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THE ROLE OF GOLD IN FINANCIAL INVESTMENT: A MALAYSIAN PERSPECTIVE

Abstract. *The paper assesses whether gold investment provides diversification, hedge, or safe haven benefit for the case of Malaysia using daily data from August 2001 to March 2010. The results indicate that at best gold serves as a diversification asset for Malaysian investors. In the analysis, we also find changing investment role of gold in recent years marked by global financial market uncertainties. The hedge and safe haven properties of gold investment documented in the initial sub-sample have been degraded to only diversification property. Moreover, the extreme market conditions tend to weaken the role of gold as a diversification asset in financial portfolio formation.*

Keywords*: Financial Investment, Gold, Diversification, Hedge, Safe Haven*

JEL Classification: G10, G11

1. INTRODUCTION

Over the last two decades, the international financial markets have experienced a series of financial crises and turbulences in different parts of the world. Among them include the Mexican crisis in 1994, the Asian financial crisis in 1997/1998, the Russian crisis in 1998, Brazilian crisis in 1999, the Argentine financial crisis in 2001/2002 and most recently the US subprime crisis in 2007 and Greece's financial crisis in 2009. In all cases, these crises resulted in drastic drop and excessive volatility in the stock

markets of the crisis-originating countries. The national markets of other economies suffered as well through the "contagion" effect. These adverse financial shocks brought substantial costs to the crisis-affected countries as the shocks were translated into banking distress and economic slumps. As an example, the 1997/1998 Asian crisis brought the market index of Thailand, the crisis-originating country, to nosedive from a peak of 1410.33 points in January 1996 to 214.53 in August 1998. Other regional markets particularly Indonesia, Malaysia, and the Philippines nosedived as well, observing their market prices to shred by more than half over roughly the same periods. These shocks were then propagated to the real sector. The growth rates of Indonesia, Malaysia, the Philippines and Thailand in 1997 were respectively 4.7%, 7.3%, 5.2% and -1.7%. In 1998, these figures dropped drastically for all countries to -13.1% (Indonesia), -7.4% (Malaysia), -0.6% (Philippines) and -10.2% (Thailand).

The recurring heightened volatility in the stock markets is normally viewed to impose substantial risk to stock investment. Existing studies on stock market risk have a predominant focus on characterizing the risk using GARCH-type models and whether the risk can be diversified through international diversification. The risk dynamics have been examined for not only developed markets, which occupy majority of studies, but also to emerging markets as far as Lithuania (Teresienė, 2009). Studies on the benefits of international diversification tend to suggest increasing interactions among national markets and their interactions are more intense during crisis episodes and accordingly limit the benefits of diversifying away financial risks originating from a specific market (Lee and Kim, 1993; Arshanapalli and Doukas, 1993; and Meric and Meric (1997). These studies thus highlight the need to identify other types of financial assets as a protection against this risk.

The crisis episodes seem to conjure up the image of gold as an alternative investment asset or an important part of assets in financial portfolios. The emerging interest in gold in times of crises perhaps stems from its historical use as a medium of exchange and standard of value and its stable purchasing power over times. In light of these, few studies have raised an empirical inquiry as to whether gold can at least diversify portfolio risk or at best provide a safe haven. Notable among these studies are recent works by Capie et al. (2005), Hillier et al. (2006) and Baur and Lucey (2010). Capie et al. (2006) examine whether gold serves as a hedge against fluctuations in sterling-dollar and yen-dollar rates and arrive at a conclusion that gold possesses the exchange rate hedge property. However, they also note that the extent of hedging tends to vary over time. Hillier et al. (2006) evaluate the investment role of precious metals – gold, platinum and silver. They note low correlations between these three metals and stock market returns, which suggest the diversification role of the precious metals. Evidence for their hedging ability is also uncovered during the periods of abnormal stock market volatility. Finally, Baur and Lucey (2010) estimate the relations between U.S., U. K. and German stock and bond returns and gold returns.

They document evidence for the hedging role of gold. Moreover, gold also provides a safe haven in extreme market conditions.

