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Developing a Forecast Model for Transactions Value in Iran Mercantile Exchange (IME)

Ali Shamdani hagh*
Management Faculty, Islamic Azad University, Tehran Central Branch
No.128, Next to Bank Refah, Before Enghelab Sq, Azadi Ave,Tehran, Iran

Seyed Amin Afsahi,
Entrepreneurship Faculty, University of Tehran
Farshi Moqaddam St (16th) St, North Kargar Ave, Tehran, Iran

Abstract
Commodity exchanges in the world are known as the organized and self-regulated markets for discovery of efficient, transparent and fair price. Despite the high impact of the commodity exchanges on national economies and the UNCTAD's forecast about the growing of commodity exchanges in developing countries, so far, no model has been developed to predict the Iran Mercantile Exchange trading value. Therefore, developing a model for suppliers and applicants seems essential. In this paper, forecasting model of trading value of IME, has developed by discovering the macroeconomic indicators which are effective on the trading value in IME. Totally, indicators like inflation, unemployment, construction budget, exports, imports, taxes, USD exchange rate, economic growth, world GDP, world oil prices and oil revenues of the government during the analysis period of 2008 to 2015, are counted and considered in the paper.In the current research, for the quantitative analysis of data, Pearson correlation coefficient and R^2 for identification of economic variables which are effective on IME trading value and correlation test with significant level of 99% and 5 degrees of freedom are used. Then, by using least squares method of regression equation, the macroeconomic indicators effects on IME traded value are estimated.In order to investigate and compare the forecasting power of the model Root Mean Square Error(RMSE) and The Mean Squared Error (MSE) are used. The results show that, the IME trade value is affected from indicators like USD exchange rate, trade balance, world GDP, world economic growth rate, world inflation rate and supplier price index in Iran's economy. In the middle, USD exchange rate has the most positive effect (1.21) and supplier price index (-4.24) has the most negative reverse effect on the IME trade value. Research findings shows that, based on the fitted model for forecasting of IME trade value of IME, RMSE equals to 0.063, MSE is equal to 0.047 and based on the fitted model, has a high power to be used.
Keywords: Commodity exchange, IME, Iran's Macroeconomic indexes, World's economy trends, Forecast of transactions value.

Introduction

Commodity exchanges and modern financial instruments can be considered the last loop of chain in the process of market expansion. In fact, commodity exchanges have emerged in response to the need for enhancing transparency and information accessibility in an economy, managing risks arising from price fluctuations, organizing markets in order to improve efficiency and ultimately reduce transaction costs (Iran Mercantile Exchange Economic Studies Management, 2010, 1).

Although the modern commodity exchanges originate from countries which are already developed, the importance of these economic institutions have been well recognized in developing countries. In fact, commodity exchanges are being rapidly adopted and expanded in developing countries so that 10 out of 22 world top exchanges (in terms of turnover) are based in India, China, Malaysia, South Africa and Brazil. Moreover, the available statistics suggests that turnovers in commodity exchanges based in developing countries have been growing at a pace twice their counterparts in developed countries (Santana and Boado, 2007, 26-18).

Along with other developing countries, Iran Mercantile Exchange (IME) has been assigned critical tasks to improve the performance and expansion of the national economy. The continuously successful involvement of IME in the capital market can pave the way for considerable developments in Iran's economy.

Commodity exchanges can improve the overall economic performance through the promotion of investments in all sectors of industry, agriculture, and services. Commodity exchanges are characterized by several unique features, including a well-regulated market created to facilitate the trading of goods, organizing the commodities market through an administrative mechanism, governing the obligations and guaranteeing the best interests of parties for all transactions, transparent discovery of prices based on supply/demand interaction and market requirements, providing the possibility to manage risks in the market, making cash/credit transactions, futures and options through modern financial instruments, expansion of investment and provision of financial facilities for trading and finally, notification about the status of domestic and foreign markets for listed goods in order to enhance the knowledge of market practitioners. Given the role of commodity exchange in the

improvement of economic structure and subsequently the expansion of the economy, it is crucial to explore the attractiveness of engagement in the IME (Namazi, 2013, 23).

So far, there have been more than 187 commodities listed on IME, where the value of transactions hit 670 trillion IRR at its peak during March 2012- March 2013. The volume and value of transactions over the past 8 years have generally taken an upward trend. This trend is expected to further accelerate as the next development plan is enforced, since the current structure of the world's most prosperous commodity exchanges, ranging from Chicago Mercantile Exchange (CME) to Indian and Brazilian commodity exchanges, rely on futures rather than physical aspects (Buado and Gross, 2013, 18-26). Therefore, beside the fact that designing a model for economic activists and suppliers to identify the future trends of IME trades will increase the attractions of this zone of business in Iran's economy, this will flourish the investment in the exchange as a productive market. Although, to this moment there has no record of designing a model to forecast IME trade value.

Consequently, identification of affecting factors on IME trades and developing a forecasting model for future trend of IME trades is considered essential.

Background

Based on the maturity date for financial commitments, they will be classified to the monetary market (Financial market for debt short term documents with low risk) and capital market (Financial market for debt one-year maturity date documents with high risk). (Frank J. Fabozzi, 2015,25)

Capital market is composed of dissimilar elements like exchanges, funds and investment companies. Exchange is a regulated market and formed for trading of securities (like stocks) or commodities (like metals, oil and petrochemical products). (Jahankhani, 2016, 73).

