

Does the Volatility of Foreign Portfolio Inflow to Saudi stock Market affect Financial Variables? An Investigation by means of Multivariate GARCH (MGRCH)

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Abstract

This paper aims at investigating volatility spillover of foreign portfolio investment (FPI) inflow to Saudi stock market on financial variables. The model comprises six financial variables that is Tadawul all Shares Index, foreign portfolio investment, nominal effective exchange rate, interest rate differentials, oil prices and price-earnings ratio. Multivariate GARCH (MGARCH) estimates of quarterly data covering the period 2006q1 – 2017q2 confirms that influence owing to covariance stationarity (modulus smaller than one) of four variables including FPI. Results unveil that there is long-run relationship among model variables and all coefficients of the mean and variance equations are very much significant.

Keywords: *Financial Variables, Covariance Stationary, MGARCH, Modulus, Spillover, Volatility.*

Introduction

No doubt, that capital inflow benefits the recipient economies in terms of increasing limited financial resources by means of foreign exchange availability, which in turn induce investment and ultimately economic growth. There is also the possibility of integration with the world stock markets. On the other hand, there is a potential risk of uncertainty and volatility specifically from foreign portfolio inflow (Pal, Parthapratim 2010). The importance of volatility stems from the fact that it is an appropriate measure of risk. Foreign capital flows into two forms: foreign direct investment (FDI) which is the most common type where foreign investor are interested investing directly in companies that takes long time, while foreign portfolio investment (FPI) is shorter in terms of time aiming at realizing quick profits by investing in the shares of listed companies in stock market (Maverick 2015).

The Saudi stock market has undergone many important changes and improvement since its establishment in 1954 until 1980 when Saudi Arabian Monetary Authority (SAMA) took the responsibility for developing the stock market. In addition, since the foundation of the Capital Market Authority (CMA) in 2003, until the amendment of legislations to allow foreign investors to buy and sell shares in June 2015. Many factors are in favors of Saudi stock market that induce foreign investment to inflow exemplified by the

membership of the Kingdom of Saudi Arabia (KSA) to the world trade organization, membership of G-20, economic stability due to the large share of government export dominated by US dollar (Alkhareif 2015), sound infrastructure, and well-regulated banking system. However, there is a number of adverse factors that hamper the inflow of foreign investment bring to mind by lack of transparency and the imposition a quota of Saudi employees in companies. The opening of stock market to foreign investors encouraged (Aljazira Capital 2015) the rating of listed sectors that attract investment: in the first place was the 12 companies that constitute the banking and financial services owing to stability and minimal risks. Followed by 14 petrochemical industries with stable profit margins, 14 cement factories for rising demand by housing and infrastructure, and 14 retail companies as rising demand by population growth, building and construction.

The motivation behind this paper is paucity of studies on this topic with respect to Saudi Arabia. Most studies dealt with the impact of FDI, to my knowledge only two academic papers have dealt with the issue of foreign portfolio investment in the Saudi Stock market that is (Ali and Masih 2016, Yasmeen 2014). Based on Valadkhani, and O'Brien (2012, 2009) papers MGARCH gives appropriate answers for many questions, as does a shock on FPI escalate the volatility of other financial variables in the Saudi stock market, does the impact the same for negative and positive shocks, and is there any correlation between financial variables.

This paper is organized as follows: an introductory section, followed by literature review, methodology and data, empirical results, discussion and finally conclusion.

Literature Review

Many researchers around the globe have studied the effect of FPI on various economic and financial variables using regression, vector autoregressive, generalized methods of moments (GMM), Fama and MGARCH models. All studies presented below were concerned with measuring the effect of FPI on other variables, except Rizvi and Arshad (2014), Karunanayake, Valadkhani, and O'Brien (2012, 2009) and Wenjing and Yiyu (2010) who employed MGARCH to trace out volatility transmission.

However, as mentioned very few studies have established relationship between FPI and other variables in the Saudi context, of which are Ali and Masih (2016) study on existence of significant premiums to volatility, size, momentum, value, and dividend yield in the Saudi stock market via 5-factors Fama model, over the period from January 1999 to December 2014. Their finding documented the existence of significant premiums for all factors under investigation and riskier assets do not necessarily offer higher returns. In addition, Yasmeen (2014) confirmed the existence of a positive and significant impact of foreign investment on the index of the stock by OLS.

