing companies. The mechanism of the consequences of oil shocks in Iran's economy may be very different because it is an oil-exporting country. The primary economic factors of Iran's economy—general revenues, government expenditure and revenues, and total demand—are in reality influenced by oil revenues. As a result, changes in the price of oil have an impact on how well businesses operate, their products sell, and how much money they make, which has an impact on stock returns (Paitakhti Eskoui and Shafie, 2013). On the other hand, changes in the price of oil are a key illustration of an economic risk that can occasionally have a negative impact on stock market investment. Oil-dependent countries have an economic impact from fluctuations in oil prices. Numerous research on the connection between oil prices and economic factors have been done since the oil shock of the 1970s. Due to its over-reliance on oil income, Iran's economy raises the issue of how oil supply and demand shocks may affect the country's economic indicators, particularly the index of the Tehran Stock Exchange.

We will investigate the effects of oil price shocks on the development of asset portfolio anomalies in the oil industry as it is one of the most common investment alternatives for investors in the industry.

Theoretical foundations and research background

Decisions of investors and oil shocks

Among the essential commodities in the world, each country's crude oil is distinct based on whether it is a consumer or a producer. Therefore, the fluctuation in its price eventually has an impact on the world economy. Oil price shocks are sudden fluctuations in oil prices that can have a favorable or negative impact on the economy of the country. This phenomenon, which was accompanied by a rise in the general level of prices and a large decline in productivity, has been criticized for the economic crisis in the United States (US) in the 1970s and even the current incidents reported on Wall Street (Sweimi et al., 2018).

As a result, according to Kilian and Murphy (2014), changes in monetary policy, changes in the labor market, and changes in energy technology may all be attributed to oil price shocks. As a result, research on the oil market and its effects on the global economy has been reevaluated in light of the fluctuations in the real price of oil since 2003.

Oil price shock

Different theories have been offered to explain the causes of these events as a result of the sharp rise in crude oil prices in recent years and the widening range of price fluctuations of this strategic commodity. In general, it can be argued that three groups of factors have an impact on the price of crude oil, just like they do on any other commodity. First Division: Political variables are primarily impacting supply and demand. The second group is politico-psychological elements, which are often political phenomena with psychological effects and outcomes. As long as there is a political phenomenon, its psychological impacts are also there. Oil is an extractive substance rather than a produced product. Oil has become a geopolitical phenomenon that is impacted by any form of political modification, especially in the supply areas, because the primary locations where reserves are situated and naturally where extraction and production of this material take place do not match the main areas where it is consumed. Technological variables go into the third group. This product is more sensitive, necessary, and strategic than any other, and as a result, these considerations have a more significant impact on its pricing (Emami et al., 2013).

A review of the topic literature reveals that classical financial fields, neoclassical finance, behavioral finance, and neurofinance have all concentrated on the same area (one dimension) at various times. Of course, by moving forward in time, the examination of concepts from the same era will be justified. However, given the evolution of financial and investment theories, as well as the presentation of different and complementary perspectives on investor decision-making, it should be noted that evaluating the supplementary structure of investor decision-making according to multiple dimensions of the issue can provide the researcher with a more comprehensive view of how to make decisions. Although many academics and professors who support traditional finance are still unconvinced that the influence of human feelings and perceptual errors on financial decisions should be researched and investigated as a separate field; on the other hand, behavioral science proponents think that understanding the pertinent psychological topics is crucial to success in the investment world.

It is possible to explain the theoretical reason for utilizing changes in oil prices as a market-influencing factor by assuming that the stock value is equal to the total discounted value of all anticipated future cash flows. Macroeconomic factors, such as oil shocks, can affect these cash flows. However, in countries that export oil, an increase in oil prices should have a positive impact on government budget revenues, a rise in government public expenditures, and total demand. In oil-importing nations, a rise in oil prices will, directly and indirectly, reduce the expected value of future cash flows. It is important to note that a rise in the price of oil may raise the cost of importing capital and consumer goods for oil-exporting countries because these countries source a large portion of the items they require from developed and developing economies. The cost of oil and other stock market values are directly correlated. Because of the economy's health, there is less demand for oil, which has led to a rise in price. It is only natural for basic metal prices to drop as a result of this decline in demand.

There have been numerous field studies on the relationships between different economic variables and oil prices, but it is difficult to find studies that used the non-linear method and monthly data to examine the relationships between returns and stock market volatility with oil prices in significant international oil exporting countries. In the petrochemical, chemical, and refinery sectors, the price of raw materials and the sale price reduce when the price of oil declines.

The price of raw materials and the sale price in the petrochemical, chemical, and refinery sectors fall when oil prices fall. Because these enterprises have a profit margin, their profitability suffers as a result. This is also true for metal, mining, and other industries. Furthermore, when the price of oil and oil derivatives, basic metals, and minerals falls, the government's budget deficit rises, and the government's options are limited when it comes to building expenditures.

In reality, the government's oil revenue will only be used to pay subsidies and employee salaries, which could cause stagnation in the construction, cement, tile, and ceramic industries as well as a budget deficit. Instead of receiving funding from the government, contracting companies will only be treated as creditors. It's probable that this problem also reduces the index's and the stock market's worth. Finally, this vicious cycle will result in a decline in the stock market index number (Masoumeh Eidani, 2015).

Crude oil price fluctuations on the global market demonstrate that two key factors always affect the price of this product: the quantity and timing of oil extraction, and a variety of other factors, including political and economic factors as well as the role of international organizations like OPEC. The cost of crude oil has changed dramatically during the past 20 years. It has had slight changes in an increasing trend.

