

## Does Volatility Generate Major & Minor Stocks in Saudi Stocks Market

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### ABSTRACT

*This study attempts to answer a main question: Are there reciprocal effects between the variances of the stock returns in the Saudi market as well as the answer to a sub-question what are the leading stocks in the Saudi market. The 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). This sample reflects the main trends in the Saudi market. 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. The study applied the M GARCH-VEC methodology to estimate stock return variances and then perform a multiple regression of five equations using the ARCH Heteroscedasticity estimator. The results of the analysis showed 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 showed that the returns variances of SABIC and Al Rajhi stocks have the most impact on the rest of the returns of the stocks, so they considered as leading stocks in the market. While the variances return of Etisalat, Almarai and Al Bahri have a weaker impact on the rest of the stocks variances returns, so they are considered as minor stocks.*

**Keywords:** Stock return variance, M GARCH-VEC, ARCH Heteroscedasticity

### INTRODUCTION

The role of stocks market, also named 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. The economic prosperity (or deterioration) and rigidity (or flexibility) are predominantly determined by the situation at the stock market. The importance of the stock market is assessed by the volume of the capital invested in the market. The comparison between the size of invested capital and the national income clearly reflects marginal efficiency of the national currency and consequently the relative strengthens of the economy (William, 2009).

Whether joint movements of stock returns move in the same direction or in opposite ones, this shape current and future investors' portfolios status. These movements set again the way financial agents advice the investors regarding a certain stock. Joint movements determine

differentiate between leading stocks and vulnerable ones. Accordingly, policy makers direct the economy to achieve its national targets and to prevent it from up and down swings disturbances. Recent development in financial econometrics have 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, 2009).

The aim of this study is to answer main question which stated "Is there exist an interaction in the volatility between Stock in Saudi stock exchange" with sub questions " What are the stocks which have the dominant impacts upon other stock? What are the vulnerable stocks that have influence 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 market, Postulating the ranking of stock that affecting the market and consequently the economy, Helping the

policy makers in their decisions to stabilize the KSA economy by providing sound results about the stock, Informing the financial agencies and business men 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 more over it 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 Saudi market is compare whether the dependencies between Saudi stocks have similar nature to that ones 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 dependency in developing markets, in addition to necessate the importancy of these models in tackling time varying data have dependency to some degree on subjective factors.

### LITERATURE REVIEW

The modeling of asset returns volatility continues to be one of the key areas of financial research to provide substantial information on risk patterns involved in investment and transaction processes. Many works have been undertaken in this area. Given the fact that stock markets normally exhibit high levels of price volatility which lead to unpredictable outcomes, it is important to examine the dynamics of volatility. Volatility refers to the amount of uncertainty or risk about the size of changes in a security's value. A higher volatility refers to a security's value that can be potentially spread out over a larger range of values whereas, lower volatility means a security's value that does not fluctuate dramatically, but changes in value over a period. Topics on forces that determine the equilibrium market volatility and the risk premium are probably the most debated in the analysis of financial markets. The debates are

driven, in part, by empirical evidence of market "anomalies" which have challenged students of the subject. Consumption -based asset pricing theory has had a profound impact on our view of financial markets.

Stock market returns assume conditional and unconditional variances. The former relates to contemporaneous or short-term shocks and is unlikely to be constant over time. The latter is assumed to be constant. Thus, the disturbance or error term in the stock return series normally exhibits 'varying' variance and hence requires heteroscedasticity as a treatment. In a seminal work, Engle (2002) proposed the Auto Regressive Conditional Heteroscedasticity (ARCH) process to model conditional variance. In an ARCH framework, the error variance is a function of the squared error variance in the previous term. It has been found that the stock market volatility changes over time (i. e., it is 'time-varying') and exhibits 'volatility clustering.' A series with some periods of low volatility and some periods of high volatility is said to exhibit volatility clustering.

A generalized arch (GARCH) model extended by Bollerslev (1986) is another popular model for estimating stochastic volatility. These models are widely used in various branches of econometrics, especially in financial time series analysis. Besides, with the introduction of models of ARCH and GARCH, there have been number of empirical applications of modeling variance (volatility) of financial time series. Since the GARCH model captures the tendency in financial data for volatility clustering, it is possible to explicitly relate information to volatility, as any change in the rate at which information arriving on the market will change the volatility in that market. Thus, unless information remains constant, which is hardly the case, volatility must be time-varying, even daily. Understanding and predicting the temporal dependence in the second-order moments of asset returns is important for many issues in financial econometrics. It is now widely accepted that financial volatilities move together over time across assets and markets. Recognizing this feature through a multivariate modeling framework leads to more relevant empirical models than working with separate univariate models. From a financial point of view, it opens the door to better decision tools in various areas, such as asset pricing, portfolio selection, option pricing, hedging and risk management. The most obvious application of MGARCH (multivariate GARCH) models is the