IME is a regulated and organized market that certain commodities or financial documents which are related to certain commodities named securities based on the commodities, are traded in. The majority of customers for commodity exchanges which are active regularly, are consumers or suppliers that feeds their needs through such market. (Shahidi and Sohani, 2014, 9).

Backing to the formation of commodity exchanges in 19th century, these exchanges are formed due to the failure and inefficiency of traditional market. In fact, existence of problems in traditional markets in any aspect of production, distribution, and demand and following by commodity price fluctuations from one side and benefits of commodity exchanges from the other side has led to formation of a desire to establish commodity exchanges by different countries.

Commodity Exchanges in Developing Countries

Many of commodity markets in developing and in transition economies, have experienced severe structural reforms, during recent decades. Vast liberalization has prevented the presence of government and its supports in this sector. Therefore, supply chains which were known by commodity market activists, were no more applicable in other ways, accessing to markets like side services of semi-governmental marketing institutions which are more complex and unpredictable. These side services, are supporting in price setting, market data, warehousing and logistics, financing, developing services and input provision. Without stabilizing inputs and rooted complex of performances which were facilitators of supply chain, trade costs of so many of commodity market activists has been increased. Thus, commodity exchanges can provide marketing services of semi-financial institutions in a way which is appropriate from the financial point of view and this can be considered as one of the best way to fill the gap from the retreat of the government from this section because the commodity exchange is an organized, competitive and structured market which is used by suppliers to offer their products to customers after the pricing and evaluation processes by the market experts and one of the benefits of this market is the presence of supervisory and regulatory institutions and the competition of many suppliers which all suppliers, consumers and traders will be benefited from the presence of such institutions from the view point of dominant rules and regulations on the exchange. (UNCTAD, 2014)

From the view point of trade volume, 9 out of 22 commodity exchanges in the world are located in the developing countries such as 3 exchanges in each of the countries of china, India and other exchanges in Brazil, Malaysia, South Africa. Most of the affair-mentioned exchanges are established during economic liberalization of the commodity market by the government in 80s and 90s decades. Furthermore, 3 exchanges of India have established in 2002 and 2003 and 2 commodity exchanges of the India, national India derivatives exchanges and the two commodity exchanges could successfully enter to the list of top ten exchanges of the world during the decade and leave behind the top exchanges like New York Stock Exchange (NYSE). Also. Dalian Commodity Exchange (DCE) and Shanghai Futures Exchange (SHFE) were racing Chicago Mercantile Exchange (CME) for standing in the first position during 2013 and 2014. Commodity exchanges of the developing countries has experienced a trade growth rate which was double the rate of the exchanges which are the member of the Organization for Economic Cooperation and Development (OECD). This issue has been lead to the increasing to the one third of the whole futures and options trading and this trend is still continuing with a considerable pace.

Moreover, by dividing the data into different sections, trading volume for the contracts of the exchanges in the developing countries in the sections like agricultural are surpassing from the countries which are the member of the OECD. The high pace for trade volume growth has also increased in the developing countries in sectors like metals and energy. (By the way, by the stimulation of energy trade in the member countries of OECD with the price fluctuations, developing countries quota in the energy sector is still limited). (UNCTAD, 2015, 46-48)

Meanwhile, in the 27th international conference of Swiss Futures and Options Association (SFOA) which was held in 2006, there were forecasts on the meaningful growth rate for Asian commodity exchanges in UAE, Iran, Pakistan, Indonesia and Thailand in mid and long term. (Bodo and Grass, 2014, 18-26). But is this forecast justified or will be true about IME? What are the effective factors in the macro level of the economy for growth or recession of the trade in the exchange?

Relying on the results of UNCTAD's extensive studies on world commodity exchanges, the main hypothesis of this study suggested that trade activity at IME will ensure an efficient price discovery, which in turn realizes transparent transactions. Moreover, risk management can facilitate through the unique financial instruments at IME, thus slashing the transaction costs in the national economy. At the same time, low volatility in the prices of goods and services will bring about a stable and sustainable economic growth, promoted social welfare, and accelerated economic development.

Based on the inherent attractiveness of commodity exchanges, this paper attempted to answer the following questions:

(A) What is the relationship between macroeconomic indicators and growth/stagnation of trade in IME?

(B) How can we forecast trade value in IME?

At the same time with the government liberalization plan of Islamic Republic of Iran's economy which was commenced after finishing of eight years of war with Iraq, the emergence of forming a structured and organized to free confrontation of supply and demand and achieving to the positive effect of production and consumption economy has made the government to provide the necessary legal context for the establishment and launching of commodity exchanges. In this ground within the approval of the paragraph (c) of article (95) from the third development plan rule and the article (A) of the fourth development plan rule, the high council of the exchange was assigned to form and develop commodity exchanges in Iran.

As a result, Tehran Metals Exchange (TME) has started its operation as the first commodity exchange in September of 2003 as well by passing a year, Iran Agricultural Exchange (IAE) has also established in September 2004.

Afterward, based on the approval of the high council of the exchange and the new market rule of the securities exchange, Iran Mercantile Exchange (IME) has been formed by the merger of the Tehran Metal Exchange (TME) and Iran Agriculture Exchange (IAE) and the company has commenced its work from Oct 2007, upon the underwriting of the securities and holding of the general assembly.