One of the significant outside variables affecting the Iranian stock market index is changes in the price of oil. Although oil shocks can hurt the stock market because of the uncertainty they cause in the financial markets, this problem depends on the shock's specific characteristics (demand side or supply side). The markets may react to a shock in two ways: positively if it comes from the demand side and negatively if it comes from the supply side (Phillips et al., 2011). However, abrupt alterations in the price of oil will have negative (temporary) consequences on overall output since they will promote mistrust and raise costs for the market for distributing resources (Gu and Klisen, 2005).

Many academics believe that the price of oil has an indirect impact on the stock market, and macroeconomic metrics support this claim. According to Porland (2009), an increase in the price of oil due to an increase in the income of oil-exporting countries has a favorable influence on their economic performance, causing a rise in output and a decrease in unemployment. Any increase in the price of oil will have the reverse effect on countries that import it, causing an increase in production costs and, as a result, a fall in demand. Because oil is one of the most significant variables in production, a rise in the price of oil raises production costs (Aroori and Nain, 2010). (Bakus and Karuchini, 2000). The quantity of demand will be reduced by passing costs to consumers as their prices rise and consumer spending rises (Bernanke, 2006). Lower consumption will result in lower output and, as a result, a rise in unemployment (Lardik and Migo Noon, 2006). The stock market index in these countries will fall when the price of crude oil rises (Sadorsky, 1999). There is data showing a clear relationship between oil price shocks and stock market efficiency in countries that export oil (Arori and

Rowlett, 2011). Oil prices are viewed as a danger factor for the stock market in oil-importing countries due to the negative correlation between oil prices and stock market returns (Jones and Cowell, 1996). The revenue made from selling oil contributes significantly to the economic and general welfare of the countries that export it. These earnings are regarded as a portion of the national income of these countries and may be utilized for economic growth through both domestic and international investment (Mehrara and Hairi, 2017). The interest rate rises in response to an increase in the price of oil. Additionally, the central bank frequently employs contractionary monetary policies to combat inflation, which raises interest rates (Wu, 2011). Modifications in oil prices have a significant impact on businesses' fiscal viability or cash flows, which in turn can have an impact on dividend payments, profitability, and share prices (Park and Ratty, 2008; Tsai, 2008).

According to Basher and Sadorsky (2006), two scenarios will develop if the price of oil rises: first, consumers would search for less expensive energy sources, and second, the cost of production for businesses that utilize oil as a method of production will rise. This raises risk and uncertainty, which eventually harms the stock market and decreases investment. The drop in profit and dividends drove on by the rise in cost was found to be significant. This study evaluated the relationship between oil price shocks and the stock prices of companies that do not manufacture oil and are unable to pass along the rise in costs to consumers. It is the primary factor influencing stock prices. Countries that rely heavily on oil, such as OPEC members, may suffer the direct impact of rising oil prices. Oil exports provide a large portion of foreign money and government budget revenues and expenditures for such countries, and the unpredictability of oil price fluctuations plays a key role in the growth of these countries and their financial markets.

The background of the research

balakumar et al (2022) In this study, they investigated the consequences of structural oil price shocks on one of the most common and widespread movement abnormalities. They used a structural vector autoregression (SVAR) model to find the time-varying responses of Indian, Japanese, UK and US moving profits to different structural oil shocks – global aggregate demand shock, oil speculation shock and other oil shocks. Demand shocks Structural oil shocks, especially oil demand and speculative shocks, have important implications as conditional information in forecasting stock returns. Overall, the results show that oil structural shocks have a significant impact on the portfolio of small and losing stocks.

zho et al (2021) In a research to investigate the impact of oil price shocks on stock market anomalies, they presented a perspective of oil price and stock market. After analyzing oil prices into three types (Kilian, 2009), they found that shocks have the strongest effect on stock market anomalies. On the other hand, oil supplies and specific oil consumption shocks have little effect. Similar results are found in industry analysis. Interestingly, the association between shocks to total use and anomalies is strongest among firms with small size or high specific indices.

Zhou et al. (2020) evaluated the oil and gas industry's oil price shocks, investor attitudes, and asset pricing anomalies. They found that arbitrage's high prices and risk had a major deterrent impact on the oil and gas business. It also has investment and policy implications for investors, corporate executives, and policymakers.

Naderi Beni et al. (2019) used Bayesian hierarchical and Markov chain Monte Carlo modeling to evaluate the accounting anomalies test of the Fama and French three-factor models at the firm level. To test the hypotheses, a sample of 1150 company year data (13800 company month observations) was chosen from the Tehran Stock Exchange between 1387 and 1396. The findings of this study demonstrate that the three-factor model of Fama and French at the corporate level does not identify size, the ratio of book value to market value, profitability, investment growth, accrual items of working capital, investments, number of shares issued, and external financing as anomalies.

Ho et al. (2018) re-examined 447 abnormalities cited in the financial literature in their study Re-measurement of Anomalies. In the end, the researchers concluded that many of the anomalies brought up would no longer qualify as anomalies if the right techniques were employed. These researchers claim that 85% of the claimed anomalies are not anomalies and that the determination that they are anomalies is the product of methodological issues and the desire to obtain unambiguous findings. The association between stock price concurrent and voluntary disclosure was examined by Rashid, Bint Saeed, Yusuf, and Javad (2018). The findings demonstrated a U-shaped link between contemporaneity and voluntary disclosure as well as the impact of private information on stock prices in addition to public information. The findings also revealed a favorable and significant correlation between the stock price synchrony and the amount of voluntary disclosure practiced by the firm.

According to Gu et al. (2018), combining several machine learning approaches with asset and factor return forecasting, these factors provide value in terms of obtaining positive out-of-sample R2 return forecasting.