Anayochukwu (2012) by the usage of multiple regression and Granger causality identified significant and positive impact of foreign portfolio investment on the returns of Nigerian Stock market. Parthapratim (2010) realized that foreign portfolio investment have not benefited India, influencing only the secondary market segment of the Indian stock market. Ferreiran and Laux (2009) noted that the inflow of foreign portfolio investment is an indicator of GDP growth in developed and less-developed countries. Kim, et al (2008) displayed the effects of capital inflows on asset price that by forcing institutions to reduce the possibility of mismatch between their foreign appreciation in East Asia. Ahn (2008) presented the Korean response to outflow of capital, currency assets, and liabilities that induced institutions to reduce their internal risk management. Athukorala (2003) believes that portfolio inflows lead to the appreciation of the real exchange rate (RER) in Asian countries, which did not succeed in sterilizing the effects of capital flows on RER by implementing fiscal policy.

Ibrahim and Akinbobola (2017) set up positive and significant effect of FPI on the economic growth in Nigeria using data spanning the period 1986 -2013 based on VAR. Muhammad et al (2017) results show that there is significant positive impact FPI on stock market performance in China.

Albulescu Do (2015) via GMM found long-term impact of foreign direct and portfolio investment on long-term economic growth for 13 Central East Europe countries, for the period 2005 – 2012.

Loncan and Caldeira (2015) used aggregated and disaggregated analysis through six-factor arbitrage pricing model to find out if there is an impact of foreign portfolio inflow on stock returns of Brazilian listed firms. The aggregated data revealed significant and positive impact on the index, while the second showed a statistically significant revaluation effect.

Rizvi and Arshad (2014) studied the volatilities and correlation of Islamic indices over twelve years. They found by means of MGARCH DCC low moving correlation between Islamic and conventional indices. Karunanayake et al (2012) examined the dynamics of cross-country GDP volatility transmission and their conditional correlations using quarterly data (1961-2008) for Australia, Canada, the UK and the US via MGARCH model. They identified significant cross-country GDP growth spillover among these countries, and the larger economies exert shock influences onto the smaller economies. Wenjing and Yiyu (2010) evaluated and forecasted the volatility of zero-coupon bond through MGARCH. Karunanayaka, Valadkhani and O'Brien Martin (2010) modeled the Australian stock market volatility by MGARCH.

Motley Fools (2017) defined Price-earnings ratio as relationship between the company's stock price and its earnings per share of stock issued. The stock price-earnings ratio indicates how much investors are willing to pay for every unit of currency (dollar) of earnings. High price-earnings ratio indicates that investors expect higher earnings. On the other hand, low price-earnings ratio reflects a genuine lack of growth potential.

Many researchers (Athukorala and Rajapatirana, 2003; Saborowski, 2010; Combes, Kinda and Plane, 2012; Jongwanich and Kohpaiboon, 2013; Ouedraogo 2017) proven that portfolio inflows appreciate real exchange rate which in turn reduces the country's competitiveness.

According to Bekaert and Harvey (1998), Rao (1999) and Halale (2014), there is an obvious influence of foreign portfolio investment on stock market stock indices. This influence is instantaneously leads to spiky movements in stock market indices by boosting the confidence. It is worth noting that market liquidity, size and trading cost.

The inflow and outflow of FPI is a clear evidence that KSA is integrated into world capital markets Our results make clear the relationship between portfolio investment flows and five financial variable that is Tadawul All Stocks Index (TASI), nominal effective exchange rate (NEER), oil prices (OPEC), interest rate differentials (Interest), and price earnings ratio (PE). Empirical evidence make it clear that there is volatility spillover of FPI on financial variables and transmission among them.

Methodology and Data

It is widely accepted that financial volatilities move together over time across assets and markets. Multivariate GARCH (MGARCH) is an appropriate technique for modeling the variance and covariance of the error term. It is an extension of the univariate GARCH. The mean equation is a function of exogenous variable with an error term (Bauwens et al 2006).

