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Impact of the Selected Domestic and Foreign Markets Returns on Stock Price in Iran

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One of the features of a financial market, the stock market in particular, is the market sentiment which is the overall attitude of investors toward a particular security or financial market. Investors always seek to create a portfolio with minimum risk while maintaining the expected return level. Therefore, perceiving the relationship between the stock returns and markets returns can be helpful for investors to create an optimal portfolio. On this basis, the present study aims at investigating the Dynamic Conditional Correlation (DCC) between the returns on the domestic markets (industry stock market and exchange rate) and foreign markets using monthly data of oil and base metals including total metals, copper, steel and returns on the stock price index in Iran during March 2001 to April 2017 using the Dynamic Conditional Correlation Fractionally Integrated Asymmetric Power ARCH (DCC-FIAPARCH) approach. The obtained results indicate a statistically significant and positive DCC coefficient between metals, industrial products, and copper returns with the stocks returns. Consequently, it is not possible to put each of these assets with the stocks in an identical situation (purchase or sale), but instead they should be always situations for risk control. However, in connection with other markets, DCC is not significant; accordingly, assets can be placed in the investment portfolio together with the stocks.

Keywords: Stocks, Oil Price, Exchange Rate, Copper, Steel, Dynamic Conditional Correlation, DCC-FIAPARCH
JEL Classification*:* C32, G11, G15, Q40

1 Introduction

The presence of a stock exchange market is one of the major and vital necessities for the success of economic activities in any country. One of the main effects of the stock market on economy is the growth of fixed

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investment, and consequently the increase in employment, value added production (Nike et al., 2018). Such a market increases production and fulfills the objectives of economic and social development through centralization and optimal allocation of the capitals (Madsen, 2002).

If capital market demonstrates a poor performance, it will influence all other sectors and result in their dysfunctionality (Gan et al., 2006). According to the existing approaches in financial affairs, investors' decision-making does not occur merely based on logical and quantitative analyses, and the factors resulting from expectations of the rival markets also impose considerable impact on how stockholders react to the transactions within the market. The steady increase in the interdependence of global markets, combined with international financial integration, has accelerated the financialization of commodity markets (Tang & Xiong, 2012; Robays, 2016). Several empirical studies have shown that there is considerable time-increasing interdependence among markets, the reasons of which may be elimination of any kind of limitation in movements of the capital as well as improvement of communications. In this context, the dynamics of the price of financial assets, as outlined in free global markets, are important indicators of collective expectations about the future of the global economy and investment horizons (Chkili, 2012).

According to Markowitz (1952), investors aim to minimize the risk of portfolio while maintaining the expected return at a good level. In this regard, combination of different assets should not have a completely positive correlation since such diversity would help to reduce the portfolio risk without any reduction in its returns. Therefore, a key factor for creating an optimal portfolio is the knowledge of the assets' behaviors toward each other, i.e. the relationship among asset markets. As indicated by the empirical evidence, markets are not separate entities and do not move in separate spaces; thus, fluctuations in different asset markets are strictly interrelated (Yang et al., 2005; Chuanguo & Chena, 2012; Gil-Alana & Yaya, 2014; Broadstock & Filis, 2014; Mensi et al., 2014; Arfaoui & Rejeb, 2016, and Nike et al., 2018).

An indication of the relationship among financial markets is the contagion among them, which is defined in two forms, namely contagion in returns and contagion in turbulence. Accordingly, the contagion and turbulence in Tehran Stock Exchange (TSE) market index is undoubtedly influenced by the shocks in other foreign and domestic financial and non-financial assets. In financial literature, the theoretical explanations on financial contagion are classified into two groups (Classens & Forbes, 2004). The first group deals with mechanical contagion resulting from the real and financial interdependence between markets and countries (Calvo & Reinhart, 1996), which has come to existence due to some fundamental factors such as public shocks, commercial relations, and financial relations.

