

A Conceptual Model of Stock Market Efficiency: Does Economic Uncertainty Matter?

Shu-Yee Yeap & Pei-Tha Gan

Faculty of Management & Economics
Universiti Pendidikan Sultan Idris
35900 Tanjong Malim, Perak, Malaysia
Email: shuyee1013@gmail.com

DOI: <https://doi.org/10.37134/jcit.vol7.8.2017>

Abstract

Many empirical works study the efficient market hypothesis by examining the relationship between the macroeconomic factors and the stock markets, however, there are scant studies focused on the economic uncertainty in a precise method by studying the stock market efficiency. The purpose of this paper is to propose the conceptual framework of stock market efficiency in economic uncertainty. The economic uncertainty, can be categorized into exchange rate uncertainty, monetary policy uncertainty (namely, interest rate uncertainty, money supply uncertainty), inflation uncertainty, and output uncertainty, and is associated with the stock market efficiency. The expected findings suggest that economic uncertainty contains useful information and is important in determining the stock market efficiency and could promote a better efficiency in stock market.

Keywords Stock market efficiency, economic uncertainty, efficient market hypothesis

1. Introduction

Stock markets can be influenced by many factors such as the social or political events, domestic and international economic, and etc. These stock markets movement could be explained by the efficient market hypothesis introduced by Fama (1970), which stock returns can fully reflect all available information about the securities prices in the market. Many empirical works study the efficient market hypothesis by examining the relationship between the macroeconomic factors and the stock markets, and suggest that macroeconomic factors can serve as the leading indicators that affecting the stock markets (Fama and Schwert, 1977). However, there are scant studies focused on the economic uncertainty in a precise method by studying the stock market efficiency. Uncertainty has been increasing ly concerns in the financial economics due to the fact that it contributes a great influence to the world stock markets (Parasuraman and Ramudu, 2011). The shocks to the economic uncertainty may have both positive and negative effect to the stock market because according to Ilmanen (2003), the stock returns may at least partially result from the condition of the uncertainties. Therefore, a question arises that whether economic uncertainty matters on the stock market efficiency.

In line with the aim of the study, economic uncertainty may include exchange rate uncertainty, monetary policy uncertainty, inflation uncertainty and output uncertainty (Gan, 2014). Orabiand Alqurran (2015) argue that the broader definition of economic uncertainty can encompass variability, volatility and fluctuation or risk. With respect to the exchange rate uncertainty, stock market performance could be negatively depressed by the exchange rate volatility (Lawal and Ijirshar, 2015). It significantly influences the stock returns especially for an international operated firm (Aggarwal, 2003). This is due to appreciation and depreciation

of a currency may affect one firm's costs and revenue, and therefore their decision on investment. In fact, exchange rate is a risk bear by the investors and firms in foreign trades. The volatility of exchange rate may disturb the export, import, and the investment flows which would affect the stock return. Besides that, international business is affected by the globalization which is the key factor in affecting the operation of a firm (Gazioglu, 2000).

Monetary policy uncertainty refers to the interest rate uncertainty and money supply uncertainty. With respect to the interest rate uncertainty, the short-term and long-term interest rate uncertainty contribute a negative reaction to the real economic activities (Creal and Wu, 2014), and thus affecting the stock market. The variability, fluctuation and uncertainty on the interest rate would affect the decision of investors due to variability affects the present value of expected stock returns, and thus affected their wealth (Tatom, 1984). For instance, interest rate uncertainty forces a downward on inflation during the Great Depression; while the interest rate uncertainty forces an upward on the inflation during the Great Inflation, causes the choice of investment of the investors. With respect to the money supply uncertainty, money supply is acknowledged as an important factor in influencing the economy and the stock return directly due to the central banks manipulated the monetary policy, notably the money supply to influence the real economic activities (Sirucek, 2013), and thus the stock market performance. An unanticipated variability in the money supply thus contributes to the fluctuation of stock returns of a securities (Bernanke and Kuttner, 2005). The money supply uncertainty may alter the financial assets' risk premium which would reflect to the expected return of the investors because they have to bear the risk of holding such stocks (Friedman, 1984). Moreover, money supply variability is correlated with the increase of inflation uncertainty, and hence negative correlated with the stock returns (Humpe and Macmillan, 2009; Choi and Yoon, 2015).

