Interrelations in Saudi Stocks Market

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ABSTRACT

This study asks about the existence of co-variances and correlations among variances in the Saudi stock returns and aims at knowing which stocks are the most closely related to other stocks. A sample of five stocks representing basic materials, banking, services, food and transport sectors and reflecting the main trends in the Saudi market were selected (SABIC, Al Rajhi, Etisalat, Almarai and Al Bahri respectively). Daily stock returns were collected during the period from 2011 to 2016, representing the life of the 5-year plan. The authors used the MARCH-DVEC methodology to estimate the variances and correlations of stock return variances, considering the interactions of stock return variances. The results confirmed the existence of positive co-variances and correlations between stock returns. Al Rajhi, Sabic and Etisalat stock returns showed the largest co-variances and correlations. The general trend values of co-variances indicated positive growth except for Al Bahri. This study concluded that relations between Saudi stocks are stable over time, confirming the Saudi stocks market stability.

Keywords: Stock Return Variance, Multivariate Generalized Autoregressive Conditional Heteroscedasticity -VEC, Correlation, Co-variance
JEL Classifications: C130, C49, G10

1. INTRODUCTION

Stock markets are increasingly affecting economic activities. The directions of the stock volatility determine the features of a domestic economy, the credit classification, and hence the flow of investments in a country. With respect to the level of investments, the phases of business cycle can be highlighted. Economic prosperity or deterioration, rigidity or flexibility, depend on the stock market situation. The size of stock markets varies according to invested capital in these markets. The comparison between the invested capital and national income reflects the marginal efficiency of a currency and consequently the relative strength of an economy.

The joint movements of the stock returns either in the same or in the opposite directions shapes the current and future status of investors portfolios. Accordingly, financial agents advise investors to buy or to disengage from certain stock. The joint movement determines the leading as well as the vulnerable stocks, and direct policy-makers decisions to achieve the national targets

and stabilize an economy from up and down swings disturbances. Recent developments in financial econometrics provide accurate and precise models that capture different aspects about markets and deal with stock market volatility.

This study addresses the following main question: Are there any interactions in volatility between stocks in the Saudi stock exchange? The sub-question defined for this research is as follows: "What are the directions of volatility interrelations among stocks in this stock market?" By answering these questions, the authors aim at formulating a baseline for the understanding of interactions between stocks from different industries and highlighting the directions of interactions in the studied market. This research would shape out the kinds of interrelations among stocks and manipulate stock interrelations using multivariate generalized autoregressive conditional heteroscedasticity (M-GARCH), a modern financial economic ties model. Using data extracted from stock returns, more precision can be added to M-GARCH models and this would enhance the use of such models in other research

fields. The application of M-GARCH models to the Saudi stock market tests whether correlations and covariances in such new market can be precisely captured without adjustments. The last point enhances theoretical facets related to the limitations of the model when focusing on correlations and covariances of stock markets in developing countries.

2. LITERATURE REVIEW

Chowdhury et al. (2017) studied the stock return auto-correlation day-of-the-week and volatility in KSA stock market. They confirmed the existence of positive auto-correlations among individual stocks and index returns. They also showed that average auto-correlations among individual stock returns are lower than auto-correlations of index return. Al-Barrak (2009) studied the day-of-the-week effect in some gulf cooperation council (GCC) stock market (KSA, Kuwait, Dubai). The results confirm the presence of the-day-of-the-week effect in the Kuwait stock market, the smaller market of the study.

Abdalla (2012) studied the modeling of the stock returns volatility in KSA stock of exchange. The use of the GARCH (1,1) model provided a strong evidence of the persistence of the time varying volatility. Findings also detected the presence of a positive risk premium, as well as a symmetry in stock returns, confirming the presence of a leverage effect in the return's series (decreasing returns make more volatility compared to increasing returns).

3. THEORETICAL BACKGROUND

GARCH models have prominently featured in the analysis of financial time series. Recently, research, initially developed for univariate GARCH model, has been devoted to the multivariate extension of the concepts and models. The most popular models are: VEC, constant conditional correlation (CCC), dynamic conditional correlation (DCC) and the Boba, Engle, Kraft and Kroner (BEkk) model.

