The Effect of Money Supply On the Volatility of Korean Stock Market

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Abstract. In this study we examine the relationships between change in Korean and U.S. money supply and stock returns with GARCH, GJR-GARCH and EGARCH models. The main results of our empirical analysis are summarized as follows. First, we found that there is no relationship between change in Korean and U.S money supply and volatility in Korean stock returns, suggesting that change in money supply does not influence the flow of information to the market. Second, the asymmetric effect of bad news on volatility is higher when contemporaneous change in Korean and U.S. money supply is included. Change in the Korean and U.S money supply directly does not affect the Korean stock returns. Finally, the results based on a variance model indicate that the money supply(Korea, U.S.) did not have any effect. The formal studies support that there is no significant forecasting power of past changes in money supply. And, it is not affect asymmetric effects on returns. While stock returns should not be guided by the direct effect on the change in money supply, influence of money supply should not be disregarded due to the impact of stock returns on macroeconomic activity.

1. Introduction

It has been of great interest to financial economists of whether money supply affects stock returns. A number of studies have established that a relationship exists between money supply and stock returns.

Change in money supply is closely related to fluctuation of stock prices. Change in money supply directly affect the stock market, while it indirectly affect the bond market through the interest rate adjustment. If increase in money supply invokes decrease in real interest rate, investors would expect stock returns become much higher after increase in money supply. However, excessive increase in the money supply might induce inflation that will negatively affect the stock prices. Thus, money supply can increase volatility of stock market.

However, papers analyzed effects on stock returns volatility for change in the money supply have not been published much. Most of the papers analyzed a relationship with VAR model and Granger causality test.

The main goal of this paper is to determine whether change in money supply as a proxy of information flow can be useful to improve the prediction of future returns and volatility. For this

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purpose, we examine the relationships between change in money supply and stock returns for domestic country. Changes in the monetary policy of big country, like the United States that provides liquidity in the global financial market, will have a negative or positive impact to the other countries' financial markets through foreign trading. Thus, we also examine the relationships between U.S. money supply and Korean stock market.

For the empirical analysis, we consider monthly data in two money supply (U.S. and Korea) and Korean stock returns. We estimate and analyze the relationship between return volatility and money supply using GARCH, the Glosten-Jagannathan-Runkle GARCH (GJR–GARCH) and exponential GARCH (EGARCH) models.

The remainder of this paper is organized as follows. A literature review is presented in Section 2. Section 3 presents the data and descriptive statistics. Section 4 presents the methodology of the study. The empirical results are discussed in Section 5. Section 6 concludes the paper.

2. Literature review

The issue of money supply has long been debated. Some empirical studies agree that stock returns is affected change in money supply. Homa and Jappee [1] presents evidence that a significant and systematic relationship exists between the money supply and the average level of stock prices is positively related to the money supply. Hamburner and Kochin [2] concluded that changes in monetary growth have a number of different effects on the market. They suggested that there is a direct portfolio effect, although it is difficult to completely disentangle this effect from the one operating through corporate earnings expectations.

Thorbecke [3] presents results that expansionary policy increases ex-post stock returns and exposure to monetary policy increases and asset's ex-ante return.

Hwang [4] investigated the stock price and money supply. He find that the real quantity of money(defined as M2) demanded relative to income is positively related to the deflated price of equities in the Korean stock Market. He in this research confirm that the government's monetary policies directly influence the capital market.

Chen [5] found that monetary has larger effects on stock returns in bear market and shown that a contractionary monetary policy leads to a higher probability of switching to the bear-market regime. In contrast, other empirical studies show that there is no significant forecasting power of past changes in money supply**.** Rozeff [6] examines stock market efficiency with respect to money supply data by testing regression models of stock returns on monetary variables and trading rules based on money supply data. His results found no meaningful lag in the effect of monetary policy on the stock market and that no profitable security trading rules using past values of the money supply exist. Rogarlski and Vinso [7] show that causality does not appear to go from money supply to stock prices but rather from stock prices to money supply and possibly back again. Yoon [8] investigates the effect of money stock on expected share price and expected distribution with a mean-variance model. The empirical study was divided into two periods of time(the pre-financial crisis period and the post-crisis). He found that the results based on a GARCH model indicate that the unexpected money stock did not have any effect, while its speculative part had a negative effect on the expected variance in the post-crisis period. Alatiqi and Fazel [9] argue against the existence of relationships. They present that there is no causal relation from money supply to stock prices.