Multivariate GARCH is an extension from a univariate GARCH model to an N-variate model requires allowing the conditional variance-covariance matrix of the N -dimensional zero mean random variables to depend on the elements of the information set (Anderson et al 2008). We will use DVECH and BEKK for estimation. The DVECH specifies the mean equation of a financial variable i as a function of its own innovations (ε_{it}) and its own lagged values. The conditional variance depends on squared own lagged residuals and the lagged own variances, while the conditional covariance depends on the cross product of

the lagged residuals and lagged covariance of other variables (Harris and Sollis 2003). Under DVECH, the model follows GARCH-type and written as follows (Minovic and Simuenovic 2008):

$$\sigma_{ij,t} = c_{ij} + \sum_{h=1}^p a_{h,ij} \varepsilon_{t-h,i} \varepsilon_{t-h,j} + \sum_{h=1}^q b_{h,ij} \sigma_{t-h,ij}; 1 \leq i \leq j \leq k$$

Where $c_{ij}, a_{h,ij}, b_{h,ij}$ are parameters

The DVECH (1,1) model is defined as:

$$h_t = c + A\eta_{t-1} + Gh_{t-1}; h_t = vech(H_t); \eta_t = vech(\varepsilon_t \varepsilon_t')$$

The BEKK (1,1) is special case of VEC model defined as:

$$H_t = C^* C^* + \sum_{k=1}^K A_k^* \varepsilon_{t-1} \varepsilon_{t-1}' A_k^* + \sum_{k=1}^K G_k^* H_{t-1} G_k^*$$

Where $C^*; A_k^*; G_k^*$ are $N \times N$ matrices but C^* is upper triangular. The intercept indicates the conditional mean of financial variable showing the influence from variable j own past values (i.e. own-mean spillovers) when $i = j$, and the cross-spillover from variable j to i when $i \neq j$ and ε_{ij} variable own shock we assume to be identically and independently distributed IID with zero mean and unit variance. The estimated B_{ij} provides further evidence for volatility spillover persistence across the variables (Karunanayake et al (2012).

We collected secondary data from two main sources. First, the Saudi Arabian Monetary Authority provided the following financial variables: Foreign portfolio investment (FPI), and oil prices (OPEC) in million Saudi Riyals, while price-earnings ratio (PE), interest rate (Interest), and the general index are in points. Second, the Reer_database_ver6_2017 delivered the nominal effective exchange rate (NEER). The data frequency is quarterly covering the period 2006q1- 2017q2.

Empirical Results

Descriptive Statistics

We use the covariance to measure the joint variability of two variables. It takes positive sign if the behavior of the two variable is the same those greater or lesser values of variable correspond with other variable, the opposite behavior receipts negative sign. The normalized magnitude of the covariance i.e. the correlation coefficient gives the strength of the linear relationship between the two variable. We use in addition the variance (Var.) to measure the spread out of variables from their average value, and coefficient of variation (CV) to determine the volatility of the model variables. Table (1) displays both the covariance and correlation coefficients (ρ) respectively in the off diagonal, and variance and coefficient of variation in the main diagonal.

Table (1) Covariance and Coefficient of Variation

Probability	INDEX	NEER	OPEC	PE	FPI	Interest
INDEX <i>CV/Var</i>	2065697 0.20					
NEER <i>ρ/Var/CV</i>	1664.44* 0.281	17.00 0.04				
OPEC <i>ρ/Var/CV</i>	4339.78 0.167	-46.38*** -0.621	327.94 0.26			

PE	-80.85	-6.52**	27.86**	21.93		
$\rho/Var/CV$	-0.012	-0.338	0.328	0.27		
FPI	1422992.	-3108.8	23914.84i**	-9754.5**	16252397	
$\rho/Var/CV$	0.246	-0.187	0.329	0.517	0.27	
Interest	-198.79***	-0.44	-1.42	-1.28**	808.32***	0.23
$\rho/Var/CV$	0.285	0.222	-0.162	0.564	0.414	1.00

(*), (**) and (***) indicates rejection of the null hypothesis at 10%, 5% and 1%

Foreign portfolio investment (FPI) and Price earnings ratio (PE) are the only variables that correlated with all model variables except the index, and dispersed equally, i.e. have the same coefficient of variation. NEER and Oil prices move on opposite direction, their coefficient of correlation is significant and largest among all correlation coefficients. The positive and significant correlation coefficient between interest rate differentials and price earnings ratio is the second largest coefficient. However, the coefficient of variation (CV) displays that the most dispersed variable is the interest rate differentials despite its least variance. FPI, PE, and Oil prices are of equal dispersion, while, the nominal effective exchange rate is the least dispersed variable. The variance of FPI is largest spread out of its mean followed by index and oil prices while NEER and PE are low. Notably the normality test assured the acceptance of the null hypothesis of normal distribution of all variables.