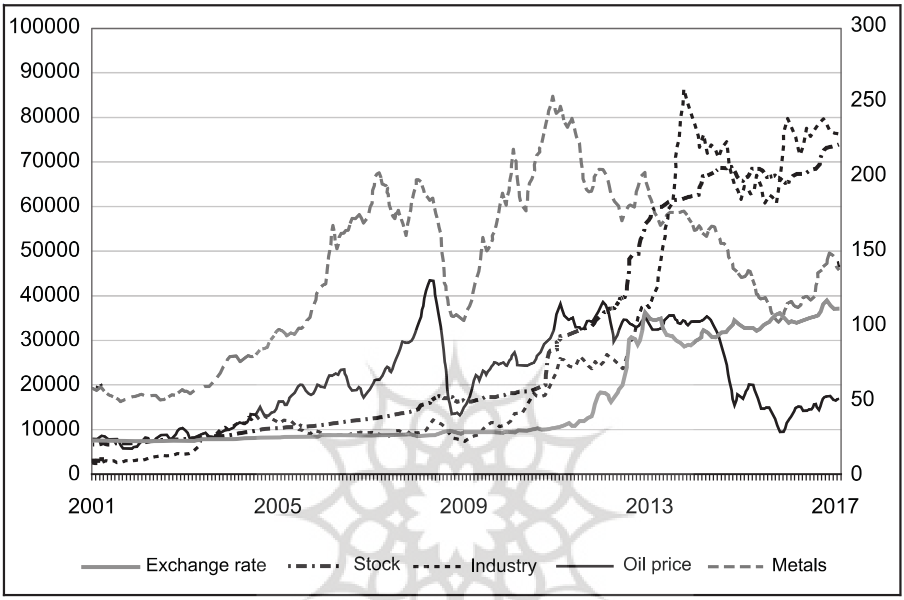

Figure 1. The Price Changes of Different Markets.
Source: Research Findings.

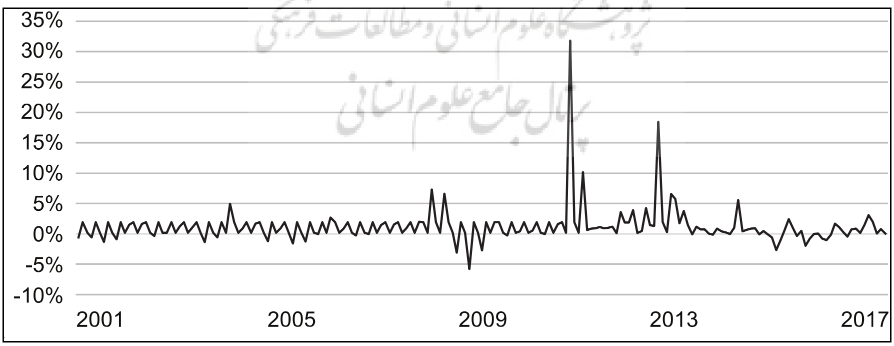

Figure 2. The Changes in the Industry Index Returns.
Source: Research Findings.

The other group proposes mental contagion, which is focused on the behavior of investors (including cash-caused and motivational problems, asymmetric information, market coordination problems, and investor's re-connection) (Dornbush et al., 1980). Markets are significantly interrelated with the outlook for the global business cycle so that investors feel that the content of information on the prices of these assets may be shown in the future (Arfaoui, & Rejeb, 2016). The correlation between the assets and different tools along with the changing structure of such correlation not only complicate the portfolio diversification in practice, but also have important implications for the portfolio composition.

Accordingly, the present study investigates the Dynamic Conditional Correlation (DCC) between the selected domestic and foreign assets returns (oil, industry, exchange, and base metals including total, copper, and steel) and the stock price index returns during March 2001 to April 2017 using the DCC-FIAPARCH approach. Figure 1 shows the price changes of the industries that have been used and the changes in the industry index returns. Figure 2 represents a change in the industry index over the period from 2001 to 2017, indicating that the index is not very high over time.

The FIAPARCH has the flexibility to model the conditional second moment taking into account the long memory property, predictability structure of the return volatility and volatility asymmetric characteristics (i.e., the leverage effects). For its part, the DCC model allows to capture the evolving conditional correlations among the sample markets relating to market conditions. This extended model is also less restrictive on the number of variables included, compared to other multivariate volatility models such as the full BEKK–GARCH and the VEC–GARCH models. Interestingly, the estimated parameters of DCCs allow one to evaluate in-depth changes in correlations during tranquil/volatile periods.

These features in the volatility processes of asset returns have major implications for asset allocations, optimal portfolio designs, benefits of portfolio diversification, etc. (see, Conrad et al., 2011). The parameterization of a DCC–FIAPARCH model allows for directly inferring the time-varying correlations between the commodity futures and stock markets as well as for dealing with a relatively large number of variables in the system.

The current study is presented in five sections; in the second section, the theoretical foundations are introduced; in the third and fourth sections, the statistical analysis of data and the model estimation and analysis results are untaken. Finally, in the fifth section, the results and policy proposals are presented.

2 Review of Literature

2.1 Theoretical Basis

This section studies the theoretical basis of the relationship between the oil, industry, exchange and basic metals (copper and steel) markets with the stock market. The global oil market is one of the factors that affect the stock market. Iran's economy, as an oil exporting country, anticipates the changes occurring in global oil market which influences Iran's stock market. The empirical evidence both has confirmed and rejected this theory.

Reserchers such as Jones and Kaul (1996), Sadorsky (1999), Basher and Sadorsky (2006), Jammazi and Aloui (2009), El-Sharif et al. (2005), Sadorsky (2001), Park and Ratti (2008), Lu et al. (2017), Serletis and Xu (2017), Chen and Wang (2017) and Degiannakis et al. (2017) have confirmed such relationship for different countries. Other researchers such as Apergis and Miller (2009), Miller and Ratti (2009) and Al Janabi et al. (2010) have not confirmed such a significant relationship between oil price and stocks returns.

