Does Volatility Generate Major and Minor Stocks in Saudi Stocks Market?

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Abstract

This study attempts to answer the main question: are there reciprocal effects between the variances of the stock returns in the Saudi market, also the answer to a sub-question. What are the leading stocks in the Saudi market?. Study selected a sample of five stocks representing the basic materials, banking, services, food and transport sectors (SABIC, Al Rajhi, Etisalat, Almarai and Al Bahri respectively). The data sample for the period from 2011 to 2016 is taken, which represents the lifespan of the five-year plan. Daily stock returns were calculated during this period. Study applies the M GARCH-VEC methodology to estimate stock return variances and then perform a multiple regression of five equations using the ARCH Heteroscedasticity estimator. Results of the analysis show a positive effect between stock return variances as well as a positive automatic variance of all stocks returns variances. Finally, the results of the regression analysis of the various equations show that the returns variances of SABIC and Al Rajhi stocks have a dominant impact on the rest of the stock's returns. So they are considered as leading stocks in the market. While the variances returns of Etisalat, Almarai and Al Bahri have a limited impact on the rest of the stocks variances returns, so they are considered as minor stocks.

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1. Introduction

Role of the stocks market, also known as stocks exchange, is increasingly affecting all economic activities in every country. Directions of the stock volatility influence national economy, a country credit classification and hence the flow of the investments. Depending on the level of investment, the phases of business cycle can be highlighted. Economic prosperity (or deterioration) and rigidity (or flexibility) are predominantly determined by the situation at the stock market. Importance of the stock market is assessed by the volume of the capital invested in the market. Comparison between the size of invested capital and the national income reflects marginal efficiency of the national currency and consequently, the relative strengthens of the economy (Sharpe, 2009).

Whether joint movements of stock returns move in the same direction or opposite ones, this shape current and future investors' portfolios status. These movements set again the way financial agents advise the investors regarding a certain stock. Joint movements determine to differentiate between leading stocks and vulnerable ones. Accordingly, policymakers direct the economy to achieve its national targets and to prevent it from up and downswing disturbances. Recent development in financial econometrics has produced accurate and precise models that handle stock market volatility and capture different aspects of such markets. Though the models detect numerical findings that play vital role in meeting the diversity of concerns raised in this study (Wang, 2008).

This study aims to answer the main question stated "Does there exist interactions in the volatility between Stock in Saudi stock exchange" with sub-question "What are the stocks which have the dominant impacts upon other stocks?, What are the vulnerable stocks that have influenced by the other stock?". By answering these questions we reach the main objectives of this paper which is "Bridging the gap in the studies concerning the interrelations between the stocks in KSA (Kingdom of Saudi Arabia) market, Postulating the ranking of stock that are affecting the market and consequently the economy, Helping the policymakers in their decisions to stabilize the KSA economy by providing sound results about the stock, Informing the financial agencies and businessmen by expected movements in the market and hence they can formulate proper future expectations concerning their investment. The study manipulating the stocks dependences by modern financial econometrics model (M GARCH) which is straight forward to assets returns volatility moreover is widely applied in the area of financial-economic, hence the accuracy of model results motivate financial-economic scientists to draw more precise theories concerning the financial realm and consequently contribute positively in stabilizing the financial markets. By applying such models which is convenient with the data concerning the return of stocks the study can pave the way to the applications of M GARCH models to highlight volatility hegemony between stocks in a modern markets such as KSA stocks market (in establishing), this may emphasis the applications of the models to area has different characteristics from western markets.

Moreover, the application of M GARCH models to the Saudi market is compared to whether the dependencies between Saudi stocks have similar nature to those in western and eastern markets or not. Finally, the results can consolidate the expansion of theoretical facets of the models in manipulating MGARCH models to stocks interdependence in developing markets. MGARCH models fulfil the analyzing of co-movements of financial returns also can analyze asset pricing, portfolio theory. The development of MGARCH models could be thought of as a great breakthrough against the curse of dimensionality in financial modelling. MGARCH models can be applied to VaR estimation and risk management or diversification, which require the volatilities and co-volatilities of several markets (Bauwens et al., 2006). These models are usually estimated by maximum likelihood assuming that the distribution of one observation conditionally to the past is normal.