Unit Roots Tests

The existence of stochastic trend in many economic and financial time series denotes an existence of unit root, which complicates the interpretation of estimation results because of spurious regression that gives high coefficient of determination for uncorrelated data accompanied with inappropriate t-values. Detecting unit root existence in the time series and the required steps to remove it is the first step in establishing long run relationship among those series. Usually two methods remove the unit i.e. differencing and time-regression. Diagnostic tests are many the most popular are Augmented Dickey-Fuller (ADF) and Phillips-Peron (PP).

Augment Dickey-Fuller and Philips-Peron unit roots tests (Table 2) disclose that the index and OPEC are stationary, while NEER, PE and interest are stationary at the first difference. Augment Dickey-Fuller reveals that FPI, gains stationarity at the second difference while it is stationary at the first difference by Phillips-Peron.

Table (2) Unit Root Test Results

Variable	Augmented Dickey-Fuller			Phillips-Peron	
	Level	Ist. Diff.	2 nd Diff.	Level	Ist. Diff.
Index	-5.390***			-5.205***	
Interest	0.478	-6.234***		-2.165	-6.007***
OPEC	-6.349***			-6.349***	
NEER	-2.214	-4.724***		-1.754	-4.685***
PE	-2.813*	-10.753***		-3.637***	
FPI	-2.109	2.210	-7.982***	-2.262	6.815***

(*) (**) (***) indicates rejection of null hypothesis of unit root at 10%, 5%, and 1%

Cointegration Results

Table (3) Cointegration Results

Sample (adjusted): 2007Q3 2016Q4
Included observations: 38 after adjustments
Trend assumption: Linear deterministic trend

Series: INDEX NEER OPEC PE FPI, INTEREST				
Lags interval (in first differences): 1 to 1				
Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.771413	144.4141	95.75366	0.0000
At most 1 *	0.631189	88.33218	69.81889	0.0008
At most 2 *	0.531822	50.42827	47.85613	0.0281
At most 3	0.26876	21.58983	29.79707	0.3219
At most 4	0.2219	9.695298	15.49471	0.3049
At most 5	0.00423	0.161073	3.841466	0.6882
Trace test indicates 3 cointegrating equation(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

Table (3) above displays that Trace test indicates three cointegrating equations at the 0.05 level. This means that there is a long-run relationship among these variable. The detection of cointegration make Vector Error Correction model as eligible one but we use ARDL instead to validate long run and short run relationships among variables.

Estimation Results

Multivariate GARCH results predicted the dependence of the co-movement of financial variables. Both models presented the same estimates of the mean and variance equations. All coefficients of the mean and variance equations have a positive sign and significantly different from zero at 1%. The own-mean volatility offers indication of an impact of current financial variables ascending from their first lags. The order of estimated coefficient of mean equation in terms of magnitude is as follows: FPI, INDEX, NEER, OPEC, PE and INTEREST.

Table (4) Diagonal BEKK and Diagonal VECM Results

Variable	Mean Equation Coefficients		Variance Equation Coefficients		
	BEKK	VECH	Variable	BEKK	VECH
C(1)	7679.481***	7679.481***	C(7)	0.009998***	0.009998***
C(2)	106.4611***	106.4611***	C(8)	0.354953***	0.354953***
C(3)	53.78851***	53.78851***	C(9)	0.837409***	0.837409***
C(4)	12.3765***	12.3765***	C(10)	0.878052***	0.878052***
C(5)	16411.46***	16411.46***	C(11)	1.294751***	1.294751***
C(6)	0.618581***	0.618581***	C(12)	0.266658***	0.266658***
			C(13)	0.406891***	0.4068901***
			C(14)	0.94544***	0.94544***
			C(15)	0.861712***	0.861712***
			C(16)	0.744393***	0.744393***
			C(17)	-0.20235***	-0.20235***
			C(18)	0.957437***	0.957437***
			C(19)	0.857438***	0.857438***

(*) (**) (***) indicates rejection of null hypothesis of unit root at 10%, 5%, and 1%

Diagnostic Tests

Covariance stationary test results ($ajj + bjj$) of an index estimated to be 0.893856, NEER (0.893856), OPEC (1.325096), PE (1.717325), FPI (0.987792), and Interest (0.900761) indicate multidirectional volatility spillover runs from four variables to OPEC and PE.