Thus, IME by enjoying 9 years of experience is the host for the trading of industrial, oil based and petrochemical products and agricultural products in both form of cash and forward settlement.

Until 20th of March 2015, a sum of 49 products from 49 foreign companies and 138 local companies in metals and minerals trading floor, 56 products from 36 foreign companies and 149 local companies in oil based and petrochemical trading floor and 62 products in agricultural trading floor is listed in IME.

Also, launching of derivatives instruments like futures contracts on gold coin, cumin seed, soybean meal and also options contracts are within the career of the IME.

Side market of IME has launched from 7th of Oct 2014 by offering of rail scrap from RAJA (Iran Rail Way Company) and by the end of the 2015, 8 companies were listed in trading floor and total number of 180 products from 380 companies were listed and traded in IME. All transactions are conducted through standard contracts and two form of cash and derivatives are available.

Year	Total value Transaction of IME(Billion IRR)	Growth Rate(%)
21March2008-20March2009	82746	-
21March2009-20March2010	92184	11
21March2010-20March2011	125315	36
21March2011-20March2012	302317	141
21March2012-20March2013	677891	124
21March2013-20March2014	637214	-6
21March2014-20March2015	574059	-10

Unfortunately, we have found no considerable researches through macro perspective about performance evaluation of the 9 years of IME activities. Most of the research was done in this ground has been generally focused on the performance of gold coin futures contract market. Regarding the evaluation of intrinsic function of commodity exchanges such as efficient price determination, a research has done by Behzad Afkari in Mashhad Ferdousi University with the guidance of the Dr. Hossein Mohammadi in 2012 under the title of "role of IME in agricultural price determination". In this research, the effective factors for setting and discovering of

the price of four major agricultural products such as wheat, feed barley, soybean meal and maize and their price fluctuations from Oct 2007 to 2011, were studied by using weekly trade data. Overall, the research results reveals that Iran's oil price fluctuations have no considerable and meaningful effect on the price fluctuations in IME but the changes in the foreign currency rate market, has led to noticeable and meaningful effects on this market.

Analysis Method

Based on the Shim researches in 2006, stability of the macro economy and governmental regulations are almost the prerequisites of commodity exchanges in the developing countries.

Based on the findings of the researches, in order to evaluate the trends of IME trades which has the potential for the continuous development, the evaluation of macro-economic indices of Iran, the stability of macro economy and price trends in global markets are essential.

Based on this, the effective indicators are achieved and the primary outlook of what may happen to IME will be visible as an image.

As for the quantitative data analysis, however, Pearson correlation(rx,y=(cov(x,y))/sx,sy) and R^2 were employed to identify the variables contributing to the value and volume of transactions at Iran Mercantile Exchange, as well as correlation test at a significance level of 99% and DOF of 5.(t=r/((1-r^2)/(n-2))^(1/2))

Moreover, regression analysis was performed in the model prediction and developed to estimate the value and volume of transactions at IME, influenced by the macroeconomic variables.

In this section, spurious regression of the model was prevented by examining whether there is a unit root in the research variables. Then, the Johansen co-integration test was conducted on time series data in order to find out whether there is a long-term relationship between the variables based on test statistics. The null hypothesis suggested, there is no long-term relationship between macroeconomic variables and the volume and value of transactions at IME on a significance level of 95%.

The optimal order of the VAR model was determined through interruption criteria based on Schwartz criterion, which could lose the lower DOF than other criteria.

Then, the least squares in regression equation were adopted to assess the effectiveness of macroeconomic variables on the value and volume of transactions at IME.

Both root mean square error (RMSE) and mean absolute error (MAE) were used to evaluate and compare the predictive power of the model.

Therefore, indices and variables which are effective of Iran's and world economy on IME trading trends from 21 March 2008 to 20 March 2015 will be evaluated.

The statistics which are used for the 212 March 2008 to 20 March 2015 period from the statistics and performance evaluation departments and also figures from the economic studies and market development department.

Necessary data of Iran's economy has been also acquired from central bank of Iran's reports and the statistical center of Iran.

The past world economy trends background info and its related forecasts, has been achieved from the official reports of the International Monetary Fund (IMF) and Opec.

Data Analysis

General level of prices, unemployed population, development budget, export, import, taxes income, USD exchange rate, GDP, international oil price and government oil income in the period of 21 March 2008 to 20 March 2015 are used as the macroeconomic indices. Also IMF data and Opec data on world oil price and global price indices, global GDP and global indices of base commodities are employed in this research.

1- World oil prices

A study of the correlation between world oil price of Iran in global markets and IME trade value during 21 March 2008 to 20 March 2015, shows that Peterson correlation coefficient is 0.77 and shows a R^2, 0.59 and 59 as coefficient of determination.

As a result of the independence test, T=2.68 which shows a rejection of the hypothesis of the test in the meaningful level of 99 and with 5 degree of freedom, for the meaningful relations of oil price and IME trade value.