3. Sample data

For the empirical analysis of this study, we used monthly Korean stock market price index, Korean money supply(M1, M2, Lf) and United states money supply(M1, M2, M3). We used data from January 1980 to June 2013. These data were obtained from Korea Bank and Board of Governors of the Federal Reserve system. Monthly index returns were calculated in terms of percentage logarithmic change, based on the following formulae:

$$r_t = ln\left({P_t}/{P_{t-1}}\right) \times 100, \quad (1)$$

$$S_t = ln\left({M_t}/{M_{t-1}}\right) \times 100. \quad (2)$$

where P_t is the monthly close of the index and M_t is each money supply.

3.1 Descriptive statistics

Table 1~3 summarize the descriptive statistics for stock market returns and money supply. Mean of returns, change in Korean money supply and U.S money supply were positive. The kurtosis was positive for monthly stock returns and each money supply, and greater than 3. Returns skewness and each change in money supply skewness was positive except change in Korean money supply(M1). Seasonally adjusted data were used to measure money supply. Applying the Jarque-Bera (J-B) test for normality rejected the null hypothesis of normality for returns and money supply.

Table 1. Summary statistics of returns

	Returns
Mean	0.7082
Median	0.7237
Maximum	39.3162
Minimum	-29.9747
Std. Dev.	7.1689
Skewness	0.2143
Kurtosis	6.3010
Jarque-Bera	185.1373[0.0000]

Notes: Jarque-Bera(J-B) is the test statistic for the null hypothesis of normality in sample returns distribution. Significance levels: *** 1%, ** 5%, * 1%.

Table 2. Summary statistics of change in Korean money supply

	M1	M2	Lf
Mean	1.2133	1.3221	1.1534
Median	1.2117	1.1968	1.0489
Maximum	10.3803	5.4031	4.4047
Minimum	-11.1521	-1.4100	-0.5789
Std. Dev.	2.3206	1.1002	0.7745
Skewness	-0.5683	0.6050	0.5436
Kurtosis	7.3579	3.6527	3.6613
Jarque-Bera	338.9017[0.0000]	31.5854[0.0000]	22.2044[0.0000]

Notes: Jarque-Bera(J-B) is the test statistic for the null hypothesis of normality in sample returns distribution. Significance levels: *** 1%, ** 5%, * 1%.

Table 3. Summary statistics of change in U.S. money supply

	M1	M2	M3
Mean	0.4682	0.4905	0.5532
Median	0.4233	0.4763	0.5540
Maximum	5.9297	2.7625	2.0181
Minimum	-3.2562	-0.8031	-0.4295
Std. Dev.	0.8353	0.3803	0.3767
Skewness	1.5996	1.4719	0.2463
Kurtosis	12.8138	9.6668	3.4505
Jarque-Bera	1780.234[0.0000]	887.4242[0.0000]	5.8142[0.0546]

Notes: Jarque-Bera(J-B) is the test statistic for the null hypothesis of normality in sample returns distribution. Significance levels: *** 1%, ** 5%, * 1%.

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3.2 Unit root tests

We tested the stationarity of returns and trading volume series, for which the most common test is the unit root test. To test for a unit root, we employed both the augmented Dickey-Fuller (ADF) test and the Phillips-Perron (PP) test. Table 3 provides the results of unit root test. The null hypothesis that returns and trading volume are nonstationary was rejected at the 1% significance level, indicating that both trading volume and returns are stationary.
We tested the stationarity of returns and money supply, for which the most common test is the unit test. To test for a unit root, we employed both the augmented Dickey-Fuller (ADF) test and the Phillips-Perron (PP) test. Table 2 provides the results. The null hypothesis that returns and money supply are nonstationary was rejected at the 1% significance level, indicating that both returns and money supply are stationary.