Portmanteau Test: Table (6) depicts estimated Portmanteau Ljung-Box Q-statistics and adjusted Q-statistics for the system residuals using Cholesky of covariance method. Both statistics indicate the acceptance of the null hypothesis of no autocorrelation at 1 per cent except at lag one while 5 per cent rejects the null hypothesis up to lag six, which means no lasting ARCH effect in the model.

Transformed Variance Coefficients point to cross-volatility of the model variables (Table 5). The constant term in the both model is positive and significant and of the same magnitude. The own shocks estimated by means of BEKK are all significant 1% while two of the own shocks estimated by DVECH are insignificant that is FPI (A1(5,5)) and PE (B1(4,4)). The magnitude of the own shocks via BEKK is slightly greater than DVECH. Model variables respond to their own shocks and shocks from other variables indicating the importance of lagged values on the current one. Matrix $A(m, n)$ captures ARCH effects indicating the importance of variable's own shocks. Matrix $B(m, n)$ explains the rate of shocks decay. Results from DVECH model show that cross-volatility coefficients, $aij(i \neq j)$ in all four variables are significantly different from zero, and the degree of cross-volatility shocks pair-wise is the strongest between real effective exchange rate and inflation rate (2.7793) and the weakest. The own-volatility coefficients $bij(i = j)$ for the lagged conditional variance of all six variables are again positive and statistically significant. They show volatility persistence. These own-volatility spillovers effects vary from its lowest in OPEC to highest in FPI.

Table (5) Transformed Variance Coefficients

	BEKK	VECH
M	0.009998**	0.009998***
A1(1,1)	0.354953***	0.125991**
A1(1,2)		0.297241**
A1(1,3)		0.311667**
A1(1,4)		0.459575**
A1(1,5)		0.094651**
A1(1,6)		0.144427**
A1(2,2)	0.837409***	0.701253**
A1(2,3)		0.735288**
A1(2,4)		.084236**
A1(2,5)		0.223302**
A1(2,6)		0.340734**
A1(3,3)	0.878052***	0.770975**
A1(3,4)		1.136858**
A1(3,5)		0.234139**
A1(3,6)		0.357271**
A1(4,4)	1.294751***	1.67638**
A1(4,5)		0.345255**
A1(4,6)		0.526822**
A1(5,5)	0.266658***	0.071106
A1(5,6)		0.108501**
A1(6,6)	0.406891***	0.16556**
B1(1,1)	0.94544***	0.893856**
B1(1,2)		0.814697***

B1(1,3)		0.703778***
B1(1,4)		-0.19131***
B1(1,5)		0.905199***
B1(1,6)		0.810656***
B1(2,2)	0.861712***	0.742548***
B1(2,3)		0.641452***
B1(2,4)		-0.17437***
B1(2,5)		0.825036***
B1(2,6)		0.738865***
B1(3,3)	0.744393***	0.554121***
B1(3,4)		-0.15063***
B1(3,5)		0.712709***
B1(3,6)		0.638271***
B1(4,4)	-0.20235***	0.040945***
B1(4,5)		-0.19374***
B1(4,6)		-0.1735***
B1(5,5)	0.957437***	0.916686***
B1(5,6)		0.820944***
B1(6,6)	0.857438***	0.735201***