The complexity of the M-GARCH models and the dimension curse that is associated with such models have been the major obstacle to their applications in asset pricing, portfolio management and cross sections of stocks interaction. The reason is the inversion of the parameters of Gaussian likelihood-based estimation methods. Existing approaches to alleviate the dimensionality curse rely on either constraining the structure of the model to reduce the number of parameters or using an alternative estimation criterion. Two steps to solve a high dimension problem which does not preclude a high-dimension parameter are considered. The first step is to estimate univariate GARCH model for each series, equation by equation. The second step is about the use of standardized residuals to estimate the parameters of dynamic correlation (Engle and Sheppard, 2001). One advantage of this method is that the derivation of equation by equation estimators is independent of specification of a conditional correlation matrix. It can be therefore employed for CCC models and DCC models leading to the same estimators of individual volatilities.

The cross-market effects capturing the return linkage and transmission of shocks and volatility from one market or stocks to another are often used to indicate market or stock integration. The estimated time-varying conditional covariances defined by BEKK model can measure the extended market integration in term of volatility. Multivariate effects across return can be captured through modeling the conditional correlations while the univariate GARCH model has two limitations. The first limitation is that this model does not accommodate the asymmetric effects of positive and negative shocks. The second limitation is that this model assumes independence between conditional volatilities across stocks return. The multi-variate model are then introduced to capture such interdependences between markets or stocks. M-GARCH models explain how co-variances move over times. The crucial stage in MGRACH modeling is to provide a realistic but parsimonious specification of the variance matrix ensuring its positivity. Price movements in one market can spread easily and instantly to the other markets. Financial markets are more dependent on each other than ever before, so knowing how the markets are interrelated is of a great importance in finance. For an investor or a financial institution that hold multiple assets, the dynamic relationships between returns on the assets play an important role in decision-making (Tsay, 2002). So, to capture such dynamic nature, the solution is to model interdependent variables by using M-GARCH models to multivariate time series which is none weakly stationary because its first and second moments are none time invariant (Table 1).

A pioneer indicator is stock index that tracks stocks of generally the best commercial firms that are financially stable and offer good revenues to stakeholders making them ambitious. Because pioneer firms often reflect the macroeconomic welfare, the working of a leadership index can be estimated a source of the strength of a certain field or area. One of the most well-known pioneer indicators is the Dow Jones industrial average, which includes a list of 30 pioneer firms chosen by the Wall Street Journal.

Saudi Arabia's Tadawul has been the hugest loser in the GCC area so far the year 2018, with shares suffering from the negative stakeholders indurations due to the indecision appearing among

Table 1: Stocks of the study

Financial indicators	Sabic	Rajhi	Etisalat	Maraie	Bahri
Nominal value	10 SR	10 SR	10 SR	10 SR	10SR
Market Value	293,400	101,562	149600	63520	1313156
	In million SR	In million SR	In million SR	In million SR	In million SR
Book value	52.20 SR	32.99 SR	30.52 SR	16.70 SR	23.43 SR
Book value multiplier	1.88	1.89	2.43	4.73	1.42
Stock Profitability	4.94 SR	5.37 SR	4.75 SR	3.37 SR	2.99 SR
Profitability multiplier	16.5	11.53	15.11	31.54	11.14

OPEC and non-OPEC members to freeze petrol production. The Saudi Arabia has also scaled down its investments in many projects planned earlier. The value of contracts awarded plummeted by 39 per cent in the first quarter of 2016 followed by a decline of 27% in the second quarter on a quarter-on-quarter basis. Contraction which is paid to the economy have made stakeholders skeptical, and let them too heavily withdraw from Saudi stocks. To keep the equity markets and to boost investments, Saudi Arabia submitted on September 4 the regulations on foreign investment in its securities markets, sooner than last announced. Other reforms in the stock market are also in line with the country's vision aiming to lessen its dependence on petrol.

4. METHODOLOGY

Firstly, one variable (stock) was selected from each industry included in the stock market. The variable selection depends on its importance in the industry (sector) and the extent to which it reflects and represents all the stock of this industry (sector). Accordingly, simultaneous movements of this stock could be generalized to all stocks of the market. Secondly, with respect to data collection, we limited the study to the last 5 years representing the 5-year plan for KSA. Moreover, the period of 5 years could be considered as the average span of the trade cycle in which short run disturbances may happen. In addition, data was manipulated on daily basis. Thirdly, with respect to data analysis, the authors suggested the M-GARCH model. The flexibility and capability of such model enable it to accurately provide answers to the research questions. Data are manipulated using DVEC and estimated by averaging correlations and co-variances.