Year	Average of Iran's Crude Oil (Barrel/USD)
21 March2008-20 March2009	79.8
21 March2009-20 March2010	69
21 March2010-20 March2011	83.3
21 March2011-20 March2012	110
21 March2012-20 March2013	107
21 March2013-20 March2014	104
21 March2014-20 March2015	95

2- GDP of World Economy

IMF, publishes the world GDP:

Year	World GDP (Billion USD)
21 March2008-20 March2009	63,014
21 March2009-20 March2010	59,683
21 March2010-20 March2011	65,339
21 March2011-20 March2012	72,422
21 March2012-20 March2013	73,777
21 March2013-20 March2014	75,467
21 March2014-20 March2015	77,269

Pearson correlation coefficient between world GDP and IME trade value: 0.92

Based on this, R^2 is equal to 0.84 and coefficient of determination will be 84. As a result of independent test, t=5.24 which is a proof of independence test hypothesis in the meaningful level of 99 percent for the meaningful relation of world GDP and IME trade value.

3- Index of world price

But by taking a look to the correlation of world price index which has offered by IMF with the base year of 2000 and IME trade value and volume, shows a different situation:

Year	Average Consumer Price Index
21 March2008-20 March2009	140.9
21 March2009-20 March2010	144.8
21 March2010-20 March2011	150.3
21 March2011-20 March2012	158
21 March2012-20 March2013	164.6
21 March2013-20 March2014	171
21 March2014-20 March2015	176.9

Pearson correlation coefficient between world price indices and IME trade value: 0.92

Based on this, R^2 is equal to 0.82 and coefficient of determination will be 82. As a result of independent test, t=4.9 which is a proof of independence test hypothesis in the meaningful level of 99 percent and freedom degree of 4 for the meaningful relation of world price indices and IME trade value.

4-Base commodities price indices

As well, level of affection of IME from the world price indices from commodity price index which is designed and announced by IME, has been used. This index (Commodity Industrial Inputs Price) has gathered a basket from diversified traded commodities in commodity exchanges like agricultural products, raw materials and metals and mineral products. Calculation of the correlation coefficient between this index and IME trade value within the studied period shows a 0.31 coefficient. Based on this, R^2 equals to 0.09 and the coefficient of determination will be 9 percent.

Year	Commodity Industrial Inputs Price(IRR)
21 March2008-20 March2009	145.6
21 March2009-20 March2010	118.6
21 March2010-20 March2011	169.9
21 March2011-20 March2012	197.7
21 March2012-20 March2013	167.1
21 March2013-20 March2014	163.3
21 March2014-20 March2015	153.5

As a result of independent test, t=0.72 which rejects the independence test hypothesis in the meaningful level of 99 percent and freedom degree of 5 percent for the meaningful relation of world prices of commodities and IME trade value.

5-Price indices

Calculate the correlation coefficient between trend of commodity price indices, consumer services and supplier

price indices and IME trade value shows that:

Coefficient between trend of commodity price indices, consumer services and supplier price indices and IME trade value:0.86

Based on this, R^2 is equal to 0.74 and coefficient of determination will be 74. As a result of independent test, t=3.76 which is a rejection of independence test hypothesis in the meaningful level of 99 percent for the meaningful relation of consumer services commodity price indices and IME trade value.

Pearson correlation coefficient between supplier price indices and IME trade value: 0.88

Based on this, R^2 is equal to 0.77 and coefficient of determination will be 77 percent. As a result of independent test, t=4.14 which is a proof of independence test hypothesis in the meaningful level of 99 percent for the meaningful relation of fluctuations of world prices of commodity and IME trade value. In nutshell, supplier price indices, has a stronger and correlation with the IME trade value.

Year	Consumer Price Index	Supplier Price Index
21 March2008-20 March2009	66.1	59.5
21 March2009-20 March2010	73.2	63.9
21 March2010-20 March2011	82.3	74.5
21 March2011-20 March2012	100	100
21 March2012-20 March2013	130.5	132.4
21 March2013-20 March2014	175.9	178.1
21 March2014-20 March2015	203.2	204.5

6- National GDP

Correlation of national GDP with the fixed prices for the period of 21 March 2008 to 20 March 2015 was evaluated.

Year	GDP Constant Price (Billion IRR)
21 March2008-20 March2009	1918681
21 March2009-20 March2010	1942990
21 March2010-20 March2011	2068912
21 March2011-20 March2012	2157934
21 March2012-20 March2013	2011554
21 March2013-20 March2014	1972852
21 March2014-20 March2015	2031596

Pearson correlation coefficient between national GDP to fixed prices and IME trade value: 0.12

Based on this, R^2 is equal to 0.01 and coefficient of determination will be 1 percent. As a result of independent test, t=0.27 which is a rejection of independence test hypothesis in the meaningful level of 99 percent and 5 degree of freedom for the meaningful relation of economic growth and IME trade value.

7- Unemployment

Based on the economic indicators of Central Bank of Iran (CBI) and unemployment rate which is announced by the statistics center of Iran, the unemployed population rate of the country for the period of 21 March 2008 to 20 March 2015 will be as follows:

Year	Unemployment Population (Million)
21 March2008-20 March2009	2.3816
21 March2009-20 March2010	2.8322
21 March2010-20 March2011	3.2265
21 March2011-20 March2012	2.8782
21 March2012-20 March2013	2.9402
21 March2013-20 March2014	2.4752
21 March2014-20 March2015	2.5228

Pearson correlation coefficient between unemployed population rate and IME trade value: -0.21

Based on this, R^2 is equal to 0.04 and coefficient of determination will be 4 percent. As a result of independent test, t=0.48 which is a rejection of independence test hypothesis in the meaningful level of 99 percent and 5 degree of freedom for the meaningful relation of unemployment rate and IME trade value.