With respect to the inflation uncertainty, inflation uncertainty is negative correlated with the stock returns, both expected and unexpected inflation (Fama and Schwert, 1977). The unexpected changes in the inflation (inflation uncertainty) reduces the present value of the future firm cash flows due to inflation may affect the discount rate, and hence affecting the stock returns. The negative impact on the firm's income is resulting from the immediate increasing of the costs where the output prices are adjusting in a slow trend, thus the firm's profit is reducing and stock returns are affecting as well (Cochran and DeFina, 1993). Besides, inflation uncertainty is a component of systematic risk which is expected to be significantly affecting the stock returns (Cochran and DeFina, 1993). With respect to the output uncertainty, it is the economic growth measured by the GDP, is a sound factor that may give significant impact to the profitability of a firm by influencing the expected earnings which would reflect on the shares' dividends and hence affecting the stock price and stock returns (Fama, 1990; Liu and Sinclair, 2008; Oskooe, 2010). Stock market is always depending on the health of the economy (Schwert, 1989), thus, a positive relationship could be found between both variables. The positive output uncertainty happens when actual output is higher than the full capacity output; while the negative output uncertainty happens when the actual output is lower than the full capacity output. The uncertainty refers to the output gap, indicates an economy is running in an inefficient rate, the resources are either overworking or underworking, and hence influences the investment choice of investors.

The motivation of the paper is that stock returns can fully reflect all available information about the securities prices in the market. Many empirical works are mainly focusing in examining the stock market efficiency associated with the macroeconomic factors but rarely

focus in the concern of economic uncertainty. Based on the efficient market hypothesis introduced by Fama (1970) stated that stock returns can fully reflect all available information about the securities prices. Undoubtedly, economic uncertainty can serve as important information to influence the stock market performance. This is due to the fact that economic uncertainty contributes a great influence to the world stock markets (Parasuraman and Ramudu, 2011). Furthermore, Ilmanen (2003) suggests that the stock returns may at least partially outcome from the condition of the uncertainties. Therefore, economic uncertainty should not be ignored when study the stock market efficiency.

The purpose of this paper is to propose a conceptual framework of stock market efficiency in economic uncertainty. Does the economic uncertainty, namely exchange rate uncertainty, monetary policy uncertainty (namely, interest rate uncertainty, money supply uncertainty), inflation uncertainty, and output uncertainty, is associated with the stock market efficiency? The answer is "yes" based on the empirical literatures, shows that the economic uncertainty does matter on the stock prices which would influence the stock market efficiency. By study the economic uncertainty, it contains useful information for a bunch of decision makers about the fact that economic uncertainty is important in determining the stock market performance (Baker et. al., 2016). In doing so, a better efficiency in stock market may be promoted in which the stock market response effectively to the good news and bad news (the uncertainty) in the market (Ball and Brown, 1968).

The rest of the paper is organized as follow. Section 2 presents the theoretical model associate with the economic uncertainty and the concept of stock market efficiency. Section 3 will be presenting the suggested findings and conclusion of the study.

2. Theoretical Model

There are numbers of competing theory that can be used to determine the stock market efficiency, namely, capital asset pricing model (CAPM), arbitrage pricing theory (APT), and efficient market hypothesis (EMH). With respect to the CAPM theory, it is widely used to determine the capital costs and pricing stocks. Among the studies that mark off the significance of diversification of risk was the seminal work by Markowitz (1952). He restructures the portfolio theory's field using a mean-variance efficient portfolio framework. This theory described in graphic as the efficient frontier model which could expected the highest stock return at the given level of risk. Sharpe (1964), Lintner (1965) and Mosin (1966) expand the work of Markowitz using the CAPM which assume that markets are segmented in the case of local markets found that this model is an equilibrium economic model that played a significant role in establish the underpinning of the modern portfolio theory. By estimating the related risk and expected return of the stock, CAPM come up with an accurate estimation on the relationship between risk and expected return of a stock.