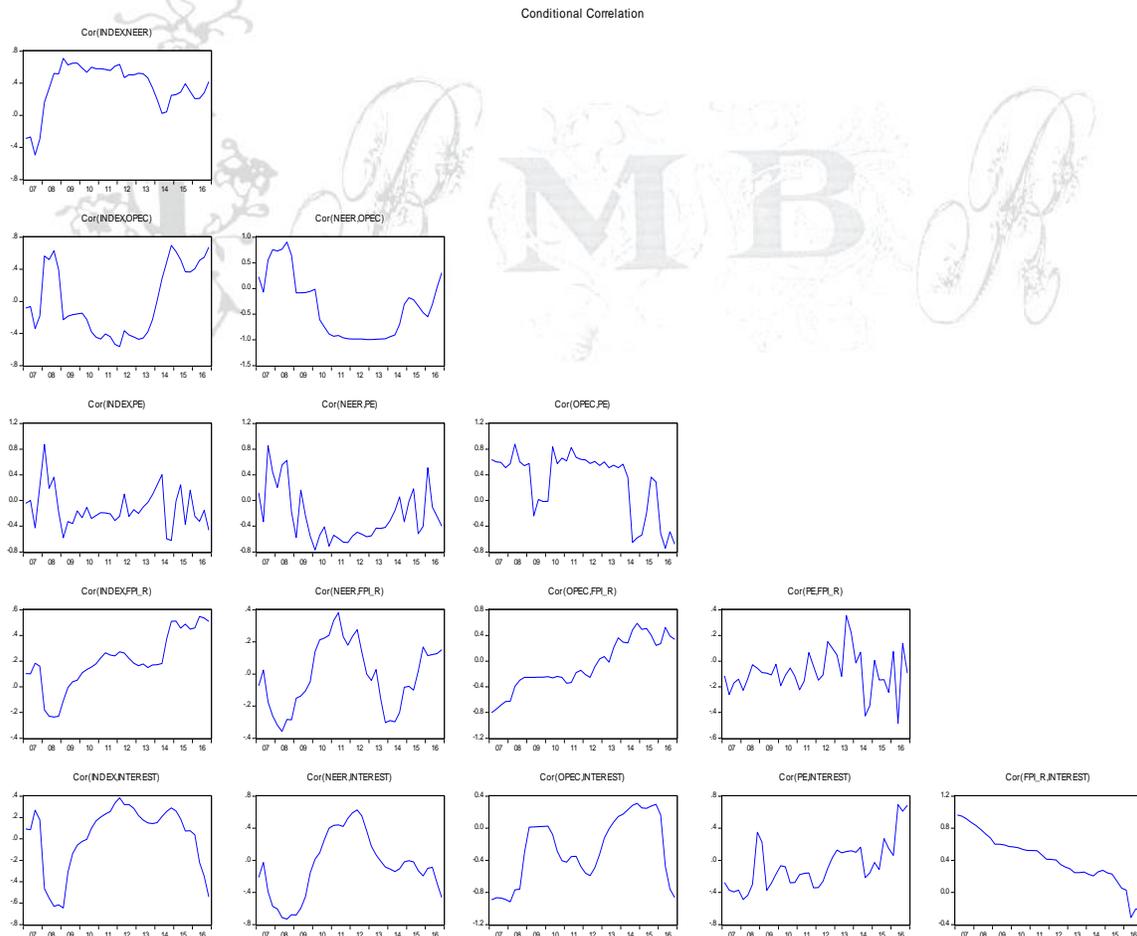


Figure (1) Conditional Correlations

The simple and conditional correlation coefficients in table (7) and table (8) in the annex showed that FPI and Interest rate differentials are the most significant and positive correlated variables followed by negative FPI-OPEC, FPI-PE correlation. Movement of correlation between index and FPI has steady upward trend since third quarter of 2008, and interest-index correlation. Movement of bivariate conditional correlation between index and other variables was oscillating between the highest and least coefficients at two dates 2008 and 2014, however, the trend is upward for INDEX-NEER, INDEX-FPI, and INDEX-INTEREST.