8- Oil income

Pearson correlation coefficient between government oil income and IME trade value: -0.60. Based on this, R^2 is equal to 0.36 and coefficient of determination will be 36 percent. As a result of independent test, t=-1.67 which is a rejection of independence test hypothesis in the meaningful level of 99 percent and 5 degree of freedom for the meaningful relation of government oil income and IME trade value.

Year	Oil Income (Billion USD)
21 March2008-20 March2009	81.9
21 March2009-20 March2010	62
21 March2010-20 March2011	74
21 March2011-20 March2012	113
21 March2012-20 March2013	50
21 March2013-20 March2014	41.6
21 March2014-20 March2015	38.1

9- Foreign Trade

Pearson correlation coefficient between foreign trade and IME trade value will be studied here:

Year	Import(Billion USD)	Export(Billion USD)	Trade balance
21 March2008-20 March 2009	56	18.3	-37.7
21 March2009-20 March 2010	55.2	21.9	-33.3
21 March2010-20 March 2011	64.4	26.5	-37.9
21 March2011-20 March 2012	61.8	33.8	-28
21 March2012-20 March 2013	53.4	32.5	-20.9
21 March2013-20 March 2014	49.7	31.5	-18.2
21 March2014-20 March 2015	53.5	36.5	-17

Pearson correlation coefficient between foreign trade and IME trade value: -0.63

Based on this, R^2 is equal to 0.39 and coefficient of determination will be 39 percent. As a result of independent test, t=-1.8 which is a rejection of independence test hypothesis in the meaningful level of 99 percent and 5 degree of freedom for the meaningful relation of import value and IME trade value.

Pearson correlation coefficient between export value and IME trade value: 0.80

Based on this, R^2 is equal to 0.64 and coefficient of determination will be 64 percent. As a result of independent test, t=2.98 which is a rejection of independence test hypothesis in the meaningful level of 99 percent and 5 degree of freedom for the meaningful relation of export value and IME trade value.

Pearson correlation coefficient between trade balance value and IME trade value: 0.95

Based on this, R^2 is equal to 0.90 and coefficient of determination will be 90 percent. As a result of independent test, t=6.8 which is a proof of independence test hypothesis in the meaningful level of 99 percent and 5 degree of freedom for the meaningful relation of trade balance value and IME trade value.

Therefore, trade balance is a more apparent index about the relation and correlation of IME trade value and foreign trade.

10- USD exchange rate

To study the correlation of currency rate and IME trade volume during 21 March 2008 to 20 March 2015:

Year	USD exchange rate (IRR)
21 March2008-20 March2009	9,660
21 March2009-20 March2010	9,980
21 March2010-20 March2011	10,440
21 March2011-20 March2012	12,050
21 March2012-20 March2013	26,080
21 March2013-20 March2014	31,840
21 March2014-20 March2015	32,800

Pearson correlation coefficient between USD exchange rate in free market and IME trade value: 0.93

Based on this, R^2 is equal to 0.86 and coefficient of determination will be 86 percent. As a result of independent test, t=5.65 which is a proof of independence test hypothesis in the meaningful level of 99 percent and 5 degree of freedom for the meaningful relation of USD conversion rate in free market and IME trade value. Therefore, meaningfulness of the relation and positive correlation of USD conversion rate in free market and IME trade value is confirmed.

11-Governement tax incomes

Study of the tax income for the government during 21 March 2008 to 20 March 2015 and its relation to IME trade value has shown as follow:

Tax Income(Billion Rial)	21Mar2008-20Mar2009	21Mar2009-20Mar2010	21Mar2010-20Mar2011	21Mar2011-20Mar2012	21Mar2012-20Mar2013	21Mar2013-20Mar2014	21Mar2014-20Mar2015
Legal Entities	127794.20	167299.90	116500.20	157892.60	169705.70	179969.30	240047.50
Income	31587.70	33928.00	41115.70	49612.30	62678.10	76067.80	94037.80
Import	56689.10	62554.40	77886.30	78929.80	76402.90	80397.70	133425.60
Goods and Servises	15899.80	28451.30	37893.20	60104.00	70485.90	135969.10	217026.30

Pearson correlation coefficient between legal persons and IME trade value: 0.67

Based on this, R^2 is equal to 0.45 and coefficient of determination will be 45 percent. As a result of independent test, t=2.02which is a rejection of independence test hypothesis in the meaningful level of 99 percent and 5 degree of freedom for the meaningful relation of supplier price index and IME trade volume.

Pearson correlation coefficient between tax on income and IME trade value: 0.86

Based on this, R^2 is equal to 0.74 and coefficient of determination will be 74 percent. As a result of independent test, t=3.76 which is a rejection of independence test hypothesis in the meaningful level of 99 percent and 5 degree of freedom for the meaningful relation of tax on income and IME trade volume.

Pearson correlation coefficient between taxes on the commodities and services and IME trade value: 0.73

Based on this, R^2 is equal to 0.53 and coefficient of determination will be 53 percent. As a result of independent test, t=2.38 which is a rejection of independence test hypothesis in the meaningful level of 99 percent and 5 degree of freedom for the meaningful relation of supplier price index and IME trade volume.