Therefore, for a better understanding, we should consider the capital market's response to oil shocks that depends whether the country is an oil exporter or oil importer. According to the results of this study, the return of the stock market in countries such as Norway, which is the net exporter of oil, has a positive relationship with the oil price while in oil-importer countries, it has a negative relationship with the oil price (Park & Ratti, 2008; Mollick & Assefa, 2013).

The second factor that has a great influence on the stock market is the foreign exchange market. Regarding the dynamic relationship between exchange rate and stock prices, no general consensus has yet been achieved. Dornbusch and Fisher (1980), by stating the flow-oriented method, and Chowdhuri and Anuradha (2018) assume that the current account of the country and the current balance are two important determinants of the exchange rate.

Accordingly, changes in the exchange rate affect international competitiveness and trade balance, thus influence real economic variables such as production and real income as well as the current and future cash flows of companies and their stock prices. According to this model, domestic currency depreciation (increase in the exchange rate) makes local companies more competitive and makes their exports cheaper in an international comparison. Increasing the advantage of domestic commodities and consequently, increasing exports leads to higher incomes, which, in turn, increases the stock prices of companies; therefore, in these models, the exchange rate affects the stock price in a positive relationship. The second view is well known as the view of the stock-oriented models. In these models, it is assumed that the capital account is the determinant factor of the exchange rate.

These models include the portfolio balance model and the monetary model. With regard to the portfolio model, Branson (1983) states that there is a negative relationship between the exchange rate and the stock price. According to this model, falling stock prices result in a reduction in domestic investors' wealth. This leads to lower demand for money with lower interest rates. Lowering the interest rate leads to the outflow of the capital toward overseas markets, assuming the stability of other conditions, it causes the decline of domestic currency value, and appreciation of the exchange rate. In Gavin (1989)'s monetary model, unlike the above two models, there is no relationship between the exchange rate and the stock price.

The market for industrial products is the third factor that can cause changes in stock market. Any changes in the industrial production affect profit and stock profit (Garin et al., 2016). Since changes at production level lead to increased economic activity, followed by increased revenue of companies. Such potential higher revenue can result in the increased stock value and consequently, increased stock profit (Young, 2006).

And at last, the market for basic metals (copper and steel) is the fourth affective market on stock market. Metals are the key inputs in industrial production and construction. There are various types of metals, including base metals and precious metals, which contribute to industrial production and have an important role in the country's economic development (Manisha, 2017). The base metals industry is currently the second largest industry in Iran's capital market (accounting for 11% of the total market value), and the active companies in this area are mostly manufacturing steel and copper products.

Products of these companies are sold in Iran as well as in export markets, and thus the price of products of the base metals industry is determined by the global prices. For example, the price of copper for the domestic market in Iran Mercantile Exchange is determined by the formula of: "the average global copper rate per week (London Stock Exchange) multiplied by the exchange rate multiplied by 97 percent". Overall, the two factors of global prices and the exchange rate are the main influential factors on the pricing of basic metals in the domestic market, and the changes in these two factors have significant effects on the profitability and stock prices of these companies. Therefore, studying the price movement of these metals is necessary to assess the impact of international prices, with emphasizing price discovery and avoiding price fluctuations (Manisha, 2017). It should be noted that in the capital market of Iran, the industry of metal ores extraction (with a share of 4.5 percent of the total market value) is indirectly affected by the global steel price. This is because the products of active companies in this industry are also priced based on a percentage of the steel ingot price.

For example, iron ore concentrate and pellet are priced at 13 percent and 21.5 percent of the steel price, respectively. Accordingly, knowing the effects of the global base metals markets on Iran's stock market can help investors determine the optimal portfolio composition.

Present paper has theoretical and technical differences with previous researches. In theoretical aspect, it has been attempted to focus on markets which are effective on fluctuations of Tehran Stock Exchange return instead of focusing on macroeconomic factors affecting stock return fluctuations. Focusing on markets is useful because direct effects would be effective on stock returns fluctuations without any intermediary and indirect effects (which generally have opposing effects on direct effect) will not cause any deviation in results. From the technical aspect, this paper uses FIAPIARCH models for the first time using data of Iran.

2.2 Emperical Literature

Broadstock and Filis (2014) use the correlation of variables during 1995 to 2013 to find the relation between the oil price and stock return for USA and China. The results show that there is a correlation between these two variables and this correlation changes during time. They also find that China in comparison to the US is more flexible to oil shocks.

Mensi et al (2014), investigate the relationship between time variables of a major stock market based on oil (Saudi Arabia Stock Exchange) with major futures commodity market including oil, gold, silver, wheat, cereals and rice based on DCC-FIAPARCH model. Asymmetric results as well as long-term memory show slow dynamic conditional correlations between commodity markets (except silver) and Saudi Arabia Stock Exchange. The Results emphasize on the usefulness of incorporating goods into a traditional stock market portfolio.