study of the relations between the volatilities and co-volatilities of several markets. Is the volatility of a market leading the volatility of other markets? Is the volatility of an asset transmitted to another asset directly (through its conditional variance) or indirectly (through its conditional co-variances)? Does a shock on a market increase the volatility on another market, and by how much? Would the impact be the same for negative and positive shocks of equal amplitude? A related issue is whether the correlations between asset returns change over time. Are they higher during periods of higher volatility (sometimes associated with financial crises)? Do they increase on long run, perhaps because of the globalization of financial markets? Such issues can be studied directly by using a multivariate model, and raise the question of the specification of the dynamics of co-variances or correlations. In a slightly different perspective, a few papers have used MGARCH models to assess the impact of volatility in financial markets on real variables like exports and output growth rates, and the volatility of these growth rates. Another application of MGARCH models is the computation of time-varying hedge ratios. Traditionally, constant hedge ratios are estimated by OLS as the slope of a regression of spot returns on future returns, because this is equivalent to estimating the ratio of the covariance between spot and futures over the variance of the futures. Since a bivariate MGARCH model for the spot and future returns directly specifies their conditional variance-covariance matrix, the hedge ratio can be computed as a byproduct of estimation and updated by using new observations as they become available.

Abdulhadi, et al (2015) studied the stock market behavior (fractal analysis of Saudi stock exchange) by applying Hurst exponent for each time series. The results revealed that Saudi market is not totally random during the period of the study. Also, they found that there existed long run dependence in Saudi stock market returns comply with neither the week form of the efficient market hypothesis nor random weak assumption.

Talat VLVSEVER, et al (2011) studied the day-of-the-week effect in KSA stock of exchange by applying ANON-linear GARCH analysis. The results revealed that returns on the five trading days follow different process. These findings confirm that mean daily returns are significantly different from each other and

validate the day-of-the-week effect in TADAWUL.

Yasimeen Sultan & Nashwa Mustafa (2000) measure the impact of investment on the stock market in Saudi Arabia. They confirmed the the relationship between investment levels and the index of the stock market using the descriptive method to view variables concepts.

Involving a sample of Arab capital markets (Jordan, Saudi Arabia, Palestine), HyatZaid (2014) studied the role of technical analysis in making an investment decision. The aim of the study was 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 time period - Year 2014-. The 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 are predicted and selling otherwise However, not all the indicators have achieved the same results and returns, index is the relative strength were his references an early change direction and the beginning of a new cycle, 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.

Mayada S. Taj-Al-Din & Bashar Th. Al-Shakarji (2008) studied Constructing of Stock's Indicator and its Relation with Economical Status "Analytical Study for Al-Riyadh Financial Market" They used the Value method which is considered one of the most potential methods in constructing indicators. Several international and Arab financial markets have been studied and Saudi Arabia is amongst the Arab world financial markets having huge value assets (Riyadh Stock Market). The research questions whether the indicator may reflect the market performance and consequently the current economic situation in the country. This study has been delineated by two aspects: First: the conceptual one is a group of concepts on the indicator, usage and the way the construction has been furcated. Additionally, the international indicators were used in this context.

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The conceptual aspect has recreated a facility for the analytical (Second) aspect. Daily and monthly periodically issued data by financial market websites during 2006 were managed. The research concluded that the indicator influences market situation and economic performance, because there is a vast variance on the sector level, as well as the rate of company's shareholding in the gross market values that may drastically be postulated in constructing the indicator.

Duaa AL-Husaeny & adnan Salim qasem (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 electronic exchange system. On the basis of 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.

### METHODOLOGY

The 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 The variable selection depends on its relative importance in the industry (sector) and hence it can reflect and represent all the stock 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, with respect to data collection, we limited the study to the five-year-plan period of time partly considered as the average span of the trade cycle whereas short run disturbances may happen. In addition, the data should be daily manipulated.

### STOCKS OF THE STUDY

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

Thirdly, concerning data analysis, we suggest the multivariate GARCH (M GARCH) model in order to 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 stocks are estimated along 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 numbers of people, acting relatively well during terms of economic recession and stable progress. In addition, it pays dividends to stakeholders on a current basis and enjoys high reputation. Saudi Arabia's Tadawul has been the

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hugest loser in the GCC area so far this year, with shares bearing the brunt of the negative stakeholders endurance due to the indecision appearing among 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 per cent 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.