The present paper attempts to contribute to this line of research by examining the role of gold in financial investment from an emerging market perspective, Malaysia. We focus on the emerging Malaysian market since it is the emerging markets that frequently exhibit volatile market movements relative to the advanced markets and, in Malaysia, the importance of gold was strongly voiced during the Asian crisis. In the analysis, we assess whether gold investment can provide diversifying role, hedging role or safe haven role for stock market investors as recently defined by Baur and Lucey (2010), which is based on correlations between gold returns and stock market returns. Simply stated, gold is said to provide a diversifying role if its return is positively but less than perfectly correlated with stock market return. Gold serves as a hedge if its return is independent from or negatively correlated with the stock return. Finally, if this hedging characteristic of gold investment also prevails during periods of market turmoil or stress, the gold is considered to be a safe haven.

In the analysis, we look at the relation between domestic gold and stock market returns within a regression framework. Based on daily data from August 2001 to March 2010, our analysis covers both full sample and two equally-divided sub-samples. The latter is implemented such that we can roughly address possible changing relations between gold and stock returns in the recent period marked by heightened volatility during years surrounding the US subprime crisis. The next section details the empirical approach. Section 3 describes the data followed by estimation results in section 4. Finally, section 5 concludes with the main findings.

2. EMPIRICAL APPROACH

In line with Baur and Lucey (2010), we rely on a regression model to assess the investment role of gold. More specifically, since we observe evidence of time-varying conditional variances of the regression residuals, we base our analysis on the EGARCH(1, 1) specification. To begin, our basic EGARCH(1, 1) model is written as:

$$\Delta G_t = \beta_0 + \beta_1 \Delta S_t + \beta_2 \Delta S_{t-1} + \varepsilon_t \tag{1}$$

$$\varepsilon_t \mid I_{t-1} \sim N(0, h_t) \tag{2}$$

$$\log h_t = \theta_0 + \theta_1 \left| \frac{\varepsilon_{t-1}}{\sqrt{h_{t-1}}} \right| + \theta_2 \frac{\varepsilon_{t-1}}{h_{t-1}} + \theta_3 \log h_{t-1} \tag{3}$$

where G is gold prices, S is stock prices and Δ is the first-difference operator. Both gold and stock prices are expressed in natural logarithm. Thus, ΔG and ΔS represent the continuously compounded rates of return of respectively gold and stock investments. Note that we incorporate once-lagged stock return in the regression since the changes in stock prices may be impounded into the prices of gold with lag. We find lag 1 to be sufficient according to the AIC information criterion.

Equation (1) is the mean equation, which we use to infer the investment role of gold. In equation 2, we specify the error density function, conditional on information up to time t – 1, to be normally distributed with mean 0 and variance h_t. Equation (3) specifies the error variance to follow an EGARCH(1, 1) process. The EGARCH model has an advantage in that it requires no non-negativity restrictions of the parameters in the variance equation as in the case of the traditional GARCH(1, 1) specification. Moreover, it allows positive and negative shocks to have asymmetric influences on volatility (Lobo, 2000 and Koutmos et al., 2006). Based on (3), negative news (i.e. $\varepsilon_t < 0$) leads to higher volatility if $\theta_2 < 0$.

As noted, the investment role of gold is inferred from (1). More specifically, gold serves as a diversification asset if the sum of stock market coefficients is significantly more than 0 but less than 1. On the contrary, if it is insignificantly different from 0 or significantly negative, then gold has the hedging property. Then, in order to assess whether gold is a safe haven, we extend the basic mean equation to include an interactive dummy as:

$$\Delta G_t = \beta_0 + \beta_1 \Delta S_t + \beta_2 \Delta S_{t-1} + \beta_3 (D_P \times \Delta S)_t + \beta_4 (D_P \times \Delta S)_{t-1} + \varepsilon_t \qquad (4)$$

where D_P is a dummy variable taking the value of 1 if the stock returns are in the pth percentile and 0 otherwise. We consider p = 1, 2.5, 5, and 10. Equation (4) nests equation (1) as a special case when the extreme market conditions do not change the relations between gold and stock returns, i.e. $\beta_3 = \beta_4 = 0$.

Based on the estimation of (4), we test the following hypotheses (H1 and H2) using the standard Wald F-statistics:

$$\text{H1:} \quad \beta_1 + \beta_2 = 0 \qquad (5)$$

$$\text{H2:} \quad \beta_1 + \beta_2 + \beta_3 + \beta_4 = 0 \qquad (6)$$

Hypothesis 1 evaluates the diversifying and hedging roles of gold investment in normal market conditions, as stated above. Meanwhile, hypothesis 2 adds the safe haven role in the analysis. Namely, if the hypothesis is not rejected or if the coefficient sum is negative, then gold investment serves as a safe-haven for investors. If we find the coefficient sum to be significantly positive, we further test whether it is equal to 1.