Arfaoui & Rejeb (2016), use simultaneous equations to study the relation between oil, gold, US dollar and stock price during 1995-2015. The results show that there is a negative relation between oil price and stock price. The future price of petroleum and gross import of China's oil will affect oil price. Gold price is determined by change in oil price, US dollar and stock price and slowly and positively affected by US oil import and US dollar.

Haydari et al (2012) study the relation between real exchange rate uncertainty and stock price index in Tehran Stock Exchange during 1999-2012 by VAR- GARCH model. Their results show that there is a negative and significant relation between real exchange rate uncertainty and stock price index and there is no significant relation between stock price uncertainty and exchange rate.

Falahi et al (2014), using the DCC-GARCH method, investigate the correlation structure in daily data of exchange rate returns, stock market index and gold price over the period of 2011-2013. The results of the study indicate that there is a high correlation between exchange rate return and gold, as well as a low conditional correlation between the returns of the market index and the exchange rate and gold. The results of the optimization of this study show that it would be better to allocate a significant portion of the investment assets to the stock market investment.

Paytakhti Oskouie et al (2014), study the impact of oil price fluctuation on stock price index changes during October 1997 – December 2013 by using SVAR model. With analyzing the reaction functions they figure out that up until 5 period, structural shock of increase in oil price change will cause increase in stock price changes. And also with analyzing the variance decomposition, they conclude that oil price change can explain 5 percent of change in stock price index in the long run.

3 Statistical Analysis

The variables which have been used in this survey consist of copper return in global market (rcop), industry return in domestic economy (rind), basic metals return in global market (rme), oil return in global market (ro), stock return based on Tehran Stock Exchange index (rs), exchange return or dollar in unofficial market in Rial currency (rx) and steel return in global market (rstl). The required data are collected from the Central Bank of Iran[1], the World Bank[2], Indexmundi[3] and the official website of Tehran Stock Exchange[4].

According to Table 1, foreign exchange market has the most fluctuation among the reviewed financial markets. The next are the oil market and copper market. In the domestic markets, industry market is also the most fluctuated. The stock market is next in terms of standard deviation. The average

[1] www.cbi.ir
[2] www.worldbank.org
[3] www.indexmundi.com
[4] www.irbourse.com

percentage change for stock and industry is one percent at most. However, in global markets, the average monthly yield is less than 1%.

Table 1
Descriptive Statistics of Variables

Market	Foreign	Internal	Internal	Foreign	Foreign	Internal	Foreign
symbol	Rstl (%)	Rx (%)	Rs (%)	Ro (%)	Rme (%)	Rind (%)	Rcop (%)
average	0.362	159.725	1.986	0.597	0.582	1.951	0.946
middle	0.131	16.0	0.72	1.247	0.674	0.669	1.341
maximum	8.802	8210.000	27.121	2.258	15.205	27.966	25.957
minimum	-13.556	-3084.000	-10.495	-26.790	-19.878	-10.657	-29.541
Standard deviation	3.388	974.527	5.974	8.402	5.178	6.229	7.223

Source: Research Findings.

Econometrics modeling of time series data is based on the assumption of static variables. Accordingly, the validity of all estimated models and the analysis depends on the stability of the variables used in the models. Since this study is done on the monthly basis, it is necessary to apply appropriate tests to monitor the stability of the variables at the monthly level. Accordingly, the HEGY seasonal unit root test is used. It should be noted that the zero assumption of the HEGY seasonal unit root test is based on the existence of a unit root (non-stationary). The results of the HEGY seasonal unit root test for seasonal variables are presented in Table 2. Also, based on the results of the HEGY seasonal unit root test, all variables used in this study are on a monthly basis and have no seasonal or non-seasonal unit root in the significance level of 5%. Based on the results of the HEGY test, all estimated models in this research are reliable, so the results are reliable as well.

Table 2
Unit Root Test Analysis of Variables Using HEGY test

Variable	Unit root type	F statistics	P. Level
rcorp	Non seasonal unit root	-4/193	0/009
	RSU (2-month cycle)	-5/840	0/006
	RSU (4-month cycle)	18/571	0/000
	RSU (cycle of 2 and 4 months)	16/665	0/000
	RSU (12-month cycle)	8/970	0/003
	RSU (3-month cycle)	21/330	0/000
	RSU (6-month cycle)	12/146	0/000
rind	Non seasonal unit root	-3/398	0/018
	RSU (2-month cycle)	-5/242	0/006