2. Literature Review

Modelling volatility in asset returns remains one of the key areas of financial analysis to provide substantial information on risk trends associated with investment and transaction processes. In this area, many works were undertaken. Since stock markets usually show high levels of price volatility leading to unpredictable results, it is important to look at the dynamics of volatility. Volatility refers to the amount of volatility or risk of changes in the price of a security. Higher volatility refers to the value of a security that can theoretically be distributed over a broader range of values whereas lower volatility refers to the value of a security that

does not fluctuate significantly but varies in value over time. Power topics that assess the stability of the equilibrium market and the risk premium are perhaps the most discussed in financial market research. Consumption-based theory of asset pricing has had a profound effect on our understanding of financial markets. Returns on the stock market tend to differ conditionally or unconditionally. The latter has to do with current and short-term shocks and is unlikely to be constant over time.

In a seminal work, Engle (2002) suggested modelling conditional variance by the Auto-Regressive Conditional Heteroscedasticity (ARCH) method. The error variance in an ARCH setting is a function of the previous term's squared error variance. It has been found that the volatility of the stock market changes over time (i.e. it is' time-varying') and shows' clustering of volatility. Another popular model to estimate stochastic volatility is a generalized arch (GARCH) model extended by Bollerslev (1986) see Bollerslev, Tauchen, & Zhou (2009). Such models are commonly used in different econometrics branches, especially in the analysis of financial time series. Besides, with the advent of ARCH and GARCH models, there have been many empirical applications of financial time series modelling variability (volatility). Since the GARCH model captures the volatility clustering pattern in financial data, information can be explicitly linked to volatility, as any adjustment in the rate at which information on the market will change is probable. Therefore, if data remains constant, which is hardly the case, uncertainty will vary in time, even daily. Knowing and forecasting transient dependency at second-order moments of returns on capital is critical for many financial econometrics issues. It is now widely accepted that financial risk can shift through capital and markets over time. Recognizing this function through a multivariate modelling process leads to experimental models more applicable than operating with separate univariate models. This opens the door for improved decision-making tools in various areas, such as asset pricing, portfolio choice, option pricing, hedging, and risk management, from a financial perspective.

MGARCH (multivariate GARCH) models ' most obvious application is the analysis of the relationships between the volatility and co-volatility of several markets. Is a market's volatility leading other markets ' volatility? Is the volatility of an asset directly (through its conditional variance) or indirectly (through its conditional covariances) transferred to another asset? Is a market shock rising uncertainty in another market, and by how much? Would the effect be the same for equally large negative and positive shocks? A related question is whether the associations between the returns of capital change over time. Were they lower (sometimes correlated with financial crises) during cycles of higher volatility? Will they increase over the long term, maybe due to the financial market globalization. These problems can be analyzed explicitly using a multivariate model and raise the issue of covariance and correlation dynamics specification. From a slightly different perspective, several papers used MGARCH models to assess the impact of financial market fluctuations on real variables such as exports and growth rates of production, as well as the variability of these growth rates. The estimation of time-varying hedge ratios is another feature of MGARCH models. Traditionally, OLS calculates constant hedge ratios as the slope of a regression of spot returns on future returns, as this is analogous to calculating the covariance ratio between spot and futures over futures volatility. Since a bivariate MGARCH model explicitly defines its conditional variance-covariance matrix for the spot and future returns, the hedge ratio can be computed as an approximation by-product and revised using new observations as they become available.

Abdulhadi, Shetty, & Alshamali (2015) analyzed stock market activity (Saudi stock exchange fractal analysis) by applying exponent Hurst for each time series. The results revealed that during the study period, the Saudi market is not entirely random. They also found that long-

term reliance on Saudi stock market returns is not consistent with either the weak form of the efficient market hypothesis. Ulussever, Yumusak, & Kar (2011) used a non–linear GARCH analysis to analyze the day-to-week effect in KSA exchange stock. The results revealed that returns follow different processes on the five trading days. These results confirm the significant difference between mean daily returns and support the day of the week effect in Tadawul stock exchange. Sultan & Mustafa (2000) measure the impact of investment on the stock market in Saudi Arabia. They confirmed the relationship between investment levels and the index of the stock market using the descriptive method to view variables concepts. Incorporating a sample of Arab capital markets (Jordan, Saudi Arabia, Palestine), Zaid (2014) studied the role of technical analysis in making an investment decision. The study aimed to investigate this practical study was conducted on the two banks of each market using two technical indicators of relative strength, convergence and divergence moving averages index, during the same period. Study concluded that technical analysis was instrumental in making investment shares decision process, in the sense that it helps agents determining the appropriate time to invest regarding upward or downward predictable cycles trends: buying when upward cycle is predicted and selling otherwise. However, not all the indicators have achieved the same results and returns, while the convergence and divergence of moving averages (MACD) came late signals somewhat, and thus gains achieved will be less than those realized from Relative Strength. The MACD gave a lot of signals that could have been avoided for the lack of gains.