With respect to the APT, developed by Ross (1976), is the idea that stocks are exposed to the market risk as well as some kind of common systematic risks in the economy which are non-diversifiable, such as interest rate, inflation rate, aggregate output, industry effect, and etc. (Mishkin and Eakins, 1998). The APT model postulates that the market risk as well as several sources of systematic risk in the economy can affected the stock returns. Cho et. al. (1986) use the APT to test the stock market in eleven different countries over the period of

January 1973 to December 1983 found that they can alleviate the problem of variation of factor structure, especially within countries. Mittoo (1992) investigate the relationship between the macroeconomic factors and the Canada and US stock markets found that both markets are integrated during and the macroeconomic factors do matter on the stock returns. Chen and Jordan (1993) test the predictability of macroeconomic factors on the stock returns found that macro indicators do affecting the stock returns.

With respect to the EMH, introduced by Fama (1970), underpinned the context in efficient market is that stock price reflects in an unpredictable path; which means that the freer and the minimal market intervention, the more efficient is the market. According to Fratzscher (2002), past information should not influence the stock prices under a fully efficient market. Malkiel (2003) further explained this as to which investors are not permitted to earn extra than the average yield without getting an extra average risk in an efficient stock market. Moreover, based on the assumption of EMH theory stated that stock prices fully reflect all available information about the securities prices, besides the macroeconomic factors, economic uncertainty can be considered as the relevant information that could influence the stock market performance too (Parasuraman and Ramudu, 2011).

Based on the theories above mentioned, CAPM and APT have its limitation which both theories do not include the factor of uncertainty which associated with the stock market efficiency. Therefore, EMH is a reasonable theory that is in line with the study based on the assumption that stock returns reflect fully all available information about securities at a given time period; in other words, the economic uncertainty serve as the essential information that can be encompassed in the EMH associated with the stock market efficiency.

2.1 The concept of stock market efficiency

Fama (1970) stated that market is efficient when the stock returns can fully reflect all available information about the securities prices. He categorized the efficient market into three relevant information: First, the weak form efficiency. This refers to the current stock prices fully reflect the past history of the stock prices. In other words, no one could beat the market or gain any abnormal profit from analyzing the past history prices. In order to test the weak form efficiency, autocorrelation test can be used to examine the past stock prices. This is due to the interrelationship between the past and current prices are the nature basis to test the weak form efficiency. If there exists an autocorrelation between the past time series data, market is weak form inefficient, indicates that one could earn profit from analyzing the past stock prices (Olowe, 1999; Nwosu et. al., 2013).

Second, the semi strong form efficiency. This refers to the current stock prices fully reflect all the past history and public information about the stock prices. The public information includes the economic factors (exchange rate, inflation rate, interest rate, unemployment, and etc.) and public announcement (company's financial statements such as dividend announcements, merges plan, and etc.) in other words, neither technical or fundamental analysis can be made to beat the market. This is due to stock prices are reflect quickly to the new information in the market. And hence no one could predict the stock returns based on the public information. The semi strong form efficiency can be determined by examine the relationship between macroeconomic factors and the stock prices. The estimated relationship can be expressed as follow; where SP_1 indicates the stock prices, X_1 indicates the macroeconomic factor:

- i. $SP_1 \rightarrow X_1$
When there is a unidirectional relationship from the stock prices to the macroeconomic factors, this indicates that market is semi strong form efficient (Groenewold and Kang, 1993; Hatemi-J, 2002), indicates that stock prices are adjust quickly to the available information in the market.
- ii. $X_1 \rightarrow SP_1$
When there is a unidirectional relationship from macroeconomic factors to the stock prices, the market is considered semi strong form inefficient (Habibullah et. al., 1998; Ahmed and Imam, 2007; Hatemi-J, 2012), indicates that one could gain abnormal profit from the fundamental analysis.
- iii. $SP_1 \leftrightarrow X_1$
When a bidirectional relationship is found between the macroeconomic factors and stock prices, stock market is inefficient (Jeng and Butler, 1990; Hasan and Wadud, 2015), indicates that macroeconomic factors could be used to predict the stock prices.
- iv. $SP_1 \not\leftrightarrow X_1$
When there is no causality found between both variables, indicates both variables are independent and not temporally correlated; market could be considered as efficient (Mookerjee, 1987; Leigh, 1997; Plihal, 2016).

Third, the strong form efficiency. This refers to the current stock prices fully reflect the public and even the private information. The private information includes the insider information where it is not publicly known. In other words, no one could gain any profit even they are trading on the information that are not publicly announced. The study on the strong form efficiency is majorly on the performance of the insider trading and investment (mutual) funds. This may due to the private information could be obtained when an investor or a manager who usually visits corporates and from time to time they can know the issues about that company and is expected to gain abnormal profits using that insider information (Malkiel, 2003). The strong form efficiency indicates that the investment funds could not be used to predict the current stock prices.

Based on the assumption mentioned above, we can conclude that when there is a bidirectional relationship is found between the macroeconomic factors and stock prices, and a unidirectional relationship from macroeconomic factors to stock prices, this shows that market is inefficient. This imply that there exists an explanatory power of macroeconomic factors on the stock prices, indicates one could gain abnormal profits from the market. On the other hand, when there is a unidirectional relationship found from the stock prices to the macroeconomic factors, stock market is considered as efficient, indicates that stock prices reflect all the information available in the market.

2.2 Model Specification

Considering the macroeconomic factors, Fama model can serve as a benchmark model for performance measure and can be modified to encompass economic uncertainty through gap form, i.e., a gap form is the deviation between the actual value and the potential value that implies uncertainty, see Gan (2014). There are researchers examine the uncertainty by using the gap form. Smets (1998) and Froyland and Lonning (2000) examines the effect of output uncertainty by using the gap form in the measured of deviations between the actual output level and the potential output level. Taylor (1994) and Ben-Haim et. al. (2017) proposes the gap model in illustrated the shock or uncertainty of inflation which measured the deviations between the actual inflation rate and its target rate. Istrefiand Mouabbi (2016) measure the risk exposed to the interest rate using the interest rate gap based on the prediction of the short-term and the long-term interest rate. Since the “gap” is used by researchers to examine the unknown economic risk/uncertainty, the estimation of gap variables can be considered as uncertainty; such that the estimated gap model could be applied on other macroeconomic factors (namely, exchange rate gap and money supply gap).

The gap form model is estimated as follow:

$$SR_{g_t} = -\beta_{2_t}M_{g_t} - \beta_{3_t}i_{g_t} - \beta_{4_t}REER_{g_t} - \beta_{5_t}\pi_{g_t} + \beta_{6_t}y_{g_t} + \epsilon_t \quad (1)$$

Where SR indicates the stock returns, M indicates money supply, i indicates interest rate, $REER$ indicates the real effective exchange rate, π indicates inflation rate, y indicates the output. Eq. (1) is Fama’s modified model that encompasses the economic uncertainty; where, g represents gap and ϵ_t represents error term; the positive and negative signs imply economic relationship. The gap is the deviations between the potential value and the actual value. The potential value, also known as the equilibrium value can be served as a good benchmark to strengthen the preciseness of the uncertainty model.