	RSU (4-month cycle)	7/637	0/011
	RSU (cycle of 2 and 4 months)	17/101	0/000
	RSU (12-month cycle)	14/236	0/000
	RSU (3-month cycle)	8/258	0/005
	RSU (6-month cycle)	7/377	0/018
rme	Non seasonal unit root	3/433-	0/014
	RSU (2-month cycle)	4/646-	0/006
	RSU (4-month cycle)	15/070	0/000
	RSU (cycle of 2 and 4 months)	17/061	0/000
	RSU (12-month cycle)	10/165	0/001
	RSU (3-month cycle)	22/280	0/000
	RSU (6-month cycle)	16/473	0/000
rme	Non seasonal unit root	-3/558	0/013
	RSU (2-month cycle)	-3/947	0/006
	RSU (4-month cycle)	16/505	0/000
	RSU (cycle of 2 and 4 months)	9/869	0/000
	RSU (12-month cycle)	8/929	0/002
	RSU (3-month cycle)	22/425	0/000
	RSU (6-month cycle)	11/289	0/000
rs	Non seasonal unit root	-2/688	0/074
	RSU (2-month cycle)	-3/847	0/006
	RSU (4-month cycle)	11/582	0/000
	RSU (cycle of 2 and 4 months)	14/914	0/000
	RSU (12-month cycle)	11/255	0/000
	RSU (3-month cycle)	13/940	0/000
	RSU (6-month cycle)	9/397	0/002
rstl	Non seasonal unit root	-4/741	0/006
	RSU (2-month cycle)	-3/554	0/009
	RSU (4-month cycle)	18/973	0/000
	RSU (cycle of 2 and 4 months)	17/853	0/000
	RSU (12-month cycle)	15/253	0/000
	RSU (3-month cycle)	16/627	0/000
	RSU (6-month cycle)	19/038	0/000
	Non seasonal unit root	-3/524	0/044
rx	RSU (2-month cycle)	-3/996	0/006
	RSU (4-month cycle)	3/924	0/016
	RSU (cycle of 2 and 4 months)	26/979	0/000
	RSU (12-month cycle)	10/593	0/000
	RSU (3-month cycle)	18/379	0/000
	RSU (6-month cycle)	10/037	0/000

Source: Research Findings.

4 Model Estimation and Results Analysis

In the present study, the DCC-FIAPARCH approach is used to investigate the effect of shocks of the selected domestic and foreign markets (oil, industry, exchange, and base metals including total, copper, and steel) on fluctuations of the TSE market returns during March 2001 to April 2017. From a methodological point, we accordingly employ the bivariate dynamic conditional correlation fractionally integrated asymmetric power ARCH (DCC–FIAPARCH) model under the t-student distributions. Our empirical framework nest the FIAPARCH model (Tse, 1998) and the DCC specification, which allows to synergize their advantages. We decide to model the structure of conditional correlations by using the DCC approach by Engle (2002).

It should be noted that, in the estimates, the intervals of the conditional mean equation, i.e. ARCH and GARCH, and the conditional variance equation are determined based on the Akaike Information Criterion (AIC) and the Schwarz Bayesian Criterion (SBC). This approach is followed by Box-Jenkins' methodology. Moreover, distribution of all the studied assets is considered by the t-distribution. The t-distribution is more comprehensive than normal distribution but approximately coincides with normal distribution in larger sample sizes. In other words, the t-distribution inclines toward normal distribution. In general, the estimation process of the DCC-FIAPARCH model results in two types of patterns in the studied assets.

Tables 3 and 4 estimate the ARIMA-(1,0,0)-DCC-FIAPARCH(1,d,1) and FARIMA(p, d, q)-DCC-FIAPARCH(1,d,1) models for the studied assets, respectively, in dual form with the stock index. As represented in both tables, in all the estimated models, the autoregressive moving average coefficient of the conditional mean equation is smaller than a unit. On this basis, the estimated models are free of the variance inconsistency and self-correlation problems. According to the conditional variance equations in Tables 3 and 4, the differentiation ratio parameter (d) in all the models, except for the stock-industry pattern, is statistically significant so that higher differentiation ratio indicate sudden and greater changes in the conditional variance of the given asset. The differentiation parameter is not significant for copper and industry.

The leverage effect parameter (λ) is statistically significant in the conditional variance equations of the exchange and oil assets, indicating that the negative and positive shocks of the same size in the markets of these two assets do not have the same weight and role in the formation of returns turbulences. In other words, effects of the shocks on the conditional variance of the exchange and oil assets are asymmetric whereas the negative and positive shocks of the same size have a symmetric role in the formation of returns fluctuations in the stock-metals, stock-industry, stock-steel, and stock-copper markets. Furthermore, the conditional standard deviation power parameter (δ) for all the six assets, except for copper, is higher than 1 and statistically significant. As a result, it is concluded that the PARCH approach is justifiably applicable for these assets.

The average value of the conditional correlation of fluctuations during the period under review is -0.999 for the currency and stock, 0.254 for metals and stock, 0.666 for oil and stock, -0.956 for the industry and stock, 0.188 for copper and stock, and -0.39 for steel and stock. Accordingly, the positive values for metals, oil, and copper markets indicate that fluctuations in these markets lead to positive fluctuations in the TSE and increase risk in this market. Additionally, the negative coefficients of the currency and industry show that fluctuations in these markets lead to negative fluctuations in the TSE, and reduce the risk in it.