### FINDINGS

Estimator: ARCH heteroscedasticity

		Dependent Variables				
		Bahri	Maraie	Etisalat	Rajhi	Sabiv
	<b>Constant</b>	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)
<b>Independent Variables</b>	<b>Bahri</b>		0.09962 P= (0.000)	0.02382 P= (0.000)	0.06821 P= (0.000)	0.14961 P= (0.000)
	<b>Maraie</b>	0.04321 P= (0.000)		0.03129 P= (0.000)	0.07406 P= (0.000)	0.06513 P= (0.000)
	<b>Etisalat</b>	0.1999 P= (0.000)	0.0723 P= (0.000)		0.08036 P= (0.000)	0.10539 P= (0.000)
	<b>Rajhi</b>	0.4844 P= (0.000)	0.46602 P= (0.000)	0.35069 P= (0.000)		0.48659 P= (0.000)
	<b>Sabic</b>	0.4205 P= (0.000)	0.01429 P= (0.2317)	0.14553 P= (0.000)	0.2702 P= (0.000)	
	<b>R<sup>2</sup></b>	0.4241	0.15779	0.38687	0.57177	0.58708
	<b>Hetero test</b>	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)

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 variables variances as independent variables. Hence, we repeat this process for all variables and finally we determine five estimated equations by ARCH heteroscedasticity estimator. The regression equations are listed in the 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 involve the stocks with dominant effects to 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.

- The first category comprises from Bahri and Etisalat stocks. The 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 reduces 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 Etisalat stock, and finally from Maraie stock. The 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%. The constant term (equal to 0.00007) is significantly positive but remains small indicating that changes in the Etisalat variance is due to internal factors. The variances of the other stocks effects Etisalat stock variance are significantly positive., The highest effect comes from the variance of Rajhi stock, followed by Sabic variance, Maraie variance, and lastly by bahri stock variance. The ARCH estimator eliminates the heteroscedasticity problem from the data as  $P$  value of the test equals to

(0.8729) which means the acceptance of null hypothesis (none-existence of heteroscedasticity).

- The second category consist of Rajhi and Sabic stocks. The 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 remainder stocks reduced the variability in Rajhi stock variance by 58%. The 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. The 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 (none-existence of heteroscedasticity). The 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). The 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. The 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. The 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).
- The third category which consist 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%. The 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. The 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 The 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

The 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 confirms its accuracy helps better interpretation of the dependent variables. The findings could also be used for sound forecasting.

The 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, 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. the Rajhi stock variance, followed by the Sabic stock variance has the higher effects over the variances of the rest 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.