Table 4. Results of unit root test for returns and money supply

	ADF	PP
Returns	-17.4094[0.0000]	-17.4007[0.0000]
Korean Money supply(M1)	-19.3145[0.0000]	-19.4475[0.0000]
Korean Money supply(M2)	-5.0643[0.0002]	-23.9493[0.0000]
Korean Money supply(Lf)	-4.1804[0.0053]	-18.7636[0.0000]
U.S. Money supply(M1)	-4.4228[0.0022]	-19.2469[0.0000]
U.S. Money supply(M2)	-5.9434[0.0000]	-12.7542[0.0000]
U.S. Money supply(M3)	-2.3307[0.4156]	-10.6707[0.0000]

Note: The critical value for the ADF and PP tests are -3.9611 and -3.4323 at the 1% significance level, respectively. Significance levels : ***1%, **5%, *10%; ADF, augmented Dickey-Fuller test; PP, Phillips-Perron test

4. Equations

This study uses the GARCH model proposed by Bollerslev [10]. However, one of its primary limitations is that it enforces a symmetric response of volatility to both positive and negative market shocks, because conditional variance is regarded as a function of the magnitude of lagged residuals, not whether they are positive or negative. However, it has been argued that a negative market shock may lead to more volatility than a positive shock of the same magnitude. To account for this, Nelson [11] developed the EGARCH model and Glosten, Jagannathan, and Runkle [12] introduced the GJR–GARCH model. This study used both of these models to assess asymmetric volatility and the effect of new information arrival to the market. The GARCH(1,1), GJR–GARCH(1,1) and EGARCH(1,1) models are defined as follows:

$$r_t = c_1 + c_2 r_t + \varepsilon_t, \tag{3}$$

$$\varepsilon_t | I_{t-1} \sim N(0, h_{t-1}), \tag{4}$$

$$h_t = \alpha + \beta \varepsilon_{t-1}^2 + \gamma h_{t-1}, \tag{5}$$

$$h_t = \alpha + \beta \varepsilon_{t-1}^2 + \delta d_{t-1} \varepsilon_{t-1} + \gamma h_{t-1}, \tag{6}$$

$$\ln(h_t) = \alpha + \beta \left(\frac{\varepsilon_{t-1}}{\sqrt{h_{t-1}}} \right) + \delta \left| \frac{\varepsilon_{t-1}}{\sqrt{h_{t-1}}} \right| + \gamma \ln(h_{t-1}). \tag{7}$$

where r_t is the realized return of KOSPI, c_1 denotes the mean of the returns. Equation(5) is conditional mean equation. Equation (5) specifies conditional variance as a function of mean volatility α, where ε_{t-1}^2 is the lag in the squared residual of the mean (the ARCH term) and provides information about volatility clustering, h_{t-1} is the previously forecast variance (the GARCH term). Equation(6) in $\varepsilon_{t-1}^2 d_{t-1}$ is a term that captures asymmetry, and d_{t-1} is a dummy variable that is equal to one if $\varepsilon_{t-1} < 0$ (bad news) and is equal to zero if $\varepsilon_{t-1} \geq 0$ (good news). When, $\varepsilon_{t-1} < 0$, $d_{t-1} = 1$, and the effect of an ε_{t-1} shock on h_t is $(\alpha + \beta)\varepsilon_{t-1}^2$. If $\delta > 0$, negative shocks will have a larger effect on volatility than positive shocks. In equation (7), conditional variance is log-linear, which has several advantages over the pure GARCH specification. First, regardless of the magnitude of $\ln(h_t)$, the implied value of h_t can never be negative, but the coefficients can be negative. Second, instead of using ε_{t-1}^2, EGARCH uses a standardized value of $\frac{\varepsilon_{t-1}}{\sqrt{h_{t-1}}}$, which, third, allows asymmetry to be considered. Hence, the effect of shock on log conditional variance is $\alpha + \delta$ if $\frac{\varepsilon_{t-1}}{\sqrt{h_{t-1}}}$ is positive and $-\alpha + \delta$ if $\frac{\varepsilon_{t-1}}{\sqrt{h_{t-1}}}$ is negative.