Miraskari, Mahfovi, and Shabani-Nejad (2018) evaluate the relation between return distribution and stock price concurrency. According to their study's findings, businesses with high stock price synchronicity are more likely to generate a profitable sequence than those with low synchronicity. Additionally, there is a positive significant relation between skewness and stock price synchronicity; consequently, it appears that shareholders in companies with high stock price synchronicity react less strongly to bad news than investors in companies with low price synchronicity. High stock synchronicity shows that the market information reflected on stock returns is higher and the risk that investors bear is systematic risk.

Using series regression, Badri, Dolo, and Aghajani (2018) described the extra returns of price momentum and style momentum (size, industry, and the ratio of book value to market value) in their paper "Momentum generating source; proof of risk adjustment technique." based on Wang & Wu's and Fama's (1993) three-factor models as well as their model (2010). The findings demonstrated that most price, size, and industry momentum strategies boost returns when returns are adjusted for risk in a typical manner based on the three-factor model of Fama and French (1993). The additional returns of these techniques will be reduced when applying the adjusted returns as per Wang and Wu (2010). As a result, the risk-based explanation of momentum cannot be strongly disproved. Although the method of risk adjustment cannot be used to disprove the risk-based explanation of the additional return of the mentioned strategy in the case of the momentum ratio of book value to market value, it does explain why it is impossible to assign additional momentum returns to the risk factor.

Mateen Fard and Salahvarzi (2018) investigated the impact of stock price simultaneity on the probability of price decline. The financial information of 109 firms from 1389 to 1394 was analyzed in this study (654 companies - year). To test research hypotheses, mixed multivariate regression was utilized. In general, the results suggest that stock price simultaneity influences the probability of stock price decline. According to the findings, the element influencing the risk of stock price decrease is the simultaneity of stock prices. Other research findings indicate a positive and significant impact of the negative coefficient of skewness of stock returns and profitability index on the risk of stock price decline, as well as the inverse (negative) connection between the investment ratio of institutional investors and company size on the risk of stock price decline, as well as the insignificance of the relationship of growth opportunities and financial leverage, is with the risk of stock price decline.

Campbell et al. (2017) focused on 34 stock market anomalies while estimating inter-period CAPM with a stochastic variation on investment elements using vector autoregression (VAR). To compensate for the balanced nature of anomaly portfolios, cash flow news and discount rate are implemented using a bottom-up technique, which means that news is evaluated at the stock level and then aggregated up to the abnormality level. After collecting news at the portfolio level, it is clear that cash flow news is primarily responsible for the return anomalies. Inspired by the machine learning literature.

Kozak et al. (2017) studied the resilient stochastic discount factor (SDF), which summarizes the joint descriptive ability of a large number of cross-sectional stock return predictors. Simultaneously, the higher performance of these strategies over the 1/N strategy was not found, particularly in recent sample periods. According to Barroso et al. (2017), the crowding mechanism can explain the danger of telemomentum with mushrooming arbitrage. A "restricted" strategy, such as value arbitrageurs, buys stocks with high book-to-market (B/M) ratios and sells stocks with low B/M ratios. The value spread is reduced, which is a natural restriction for a value approach.

Gassen, Scaife, and Weinman (2017) looked into the connection between volatility and the assessment of stock price concurrency. The results demonstrated that stock volatility reduces the assessment of stock price concurrency based on the R2 model of the market, and typical strategies used to fix beta for volatility effects were ineffective in rectifying R2. Galariotis et al. (2016) investigated the stock market liquidity and crowding. The findings revealed a strong and significant association between liquidity and collective behavior, particularly during the crisis and post-crisis periods; and this impact was more pronounced in the US market. Huang (2015) captures arbitrage activity using the momentum spread, which is the difference between the 75th and 25th percentiles of the distribution of cumulative return stocks, and finds that greater momentum activity is related to higher returns.

Shams and Esfandiari Moghadam (2017) used contemporary and ultra-contemporary portfolio theories to evaluate the impact of group behavior on the performance of investment firms. The influence of collective behavior on the performance of these firms has been explored in this study utilizing the monthly statistical data of 24 investment companies and Lakonishuk's model (1992) based on contemporary and ultra-contemporary portfolio theories. The estimated generalized least squares (EGLS) and generalized method of moments (GMM) approaches were employed for data analysis and hypothesis testing to achieve this objective. First, the study variables were assessed in terms of the mean. The results demonstrated that mass behavior in investment firms has a major adverse impact on performance standards based on both contemporary theories and ultra-contemporary portfolio theories.

Dostdar et al. (2017) investigated the influence of mass behavior on the risk-taking of managers of investment businesses listed on the Tehran Stock Exchange in their article. The structural equation modeling method using the partial least squares (PLS) approach was used to assess the hypotheses supplied in the form of the research conceptual model. Their findings revealed an unfavorable relationship between risk-taking and the mass behavior of investment company management.

Foroughi et al. (2016) conducted a study titled "Market Abnormalities and Abnormal Returns." They used a multivariate regression model to evaluate the impact of variables related to investors' emotional propensity index on company stock prices. They investigated the idea of abnormality of future returns and investigated whether factors that are indicators of market abnormality predict future returns in the same manner as they predict future profits or growth in future earnings.

If this co-direction is established, it may be said that the return predicted by these factors is not abnormal; rather, it is the yield that should take place in accordance with the prediction (required yield). According to the findings of their study, future profits, future returns, and a rise in future returns may all be meaningfully predicted using the variables working capital accruals, stock returns, foreign financing, and asset returns. This demonstrates that the return expected by these factors is normal and fully compatible with the rational expectations assumption.