Al-Shakarji & Taj-Al-Din (2008) studied building the stock indicator and its relation to economic status "analytical research for al Riyadh financial market" using the value process, which is considered to be one of the most effective indicator building methods. Many Arab and international financial markets have been analyzed, and Saudi Arabia has huge value assets (Riyadh Stock Market) on the Arab world financial markets. The research questions whether the indicator can represent the performance of the market and consequently the country's current economic situation. This research has been delineated by two aspects: first, the theoretical one is a group of concepts on the predictor, use and furcation of the building. In this sense, global metrics have also been used. The theoretical aspect recreated an empirical (second) aspect facility. Periodically released information from financial market websites are handled daily and monthly throughout 2006. The research concluded that the indicator affects the market situation and economic performance as there is a wide variation on the level of the sector.

Doaa Noman Al-Hussaini (2011) studied the Effect of Applying the Electronic Exchange System on Revenue and Risk of Investment by the Securities. Based on a Study on a Sample of the Stocks of Listed Companies in the Saudi Financial Markets during the Period 2002-2003, the authors investigate about the effect on revenue and investment risk of common shares and transactions number and their value after moving from traditional to the electronic exchange system. Based on the continuation of the share exchange, they compared the results of the regression analysis for 30 companies shares revenues during December 2002 with those obtained after applying the new electronic system during December 2003. The results show that there is an increase in the market revenue for the year 2003 and a decrease of the systematic risk by 11% with the increase of the transactions numbers and their value.

3. Research Methods

Elaborated methodology in this research consists of three parts: choice of the study variables, data collection and data analysis. Firstly, we choose one variable namely ‘stock’ in every industry included in the stock market. This is due to its importance in the industry (sector) and hence its ability to reflect and represent all the stock in the industry (sector). So one stock can

be selected within sectors such as variable selection depends on its relative importance in the industry (sector). So we can choose one stock in the sector of basic materials, Banking, services, food industry, and sea transport. Consequently, simultaneous movements in the stock can be generalized to all stock in the market. Secondly, concerning data collection, we limited the study to the five-year-plan period partly considered as the average span of the trade cycle whereas short-run disturbances may happen. Also, the data should be daily manipulated.

Table 1. Stock of the Study

	Sabic	Rajhi	Etisalat	Maraie	Bahri
Nominal value	10 SR	10 SR	10 SR	10 SR	10SR
Market Value	293,400, In million SR	101,562, In million SR	149600 In million SR	63520 In million SR	1313156 In million SR
Book value	52.20 SR	32.99SR	30.52SR	16.70SR	23.43SR
Book value multiplier	1.88	1.89	2.43	4.73	1.42
Stock Profitability	4.94 SR	5.37SR	4.75SR	3.37SR	2.99SR
Profitability Multiplier	16.50	11.53	15.11	31.54	11.14

Source: KSA (Kingdom of Saudi Arabia) stock market

Thirdly, concerning data analysis, we suggest the multivariate GARCH (M GARCH) model answer the questions that were raised by the study. The suggested model holds the flexibility and the capability to cover the domain of the study questions (problems) and hence to extract diversified results helping in achieving the objectives of the study. The analysis is done by estimating the volatility of returns by DVEC, then the variance of each stock are estimated along with the period of the study and finally, we run multiple regression by using ARCH heteroscedasticity estimator.

Pioneer or premium stocks are stocks of firms known to be huge, well established, and financially sound for a long term of duration. The market value of these shares is generally estimated at billions of dollars as for pioneer firms with a stable financial history and a stable record of high production revenues. They also have a stable name in the services or products market. These firms are usually huge (international) firms that have been on the market for a very long duration. It also sells well-known services or products to huge number of people, acting relatively well during economic recession and stable progress. In addition, it pays dividends to stakeholders on a current basis and enjoys high reputation. Furthermore, it is currently paying dividends to stakeholders and enjoying a high reputation. Saudi Arabia's Tadawul stock exchange has been the biggest loser in the GCC region so far this year, with shares bearing the brunt of negative investor’s endurance due to indecision to freeze petrol output between OPEC and non-OPEC members.

In many previously planned projects, Saudi Arabia has also scaled down its investments. The value of contracts won fell by 39% in the first quarter of 2016, followed by a quarter on quarter decline of 27% in the second quarter. Contraction paid to the economy has sceptical investors and caused them to withdraw too heavily from Saudi stocks. Saudi Arabia submitted the regulations on foreign investment in its securities markets on September 4, earlier than previously announced, to hold equity in the markets and raise investment.