12- Development Budget of the Government

This hypothesis is always considered in the annual reports of IME for the annual general assembly which is one of the effective factors in recession or booming of this exchange, increase or decrease in the government budget planning as a result of increasing of demand for metals and minerals products and oil based products. government budget distribution process has been studied within the period of 21 March 2008 to 20 March 2015

Year	Construction Budget Performance (10K Billion IRR)
21 March2008-20 March2009	20
21 March2009-20 March2010	17
21 March2010-20 March2011	21
21 March2011-20 March2012	25
21 March2012-20 March2013	11
21 March2013-20 March2014	11
21March2014-20March2015	32.2

Pearson correlation coefficient between government development budget and IME trade value: -0.20

Based on this, R^2 is equal to 0.04 and coefficient of determination will be 4 percent. As a result of independent test, t=-0.45 which is a rejection of independence test hypothesis in the meaningful level of 99 percent and 5 degree of freedom for the meaningful relation of government development budget and IME trade value.

Forecast

The target of this analytic study is to forecast the IME trade value based on the macro economy variables in Iran's and world economy. The used variables in this article includes: total trade value in IME (Billion IRR), USD exchange rate in free market (Toman), supplier price index, trade balance (Billion USD), World GDP (Billion IRR), World prices index for the period of 21 March 2008 to 20 March 2015 by using of quarterly frequency. It is necessary to mention that, the data is in annual format but because lack of quantity of observations, the data period has transformed to quarterly from annually. In this ground, unit root test and co-integration of research variables and in the second step by using of time series models, there were attempts to evaluate the equation of IME trade value and finally the forecast of these variables are prepared based on the in and out of samples methods.

Studying of research variables

Unit root test

In this part of research in order to prevent a spurious regression in the model, existence of a unit root in the research variable are studied. The unit root test has done in the trend mode and width of the origin. The reason to employ the logarithms of the variables is that, we can analyze the outcome coefficient of the equations as tension. The results show that, all research variables have the unit root in the surface because the absolute value of the test statistic is smaller than absolute value of critical value, zero hypothesis to prove the unit root in the meaningful level of 95 percent is not rejected, in other words, these variables which are stacked from the first time and differencing will be lasting.

Table 39- Test of Unit root for research variables

Augmented Dickey-Fuller test (ADF)		
Variables	Critical value on level 95%	Statistic
Logarithm of the total Trade value of IME	-3.67	-2.97
Logarithm of USD currency rate in free market	-3.64	-3.40
Logarithm of Supplier Price Index	-3.65	-2.47
Logarithm of the trade balance	-3.65	-3.45
Logarithm of global GDP	-3.64	-2.14
Global price index logarithm	-3.64	-3.29

In the next step, while we have faced non-everlasting variables, the issue of studying the long term relations is ongoing and for this we have used Johansen co-integration test about time series of the research to understand the existence of the long term relation between the statistics of the test.

In this level it is necessary to optimal order of the VAR model be determined by using of the criteria for determining delay. Optimal delay determination must be done based on the model variables and sample volume. In the table below, optimal delay based on the different factors of selection of optimal delay for the chosen model is shown.

Because using of the Schwartz criteria leads to less miss of freedom degree in comparison to other criteria, therefore, in this research the optimal delay has been chosen based on the Schwartz criteria.

Table 40- Determination of The number of optimal interruptions

Lag	LogL	LR	FPE	AIC	SC	HQ
0	142.9391	NA	8.92e-17	-8.57671	-8.114141	-8.4259
1	394.0651	324.0335	7.18e-21	-18.326	-13.23844	-16.668
2	708.1910	202.6619*	9.83e-26*	-32.14*	-22.42725*	-28.974*

As it is clear in the table above, optimal delay based on the Schwartz criteria is the 2nd delay.

Johansen co-integration test

For the Johansen co-integration test, primarily it is necessary to evaluate the error correction model and afterward by using of rating of matrix π and $\boldsymbol{\lambda_{trace}}$ و $\boldsymbol{\lambda_{max}}$, we can find the quantity of co-integration relations. So, in nutshell, primarily, error correction model is explained and then we express the Johansen co-integration test to find the number of the co-integration relations. (Anders, 2013)

For the test of numbers of the co-integration vectors we use two statistics of test λ_{trace} $\lambda_{max}$and the general formula for these two are:

$\lambda_{trace}(r) = -T\sum_{i=r+1}^{n}(1-\widehat{\lambda_i})$ (8)

$\lambda_{\max}(r, r+1) = -T\ln(1-\widehat{\lambda_{r+1}})$ (9)

In which $\widehat{\lambda_i}$ is the estimated values of the specified root of Matrix π and T is the number of observations.

Zero hypothesis in statistic λ_{trace}

Expresses the quantity of vectors co-integration which are smaller or equal to r in face of competing hypothesis quantity of co-integration vectors which are bigger than r and in statistic $\lambda_{\max}$ shows that the number of co-integration vectors which are equal to r in face of quantity of co-integration vectors equals to r+1.