To test the effects of money supply on stock returns volatility, the following models were employed:

$$h_t = \alpha + \beta\varepsilon_{t-1}^2 + \gamma h_{t-1} + \theta S_t, \tag{8}$$

$$h_t = \alpha + \beta\varepsilon_{t-1}^2 + \delta d_{t-1}\varepsilon_{t-1} + \gamma h_{t-1} + \theta S_t, \tag{9}$$

$$\ln(h_t) = \alpha + \beta\left(\frac{\varepsilon_{t-1}}{\sqrt{h_{t-1}}}\right) + \delta\left|\frac{\varepsilon_{t-1}}{\sqrt{h_{t-1}}}\right| + \gamma\ln(h_{t-1}) + \theta S_t. \tag{10}$$

If change in money supply is considered a proxy for information arrival, then it is expected that $\theta > 0$. If change in money supply is serially correlated, β and γ will be small and statistically insignificant. The β and γ are smaller when money supply is included than when it is excluded. All parameters of variance in equations (3)–(10) can be estimated using the Brendt, Hall, Hall, and Hausman (BHHH) algorithm, assuming a general error distribution (GED) innovation.

5. Empirical results

Table 5 presents the results when contemporaneous change in money supply is excluded. The GARCH term (γ) is statistically significant at the 1% level in all models, whereas the ARCH term (β) is significant in GARCH and EGARCH model but not in GJR-GARCH. The returns exhibits high persistence in conditional variance. Note that the asymmetry term (δ), has the correct sign and is significant at the 1% level. These results imply that good news has a smaller effect on conditional volatility than bad news, that is, the market exhibits asymmetry.

Table 6 ~ 11 presents the results when contemporaneous change in money supply is included in the conditional variance equation. The coefficient of change in Korean money supply θ in Table 6 ~ 8 is statistically insignificant at the 10% level in all models. The results show that contemporaneous change in Korean money supply do not explains volatility. The estimated coefficients of β, γ and δ are highly significant but change in Korean money supply does not significantly reduce persistence.

Table 9 ~ 11 shows the same test. Just like the change in Korean money supply, the coefficient of change in U.S. money supply θ is insignificant at the 10% level in all models[1]. Also, the estimated coefficients of β, γ and δ are highly significant but change in U.S money supply does not significantly reduce persistence. Change in the Korean and U.S money supply directly does not affect the Korean stock returns. The results based on a variance model indicate that the money supply(Korea, U.S.) did not have any effect. The formal studies support that there is no significant forecasting power of past changes in money supply. And, it is not affect asymmetric effects on

[1] Lagged variable of change in money supply uses but it does not affect stock returns volatility.

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returns.

We evaluated the accuracy of each model specification using Ljung-Box $Q^2(24)$ and ARCH(10) tests, as shown in Tables 5 ~ 11. Neither test was significant at the 1% level, indicating that all models are sufficient for measuring the effects of information arrival to the market, when money supply is included.

Table 5. Results of models without money supply

	GARCH	GJR-GARCH	EGARCH
c_1	0.8629(0.3262)***	0.7601(0.3307)**	0.7116(0.3357)**
c_2	0.1135(0.0535)**	0.1093(0.0547)**	0.1361(0.0540)**
α	2.4668(1.3537)*	3.2005(1.5880)**	0.0533(0.1167)
β	0.1617(0.0583)***	0.0997(0.0643)	0.3239(0.0922)***
γ	0.7962(0.0665)***	0.7683(0.0787)***	0.9188(0.0358)***
δ		0.1505(0.0915)*	-0.0947(0.0497)*
$Q^2(24)$	23.113[0.454]	23.900[0.409]	26.353[0.284]
ARCH(10)	1.1696[0.3098]	1.0715[0.3831]	1.2675[0.2470]
Note: Standard errors are in parentheses and p-values are in brackets. The Ljung-Box $Q_2(24)$ statistic tests serial correlations up to a 24^{th} lag length in the squared standardized returns. The ARCH(10) statistic tests the ARCH effects at 10^{th} order lagged, squared residuals. Significance levels: ***1%, **5%, *10%.			