4. Results

Through the regression analysis, we take the variances of the stocks by estimating the variables via (DVEC), then we put one variance as the dependent variable and the rest of the variances of the variables as independent variables. Hence, we repeat this process for all variables and finally, we determine five estimated equations by ARCH heteroscedasticity estimator. Regression equations are listed in Table 2. Accordingly, findings related to the five generated models are as below which can be categorized to stocks have law effects towards other stocks and at the same time, they are very sensitive to other stocks volatility. The second category involves the stocks with dominant effects on other stocks and less sensitive to them, the third category consist of stock with moderate effect to other stocks and has moderate sensitivity in reacting to them.

Table 2. Regression Analysis

		Dependent variables				
		Bahri	Maraie	Etisalat	Rajhi	Sabiv
	Constant	0.00012 P= (0.000)	0.000012 P= (0.000)	0.000073 P= (0.000)	0.000026 P= (0.000)	0.000024 P= (0.000)
Independent variables	Bahri		0.09962 P= (0.000)	0.02382 P= (0.000)	0.06821 P= (0.000)	0.14961 P= (0.000)
	Maraie	0.04321 P= (0.000)		0.03129 P= (0.000)	0.07406 P= (0.000)	0.06513 P= (0.000)
	Etisalat	0.1999 P= (0.000)	0.0723 P= (0.000)		0.08036 P= (0.000)	0.10539 P= (0.000)
	Rajhi	0.4844 P= (0.000)	0.46602 P= (0.000)	0.35069 P= (0.000)		0.48659 P= (0.000)
	Sabic	0.4205 P= (0.000)	0.01429 P= (0.2317)	0.14553 P= (0.000)	0.2702 P= (0.000)	
	R^2	0.4241	0.15779	0.38687	0.57177	0.58708
	Hetero test	F= 0.00097 P= (0.9752)	F= 0.02084 P= (0.8852	f= 0.02561 P= (0.8729)	F= 0.06705 P= (0.7957)	0.14069 P=(0.7077)

Source: Regression output

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First Category Comprise From Bahri and Etisalat Stocks

Variance of Bahri stock as the dependent variable and the variances of the rest stocks as independent variables, R^2 is equal to (0.42) which means that the dependent variables reduce the variability in Bahri stock by 42%, the constant term is positive (0.00012) and statistically significant referring to the automatic change in the variance of Bahri stock. Moreover, the variances of the rest stocks have a positive and significant effect on the variance of Bahri stock. The highest effect comes from variance of Rajhi stock, then Sabic stock, then Eyisalat stock, and finally from Maraie stock. ARCH estimator eliminated the heteroscedasticity problem

from the data as shown by an insignificant value of F (equal to 0.975). When considering the variance of Etisalat stock as the dependent variable and the variances of the rest stocks as the independent variables, R^2 is found to be equal to (0.39) which indicates that the rest stocks variance reduced the variability in Etisalat stock by 39%. Constant term (equal to 0.00007) is significantly positive but remains small indicating that changes in the Etisalat variance are due to internal factors. Variances of the other stocks affect Etisalat stock variance is significantly positive. The highest effect comes from the variance of Rajhi stock, followed by Sabic variance, Maraie variance, and lastly by Bahri stock variance. ARCH estimator eliminates the heteroscedasticity problem from the data as the p-value of the test equals to (0.8729) which means the acceptance of null hypothesis (non-existence of heteroscedasticity).

Second Category Consist of Rajhi and Sabic Stocks

Variance of Rajhi stock as the dependent variable and the variances of the rest stocks as the independent variables, R^2 is equal to (0.58) which means that the variances of the remaining stocks reduced the variability in Rajhi stock variance by 58%. Constant term is relatively small and positive which indicates that the variance of Rajhi stock is due to internal factor changes by (0.000026) and is statistically significant. The variances of the other stocks affect Rajhi variance positively and significantly. The highest effect comes from Sabic stock variance, then from Etisalat variance, then from Maraie stock variance, and lastly from Bahri stock variance. ARCH estimator eliminates the problem of heteroscedasticity because the P-value of the test equals (0.7957) which substantiate the acceptance of the null hypothesis (non-existence of heteroscedasticity). Variance of Sabic stock as the dependent variable and the rest variances of the stocks are the independent variables. We found that the variances of the rest stocks reduced the variability of the Sabic stock variance by a percentage of 59% (R^2 is equal to 0.59). Constant term (equal to 0.00002) is significantly positive but small which indicates that the variance of the Sabic stock changes is due to internal factors by this amount. Variances of the rest stocks affect Sabic variance positively and significantly, the highest effect comes from Rajhi variance, followed by Bahri variance, Etisalat variance, and lastly by Maraie variance. ARCH estimator eliminates the problem of heteroscedasticity as the value of p equals (0.7077) which indicates the acceptance of the null hypothesis (non-existence of heteroscedasticity).