From the equations (1) above, stock price depends negatively on the money supply gap (Geske and Roll, 1983; Humpe and Macmillan, 2007). The money supply gap is the changes in the money supply derives from the difference between the money supply and the anticipated money supply (Thornton and Molyneux, 1995). The negative relationship is due to the uncertainty may alter the financial assets’ risk premium which would reflect to the expected return of the investors because they have to bear the risk of holding such stocks (Friedman, 1984). Therefore, investors are switching from riskier stocks to low risk or fixed income assets causing the volatility of stock returns.

The stock returns are negatively correlated with the inflation gap which measured the deviations between the actual inflation rate and its target rate (Taylor, 1994). During a high inflation uncertainty, small business intends to reduce the entire investment as well as the real economic activity and hence, influences the stock returns. In addition, investors are risk averse, the higher the uncertainty about future values, the more swiftly they are reacted to the information or news, and hence, induce a change to the stock returns (David and Veronesi, 2004).

The stock returns are negative correlated with the interest rate gap. Interest rate gap is the measure based on the prediction of the short-term and the long-term interest rate (IstrefiandMouabbi, 2016). An uncertainty on interest rate causing investors to predict a risk

of borrowing money to invest. Causing a low demand of stocks and eventually decreases the stock prices and thus, the stock returns. Moreover, uncertainty affects the present value of expected stock returns, and thus affected their wealth (Tatom, 1984). The higher the uncertainty, the higher the risk premium which would affected the expected stock returns.

The stock return is positively correlated with the output gap which is the measured of deviations between the actual output level and the potential output level (Froyland and Lonning, 2000). The gap indicates an economy is running in an inefficient rate where the investors and economists as well as the policy maker are concern about the equilibrium level of the output in the economy because the stock market is always depending on the health of the economy (Schwert, 1989) and provides a better prospect for profitable investment and thus increasing the stock returns.

The stock returns are negatively correlated with the exchange rate gap which refers to the difference between the official and the parallel market rates (Abounoori and Zobeiri, 2010). Its negative impact to stock returns is due to the risk of exchange rate volatility increases the financial transaction costs which may have an adverse impact on the performance of international portfolio and becoming a critical factor for bilateral equity and induces a home bias causing a decrease in financial activities, and hence influencing the stock returns (Caporale et. al., 2015).

Based on the literatures mentioned above, when there is a unidirectional relationship found from the gap model to the stock prices, stock market is considered as in efficient. When there is a unidirectional relationship found from the stock prices to the gap model, stock market is considered as efficient. When a bidirectional relationship is found for both variables, market is considered inefficient, whereas is there is no relationship found for both variables, stock market are considered as independent.

3. Conclusion

This paper proposes the conceptual model of the stock market efficiency associated with the economic uncertainty. Based on the efficient market hypothesis introduced by Fama (1970) stated that stock returns can fully reflect all available information about the securities prices, thus, economic uncertainty could serve as a relevant information that contribute to the stock market performance. The economic uncertainty, namely exchange rate uncertainty, monetary policy uncertainty (namely, interest rate uncertainty, money supply uncertainty), inflation uncertainty, and output uncertainty, do matter on the stock market performance, and hence could influence the stock market efficiency. By study the economic uncertainty, it contains useful information for a bunch of decision makers about the fact that economic uncertainty is important in determining the stock market performance and thus may promote a better efficiency in stock market (Baker et. al., 2016).

The limitation of the paper is that this is a conceptual paper that does not measuring the impact of economic uncertainty on the stock market efficiency. The relationship between both variables can be extended to measure for future investigation by using the Granger Causality test, such that to test the efficiency of the stock market, and auto regressive distributed lag (ARDL) approach, such that to test the long-run relationship among the variables.