We estimate the EGARCH(1, 1) with mean equation (1) and (4) for the whole sample. In addition, we also have interest in examining the possible changing investment role of gold. We observe changing market conditions over time, marked by heightened volatility in years surrounding the US sub-prime crisis. Arguably, this might intensify the flight to quality and, accordingly, change the correlation structure between stock and gold returns. To this end, we divide the sample into two sub-samples. The second sub-sample corresponds to the period of higher volatility in the Malaysian stock market arising from its responses to market uncertainties in the western world.

3. DATA

We employ daily data from August 2001 to March 2010, the span of which is dictated by data availability of gold prices. The prices of one troy ounce domestic gold bullion, known as *Kijang Emas*, are used to represent gold prices. Normally, existing studies on the issue employ global gold prices (in US dollar) converted into the currency unit of a country under study using the USD rate of the domestic currency to represent gold prices. We have no reason to believe that the emerging stock markets, which are small relative to the global markets, have influences on or relations to the global gold prices. Accordingly, the evidence for significant relation between global gold and stock market returns may reflect exchange rate change – stock return relation. For example, the concurrent ringgit depreciation and stock market downturn observed during the Asian crisis may suggest a safe-haven role of gold even if the global gold prices drop but less proportionately than the depreciation rate, i.e. gold lacks the property of a safe haven. For stock prices, we use the Kuala Lumpur composite index. Table 1 provides descriptive statistics of the two series in first-difference, i.e. their rates of return. Meanwhile, Figure 1 plots the two series in both level and first difference forms. We also depict the conditional volatility of the stock market return to reflect changing market conditions over time.

Both gold and stock prices exhibit an upward trend over the sample period, respectively recording positive average daily returns of 0.06% and 0.03%. The time pattern of stock prices also demonstrates marked reduction in 2002 and late 2007 to 2008, respectively the years of the Argentine financial crisis and the US subprime crisis. Interestingly, gold return seems to be relatively more volatile than stock market return as reflected by their respective standard deviations. Both series are

characterized by excess kurtosis or volatility clustering. The Jargue-Bera test statistics for normality soundly reject the null of normal distribution for both yields. These characteristics seem to justify the adoption of GARCH-type models in empirical specification. We further estimate an AR(1)-EGARCH(1, 1) for the market return and extract its time-varying conditional variances. From the plot in Figure 1, while there is a short-lived heightened volatility at the beginning of the sample, the volatility pattern of the stock market is more pronounced and prolonged in recent years. Indeed, based on the stock market volatility plot, we can roughly divide the sample into two sub-periods, the low volatility and high volatility regimes.

Table 1: Descriptive Statistics

	ΔG	ΔS
Mean	0.000561	0.000305
Median	0.000000	8.72E-05
Maximum	0.124645	0.042587
Minimum	-0.078182	-0.099785
Std. Dev.	0.011909	0.008518
Skewness	0.092587	-0.999659
Kurtosis	12.58588	15.06466
Jarque-Bera	8656.123	14082.94
Probability	0.000000	0.000000
Observations	2260	2260

4. ESTIMATION RESULTS

This section presents the estimation results of the models. We first look at the full sample and then discuss the results from sub-sample estimation. We equally divide the sample into two sub-samples. Thus, the first sub-sample covers the period August 2001 – November 2005 and the second sub-sample the period December 2005 – March 2010. We have interest to see whether the recent heightened volatility of the Malaysian stock market influences its relations with the domestic gold bullion market. Five models are estimated – the basic model and four extended models to allow for the return relations in extreme market conditions. We define the extreme market conditions in term of percentiles. More specifically, a dummy variable is created, which is then interacted with the market return, to represent the extreme market conditions. The dummy takes the value of 1 if the market returns are lower or equal to the pth percentile. We consider p = 10, 5, 2.5 and 1 based on the full-sample market returns.