Third Category which Consists of the Maraie Stock

In taking the variance of the stock as dependent variable and the variances of the rest stocks as independent variables, R^2 equals (0.158) which means that the variances of the stocks reduced the variability in Maraie stock by 15.8%. Constant term is small, positive and significant (equal to 0.000012) which means that the variance of Maraie stock automatically changes due to internal factors. Variances of the other stocks effects on the variance of Maraie sock are positive and significant except for Sabic variance. The highest effect comes from Rajhi variance, followed by Sabic variance and Etisalat variance. The lowest effect comes from Bahri stock variance. Findings showed that ARCH estimator eliminates the heteroscedasticity problem as p-value of the test is equal to (0.884) which means the acceptance of null hypothesis (none existence of heteroscedasticity).

Discussion

Method of estimation used in the study resulted in relatively low coefficients of determination (below 50%). For all the five tested models, results insured again the absence of heteroscedasticity and low multi-collinearity problems between the independent variables which confirm its accuracy helps better interpretation of the dependent variables. Findings could also be used for sound forecasting. Constant terms in all five models are significant but relatively low approximating zero. These results indicate that the internal changes, for instance,

the institutional measures inside organization in the dependent variables lowly contribute in explaining the dependence of the stocks variances compared to the external factors. Hence, a larger effect is generated from variations of other stocks in the market.

All stocks variances positively and significantly affect each other in all the five models of the study. Rajhi stock variance, followed by the Sabic stock variance has higher effects over the variances in the rest of stocks. This result assured that the two stocks are the most important ones in the market, they can be classified as leader stocks in the market i.e. the institutional measures inside them determine to a large extent the variability of the rest stocks at the market. At the same time, the effects of the rest stocks on the above both mentioned stocks are comparatively small, that is the internal factors are more powerful than the external ones. Bahri and Maraie stocks and to some extent Etisalat are more sensitive to the rest stocks. At the same time, their effects on the remaining stocks are weak. Accordingly, they can be classified as minor stocks on the market. Their variability can be determined to larger extent by external factors i.e. the effects of other leading stocks in the market. Such minor role of these stocks may be due to their nature which is characterized by risky feature (Bahri stock) and more elastic nature of the products (Maraie stock).

5. Conclusion

Variances of the stocks encountered in the study are widely subject to external factors, while the internal factors or the institutional measures in the stocks organizations have a limited role in determining the variability of the stock. Hence the sensitivity to outside shocks is prevailing in the market. Stocks of Rajhi and Sabic are classified as more important stocks in the market. They can be considered leader stocks over the rest. This result is attributed to the flexible characteristics of those stocks which are characterized by non-risky nature i.e. high profit with low cost of operations due to the economies of scale property associated with their operations specifically for Sabic stock.

Bahri and Maraie stocks are classified as minor stocks in the market because they are more sensitive to other stocks variances and at the same time they detain small effects on the rest of stocks variances. This is due to the nature of the two stocks. As for the Bahri stock, it has low profit with high cost because the products of the stock are risky i.e. high cost of operations as result to the diseconomies of scale associated with its operations. As for Maraie stock, its products are durable which make them more elastic products and hence more volatile to the external shocks. Method of estimation manipulated the data of the study very well. The produced results of different five models revealed that the variances of the stocks depend on each other. Then, the Saudi stocks market can be strongly considered competitive in a sense that each stock depends on other stocks by different degree. Finally, we can conclude that the stocks in the Saudi market heavily respond to the external factors (variances of other stocks) compared to the internal shocks, so the interdependence of variances is significantly prevailing in the Saudi market.

In this study the variance of each stock return had been estimated via M GARCH (DVEC), then a multiple regression was done using heteroscedasticity ARCH estimator. The findings confirmed the existence of major (dominant) stocks along with minor (dependent) stocks in the Saudi Market. Such classifications of Saudi stocks are in accordance with other findings drawn in different papers dealing with the same data (same stocks) in which their primary objectives are estimating volatility as well as correlations and covariance. So the model is appropriate and consistent with special nature of the Saudi market. Therefore the applications of the model to

the same environments can give fruitful results postulating sound arguments for model validity in financial econometrics, particularly assets return volatility.

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