Zenjirdar and Khojeste (2016) explored institutional investors' collective behavior on stock performance. Given the importance of the capital market in macroeconomics, investigating investor behavior in terms of the tendency to simulate the actions of others and the formation of mass behavior, as well as the effect of this behavior on the returns on company shares, was critical to employ the Huang and Salamon model for 49 companies studied between 2008 and 2012. In terms of its purpose, the current study is an applied study. It is a correlational study in both approach and nature. The Kolmogorov-Smirnov test was used to determine data normality, and t-tests were employed to evaluate the research's statistical hypotheses. The findings revealed that there is a significant relationship between institutional investors' collective behavior and stock returns and that this relationship is stronger in large companies than in small companies, and in companies with high financial leverage than in companies with low financial leverage.

Nikbakht et al. (2016) investigated the effect of investors' emotional behavior and accounting information on stock prices. In this research, the mechanism of the effect of investors' emotional behavior and accounting information on stock prices has been analyzed based on the residual income evaluation model. In their research, using the data of the companies admitted to the Tehran Stock Exchange during 6 years (2009-2014), the index of investors' emotional behavior was obtained, and the effect of investors' emotional behavior on the outlook for expected earnings growth and the expected rate of return is examined. Furthermore, the correlation approach was used to study the combined influence of investors' emotional behavior and accounting information on stock prices. The findings revealed that investors' emotional behavior influences the rise of predicted earnings, which in turn affects company stock prices.

Jahangiri Rad and colleagues (2014) investigated the collective behavior of investors during 2006- 2011. The regression model is applied in this study. They discovered that investors at the Tehran Stock Exchange behave in groups. Another finding of the study indicated that investors behave more collectively in rising markets than in declining markets.

The momentum of stock returns between 2001-2010 on the Tehran Stock Exchange was studied by Badri and Fath Elahi in 2014. These 10 years between 2001-2010 were used for the momentum study of the portfolio construction process, which included 6438 stock portfolios and their average returns. The data reveals that trading methods based on the momentum of returns are successful over the medium term in a sample of 94 businesses that account for the bulk of the market value of the Tehran Stock Exchange. The additional return of momentum following risk management is viewed as a challenge to the idea of market efficiency since the three-factor risk model proposed by Fama and French (1993) is unable to account for momentum over the medium term. The market's underreaction can therefore generate momentum, and behavioral theories can be used to explain the yield momentum over the medium run. The return momentum has vanished over the long term, and return momentum-based strategies now produce negligible and marginal returns.

In their study titled "Effects of national culture and behavioral difficulties in investors' decision-making: behavior in global stock markets," Ching and Lin (2015) evaluated the relationship between investors' decision-making and the four distinctive features of international stock markets. The findings of these four factors revealed that considerable mass behavior was only observed in 18 cases, or for the first time in 50% of the market stocks, which was more typical of Confucian stock markets with little complexity and significant mass behavior. Second, national cultural characteristics such as power distance to individualism, masculinity, and other features affected mass behavior. Finally, they discovered that the crowding tendency of investors greatly dominated behavioral issues such as over-optimism, false confidence, and affectation. The empirical data show that the inclination to mass behavior among investors is different. Yao et al. (2014) looked at crowding behaviors on the Chinese stock exchange. Two Chinese marketplaces were used for their investigation. In their study, which covered the years 1999 to 2008, they used daily data. According to the findings of their study, mass behavior does exist in the Chinese capital market, but it is more pronounced at the industry level than at the market level. Furthermore, their findings demonstrated that both big and small businesses exhibit stronger collective behavior. Additionally, their study's findings demonstrated that the growth stock clustering tendency is more pronounced than value stock clustering.

Methodology of research

The current research is conducted to investigate oil price shocks on the creation of asset portfolio anomalies in the oil industry. This research is retrospective in terms of time, practical in terms of purpose, result-oriented in terms of results, and retrospective in terms of type. Also, in terms of data collection, this research is descriptive and among the types of descriptive research methods, it is correlational and in terms of implementation, it is survey-exploratory. The data was gathered using the library technique to test the research's assumptions. The average partial correlation between the values of the anomaly returns is computed using daily data over a time period to construct the co-anomaly at any moment in time. The topic of whether anomaly correlation can forecast the future total variance of a diversified portfolio of anomalies up to one year is therefore addressed by this metric, which evaluates the co-movement of anomalies across time.

The data for this study is described using Eviews econometrics software after sorting and categorizing in Excel software, deleting or correcting outlier data, and filling in missing data. It is then examined using the relevant statistical and financial econometric approaches that were explained. The current study's statistical population is the firms that were listed on the stock market between 2012 and 2021, and the statistical sample was acquired through systematic exclusion.

The following models are utilized to examine the hypotheses in this study:

$$R_{i.t} = \alpha_0 + \beta_1 Oil\ Shock + \beta_2 control + \varepsilon_t$$

The second hypothesis model:

$$R_{i.t} = \alpha_0 + \beta_1 X_{t-1} + \beta_2 control + \varepsilon_t$$

which in the preceding models:

R (i.t) = the long-term and short-term excess return of a portfolio anomaly. This is the portfolio made up of the variables listed below In other words, utilizing all of the factors described below, a portfolio of the company's assets is assessed, followed by an examination of the behavioral anomalies of each one, and lastly, the excess return of the portfolio anomaly is analyzed.

The difference between today's closing price (total market index) and yesterday's closing price (total market index) divided by yesterday's closing price is used to compute share return (market return) (total market index).