Figure 1: Graphical Plots of the Series

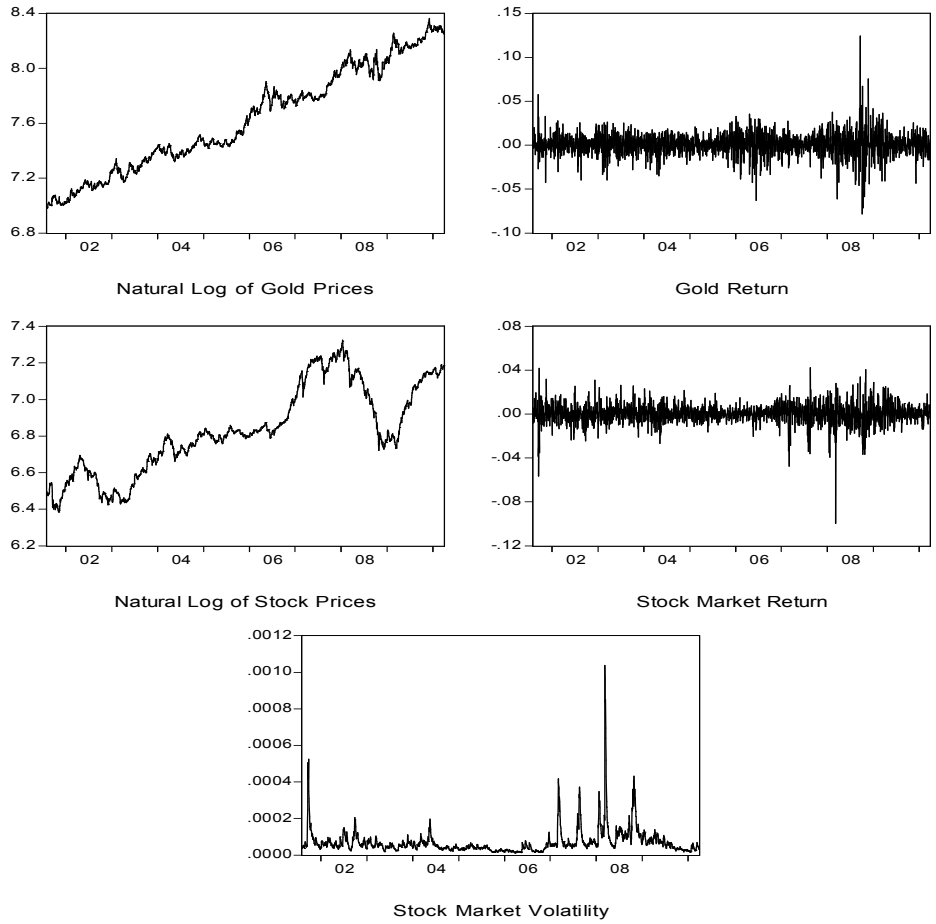

Table 2 provides estimation results for the full sample. Panel (a) and panel (b) respectively present the results of mean and variance equations. Meanwhile, panel (c) gives the Wald-F statistics for the investment role – diversification, hedge and safe haven - of gold. If the hypothesis of zero coefficient sum is not rejected, we do not conduct further test of unitary coefficient sum, the reason of which is obvious. Likewise, if we find the interactive dummies to be insignificantly different from zero, we do not carry out the test to see whether their relations during extreme market conditions are significant. Take note from the results that the coefficients of the variance equation are all significant. The volatility tends to depend most on its past volatility. Moreover, there seems to be no leverage effect in the gold market as is normally observed for stock assets. The past negative shocks (negative error terms)

tend to dampen future volatility instead of intensifying it as reflected by the positive coefficient of the standardized error terms, i.e. θ_2. These characteristics of error variances prevail in all models estimated and, as a result, will not be reiterated in further discussion