References

- Abounoori, E., & Zobeiri, H. (2010). Exchange Rate Gap Effect on Economic Growth in Iran. *International Review of Business Research Papers*, 1(6), 66-77.
- Aggarwal, R. (2003). Exchange rates and stock prices: A study of the US capital markets under floating exchange rates. *Akron Business and Economic Review*, 12, 7-12.
- Baker, S. R., Bloom, N., & Davis, S. J. (2016). Measuring economic policy uncertainty. *The Quarterly Journal of Economics*, 131(4), 1593-1636.
- Ben-Haim, Y., Demertzis, M., Den End, V., & Willem, J. (2017). Fundamental uncertainty and unconventional monetary policy: an info-gap approach. Bruegel Working Paper Issue 1/2017.
- Bernanke, B. S., & Kuttner, K. N. (2005). What explains the stock market's reaction to Federal Reserve policy? *The Journal of Finance*, 60(3), 1221-1257.
- Caporale, G. M., Ali, F. M., & Spagnolo, N. (2015). Exchange rate uncertainty and international portfolio flows: A multivariate GARCH-in-mean approach. *Journal of International Money and Finance*, 54, 70-92.
- Cho, D., Eun, C., & Senbet, L. W. (1986). International arbitrage pricing theory: an empirical investigation. *Journal of Finance*, 41, 313-329.
- Choi, K. H., & Yoon, S. M. (2015). The effect of money supply on the volatility of Korean Stock Market. *Modern Economy*, 6(05), 535.
- Cochran, S. J., & DeFina, R. H. (1993). Inflation's negative effects on real stock prices: new evidence and a test of the proxy effect hypothesis. *Applied Economics*, 25(2), 263-274.
- Creal, D. D., & Wu, J. C. (2014). *Interest rate uncertainty and economic fluctuations*. National Bureau of Economic Research Working Paper No. 20594.
- David, A., & Veronesi, P. (2004). Inflation and earnings uncertainty and volatility forecasts. *Manuscript, Graduate School of Business, University of Chicago*.
- Fama, E. (1970). Efficient capital markets: A review of theory and empirical work. *Journal of Finance*, 52, pp. 383-417.
- Fama, E. F., & Schwert, G. W. (1977). Asset returns and inflation. *Journal of financial economics*, 5(2), 115-146.
- Fratzcher, M. (2002). Financial market integration in Europe: On the effect of EMU on stock markets. *International Journal of Finance and Economic*, 7, pp. 165-193.
- Friedman, B. M. (1984). Lessons from the 1979-82 Monetary Policy Experiment. *The American Economic Review*, 74(2), 382-387.
- Froyland, E., & Lonning, I. (2000). The significance of uncertainty in monetary policy. *Norges Bank. Economic Bulletin*, 71(4), 136.
- Gan, P. T. (2014). The optimal economic uncertainty index: A grid search application. *Computational Economics*, 43(2), 159-182.
- Gazioglu, S. (2003). Capital flows to an emerging financial market in Turkey. *International Advances in Economic Research*, 9(3), 189-195.
- Geske, R., & Roll, R. (1983). The fiscal and monetary linkage between stock returns and inflation. *The Journal of Finance*, 38(1), 1-33.
- Groenewold, N., & Kang, K. C. (1993). The semi-strong efficiency of the Australian share market. *Economic Record*, 69(4), 405-410.
- Habibullah, M. S., Baharumshah, A. Z., & Tan, H. B. (1998). Monetary policy, economic activity and the stock market: An empirical analysis of the Kuala Lumpur Stock Exchange. *Journal of Management (Jurnal Pengurusan)*, 17, 41-53.
- Hasan, M. A., & Wadud, M. A. (2015). Testing Semi-Strong Form Efficiency of Dhaka Stock Exchange. *Journal of Business & Economics*, 7(2), 213.
- Hatemi-J, A. (2002). Money supply and the informational efficiency of the stock market in Korea: evidence from an alternative methodology. *Journal of Economic Integration*, 517-526.
- Humpe, A., & Macmillan, P. (2009). Can macroeconomic variables explain long-term stock market movements? A comparison of the US and Japan. *Applied Financial Economics*, 19(2), 111-119.
- Ilmanen, A. (2003). Stock-bond correlations. *The Journal of Fixed Income*, 13(2), 55-66.
- Istrefi, K. & Mouabbi, S. (2016). *Subjective interest rate uncertainty and the macroeconomy: A cross-country analysis*. Banque de France Working Paper No. 619. Available at SSRN: <https://ssrn.com/abstract=2908197>
- Jeng, C. C., Butler, J. S., & Liu, J. T. (1990). The informational efficiency of the stock market: The international evidence of 1921-1930. *Economics Letters*, 34(2), 157-162.