The insignificant estimated coefficients of the average conditional correlation of stock and currency fluctuations, stock and steel, and stock and oil indicate that the average value of the conditional correlation of fluctuations for the above mentioned assets with the stock returns in the estimated average value is significantly non-constant and changes over time. However, the significant estimated coefficients of the average conditional correlation of fluctuations for stock and metals, stock and industry, and stock and copper indicate that the average value of the conditional correlation of fluctuations for the above mentioned assets with stock returns in the estimated average value is significantly constant, and does not change over time.

The parameter k_1 in the conditional mean equation for the stock-industry model is statistically significant at the probability level of 1%. The significance of this parameter indicates that, following the emersion of shocks in the series, the conditional correlation for the next period is expected to increase. Furthermore, the parameter k_2 in the stock-exchange, stock-base metals, stock-oil, stock-industry, stock-copper, and stock-steel is statistically significant at the probability level of 1% and 5%.

Significancy of this parameter indicate the significant effect of the conditional correlation in the previous period on the conditional correlation of the current period. If this parameter is bigger and closer to 1, then it is expected that the conditional correlations of the current period are closer to the conditional correlation in the previous period. Moreover, based on the detection tests, all the studied models have no variance inconsistency and self-correlation problems. Since in the estimated models, the conditional correlation mean parameter (COR_{ij}) is statistically significant and positive only for the stock-metals, stock-industry, and stock-copper assets, such dynamic correlation should be investigated over time.

The conditional correlation between the stock price returns and metals price returns in global markets is always positive during the studied period and have a mean value of equal to 0.253%. During the same period, the conditional correlation between the stocks and metals returns in global markets experience six different trends. Accordingly, up to 22/09/2004, the price in the global market of metals exhibit a mild slope; consequently, the stocks returns in Iran also demonstrate a positive reaction to such mild sloped price changes.

However, since 22/10/2004 up to 22/11/2005, the slope of the metal price growth in global markets becomes steeper. Since Iran is considered as an importer of metals from global markets, it is natural that the final price of production increases with the increase in metals prices, thereby leading to the reduced positive reaction of the stocks returns to the steeply sloped price changes of metals in global markets. During 22/09/2005 to 23/07/2007, the prices of metals in global markets experience a highly fluctuant status but with a mild increasing trend, and consequently the conditional correlation of the stocks market returns in Iran and metals price returns in the global market increase with a mild increasing trend.

During the period from 23/08/2007 to 23/08/2009, metals prices in global markets exhibit a decreasing trend with an intense fluctuation; as a result, Iran's stocks market demonstrate a time-increasing reaction to metals price returns in global markets. Since 23/09/2009 to 22/07/2012, the metals prices in global markets experience an increasing trend as well as a price peak; consequently, the stocks market's reaction to metals returns exhibit a decreasing status with a mild slope. Furthermore, from 22/08/2012 up to the end of the studied period, the price of the base metals in the global market demonstrate a decreasing trend with a mild slope. Since this period coincide with the shocks resulting from elections, government replacement, nuclear negotiations, etc., the stocks return receive more influence from these factors rather than the shocks in global markets. For this reason, the conditional correlation between the stocks returns in Iran and metals prices is reduced.

The conditional correlation between the stock price returns and global cooper returns in global markets is always positive during the studied period, and have a mean value of 0.188%. Behavioral trend of the conditional correlation between the stock returns and copper returns during the studied period exhibit eight different behaviors so that from the beginning of the given period up to 31/03/2005, the correlation is constantly positive.

For better understanding we need to explain that Iran is considered as one of the major copper exporting countries in Middle East, and also the copper mines located in Iran are among the most important ones in the world because Iran is located on the global copper belt ranging from southeastern part of the country up to the northwestern part around Azerbaijan Province. On this basis, along with the changes in copper price returns in global markets, companies associated with this commodity, which are present in Iran's Stocks Exchange Market, become more attractive for investors, and consequently affected by changes in the total stocks returns. Up to 21/03/2005, the copper price in global markets was increasing with a mild trend, as a result of which the stock market returns in Iran reacted to the global returns of copper on a constant rate. During the period from 21/04/2005 to 22/11/2005, Iran's stock returns' reaction to the global copper price returns moved upward.

Since 22/12/2005 up to 23/07/2007, copper had a fluctuant price in global markets but the high average price was maintained in the market, which resulted in a relatively constant increase in the sensitivity of Iran's stocks returns from copper returns in global markets.

Between 23/08/2007 and 22/08/2009, the price of copper in global markets experienced an intense fluctuation, as a result of which Iran's stock returns exhibited a strict reaction. During the period from 23/08/2009 to 23/08/2012, primarily, the copper price experienced an increase and a climax, however, subsequently, with a fluctuant trend at the end of this period (i.e., 08/2012), it moved again through the price channel of the period onset (i.e., 08/2009).