Discussion

Many Saudi economists have talked about foreigners and their effect of entering the Saudi market (AL Shalhoob, 26 July 2014, Arab Business Review, 23 July 2014, Arabian Business, July 2015, Middle East Journal, 24 December 2016, Arabian Net, 13 June 2017). Their expectation were based on the following: low fixed cost of some companies for instance (SABIC); stable economic policy, diverse resources make the country the one of safest environment for investment; stability of economic legislation; dynamism of local consumption; geographic distribution of the wholesale and retail prices of medical care and food stuffs; US interest rate linkages; and structural growth. Regarding the Saudi economy: the economy is likely to get a double batch of this step. First, the inflow of foreign capital boosts GDP, pushing it towards the diversification of non-oil revenue that will ensure constant growth. Secondly, the diversified economy will help to address the high level of unemployment, especially among young people in the country. The IMF has increased from 2015 forecast for growth of 4.1% to 4.6%, expected from economic diversification to work to drive growth. Regarding Tadawul All Share Index and Saudi Stock Market: The index will become a gateway for the flow of foreign funds worth ~ 50 billion dollars into the country, thus enhancing the website for inclusion in the MSCI emerging markets index. With respect to Saudi Companies: Most large companies have cash, so the additional funding would be a great benefit to them. Instead, these companies benefit from active shareholders and improve corporate governance and accounting standards that the government is likely to implement to meet the high standards expected by foreign investors. These companies will also benefit from the guidance and expertise of experienced investors globally in terms of operating and strategic issues as well. For medium-sized companies, the flow of foreign capital will lead to lower funding costs and improve evaluation. Moreover, working with global investors will allow companies in Saudi Arabia by thinking global, will help them implement international expansion plans (global or regional). Regarding Investors: The move gives investors the opportunity to reach a long awaited the largest economy in the GCC and the Middle East. The economy has huge foreign reserves, low-quality sovereign credit risk; emerging market has great growth potential all that makes Saudi Arabia an attractive destination for foreign investors. In addition, index trading; it will give them access to the leading companies in industries such as Samba Bank, Saudi basic industries Corporation, Saudi industrial investment group, These companies do not enjoy their huge potential, but most companies also better governance standards for businesses, compared with their peers in the Middle East. Concerning other asset classes: the success of this could push the Government to open up the bond market (or instruments) to these investors. Generally, this step will have positive effects not only on the Kingdom, but also for all other countries in the GCC and the Middle East, as discussed above. However, investors are watching closely like this announcement since the decision maker in the KSA such plans in the past. Therefore, it is important that the CMA to develop specific roll well with dates and timetables for easing investor concerns and implement what would be a significant change in the way the capital markets in the Arab world. We specified certain dates and put them on the chart to get the picture of the expectations: The first date was when Capital Market Authority (CMA) opened a direct investment for foreign residents (individuals) in March 20, 2006 since then the index has been declining up to the June 2007. Despite gaining more than 4 thousand points in the next two consecutive quarters, it resumed the downward trend.

CMA opened indirect investment to foreigners (individuals and institutions) through swap agreements on 20 August 2008, and finally declared open direct investment (financial institutions only) on 15 June 2015. Foreigners can buy Saudi share just by deals made through international banks and that make mutual funds traded more costly and time-consuming. As a result of the current restrictions, foreign investors now owns

less than 5 percent of the Saudi market, representing a tiny amount—one percent of the volume traded on the Saudi stock market, which is dominated by local retail investors in full. The period between 2009Q1 2014Q3 witnessed an upward trend followed by a decline. The outcome of CMA actions was not up to the expectations. However, KSA was keen to join Morgan and Stanley (MSCI) index to drag the attention and recognition of foreign investors. This requires the following modification of the settlement duration to T+2; adoption of international accounting standards for all listed companies; repartitioning of the market segments; shorting and raise the level of the transparency and disclosure for listed companies; drop out troubled companies and adjusting corporate system of the trading unit to include real estate fund traded.

FPI is the only variable covariance stationarity emphasizes FPI volatility spillover to all other variables. Own-volatility spillovers effects vary from its lowest in OPEC to highest in FPI. The first of quarter of 2008 and 2009 witnessed the peak of bivariate conditional correlation between INDEX-PE (0.87) and INDEX-NEER (0.71) while the fourth quarter of 2014 presented the peaks of INDEX-OPEC (0.70) and INDEX-FPI (0.51). The peak of INDEX-INTEREST (0.38) was in fourth quarter of 2011.

It is worth mentioning that the dependence of KSA on oil revenues is one of the big challenges that confront decision makers in hedging the country from volatilities of oil proceeds, and to diversification the economy. The pegging of Saudi Riyal to US dollar offers credibility to monetary policy stabilizes trade and income flows, and financial assets. However, this anchor entails SAMA to relate the interest rate to the target rate of the Federal Reserve to neutralize pressures to deal with inflow and outflows of daily oil revenues that the banking system cannot absorb. The fiscal of policy under anchor system becomes a key instrument for macroeconomic management, although there is a complementary role for the liquidity management operations, prudential policies in macroeconomic management and financial sector. The rise in the external account surpluses and fiscal spending, supported by oil revenues, leads to the accumulation of excess liquidity in the banking system. SAMA is concerned with developing tools in managing liquidity, but the area is still available to exert more effort toward developing policy instruments, and develop a framework for prediction of liquidity for managing liquidity in the banking system. First, although the performance of Saudi Arabia's economy has remained very well and could become a strong position, still area available to enhance macroeconomic and fiscal policy frameworks to ensure the availability of tools and incentives and authority necessary for policy makers to address future challenges as they arise. Secondly, given the prospect of the world oil market, Saudi Arabia will be able to count on rising oil prices and increased government spending to spur economic growth in the future. Instead of depending on oil revenues, further efforts the government has to exert to diversify the economy, support continuing growth and job creation reduce unemployment among the youth and growing populations (Ahmed Al Darwish et al 2015).