Table 42- Johnson Unit root test (IME Trade value equation)

$\lambda_{\max}$ Test

Table 42- Johansen Co-integration test (IME Trae Value Equation)

Test $\boldsymbol{\lambda_{max}}$				Test Trace			
Zero Hypothesis	Opposite Hypothesis	Test Statistic	Critical Value 95 %	Zero Hypothesis	Opposite Hypothesis	Test Statistic	Critical Value 95 %
=0r	=1r	178.45	40.07	=0r	1r≥	485.26	95.75
1r≤	=2r	115.90	33.87	1r≤	2r≥	306.81	69.81
2r≤	=3r	107.83	27.58	2r≤	3r≥	190.90	47.85
3r≤	=4r	53.97	21.13	3r≤	4r≥	83.07	29.79
4r≤	=5r	29.09	14.26	4r≤	5r≥	29.10	15.49
5r≤	=6r	0.001	3.84	5r≤	6r≥	0.001	3.84

*Source: results from the research

Based on the results of co-integration for IME trade value equation is specified that for both test statistics, both zero hypothesis to reject the existence of long term relations between variables in the meaningful level of 95 % because of values and test statistic is bigger than critical value and the opposite hypothesis, shows maximum existence of 4 balanced relations between the variables are confirmed but other vectors of test are rejected and rejected the zero hypothesis which expresses the loss of existence of relationship between variables.

Evaluation of Research Experimental Model

In this section of the research, we have reviewed the impacting factors on IME trade value in 2 equations. Therefore, in this equation, logarithm sum of the IME trade value is a function from independent variable logarithm of open market exchange for USD supplier price index. Trade balance, world GDP, and world price indices. The table shows the results of fitted equations for IME trade value equation.

Table 43, results from regression equation (IME trade value).

Dependent variable: Log of IME trade value evaluation method: Least Squares
Date:11/05/15 – Time: 10:50
Sample(balanced), March 2008, March 2012
Number of observations:25

Meaningful level	/Statistic-T	Standard derivatives	coefficient	Variables
0.0000	7.539492	0.161469	1.217393	Logarithm of USD currency rate for open market
0.0000	-8.692860	0.488620	-4.247507	Logarithm of supplier price index
0.0000	6.108684	0.008376	0.051168	Logarithm of Trade Balance
0.0000	11.61848	0.583059	6.774254	Logarithm of World GDP
0.0000	6.067070	2.422665	14.69848	Logarithm of world price indices
0.0000	-8.579937	9.950720	-85.37655	Intercept
5.565223	The mean of dependent variable		0.994503	The coefficient of determination
0.872492	Deviation of dependent variable		0.993056	Adjusted coefficient of determination
-2.199248	Akaike information Statistic		0.072705	Standard deviation of regression
-1.906718	Schwarz information Statistic		0.100435	Total Square Error
-2.118112	Henan – Queen information Statistic		33.49060	Log Likelihood
1.865492	Durbin Watson statistic		687.4496	F Statistic
5.565223			0.000000	Meaningful Level of F

Based on the findings, all the achieved coefficients in the 5 percent level, because probe or meaningful level is less than 0/05 for them, has a meaningful level from zero.

Following the results, coefficient logarithm of USD currency rate which shows that with one percent increase in this stable variable, other conditions in one period, trade value will increase 1.21 percent.

Coefficient variable of log of supplier is equal to - 4.24 in which the coefficient shows that, with one percent increase in this stable variable in the period of vale in the trade value decrease as 4.24.

Coefficient variable of log of trade balance is equal to 0.05 in which the coefficient shows that, with one percent increase in this stable variable in the period of value in the trade value decreases as 0.05 percent.

Coefficient variable of log of World GDP is equal to 6.77 in which the coefficient shows that, with one percent increase in this stable variable in the period of value in the trade value increases as 6.77 percent.

Coefficient variable of log of world internal price index is equal to 14.69 in which the coefficient shows that, with one percent increase in this stable variable in the period of vale in the trade value increases as 14.69 percent.

In the end of the above table, good statistic regression model fitness is reported which statistic of determination coefficient and balanced coefficient which show an explanatory power of the model are respectively: 0.994 and 0.993 which shows the approach power of explanatory of the model.

Value of F statistic and the reported level of meaningfulness for that, expresses the total meaningfulness for the fitted regression and finally the Durbin–Watson statistic is 1.86 which implicates the rejection of autocorrelation in the residuals of the regression model. In these tables also normality tests, residuals and Homogeneity of variance, regression model residuals.

Diagram 32- Normality test results for distribution of residuals of regression equation (IME Trade value equations)

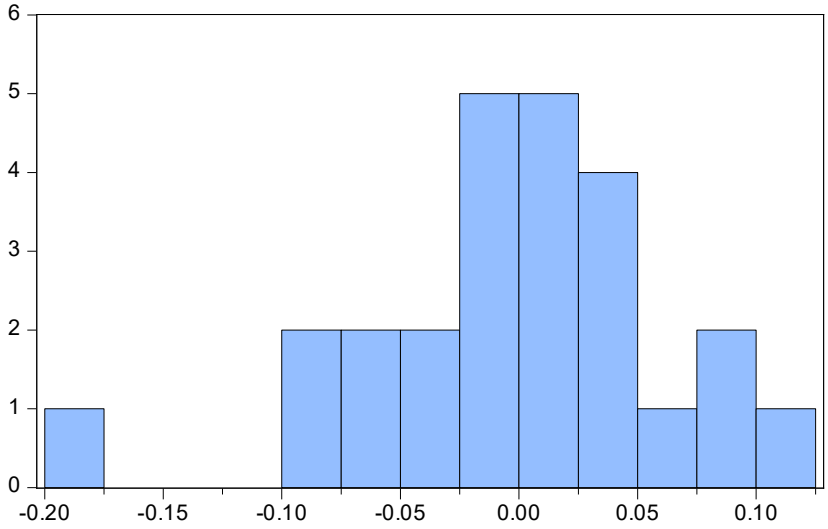


Table 44- results of homogeneity of variance for residuals on regression equation (IME Trade Value Equation)