Total Accruals = quality of accrual items

In this study, we apply Kaznik's (1999) relation as follows to assess accrual quality:

$$ACCR_{i.t} = \alpha_0 + \alpha_1[\Delta\, REV_{i.t} - \Delta\, REc_{i.t}] + \alpha_2 PPE_{i.t} + \Delta CFO_{i.t} + \varepsilon_{i.t}$$

In this regression:

$ACCR_{i.t}$ equal to the sum of the accrual items

$\Delta\, REV_{i.t}$ equal to the difference in sales revenue between year t and the previous year

$\Delta\, REc_{i.t}$ equal to the difference between the year t's net accounts receivable and the year t's net accounts receivable last year

$PPE_{i.t}$ equal to the cost of the associated machinery, equipment, and property

$\Delta CFO_{i.t}$ equal to the difference between the cash flows from year t last year.

Asset Growth

Total Asset Growth=($\frac{\text{Total Assets}}{\text{Total Assets y}-1}$)-

Distress

Gross Profitability

Gross Profit=Revenue − Cost of Goods Sol

Assets Investment to

Net Operating Assets

O-SCORE

Ohlson used the logistic regression model to predict bankruptcy. In Ohlson's model, variables of the ratio of total debt to total assets and the ratio of net profit to total assets are the best distinguishing ratios. The

Ohlson score is the result of a 9-factor linear combination of business ratios with a weighting factor.

The calculation of the Ohlson coefficient is shown below:

$$z_i = -1.32 - 0.407x_1 + 6.03x_2 - 1.43x_3 + 0.0757x_4 - 2.37x_5 - 1.83x_6 + 0.285x_7 - 1.72x_8 - 0.521x_9$$

z_i :Relative index to calculate the probability
x_1: Logarithm (the ratio of total assets to the rial index of GDP
x_2: The ratio of total liabilities to total assets
x_3: Working capital ratio to total assets
x_4 :The ratio of current liabilities to current assets
x_5 : A virtual variable that is assigned the number one if the total liabilities are greater than or equal to the total assets, and zero otherwise.
x_6 : Net profit to total assets ratio
x_7 :The ratio of operating funds to total liabilities.
x_8 :A virtual variable that is assigned a value of one if the net profit is negative for the previous two consecutive years, and a value of zero otherwise.
x_9: Changes in net profit in the form of

$$\text{Change in Net Profit} = \frac{(NI_T - NI_{T-1})}{(|NI_T| + |NI_{T-1}|)}$$

where NI is the net profit and T is the figures for the current year and T-1 is the figures for the previous year.
According to Logit Analysis, the Z value obtained for each case is placed in the following equation and the conditional probability of bankruptcy is calculated. If P(Z) is less than 0.5, the company is classified as bankrupt, and if P(Z) is greater than 0.5, the company is healthy, and the critical point here will be P(Z)=0.50.

$$P(Z) = \frac{1}{(1 + e^{-z})}$$

Return on Assets
The return on assets shows the ratio of the efficiency of the company's management in the use of all available resources to earn a profit, and the method of its calculation is as follows (Gianiti et al., 2011):

$$ROA = \frac{Net\ Profit}{Total\ Asset}$$

Size Effect = Company size
Size= log(assets)
Value company value=

$$NAV = \frac{(Assets\ -\ Liabilities)}{Total\ number\ of\ outstanding\ shares}$$

Price Momentum
To calculate MOM can be calculated by subtracting the equivalent weighted average of the best company in terms of performance from the equivalent weighted average of the weakest company in terms of performance, with an interval of one month (Carhart, 1997). If a stock's 12-month average return is positive, that stock has momentum.
Netoa
The total assets of a company
- All liabilities
- All financial assets
+ All financial liabilities
= Net operating assets
Volatility Idiosyncratic) ivol =(The 4-factor model of Carhart is applied.
The Carhart four-factor model is an expansion of the Fama-French three-factor model that takes momentum into account.
This element is often referred to as the MOM monthly momentum factor.
The tendency of a stock's share price to maintain its past trend is referred to as its momentum (the propensity to grow in price when the price is rising and the tendency to reduce in price when the price is falling).
The equivalent weighted average of the firm with the highest performance is subtracted from the equivalent weighted average of the company with the worst performance, with a one-month gap (Carhart, 1997). A stock has momentum if its 12-month average return was positive.
A common active management approach and mutual fund evaluation model is the four-factor model. Additionally, the Carhart four-factor valuation model's equation is as follows

$$EXR_t = \alpha + \beta_{mkt} MktRf_i + \beta_{hml} HML_t + \beta_{smb} SMB_t + \beta_{umd} UMD_t + \varepsilon_t$$

In the above equations:
$MktRf_i$- risk premium (excess market return)
HML_t = Monthly premium of book value to market value
SMB_t = Monthly premium of the size factor
UMD_t = Companies that perform better minus those that perform worse
Risk Anomaly Correlation Pricing Model - Asset anomaly:

$$\mathbb{E}[R_i^e] = \lambda_0 + \sum_j \widehat{\beta_{i.t}}\, \lambda_j + \varepsilon_t$$

We calculate the risk _j for each element in each of the asset pricing models using the equation above.

To compute the anomalous correlation, we utilize the fluctuations brought on by the broker's change, the variations in trader behavior, as well as the correlation determined in the preceding equations.

SUE =standard unanticipated income

$$\frac{(E_{iq} - E_{iq} - 4)}{\sigma_{iq}}$$

σ_{iq}= standard deviation

E_{iq}= Last declared income during the last 8 months

X_{t-1} =It is oil price risk that is estimated through the GARCH model.

OS.= The oil demand shock is measured by the VAR model.