During the period between 22/09/2012 and 22/05/2013, the copper price in global markets underwent a new decreasing trend with a mild slope, which coincided with severe international sanctions by the European Union and United States against Iran so that the copper cathode exports in 2012 and 2013 were reduced and reached to its lowest level ever seen. Therefore, the stocks market exhibited a relatively high sensitivity to the copper returns in global markets during 22/09/2012 to 22/05/2013.

Since 22/06/2013 to 22/06/2015, the copper price in global markets faced reduction; however, due to the domestic political tremors in the country, the stock returns' reaction to the copper return in global markets found a new trend and declined suddenly. Subsequently, this trend exhibited an increasing status with a mild slope and then in 2014 and 2015, Turkey and China (in addition to the United Arab Emirates) became Iran's major copper buyers, respectively.

During June 2015 to April 2017, the copper price in global markets went through a new price channel; further, Iran's copper export in 2018 exhibited a considerable growth compared to 2017. However, it seems that by resolving and eliminating some of the worries from the copper export volume, investors would show less sensitivity to global changes in the copper price; as a result, reaction of the stocks returns to the copper price returns in global markets is only proven during June 2015 to April 2017.

Surely, during the studied period, Iran's total copper export volume had a decreasing trend and as a result, reaction of its stocks market returns to copper returns in global markets was reduced.

Table 3

Estimates of the ARMA(1,0)-DCC–FIAPARCH(1,d,1) Model

Dep. Var.	**rs**	**rx**	**rs**	**rme**	**rs**	**ro**
AR(1)	0.465***	0.338**	0.465***	0.380***	0.465***	0.329***
	0.087	0.145	0.087	0.080	0.087	0.068
d-Figarch	0.517***	0.964***	0.517***	0.630	0.517***	0.931***
	0.183	0.041	0.183	0.661	0.183	0.225
ARCH	0.245*	-0.211**	0.245*	0.133	0.245*	0.298
	0.125	0.085	0.125	0.277	0.125	0.229
GARCH	0.658***	0.587***	0.658***	0.710*	0.658***	0.925***
	0.105	0.059	0.105	0.408	0.105	0.047
APARCH (λ)	-0.383	-0.583***	-0.383	-321.0	-0.383	0.675*
	0.335	0.200	0.335	0.257	0.335	0.364
APARCH (δ)	1.769***	1.408***	1.769***	2.003***	1.769***	1.635***
	0.398	0.206	0.398	0.297	0.398	0.332
Log like.	-550.904	-1177.288	-550.904	-521.234	-550.904	-611.713
Avg. CORij	-0.099 (0.064)		0.253** (0.103)		0.066 (0.093)	
k1	0.000 (0.000)		0.022 (0.022)		0.026 (0.025)	
k2	0.891*** (0.174)		0.929*** (0.034)		0.904*** (0.064)	
df	6.385*** (0.003)		14.715* (8.42)		2.341*** (8.23)	
Log like.	-1715.850		-1063.361		-1161.783	
AIC	19.350		12.060		13.160	
SIC	19.635		12.345		13.444	

statistic	prob.	stat.	prob.	stat.	prob.	stat.	prob.	stat.	prob.	stat.	prob.	stat.
Q(10)	0.142	14.735	0.947	3.999	0.953	3.860	0.970	3.401	0.580	8.505	0.975	3.249
$Q^2(10)$	0.106	15.772	0.717	7.090	0.856	5.493	0.838	5.724	0.138	14.843	0.057	17.853

note. *, ** and *** indicate significance at the 10%, 5%, and 1% levels, respectively. The numbers below the computational parameters are their standard errors. *Source*: Research Findings.

Table 4
Estimates of the ARFIMA(P,d,q)-DCC–FIAPARCH(1,d,1) Model

Dep. Var.	**rs**	**rx**	**rs**	**rme**	**rs**	**ro**
AR(1)	-0.724	-0.781*			0.445	**0.692***
	0.578	0.186			0.334	**0.178**
d-Figarch	0.848**	0.907*	0.421*	0.313*	-0.012	**-0.199**
	0.386	0.134	0.078	0.079	0.378	**0.149**
ARCH	0.409	0.428	0.579*	0.383	0.495***	**0.719***
	0.406	0.334	0.211	0.901	0.279	**0.249**
GARCH	0.358**	0.364**	0.302***	0.527	0.321***	**0.239****
	0.178	0.173	0.166	0.744	0.183	**0.119**
APARCH (λ)	0.634**	0.671*	0.707*	0.798*	0.659*	**0.800***
	0.257	0.188	0.126	0.217	0.206	**0.126**
APARCH (δ)	-0.560	-0.562	-0.312	-0.166	-0.336	**-0.381**
	0.559	0.596	0.253	0.260	0.333	**0.542**
Log like.	1.704*	1.689*	1.661*	2.410	1.776*	**1.849***
	0.399	0.380	0.340	1.685	0.414	**0.425**
avg. CORij	0.956*		0.188**		**-0.039**	
	0.023		0.085		**0.079**	
k1	0.249*		0.013		**0.104**	
	0.046		0.027		**0.112**	
k2	0.693*		0.929*		**0.331****	
	0.056		0.045		**0.143**	
df	5.543*		7.666*		**8.575****	
	1.2531		2.312		**3.397**	
Log like.	-895.945		-1099.586		**-949.791**	
AIC	10.121		12.75		**11.06**	
SIC	10.474		13.039		**11.386**	