- Lawal, M., & Ijirshar, U. V. (2015). Empirical analysis of exchange rate and Nigeria stock market performance. *Int. J. Sci. Res.*, 4(4), 1592-1600.
- Lintner, J. (1965). The valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets. *The review of economics and statistics*, 13-37.
- Liu, X., & Sinclair, P. (2008). Does the linkage between stock market performance and economic growth vary across Greater China? *Applied Economics Letters*, 15(7), 505-508.
- Malkiel, B. G. (2003). The efficient market hypothesis and its critics. *Journal of Economic Perspective*, 17, pp. 59-82.
- Markowitz, H. (1952). Theory of portfolio selection. *Journal of Finance*, 7, pp. 77-91.
- Mishkin, F. S., & Eakins S. G. (1998). *Financial markets and institutions*. Second edition, Addison-Wesley, US.
- Mittoo, U. R. (1992). Additional evidence on integration in the Canadian stock market. *The Journal of Finance*, 47(5), 2035-2054.
- Mookerjee, R. (1987). Monetary policy and the informational efficiency of the stock market: the evidence from many countries. *Applied Economics*, 19(11), 1521-1532.
- Mosin, J. (1966). Equilibrium in a capital asset market. *Econometrica*, 34, pp. 768-783.
- Nwosu, E. O., Orji, A., & Anagwu, O. (2013). African emerging equity markets re-examined: Testing the weak form efficiency theory. *African Development Review*, 25(4), 485-498.
- Olowe, R. A. (1999). Weak form efficiency of the Nigerian stock market: further evidence. *African development review*, 11(1), 54-68.
- Orabi, M. M. A., & Alqurran, T. A. A. (2015). Effect of volatility changes on emerging stock markets: the case of Jordan. *Journal of Management Research*, 7(4), 132-143.
- Oskooe, S. A. (2010). Emerging stock market performance and economic growth. *American Journal of Applied Sciences*, 7(2), 265.
- Parasuraman, N. R., & Ramudu, P. J. (2011). Historical and implied volatility: an investigation into Nse Nifty futures and options. *Australian Journal of Business and Management Research*, 1(7), 112.
- Plihal, T. (2016). Stock market informational efficiency in Germany: granger causality between DAX and selected macroeconomic indicators. *Procedia-Social and Behavioral Sciences*, 220, 321-329.
- Ross, S. (1976). The arbitrage theory of capital asset pricing. *Journal of Economic Theory*, 13, 341-360.
- Schwert, G. (1989). Why does stock market volatility change over time? *The Journal of Finance*, Vol. 44(5), 1115-1153.
- Sharpe, W. (1964). Capital asset prices: a theory of market equilibrium under conditions of risk. *Journal of Finance*, 19, pp. 763-781.
- Sirucek, M. (2013). Impact of Money Supply on Stock bubbles. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, 61(7), 2835-2842.
- Smets, F. (2002). Output gap uncertainty: does it matter for the Taylor rule? *Empirical Economics*, 27(1), 113-129.
- Tatom, J. A. (1984). Interest rate variability: its link to the variability of monetary growth and economic performance. *Federal Reserve Bank of St. Louis Review*, 31-47.
- Taylor, L. (1994). Gap models. *Journal of Development Economics*, 45(1), 17-34.
- Thornton, J. , & Molyneux, P. (1995). Velocity and the volatility of unanticipated and anticipated money supply in the United Kingdom. *International Economic Journal*, 9(3), 61-66.