Table 6. Results of models with contemporaneous Korean money supply(M1)

	GARCH	GJR-GARCH	EGARCH
c_1	0.8703(0.3250)***	0.7661(0.3290)**	0.6994(0.3346)**
c_2	0.1148(0.0535)**	0.1092(0.0547)**	0.1350(0.0542)**
α	2.1368(1.3351)	2.8596(1.5481)*	0.0488(0.1172)
β	0.1645(0.0594)***	0.0974(0.0653)	0.3262(0.0932)***
γ	0.7910(11.4342)***	0.7605(0.0814)***	0.9168(0.0368)***
δ		0.1613(0.0941)*	-0.0986(0.0506)*
θ	0.3639(0.4364)	0.4556(0.4242)	0.0082(0.0145)
$Q^2(24)$	23.357[0.440]	23.719[0.420]	25.818[0.310]
ARCH(10)	1.149[0.323]	0.987[0.453]	1.223[0.274]
Note: See table 3.			

Table 7. Results of models with contemporaneous Korean money supply(M2)

	GARCH	GJR-GARCH	EGARCH
c_1	0.8741(0.3272)***	0.7607(0.3307)**	0.7089(0.3383)**
c_2	0.1124(0.0537)**	0.1060(0.0548)*	0.1352(0.0542)**
α	1.6289(1.4686)	1.7806(1.5119)	0.0151(0.1133)
β	0.1604(0.0558)***	0.0878(0.0649)	0.3139(0.0946)***
γ	0.7983(0.0654)***	0.7736(0.0744)***	0.9221(0.0343)***
δ		0.1671(0.0879)*	-0.0995(0.0486)**
θ	0.5869(0.7046)	1.0019(0.7786)	0.0249(0.0222)
$Q^2(24)$	22.781[0.474]	22.652[0.481]	24.797[0.361]
ARCH(10)	1.160[0.316]	1.004[0.439]	1.212[0.281]
Note: See table 3.			

Table 8. Results of models with contemporaneous Korean money supply(Lf)

	GARCH	GJR-GARCH	EGARCH
c_1	1.0033(0.4039)**	0.7815(0.4010)*	0.6478(0.4198)
c_2	0.1129(0.0601)*	0.1017(0.0611)*	0.1351(0.0588)**
α	1.4231(1.9252)	1.2187(1.7356)	0.0735(0.1208)
β	0.1584(0.0665)**	0.0468(0.0597)	0.2741(0.0958)***
γ	0.7724(0.8147)***	0.7673(0.0809)***	0.9147(0.0358)***

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δ		0.2294(0.0913)**	-0.1587(0.0506)***
θ	2.4065(1.7847)	2.8038(1.6046)*	0.0358(0.0307)
$Q^2(24)$	25.017[0.349]	20.893[0.588]	23.825[0.414]
ARCH(10)	1.439[0.1618]	0.9399[0.496]	1.2062[0.286]
Note: See table 3.			

Table 9. Results of GJR–GARCH and EGARCH with contemporaneous U.S money supply(M1)

	GARCH	GJR-GARCH	EGARCH
c_1	0.8629(0.3265)***	0.7589(0.3305)**	0.7341(0.3369)**
c_2	0.1135(0.0536)**	0.1093(0.0547)**	0.1359(0.0545)**
α	2.4826(1.5498)	3.1537(1.7729)*	0.0728(0.1287)
β	0.1616(0.0584)***	0.0998(0.0646)	0.3201(0.0897)***
γ	0.7962(0.0668)***	0.7685(0.0790)***	0.9173(0.0371)***
δ		0.1509(0.0917)	-0.0921(0.05010)*
θ	-0.0082(0.8775)	0.0652(1.0374)	-0.0242(0.0332)
$Q^2(24)$	23.114[0.454]	23.878[0.411]	25.654[0.317]
ARCH(10)	1.169[0.310]	1.070[0.384]	1.249[0.257]
Note: See table 3.			

Table 10. Results of GJR–GARCH and EGARCH with contemporaneous U.S money supply(M2)

	GARCH	GJR-GARCH	EGARCH
c_1	0.8758(0.3236)***	0.7717(0.3297)**	0.7146(0.3348)**
c_2	0.1136(0.0536)**	0.1096(0.0547)**	0.1357(0.0540)***
α	1.4508(1.9144)	2.1484(2.1945)	0.0078(0.1348)
β	0.1656(0.0587)***	0.1016(0.0655)	0.3294(0.0950)***
γ	0.7987(0.0660)***	0.7737(0.0770)***	0.9202(0.0363)***
δ		0.1481(0.0897)*	-0.0945(0.049)*
θ	1.5809(2.3713)	1.6235(2.7148)	0.0716(0.0908)
$Q^2(24)$	22.776[0.474]	23.539[0.430]	25.962[0.303]
ARCH(10)	1.168[0.311]	1.052[0.399]	1.224[0.273]
Note: See table 3.			