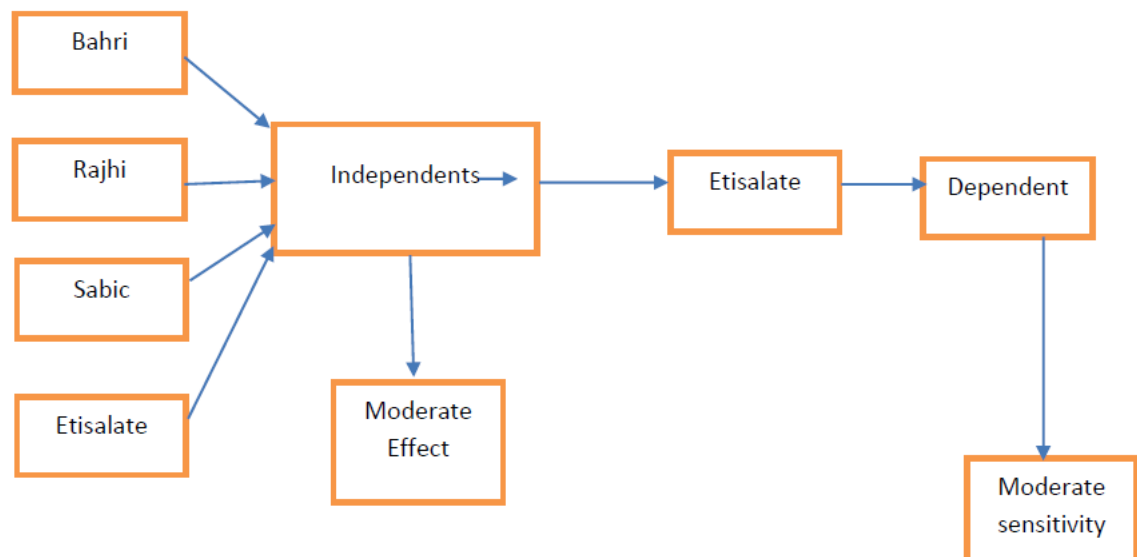
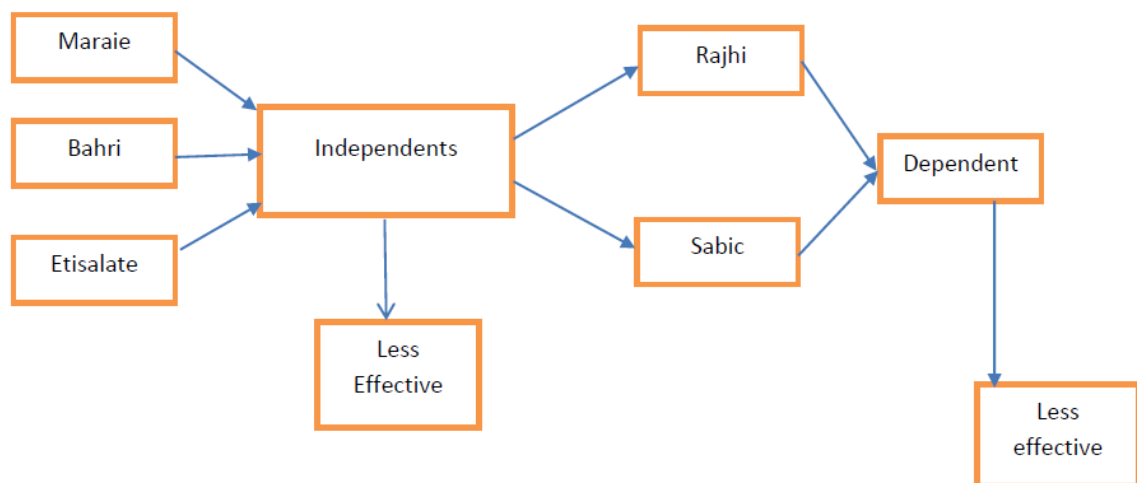
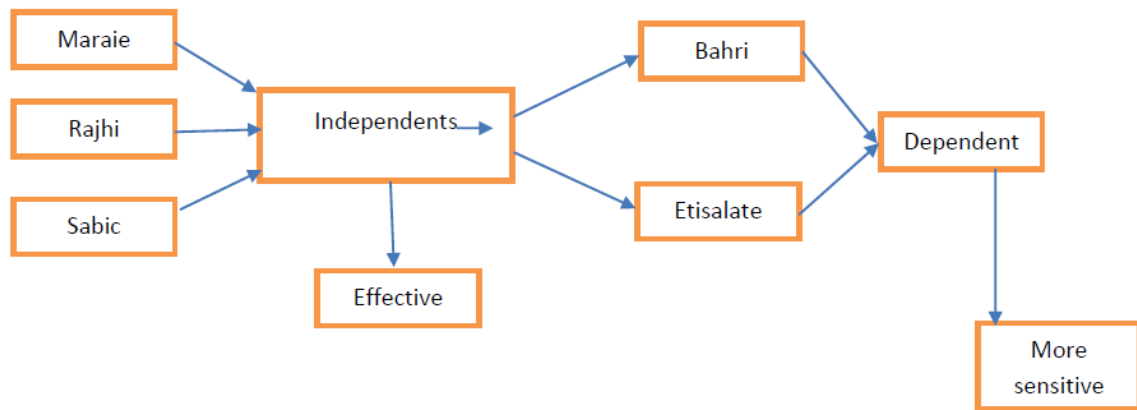
Bahri and Maraie stocks and to some extent Etisalat are more sensitive to the rest stocks. At the same time, their effects on the remainder stocks are weak. Accordingly, they can be classified as minor stocks on the market. Their variability can be determined to larger extent by external factors i.e the effects of other leading stocks in the market. Such minor role of these

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stocks may be due to their nature which is characterized by risky feature (Bahri stock) and

more elastic nature of the products (Maraie stock).

### RESULTS & CONCLUDING REMARKS



- The 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.

- The 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 is characterized by none 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.

- The 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 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 in nature which make them more elastic products and hence more volatile to the external shocks.
- The 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 reach a conclusion 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 a long with minor (dependent) stocks in 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 covariances. So the model is appropriate and consistent with special nature of Saudi market. Therefore, the applications of the model to same environments can give fruitful results postulating sound arguments for model validity in financial econometrics, particularly assets returns volatility.

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