5. FINDINGS

Table 2 presents, using DVEC, the average of correlations and co-variances between stocks in addition to trend rates.

For the period ranging from 2011 to 2016, the following findings are to be deduced (Table 1):

1. The stocks of Bahri and Maraie have an average conditional correlation equal to (0.134) and a low negative trend rate (−0.00009). Again, they have a positive covariance average equal to (0.00003) with a very low negative trend rate (−0.000000001).
2. The stocks of Bahri and Etisalat have an average conditional correlation equal to (0.128) with low negative trend rate.

In addition, they have a positive covariance average equal to (0.00004) with a very low negative trend rate equal to (−0.000000003) over the period of the study (2011-2016).

3. The stocks of Bahri and Rajhi have an average conditional correlation during the period of study equal to (0.160) but a low negative trend rate over the period of the study (−0.00006) and they have a positive covariance average equal to (0.00004) with a very low positive trend rate equal to (0.000000009) over the period of the study (2011-2016).
4. The stocks of Bahri and Sabic have an average conditional correlation during the period of study equal to (0.145) with a low negative trend rate over the period of the study (−0.00008). They also have a positive covariance average equal to (0.00005) with a very low negative trend rate equal to (−0.000000006) over the period of the study (2011-2016).
5. The stocks of Maraie and Etisalat have an average conditional correlation during the period of study equal to (0.268) with a low negative trend rate over the period of the study (−0.00003). In addition, they have a positive covariance average equal to (0.00005) with a very low positive trend rate equal to (0.000000002) over the period of the study (2011-2016).
6. The stocks of Maraie and Rajhi have an average conditional correlation during the period of study equal to (0.297) with a low negative trend rate over the period of the study (-0.00003). Moreover, they have a positive covariance average equal to (0.00005) with a very low positive trend rate equal to (−0.000000005) over the period of the study (2011-2016).
7. The stocks of Maraie and Sabic have an average conditional correlation during the period of study equal to (0.297) with a low negative trend rate over the period of the study (−0.00004). Moreover, they have a positive covariance average equal to (0.00006) with a very low positive trend rate equal to (−0.000000002) over the period of the study (2011-2016).
8. The stocks of Etisalat and Rajhi have an average conditional correlation during the period of study equal to (0.388) with a low negative trend rate over the period of the study (−0.00006) and they have a positive covariance average equal to (0.00007) with a very low positive trend rate equal to (0.000000007) over the period of the study (2011-2016).
9. The stocks of Etisalat and Sabic have an average conditional correlation during the period of study equal to (0.390) with a low negative trend rate over the period of the study (−0.00006). Moreover, they have a positive covariance average equal to (0.00009) with a very low negative trend rate equal to (0.000000009) over the period of the study (2011-2016).

Table 2: The average of correlations and co-variances between stocks

Pair of stocks	Correlation (average)	Trend rate	Covariance (average)	Trend rate
Bahri and Maraie	0.134	−0.00009	0.00003	−0.000000001
Bahri and Etisalat	0.128	−0.00009	0.00004	−0.000000003
Bahri and rajhi	0.160	−0.00006	0.00004	0.000000009
Bahri and Sabic	0.145	−0.00008	0.00005	−0.000000006
Maraie and Etisalat	0.268	−0.00003	0.00005	0.000000002
Maraie and Rajhi	0.297	−0.00003	0.00005	0.000000005
Maraie and Sabic	0.297	−0.00004	0.00006	0.000000002
Etisalat and Rajhi	0.388	−0.00006	0.00007	0.000000007
Etisalat and Sabic	0.390	−0.00006	0.00009	0.000000009
Rajhi and Sabic	0.531	−0.00001	0.0001	0.000000003

10. The stocks of Rajhi and Sabic have an average conditional correlation during the period of study equal to (0.531) with a low negative trend rate over the period of the study (−0.00001). In addition, they have positive covariance average equal to (0.0001) with a very low positive trend rate equal to (0.000000003) over the period of the study (2011-2016).