Table 11. Results of GJR–GARCH and EGARCH with contemporaneous U.S money supply(M3)

	GARCH	GJR-GARCH	EGARCH
c_1	0.8815(0.3970)**	0.7867(0.4071)*	0.7884(0.4067)*
c_2	0.1309(0.0600)**	0.1262(0.0619)**	0.1567(0.0618)**
α	1.9587(2.4112)	2.3997(2.5660)	-0.0226(0.1331)
β	0.1425(0.0564)**	0.0823(0.0641)	0.3129(0.1016)***
γ	0.8276(0.0644)***	0.8075(0.0786)***	0.9325(0.0370)***
δ		0.1344(0.0929)	-0.0863(0.0549)
θ	0.1690(2.4208)	0.6239(2.6037)	0.0696(0.0713)
$Q^2(24)$	22.608[0.484]	22.332[0.500]	24.003[0.404]
ARCH(10)	1.380[0.188]	1.193[0.294]	1.2777[0.242]
Note: See table 3.			

6. Summary

In this study we examine the relationships between change in Korean and U.S. money supply and stock returns with GARCH, GJR-GARCH and EGARCH models. There are several conclusions to this study. Frist, the stock returns exhibits strong volatility persistence and asymmetry. Second, the inclusion of contemporaneous change in Korean and U.S. money supply in the all models do not

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explains Korean stock returns volatility. Third, the asymmetric effect of bad news on volatility is higher when contemporaneous change in Korean and U.S. money supply is included. Change in the Korean and U.S money supply directly does not affect the Korean stock returns. Finally, the results based on a variance model indicate that the money supply(Korea, U.S.) did not have any effect. And, it is not affect asymmetric effects on returns. While stock returns should not be guided by the direct effect on the change in money supply, influence of money supply should not be disregarded due to the impact of stock returns on macroeconomic activity.

References

[1] K.E. Homa and D.M. Jaffee, "The supply of money and common stock prices.", *Journal of Finance*, Vol. 26, No.5, pp. 10445-1066, 1971.

[2] M. J. Hamburner and L.A. Kochin, "Money and stock prices: The Channels of Influences", *Journal of Finance*, Vol.27, No.2, pp.231-249, 1972

[3] W. Thorbecke, "On stock market returns and monetary policy", *The journal of Finance*, Vol.52, No.2, pp.635-654, 1997.

[4] Sun-Wung Hwang, "An Empirical Study on the linkage between money supply and stock price in the Korean economy", *Journal of Industrial Economics and Business*, Vol.7, No.1, pp.213-245, 1998.

[5] Shin-Sheng Chen, "Does monetary policy have asymmetric effects on stock returns?", *Journal of Money, Credit and Banking*, Vol39, No2/3, pp.667-688, 2007.

[6] Michael S. Rozeff, "Money and stock prices: Market efficiency and the lag in effect of monetary policy", *Journal of Financial Economics*, Vol.1, No.3, pp.245-302, 1974.

[7] Richard J. Rogalski and Joseph D. Vinso,"Stock returns, money supply and the direction of causality", *The Journal of Finance*, Vol.32, No.4, pp.1017-1030, 1977.

[8] Hyung-Mo Yoon, "The effect of money stock on share prices volatility-Analysis with GARCH-", *Journal of Economic Studies*, Vol.23, No.1, pp.1-22, 2005.

[9] Sara Alatiqi and Shokoofeh Fazel, "Can money supply predict stock prices?" , *Journal for Economic Educators*, Vol.8, No.2, pp.54-59, 2008.

[10]T. Bollerslev, "Generalized autoregressive conditional heteroskedasticity", *Journal of Econometric*, Vol.31, 1986, pp.307-327, 1986.