Table 2: Estimation Results – Full Sample

Estimated Coefficients	Basic Model	Extended Model with Percentiles (P)			
		P = 10	P = 5	P = 2.5	P = 1
(a) Mean Equation					
β_0	0.0008***	0.0010*	0.0010*	0.0009*	0.0009*
β_1	0.0190	0.0205	0.0144	0.0116	0.0114
β_2	0.0876*	0.0444	0.0589***	0.0724**	0.0770*
β_3	--	-0.0123	0.0005	0.0052	-0.0019
β_4	--	0.1383**	0.1230**	0.0893	0.1045
(b) Variance Equation					
θ_0	-0.1547*	-0.1643*	-0.1645*	-0.1612*	-0.1651*
θ_1	0.1092*	0.1119*	0.1114*	0.1114*	0.1129*
θ_2	0.0502*	0.0495*	0.0501*	0.0498*	0.0488*
θ_3	0.9915*	0.9907*	0.9906*	0.9909*	0.9906*
(c) Hypothesis Testing					
$\sum_{i=1}^{2} \beta_i = 0$	0.1067 [13.636]*	0.0649 [2.230]	0.0733 [3.311]***	0.0840 [4.949]**	0.0883 [5.741]**
$\sum_{i=1}^{2} \beta_i = 1$	0.1067 [958.32]*	--	0.0733 [528.69]*	0.0840 [588.12]*	0.0883 [611.65]*
$\sum_{i=1}^{4} \beta_i = 0$	--	0.1909 [20.266]*	0.1968 [18.440]*	--	--
$\sum_{i=1}^{4} \beta_i = 1$	--	0.1909 [363.87]*	0.1968 [271.65]*	--	--

Note: *, **, and *** denote significance at 1%, 5% and 10% respectively. The numbers in squared brackets are Wald-F statistics.

Looking at the basic model, we note the significance of once-lagged stock return. Its coefficient is positive. The Wald-F tests for the coefficient sum of the stock market returns in panel (c) indicate that it is significantly distinguishable from 0 but less than 1. Thus, based on (1), the gold investment does not seem to provide a hedging role. At best, since the relation between gold and stock returns is positive but less than perfectly correlated, it serves as a diversifying role in financial portfolio formation. When we incorporate extreme market conditions, we note the increased relations between gold and market returns. Using the 10^{th} percentile, their relation in normal market conditions is insignificantly different from zero. However, it turns positive and significant during the extreme market conditions. At the 5^{th} percentile, gold return tends to be positively and significantly related to market return and their relation is stronger during extreme stock market downturns. For the 2.5^{th} and 1^{st} percentiles, we document no changes in the relations as the coefficients of the interactive dummies are indistinguishable from zero. These results, thus, indicate the absence of a safe haven characteristic in gold investment. To the contrary, during extreme stock market conditions, the diversification role of gold seems to weaken.

The results for sub-sample estimation are given in Table 3. To conserve space, we present only the estimated slope coefficients of the extended mean equation and test statistics for the sum of the coefficients being equal to 0. Still, it should be noted that, in all cases of positive coefficient sum, we uncover evidence that gold and stock returns are less than perfectly correlated. The results from sub-sample analysis are revealing as to potential changes in the investment role of gold. During the first sub-period and based on the 10^{th} percentile (panel a), we find negative and significant relation between the two markets in normal stock market conditions. In extreme market conditions, the two markets seem independent. Using other percentiles (5^{th}, 2.5^{th}, and 1^{st}), we also document evidence suggesting insignificant relation between the two markets regardless of market conditions. Take note that, if we focus on contemporaneous correlations between gold and stock returns, we find the coefficient to be negative but turns positive in the extreme market conditions. However, the stock market is noted to have contradictory once-lagged effect on the gold market. Incorporating this lagged effect such that we may assess the total effect, we arrive at the conclusion that the two markets are at best independent during the first sub-period. These results indicate that gold investment plays a hedging role during normal times and serves as a safe haven during abnormal times of the stock market.

However, this property of gold investment tends to disappear during the recent period. In all cases, we note significant and positive sum of stock market coefficients during normal stock market conditions. The null hypothesis $\beta_1 + \beta_2 = 0$ is rejected at 1% significance level. Moreover, there seems to be a strengthened relation between the two in extreme market conditions since the interactive dummies are distinguishable

from 0. In all cases, the estimated coefficient sum of stock market returns during extreme market downturns is larger. Based on these sub-sample results, we incline to point to the varying investment role of gold over times. In the Malaysian context, the role of gold as a hedge and safe haven asset has been degraded to being a diversification asset in recent years marked by global market uncertainties.