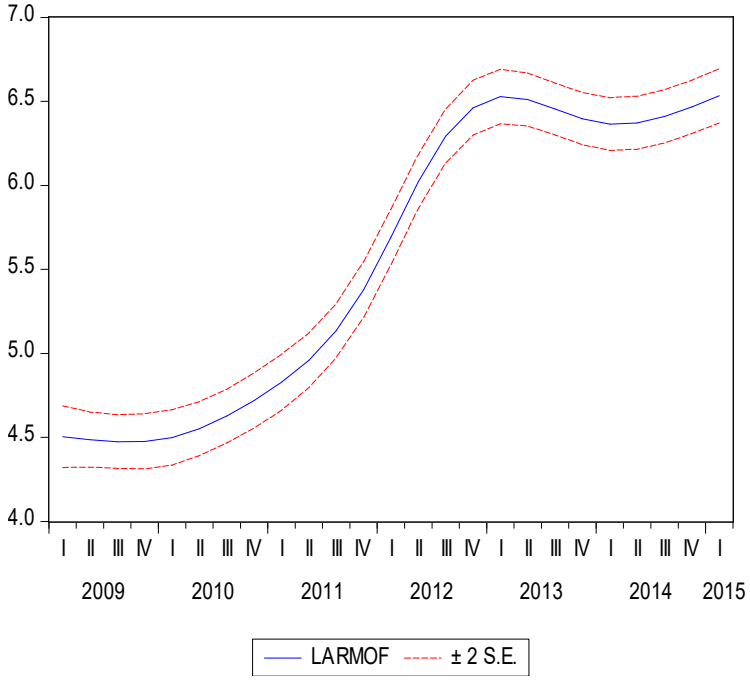
F-statistic	2.003148	Prob. F(5,19)	0.1243
Obs*R-squared	8.629574	Prob. Chi-Square(5)	0.1248
Scaled explained SS	7.047268	Prob. Chi-Square(5)	0.2171

According to the Jarque–Bera statistic and reported meaningful level for that, we may express that the distribution of residuals distribution in the regression equation is normal, Also, based on the statistic F and the report Prob value in the homogeneity of variance test for residuals, we will see that in this test, the zero hypothesis based on the Homogeneity of variance in the residuals of regression equation is not rejected and residuals have the characteristic of homogeneity of variance.

The goal of forecast is to decrease the risks in the decision making process. Although the forecasts are not regularly very exact but the error level of forecasts depends on the employed method. With allocation of more sources for the forecast and as a result, some of the losses from the lack of trust in the decision making process will be eliminated or decreased.

In the end of this section with the usage of estimating equation, the forecasting power of research equation has been analyzed.

Diagram 34- The forecasting power of the regression equation (IME Trade Value Equation)



Forecast: LARMOF	
Actual: LARMO	
Forecast sample: 2009Q1 2017Q4	
Adjusted sample: 2009Q1 2015Q1	
Included observations: 25	
Root Mean Squared Error	0.063383
Mean Absolute Error	0.047784
Mean Abs. Percent Error	0.823007
Theil Inequality Coefficient	0.005629
Bias Proportion	0.000000
Variance Proportion	0.001378
Covariance Proportion	0.998622

In order to evaluate and do the comparison of the forecasting power of the model we have used RMSE and MSE in a way that, as low as the value of these statistics it shows the higher forecasting power. The results implicate that, based on the RMSE index and MSE of the fitted model to forecast the trade value which equals to 0.063 and 0.047 which shows the high forecasting power of the fitted model.

Therefore, the forecast model of IME trade value is estimated as follows:

Trade value= (1.21) *(USD Currency rate in open market) +(-4.24) *(supplier price index) +(0.05) *(trade balance) _ (6.77) *(World GDP) +(14.69) *(World inflation rate)

Conclusion

In nutshell with calculation of Pearson correlation coefficient and coefficient of determination between sets of macroeconomic indices of Iran and world, value and volume of IME trades during the studied period (March 2008 to March 2015) and performing of correlation test in the confidence interval 99 percent and 5 degree of freedom, we have reached to this conclusion that, IME trade value trends are affected from indices such as currency rates, trade balance, world growth rate, world inflation rate and supplier price indices of Iran's economy which from the aspect of Iran's macroeconomic indices, has the highest positve effect (1.21) and supplier price index(-4.24) as highest negative effect on the IME trade values in present and for the future.

In nutshell, amid the UNCTAD achievement which shows that economic stability paves the way for the growth and mutation of commodity exchanges, IME has experienced a growth by world prices growth and endogenous shocks of Iran economy specially currency rate jumps and in the stable periods has experienced a slow growth or even the recession. In the Universal dimension, the world price indices which are determined and published from IMF with coefficient of 14.69 has the most impressive effects on the exchange trade value. Thus, evaluation of trend for changes in before mentioned indices prepare the situation for the future changes.

Opposing the first imagination of the researcher which was based on the official sayings and comments of authorities of capital market of Iran in media, budget distribution process of development budget, world oil price, government oil income during March 2008 to March 2015 was -0.2. In nutshell, correlation test of above mentioned indices with IME trade value and volume reject the existence of meaningful relation in the confidence interval of 99 percent and freedom degree of 5 and investigation of reasons behind such an occurrence needs a separate research and study.

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