$control$ It is the control variables with the market factors that are regarded through the CAPM model or the factors of the Fama-French three-factor model.

The research hypotheses are as follows:

1) Oil price shocks induce variations in portfolio anomalous returns.
2) Oil price risk affects portfolio anomalous return.

4-Results

Descriptive Statistics

Table 1 summarizes the descriptive data relating to the variables considered in this study (1). The mean, median, maximum, minimum, and standard deviation of the data, kurtosis, skewness, statistic, and probability of Jarek-Bara are displayed in the order in this table.

According to the findings in Table (1), the standard deviation indicated for the variables suggests that the fluctuations of the gap between the interest rate and the interbank loan were greater than other variables in the research. Correlation factors of abnormal return in the short term, stock market index, and market liquidity have a kurtosis, while the remaining variables have no kurtosis and are at normal levels. Furthermore, except for the interest rate differential and the interbank loan, all of the variables have skewness. The Jarkobra test statistics demonstrate the normality of the study variables, however, because the p-value of the variables is less than 0.05, the variables are not normal.

Normality test

Shapiro-Wilk normality test

The Schipro-Wilk test and the Quantitative-Jandak diagram share a similar philosophical foundation. The ordinal statistics of the data and the predicted values of the ordinal statistics of the normal distribution are taken into consideration in this test via a regression connection. The test statistic is comparable to the coefficient of determination in regression; the lower the test statistic value, the more strongly the null hypothesis is rejected, and the higher the test statistic value, the more closely the data distribution resembles the normal distribution (the normality of the data distribution).

The Schiprowilk test is based on a correlation analysis or regression relationship between the intended values of ordinal statistics.

In this table, the significant level in the Schiprowilk test is indicated by the symbol sig. It is demonstrated that the data may be confidently regarded to be normal

if it is higher than 0.05. Otherwise, the data distribution cannot be regarded as normal. Since the dependent variables do not have a normal distribution, the hypothesis that their distribution is normal is rejected at the 95% level of confidence. As a result, we need to use the non-parametric test to investigate the correlation between the variables.

Reliability test

The reliability or stability of the study variables was initially evaluated in this section. Hadri's test was applied to determine dependability. Table 4 displays the test's outcomes.

All of the variables are stable over the study period, per the findings of the table (3) of this test, where the P value is less than 0.05. This indicates that the covariance of the variables has remained consistent throughout time, along with the mean and variance of the variables. This means that include these variables in the model prevents spurious regression

Chaw test

It is necessary to first determine whether or not there is heterogeneity or individual differences to accurately diagnosis the estimate of the regression model. The panel data approach is utilized when there is heterogeneity; otherwise, Pooled data is employed. To compare the utilization of the fixed effects model with the integration of all data, Chow's test is utilized (integrated). The following are the test's presumptions:

***H_1**: panel Model*

It can be deduced that there is individual heterogeneity (unobservable individual effects) and that the panel data approach should be used to estimate the model since the results of Chave's test demonstrate that the p-value in the model is less than 0.05, rejecting hypothesis H 0 and confirming hypothesis H 1. The Hausman test is thus carried out in the next step to establish whether the fixed effect model or the random effect model should be used.

Hausman test

The Hausman test is predicated on the existence or absence of a link between the estimated regression error and the model's independent variables. The following are the test's assumptions:

H*₀*: Random Effect

H*₁*: Fixed Effect

The estimated regression error has a connection with the independent variables, as shown in Table 5, and since the P value is less than 0.05, hypothesis H0 is rejected and hypothesis H1 is accepted. The fixed effects model is the most appropriate technique for estimating the hypothesis test, according to the findings of the Chaw test and Hausman test.

The first hypothesis test:

The formation of yield anomalies as a result of oil price shocks is the topic of this study's first hypothesis. As panel data, the following is how this hypothesis is calculated using model (1):

$$R_{i.t} = \alpha_0 + \beta_1 Oil\ Shock + \beta_2 control + \varepsilon_t$$

According to the results of Table 6, the quantity of F statistic and its significance level is less than 0.05, indicating that the null hypothesis is significant with 95% confidence and is adequately able to represent the dependent variable based on the given data. Furthermore, according to the coefficient of determination, independent and control variables account for approximately 83% of the alterations in the dependent variable. The residuals in the regression do not contain autocorrelation, according to the Durbin-Watson statistic, which has a value of 1.916. The inverse and significant relationship between the change in portfolio anomalous returns and the change in oil price is demonstrated by the t-statistic for oil shocks, which has a value of -2.155, and the significance level of this test, which is less than 0.05 and equivalent to 0.007. Consequently, the first hypothesis of the study is confirmed.

With a t-statistic value of -1.464 and a significance level of more than 5% with a value of 0.144, the first model of this research shows a significant association between portfolio return irregularity and market risk. Additionally, the monthly premium of the book value to market value, with a value of -4.911 and a significance level of 0.000, and the monthly premium of the size factor, with a value of -7.499 and a p-value of less than 0.05, both have an inverse and significant relationship with the anomaly correlation of portfolio returns.