Table 3: Estimation Results - Subsamples

Percentile/ Sample	Estimated Slope Coefficients				Hypothesis Testing	
	β_1	β_2	β_3	β_3	$\sum_{i=1}^{2}\beta_i = 0$	$\sum_{i=1}^{4}\beta_i = 0$
(a) P = 10						
Aug03– Nov05	-0.1421*	0.0310	0.1206***	0.0754	-0.1111 [3.190]***	0.0850 [0.947]
Dec05– Mar10	0.1472*	0.0494	-0.119***	0.2113*	0.1965 [8.685]*	0.2892 [29.743]*
(b) P = 5						
Aug03– Nov05	-0.1255*	0.0714	0.0891	-0.1001	-0.0542 [0.868]	--
Dec05– Mar10	0.1207**	0.0499	-0.0792	0.2408*	0.1707 [7.502]*	0.3324 [32.81]*
(c) P = 2.5						
Aug03– Nov05	-0.1102*	0.0633	0.0414	-0.0564	0.0469 [0.774]	--
Dec05– Mar10	0.1127**	0.1022**	-0.0690	0.1290**	0.2149 [13.16]*	0.2749 [22.27]*
(d) P = 1						
Aug03– Nov05	-0.1151*	0.0674	0.2444*	-0.258***	-0.0478 [0.839]	-0.0622 [0.264]
Dec05– Mar10	0.1249*	0.1117*	-0.1462**	0.1589**	0.2366 [17.66]*	0.2493 [16.68]*

Note: *, **, and *** denote significance at 1%, 5% and 10% respectively. The numbers in squared brackets are Wald-F statistics.

5. CONCLUSION

The heightened volatility of financial markets sparked by a series of financial crises in different parts of the world has raised serious concern over stock investment risk and, consequently, necessitates the need to identify alternative financial assets that can ameliorate investment portfolio risk. In light of this, we empirically investigate whether gold can serve as a diversification, a hedge, or a safe haven asset for the case of Malaysia. We look at the issue from Malaysia's investment perspective by estimating the relations between gold and stock returns using daily domestic gold and stock market data from August 2001 to March 2010. In general, we find gold to serve as a diversification asset. The analysis also reveals two important findings. First, during periods of extreme market conditions, the relations between gold and stock market returns tend to be stronger. This signals the weakened diversification benefit of gold investment during period of large market downturns. And second, based on two equally-divided sub-samples, gold is found to provide a hedge against stock market risk and a safe haven during extreme stock market downturns during the first sub-sample. However, these properties of gold tend to disappear during recent years. Thus, the investment role of gold has been degraded to be a diversification asset. Again, the diversification benefit seems weakened during extreme market conditions. In short, the investment role of gold is time-varying. Probably, in the case of Malaysia, the degradation of gold from a hedge or safe haven asset to a diversification asset over recent years is due to the prolonged volatility of the market during years surrounding the sub-prime crisis.

REFERENCES

[1]**Arshanapalli, B. and Doukas, J. (1993),** ***International Stock Market Linkages: Evidence from Pre- and post- October 1987 Period***, *Journal of Banking and Finance*, 17: 193-208;

[2]**Baur, D. G. and Lucey, B. M. (2010),** ***Is Gold a Hedge or a Safe Haven? An Analysis of Stocks, Bonds and Gold****, The Financial Review* 45:217-229;

[3]**Capie, F., Mills, T. C. and Wood, G. (2005),** ***Gold as a Hedge against the Dollar***, *Journal of International Financial Markets, Institutions and Money* 15: 343-352;

[4]**Hillier, D., Draper, P. and Faff, R. (2006),** ***Do Precious Metals Shine? An Investment Perspective****, Financial Analysts Journal* 62(2): 98-106;

[5]**Koutmos, G. and Martin, A. D. (2003),** ***Asymmetric Exchange Rate Exposure: Theory and Evidence****, International Journal of Money and Finance* 22(3): 365-383;

[6]**Lee, S. B. and Kim, K. J. (1993),** ***Does the October 1987 Crash Strengthen the Co-movements among National Stock Markets*** ?, *Review of Financial Economics*, 3: 89-102;

[7]**Lobo, B. J. (2000*), Asymmetric Effects of Interest Rate Changes on Stock Prices*,** *The Financial Review* 35: 125-144;
[8]**Meric, I. and Meric. G. (1997), *Co-movements of European Equity Markets before and after the 1987 Crash***, *Multinational Finance Journal*, 1:137-152;
[9]**Teresienė, D. (2009*), Lithuanian Stock Market Analysis Using a Set of GARCH Models*,** *Journal of Business Economics and Management* 10(4): 349-360.