6. DISCUSSION

The average conditional correlation Rajhi and Sabic stock is the highest among all the other stocks in the Saudi market (Table 2). This reflects the degree of association between the banking and the basic material sectors. Furthermore, a steady trend rate over the period of the study exists because one of their covariance has the highest value compared to the rest of the stocks. This means that both stocks move together in correlation and variability i.e., there is a positive and strong association between the returns of the two stocks, but in a very low decreasing trend rate over the period the study. The next highest correlation is between Etisalat and Sabic stocks (…..) and between Etisalat and Rajhi stocks (…..) respectively. The lowest correlations in the study are between Bahri and Etisalat stocks, followed by the correlation between Bahri and Maraie stocks (…..) and the correlation between Bahri and Sabic stock (……).

From the above, the authors concluded that the highest correlations exist between the major stocks of the market whereas, the lowest correlations were calculated with the small ones. As for the trend rates in correlations, they are steadily decreasing at a very low rate, reflecting the constant type of association between stocks. Also, the trend rates of the stock co-variances are increasing at a very low rate, except for the co-variances between Bahri and the rest of stocks which are decreasing at low a rate.

Energy sector represented by the Bahri stock have the lowest correlations with the rest of stocks. This is probably due to the aversion agents express to invest in such risky sector. Meanwhile, in banking and basic materials sectors the investor's preferences are relatively similar. Trend rate variability of Bahri stock with almost all the rest of stocks is decreasing, reflecting a less persistence in the long-run view of investors towards energy and their aversion to invest in such sector. Figures point out to the fact that trend rates of variability between each pair of stocks is increasing over 2011-2016 reflecting the fixed trade off by the investors in their choices of stocks.

7. RESULTS AND CONCLUDING REMARKS

1. The correlations values between stocks in the study and their respective trend rates emphasis on the constant kind of associations between stocks over time. Hence, there may be no successive policies and measures in the stocks enterprises and institutions to alternate their roles and places in the market and this implicitly insures the fixed preferences of corresponding investors toward the market.
2. Positive correlation values between all stocks point to a persistent accordance between their performances (gain or loss) over the period of study. This emphasis the dependence of the stocks largely on business cycle swings. So, there may

be no existing measures to absorb shocks and reverse their effects.
3. In energy sector, the up-swing and down-swing price trends make the investment motives in such sector limited, the investors avoiding hazards surrounding it.
4. Banking and basic materials sectors provide the largest investment opportunities regarding their similarities and consequently close links between their returns. The attractiveness of such sectors could be explained by the willingness of investors to opt for secure alternatives to maximize their profit or to minimize their loss.
5. To some extent, the Saudi stocks market can be classified as a less vulnerable (none sensitive) to the institutional measures done by the stocks managements toward each other and hence the extent of independence in management reactions is relatively large.
6. The M-GARCH model used in the study had captured the time-varying nature of dialy returns of the five stocks encountered in the study during the period (2011-2016). The accommodated data by the model have produced results confirming the vision of the international institutions which classified the Saudi market as stable with an optimistic look from the investors too.
7. The results of correlations and co-variances which had been estimated by M-GARCH (VEC) revealed the consistency of the model in manipulating the financial data of Saudi stocks returns. The relative stable values of correlations and co-variances during the period of the study (2011-2016) would insure the convenience of stocks returns to the model pre-requirements. Furthermore, no additional relaxations to the model have been done to comply with the particularities of the Saudi stock market. This statement may motivate other similar markets to experience different versions of M-GARCH model in order to reach such precise findings and enhance financial econometrics.

8. ACKNOWLEDGEMENT

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APPENDICES

Conditional Correlation — Cor(BAHRIA,MARAAI)

Conditional Correlation — Cor(BAHRIA,RAJHI)

Conditional Covariance — Cov(BAHRIA,MARAAI)

Conditional Covariance — Cov(BAHRIA,RAJHI)

Conditional Correlation — Cor(BAHRIA,ETISALAT)

Conditional Correlation — Cor(BAHRIA,SABIC)

Conditional Covariance — Cov(BAHRIA,ETISALAT)

Conditional Covariance — Cov(BAHRIA,SABIC)

Cor(ETISALAT,SABIC)

Conditional Covariance

Cov(ETISALAT,SABIC)

Conditional Correlation

Cor(RAJHI,SABIC)