[11]Daniel B. Nelson, "Conditional Heteroskedasticity in Asset Returns: A New Approach", *Econometrica*, Vol59, No.2, pp. 323-370, 1991.

[12]Lawrence R. Glosten, Ravi Jaganathan and David E. Runkle, "On the relation between expected value and the volatility of the nominal excess return on stocks", *The Journal of Finance*, Vol.48, No.5, pp.1779-1801, 1993.

[13]Michael. W, Keran, "Expectation, Money and the stock market", *Federal Reserve Bank of St.*

Louis Review, Vol.53, No.1, pp.16-31, 1971.

[14]James E. Pesando, “The supply of money and common stock prices: Further observations on the econometric evidence”, *Journal of Finance*, Vol.29, No.3, pp.909-921, 1974

[15]Chung S. Kwon and Tai S. Shin, “Cointergration and causality between macroeconomic variables and stock market returns”, *Global Finance Journal*, Vol.10, No.1, pp.71-71, 1999.

[16]Nuno Cassola and Claudio Morana, “Monetary policy and the stock market in the euro area”, *Journal of Policy Modeling*, Vol.26, pp.387-399, 2004.

[17]Abdullah Alsubaie and Mohammad Najand, "Trading volume, time-varying conditional volatility, and asymmetric volatility spillover in the Saudi stock market", *Journal of Multinational Financial Management*, Vol. 19, pp. 139-159, 2009.

[18]T. G. Andresen, "Return volatility and trading volume : an information flow interpretation of stochastic Volatility", *Journal of Finance*, Vol. 51, No.1, pp. 169-204, 1996.

[19]H. Bessemdbinder and Paul J. Seguin, "Futures-trading activity and stock price volatility", *Journal of Finance*, Vol. 47, No. 5, pp. 2015-2034, 1992.

[20]Gong-meng Chen, Michael Firth and Oliver M. Rui, "The dynamic relation between stock returns, trading volume, and volatility", *Financial Review*, Vol. 38, pp. 153-174, 2001.

[21]Thomas E. Copeland, "A model of Asset trading under the assumption of sequential information arrival", *Journal of Finance*, Vol. 31, No. 4, pp. 1149-1168, 1976.

[22]Robert F. Engle, "Autoregressvie conditional heteroscedasticity with Estimates of the variance of United Kingdom inflation", *Ecomometrica*, Vol. 50, No. 4, pp. 987-1007, 1982.

[23]Engle , R.F. and Ng, V.K., “Measuring and testing the impact of news on volatility”, *Journal of Finance*, Vol.48, pp.1749–78, 1993.

[24]Thomas W. Epps and Mary Lee Epps(1976), "The stochastic dependence of security price changes and transaction volumes : Implications for the Mixture-of-Distributions Hypothesis", *Econometrica*, Vol. 44, No. 2, pp. 305-321, 1976.

[25] J. Fleming, Chris Kirby and Barbara Ostdiek(2006), "Stochastic volatility, trading volume, and the daily flow of information", *Journal of Business*, Vol. 79, No. 3, pp. 1551-1590, 2006.

[26]Giampiero M. Gallo and Pacini Barbara, “The effects of trading activity on market Volatility”, *European Journal of Finance*, Vol.6, pp.163-175, 2000.

[27]Eric Girard and Rita Biswas(2007), "Trading volume and market volatility : developed versus Emerging stock markets", *Financial Review*, Vol. 42, pp. 249-459, 2007.

[28]L. Harris, 1986, “Cross-security tests of the mixture of distributions hypothesis”, *Journal Financial and Quantitative Analysis*, Vol. 21, pp.39-46, 1986.

ISBN: 978-605-64453-0-9

[29]Christopher G. Lamoureux and William D. Lastrapes, "Heteroskedasticity in stock return data : volume versus GARCH effects", *Journal of Finance*, Vol. 45, No. 1, pp. 221-229, 1990.

[30]Cheng F. Lee and Oliver M. Rui, "Does trading volume contain information to predict stock returns? evidence from china's stock markets", *Review of Quantitative Finance and Accounting*, Vol. 14, pp. 341-360, 2000.

ISBN: 978-605-64453-0-9