statistic	prob.	stat.	prob.	stat.	prob.	stat.	prob.	stat.	prob.	stat.	prob.	stat.
Q(10)	8.184	0.75	6.783	8.184	0.75	6.783	8.184	0.75	6.783	8.184	0.75	**6.783**
$Q^2(10)$	2.163	1	0.915	2.163	1	0.915	2.163	1	0.915	2.163	1	**0.915**

note. *, ** and *** indicate significance at the 10%, 5%, and 1% levels, respectively. The numbers below the computational parameters are their standard errors. *Source*: Research Findings.

The conditional correlation between the stock price returns and industry returns, on average, is equal to 0.956. Such high correlation indicate the high importance of the industries in Iran's Stocks Market. The correlation between the stocks and industry returns until 23/09/2013 is growing with a very mild trend; however, near the end of September 2013, the stocks market experience the impacts of political tremors such as elections, government change, as well as the nuclear deal negotiations. On the other hand, deepening of the recession in the industry sector causes investors to incline toward non-industrial or even speculative activities; as a result, the role of the industry returns' contribution to the total stocks returns is intensely faded, and even they move in opposite directions in some cases. Meanwhile, the conditional correlation between the stocks and industry returns is increasing with a mild slope.

5 Conclusion

Understanding the relationships between financial and non-financial markets with the stocks market is one of the main subjects which is concerning the researchers, so the main objective of the present study is to investigate the dynamic conditional correlation between the selected domestic and foreign assets returns (oil, industry, exchange and base metals [total, copper, steel]) and stock price index returns in Iran. For this purpose, the monthly data from March 2001 to April 2017 along with the DCC-FIAPARCH approach are used.

The results of this survey show that, the changes in copper and metal prices returns in global markets increase the profitability of companies that produce this commodity in Iran's Stock Market due to the positive significant trend of correlation between the stocks returns and copper and metals returns during the studied period.

Another issue that can be drawn from the results is that the average conditional correlation of stock returns and currency fluctuations is negative but not significant. Thus, it does not have a negative constant trend, and despite the fact that we observe a negative trend in most sections of the studied period, e.g., 2012, the conditional correlation fluctuations of stock and currency returns move positively. Such a positive effect is explained through the portfolio equilibrium model, which claims that there is a negative relationship between the stock price and foreign exchange rates. Regarding the severe effects of the recent fluctuations of the foreign exchange market on the stock market in this period, three different groups of companies are observed. The first group includes export companies in Iran, which form a larger section of the stock measure, whose export earnings increase by raising the dollar rate. The second group includes companies which do not have exports; they conclude that with an increase in prices of a company's products within the country and thus inflation, the benefit of each companies' share increases.

While being in the stock market, which proceeds the expectations' growth, we observe, at least in the short term, that prices grow and market price increases. The third group includes the automotive companies, which are mostly importers; and because of an increase in the exchange rate, encountered a triple increase in the rate of imported parts, and a triple increase in the full cost. However, since these products were not free of charges and were determined by the competition council, the products' over-pricing was stopped, and these industries went bankrupt. Therefore, despite the dependence of most domestic industries on imports of intermediary and capital commodities, the result of positive and negative conditional correlation of fluctuations in stock and currency returns was positive in 2012.

The results also indicate that the average conditional correlation of fluctuations of stock and oil returns is positive but not significant and thus, does not have a positive constant trend. Moreover, despite the fact that we observe a positive trend in the majority of the study period, the conditional correlation of fluctuations grew negative in some periods. Increase in oil prices leads to an elevated profitability in oil dependent companies. By increasing the profit and prices of these companies, the total stock market index is increased. Study of the conditional correlation of fluctuations in stock and oil returns indicate that the stock market boom of the fluctuations conditional correlation move positively during some periods, but move negatively during the downturn.

Finally, considering that the DCC model is used to build an optimal portfolio asset, it is recommended that investors refrain from placing the mentioned assets in a portfolio to hedge them, and in the process of the portfolio formation, the other assets which are negatively correlated with the aforementioned assets, must be added to the portfolio. For future studies, the approach of this study can be used to determine the optimal weights of different assets in the final asset portfolio.

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