The following is the model that results from the current hypothesis:

Table 1. Descriptive statistics related to the variables of the research

	portfolio return anomaly	Oil price shock	Variations in investor demand	Oil price risk
Median	0.262	0.054	109.649	6332.603
Mean	0.379	0.016	93.235	5092.575
Maximun	0.788	22.324	202.301	15434.62
Mininmum	-205.93	-37.01	41.395	172.64
standard deviation	4.0868	1	51.631	3971.892
kurtosis	-46.85	-13.02	0.765	0.452
Skewness	2301.225	755.631	2.391	1.798
Jarek Bra Probably	630000000	67583180	323.65	269.573
	0	0	0	0

Table 2: Shapiro-Wilk normality test

Variables	statistics	Degrees of freedom	Sig
portfolio return anomaly	2/98	516	.00٠
Oil price shock	0/819	516	.0٠0
investor demand change	0/588	516	.0٠0
Oil price risk	0/652	516	.0٠0

Table 3: Hadri test

Variable	t statistic	P-value
abnormality in portfolio return	17/114	000/0
Oil price shock	12/399	000/0
Modification in investor demand	16/203	0/000
oil price risk	16/203	000/0

Table 4: Chaw test results

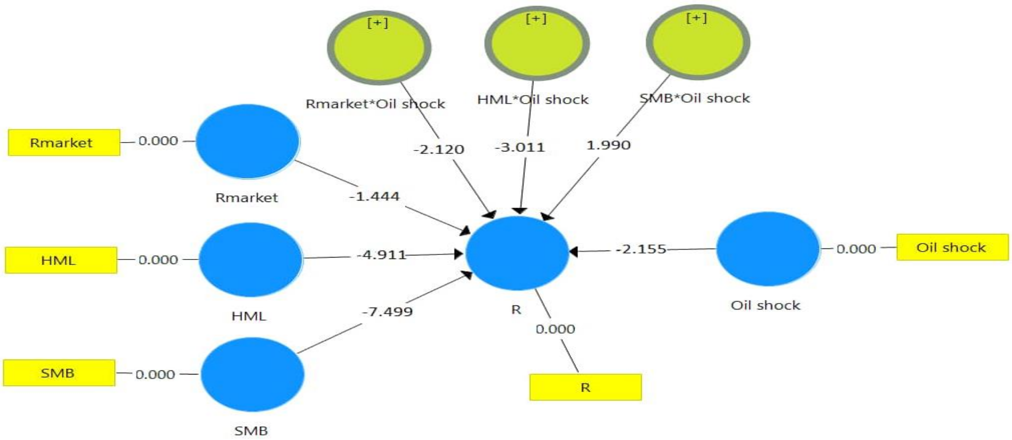
Effects test	The value of the statistic	D.F.	Prob.	Test result	
F Period Chi 2 period	11.595661 975.358599	(۱17,999) 117	0.000 0.000	Panel data Model	The second hypothesis
F period Chi 2 period	0.246657 2.292471	(۹,638) 9	0.۰٤56 0.۰۳۷۸	Panel data Model	The fifth hypothesis

Table 5: Hausman test result

Chi 2 statistic	درجه آزادی	P-value	Result	Hypotheses
۲0.425	11	۰.0398	Fixed effects model	The second hypothesis
0.000000	12	1.0000	Random effects model	The fifth hypothesis

Table 6. The outcomes of the initial research model's estimation.

	Variables	Coefficient	standard error	t statistic	Probability	Result
Width from the origin	C	0.738	0.062	11.925	0.000	
Oil price shocks	*Oil Shock*	-0.000	0.003	-2.155	0.007	Confirm
Risk Premium Market (excess market return)	RMARKET	-0.506	0.345	-1.464	0.144	reject
Monthly premium book value to market value	HML	0.000	0.000	-4.911	0.000	confirm
The monthly premium size factor	SMB	-0.081	0.011	-7.499	0.000	reject
F test:: 20.936 Probability: 0.000			Coefficient of Determination= 0.832			
Durbin-Watson's statistic 1.916			The adjusted coefficient of determination= 0.794			



The second hypothesis test

The creation of yield anomaly as a result of risk associated with oil prices is the second hypothesis of this study. The following panel data are used to estimate this hypothesis using model (2):

$$R_{i.t} = \alpha_0 + \beta_1 X_{t-1} + \beta_2 control + \varepsilon_t$$

According to the results of Table 7, the amount of F statistic and its significance level is less than 0.05, so the null hypothesis is significant with 95% confidence, and based on the available data, it is well able to express the dependent variable. Also, according to the coefficient of determination, about 76% of dependent variable changes are expressed by independent and control variables. Durbin-Watson's statistic with a value of 1.584 shows that the residuals in the regression do not have autocorrelation. The significance level of this test is less than 0.05 and equivalent to 0.018, which indicates that oil price risk has a significant relationship with portfolio return anomaly. This is supported by the t statistic for oil price risk, which has a value of -2.358. Consequently, the second research hypothesis is accepted. Market risk does not significantly relate to portfolio anomalous returns among the control variables in the second model of this study, with a t-statistic value of -

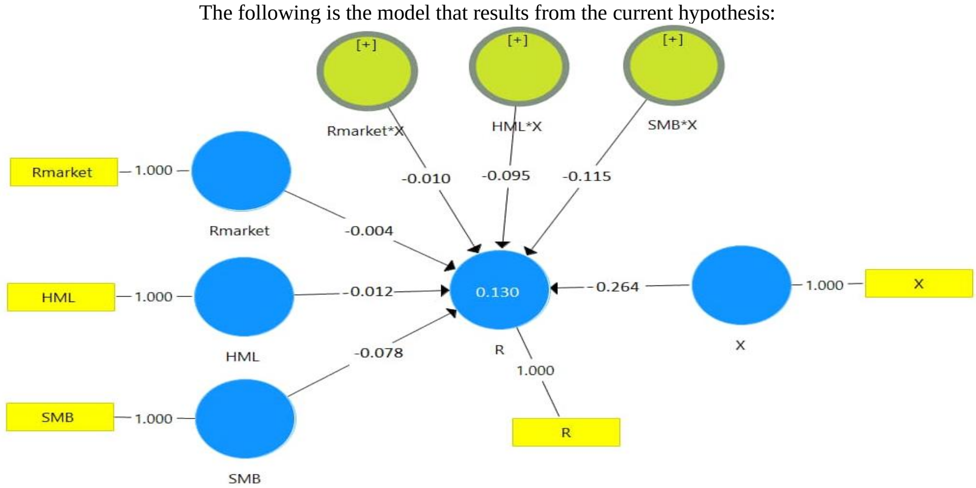
1.555 and a significance threshold of more than 5% with a value of 0.120. This test's significance level, which is less than 0.05 and equal to 0.018, shows that oil price risk and portfolio return anomaly are significantly related. The oil price risk t metric, which has a value of -2.358, lends support to this. As a result, the second research premise is accepted. In the second model of this study, with a t-statistic value of -1.555 and a significance threshold of more than 5% with a value of 0.120, market risk is not significantly related to portfolio anomalous returns among the control variables.