Conclusion

Results conform to economic theory in addition to the important role that monetary policy can play in enhancing the stock market to induce economic growth. DVECH and BEKK models of Multivariate GARCH discovered the influence of foreign portfolio inflow on Saudi financial variables for the period 2006q1 to 2017mq2. The estimated coefficient of the conditional mean and the variance were positive and significant. The model variables respond to their own shocks. Cross-volatiles are all significant. Covariance stationary test confirmed the influence of four variables including foreign portfolio. Peaks of FPI are at the second and the third quarter compared to the least inflow at the fourth. Results confirm the right decision of opening the stock market to foreigners. CMA has to meet the MSCI standards. We recommend investigating the impact of new issues as disaggregated inflow according to asset type, push factors causing capital flows to and from KSA as real GDP growth, changing financial conditions, macroeconomic fundamentals (fiscal balance, level of reserves, and deeper financial market), Treasury bill, MSCI index, capital account openness, exchange rate regime. Pull factors as real GDP growth and whole price index based on studies of Eugino, Stijn, and Damein (2015) and Ferreira and Laux (2004)

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Annex

TABLE (6) Correlogram of Using the Cholesky Orthogonalization Method

Date: 01/18/18 Time: 14:33						
Sample: 2006Q1 2017Q4						
Included observations: 40						
Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. ***	. ***	1	0.445	0.445	8.5489	0.003
. **	. .	2	0.223	0.031	10.746	0.005
. *	. .	3	0.097	-0.016	11.171	0.011
.* .	** .	4	-0.14	-0.228	12.08	0.017
* .	. .	5	-0.139	-0.001	13.014	0.023
* .	. .	6	-0.087	0.03	13.386	0.037
* .	. .	7	-0.082	-0.018	13.726	0.056
* .	* .	8	-0.132	-0.148	14.634	0.067
* .	. .	9	-0.106	-0.032	15.242	0.084
* .	. .	10	-0.112	-0.042	15.943	0.101
* .	. .	11	-0.108	-0.028	16.619	0.120
* .	* .	12	-0.091	-0.075	17.118	0.145
* .	* .	13	-0.094	-0.07	17.67	0.170
* .	. .	14	-0.089	-0.054	18.184	0.199
* .	* .	15	-0.1	-0.072	18.852	0.221
* .	* .	16	-0.094	-0.07	19.466	0.245
. .	. .	17	-0.036	-0.003	19.563	0.297
* .	* .	18	-0.111	-0.171	20.507	0.305
* .	* .	19	-0.138	-0.134	22.034	0.283
* .	* .	20	-0.134	-0.122	23.541	0.263

Table (7) Simple Correlation

Date: 12/25/17 Time: 23:05						
Correlation	INDEX	NEER	OPEC	PE	FPI	Interest
INDEX	1					
NEER	-0.69143	1				
Probability	0.1281	-----				
OPEC	-0.25439	0.442832	1			
Probability	0.6266	0.3792	-----			
PE	-0.34146	0.251042	0.863781	1		
Probability	0.5077	0.6313	0.0266	-----		
FPI	0.158606	-0.43956	-0.97495	-0.73393	1	
Probability	0.7641	0.3831	0.0009	0.0968	-----	
Interest	0.205519	-0.48454	-0.98559	-0.76646	0.996692	1
Probability	0.6961	0.3301	0.0003	0.0754	0.000	-----

Table (8) Conditional Correlation

	INDEX	NEER	OPEC	PE	FPI	Interest
INDEX	1	-0.28948	-0.08401	-0.04135	0.102274	0.092253
NEER	-0.28948	1	0.226697	0.117646	-0.07361	-0.21501
OPEC	-0.08401	0.226697	1	0.63784	-0.80348	-0.89035
PE	-0.04135	0.117646	0.63784	1	-0.11506	-0.2782
FPI	0.102274	-0.07361	-0.80348	-0.11506	1	0.963163
Interest	0.092253	-0.21501	-0.89035	-0.2782	0.963163	1