According to the results of Table 7, the amount of F statistic and its significance level is less than 0.05, so the null hypothesis is significant with 95% confidence, and based on the available data, it is well able to express the dependent variable. Also, according to the coefficient of determination, about 76% of dependent variable changes are expressed by independent and control variables. Durbin-Watson's statistic with a value of 1.584 shows that the residuals in the regression do not have autocorrelation. The significance level of this test is less than 0.05 and equivalent to 0.018, which indicates that oil price risk has a significant relationship with portfolio return anomaly. This is supported by the t statistic for oil price risk, which has a value of -2.358. Consequently, the second research hypothesis is accepted. Market risk does not significantly relate to portfolio anomalous returns among the control variables in the second model of this study, with a t-statistic value of -1.555 and a significance threshold of more than 5% with a value of 0.120. This test's significance level, which is less than 0.05 and equal to 0.018, shows that oil price risk and portfolio return anomaly are significantly related. The oil price risk t metric, which has a value of -2.358, lends support to this. As a result, the second research premise is accepted. In the second model of this study, with a t-statistic value of -1.555 and a significance threshold of more than 5% with a value of 0.120, market risk is not significantly related to portfolio anomalous returns among the control variables.

Table 7.Results for the estimation of the second research model

	Variables	Coefficient	standard error	t statistic	Probability	Result
Width from the origin	C	0.821	0.055	14.807	0.000	
Oil price shocks	X_{t-1}	0.000	0.000	-2.358	0.018	confirm
Risk Premium Market (excess market return)	RMARKET	-0.404	0.259	-1.555	0.120	reject
Monthly premium book value to market value	HML	0.000	0.000	-2.718	0.007	confirm
The monthly premium size factor	SMB	-0.078	0.007	-11.006	0.000	confirm
F test:: 29/31304 Probability: 0.000			Coefficient of Determination= 0.765			
Durbin-Watson's statistic 1/584936			The adjusted coefficient of determination= 0.739			

The following is the model that results from the current hypothesis:



Discussion and conclusion

The impact of oil price shocks on the emergence of asset portfolio anomalies in the oil industry was investigated in this study.

The first hypothesis of this research is that oil price shocks cause yield anomalies. According to the oil shocks t-statistic, which has a value of 96.214, and the significance level of this test, which is larger than 0.05 and equivalent to 0.007, oil price shocks have an inverse and significant influence on the change in portfolio anomaly returns. As a result, the research's first hypothesis is verified. Although oil shocks can hurt the stock market because of the uncertainty they cause in the financial markets, this problem depends on the shock's specific characteristics (demand side or supply side). The markets may react positively to a shock that comes from the demand side, while they may react negatively to a shock that comes from the supply side.

The formation of yield anomaly as a result of risk associated with oil prices is the second hypothesis of this study. Oil price risk has no significant relationship with portfolio return anomaly, as indicated by the t-statistic of that risk, which has a value of -2.358 and a significance level of this test that is less than 0.05 and equal to 0.018. As a result, the second research premise is rejected. The price of raw materials and the sale price fall as a result of the falling price of oil in the petrochemical, chemical, and refinery industries. The fact that these businesses have a profit margin, decreases their profitability. The government's budget deficit grows, and it has little control over building budgets. This problem also affects metal, mining, and other related businesses. In addition, when the price of crude oil, its derivatives, and basic metals and minerals decline, so do their prices. Since the government will only utilize the money it receives from oil sales to pay for staff wages and subsidies, the building, cement, tile, and ceramics industries, among others, may experience stagnation. Additionally, the budget deficit of the contracting firms rather than solely getting funding from the government also results in a decline in the value of the stock market and the index. Finally, the stock market index number keeps falling as a result of this vicious cycle. The findings of this study concur with those of Zhou et al (2020).

As a potent exogenous variable, the price of oil has a significant impact on macroeconomic variables and is one of the most significant indicators influencing economic parameters in Iran. The impact of oil price variations on domestic markets and its interactions with asset prices, such as price returns, are studied by many groups of market players, investors, and financial professionals, as well as policymakers and economists, particularly in oil-exporting nations like Iran. A framework that demonstrates how alterations in oil prices impact stock prices is something that stocks in various scenarios in their policy plans need and want.

The gross domestic product can be affected by an increase in oil prices, which is followed by an increase in oil revenues, either by increasing total demand or government spending or by increasing total supply (increased total investment, both public and private, imports of capital goods and new technology, etc.). The rise in oil prices and subsequent rise in oil income or foreign exchange income has increased the country's foreign assets. Additionally, as one of the resources that make up the monetary base, these factors have contributed to the expansion of the monetary base, which in turn has increased the money supply to a greater extent than the monetary base growth.

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