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IS GOLD A HEDGE OR A SAFE HAVEN? AN EMPIRICAL EVIDENCE OF GOLD AND STOCKS IN MALAYSIA

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ABSTRACT

This study investigates the role of gold in Malaysia for the period of July 2001 - February 2013. Specifically, we examine whether gold can be used as a hedge on average or a safe haven during financial turmoil. The noteworthy finding of our study is that gold plays an important role as a hedge, but its characteristic is short-lived. On one hand, we find little evidence that gold is a safe haven in some thresholds. On the other hand, gold at best is a weak safe haven for stockholders during financial stress. These results indicate that gold plays a minor role in emerging market like Malaysia during stock market slump. Therefore, holding a well-diversified portfolio could help in providing reasonable return and protection from economic collapse.

Keywords: Gold, Hedge; Safe Haven; Financial Crisis.

1. INTRODUCTION

Recently, it is increasingly difficult to ignore the importance of gold as an investment asset. There are calls from financial media of holding gold. Inter alia, gold can be included in portfolio of financial assets, namely stocks and bonds because investors can get diversification benefits stemming from the less than perfect correlation of gold with these assets. The high prices of gold can be linked to a "fear" trade, to wit, the price of gold increases due to investors' fears of weak future stock market.

Since year 2000, the world gold price has shown a dramatic growth of 444% (BullionVault, 2013). The performance of gold is more impressive given the losses suffered in other asset classes during the 2007/2008 financial crisis. In times of uncertainty, unwillingness to trade cause asset values become ambiguous while the trading of gold increase due to the relative

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simplicity of gold market (Dee, Li, & Zheng, 2013). Therefore, since the financial crisis, investment funds poured into precious metals. This suggests that investment in gold is not only driven by inflation hedge consideration as mentioned by Kat & Oomen (2006) and Jensen, Johnson, & Mercer (2002) but rather as tactical value in portfolio allocation. While the financial media regularly refer gold as a safe haven asset, the claim has rarely been tested in the literature.

The view that whether gold provides a diversifier, hedge or safe haven is the focus of this study. While there are a variety of definitions for asset hedge; this study uses the definition suggested by Baur & McDermott (2010) and Baur & Lucey (2010) who see it as an asset that is uncorrelated or negatively correlated with another asset or portfolio on average. A hedge does not have the (specific) property of reducing losses in times of market stress or turmoil since the asset could exhibit a positive correlation in such periods and a negative correlation in normal times with a negative correlation on average. The term diversifier refers as an asset that is positively (but not perfectly correlated) with another asset or portfolio on average. Similar to the hedge, the diversifier does not have the (specific) property of reducing losses in extreme adverse market conditions since the correlation property is only required to hold on average.

A distinguishing feature of hedge asset and diversifier asset with safe haven asset is the length of the effect, where safe haven asset can be defined as an asset that is negatively correlated with another asset or portfolio in times of market stress or turmoil. A haven is a place of safety, refuge and offering favourable opportunities or conditions (Webster, 2013). In times of stormy weather, ships seek out the safe haven of a harbour that offers investors shelter to ride out the storm. A safe haven asset must therefore be some asset that holds its value in 'stormy weather' or adverse market conditions. This property does not force the correlation to be positive or negative on average but only to be zero or negative in specific periods. Hence, in normal times or bullish market conditions the correlation can be positive or negative. Such an asset offers investors the opportunity to protect wealth in the event of negative market conditions and compensating the investor for losses since the price of the haven asset rises when the price of the other asset or portfolio falls. Furthermore, the existence of such an asset is expected to benefit and enhance the stability of capital markets by reducing the severity and the duration of extreme market conditions.

This study contributes and fills the gap of literature in several aspects. First, while there are studies on the role of gold as a safe haven asset in develop markets; there has been little discussion about this issue in emerging country, like Malaysia. We add to the previous studies by looking at a small emerging market. Second, most studies in this issue have only been carried out from an international perspective, while far too little attention has been paid from a domestic point of view. All the aforementioned studies employ gold price in the United States dollar in their analysis. Instead of using the dollar-denominated gold price and converting it into domestic currency unit as in Chua & Woodward (1982), Baur & Lucey (2010), and Baur & McDermott (2010), this study uses the domestic gold price instead. Since the price of Malaysian gold is determined by the international gold market price, the use of gold price quoted domestically in Ringgit screens out potential confounding effect of exchange rate movement and currency conversion (Ibrahim, 2012). It is not cost effective payment option for

supplier or buyer party that has to convert dollar into local currency, since exchange rate fee and volatility costs are passed on in the form of the higher prices. Third, in term of econometric model, this study compares the systematic analysis with reaction in extreme conditions. The former analyzes how gold reacts to shocks in the stock market on average, where the findings do not necessarily provide evidence for a safe haven but only a hedge. While the latter analyzes the reaction of gold to shocks under extreme conditions, which is a conditional analysis. Since we condition on extreme events, the framework tests for the existence of a safe haven property. In addition, in contrast with Ibrahim & Baharom (2011), this study estimates different thresholds simultaneously to obtain the total effect in extremely falling stock market as suggested by Baur & Lucey (2010).

2. THE PERFORMANCE AND CHARACTERISTICS OF GOLD AS A FINANCIAL ASSET

Gold with its special nature always been regarded as a safe asset. For thousands of years gold is used as a means of exchange and it is said as wealth "at all times and all places". Willem Buiter, a former professor at the London School of Economics, said gold the subject of "the longest-lasting bubble in human history". He says that he would not invest more than a sliver of his wealth "into something without intrinsic value, something whose positive value is based on nothing more than a set of self-confirming beliefs" (Economist, 2010).

While investors might consider gold as a store of value, inflationary hedge and safe haven, gold main drawback is that it pays neither a dividend, like a share, nor a coupon, like a bond, nor a rent, like property. Nevertheless, the yields on the government bonds regarded as safest, notably America's and Germany's, are thin. Equity markets are weighed down by worries about economic growth. Investing in property, on the other hand, which lay at the root of the financial crisis, requires boldness that many still lack. Since gold is an investment strategy that does not generate income, its attraction lies solely in the hope that its value will rise or at least be maintained (Economist, 2010).[1]

Like those of other goods, gold prices are determined by supply and demand. The demand for gold is roughly classified into three categories: First, demand for industrial and production use, where many use it for jewellery purposes and application in numerous industries, for instance gold is applied in the health, electronics, and chemical industries. Second, demand for use as holdings by central banks as a store of value. Occasionally, central banks engage in buying and selling gold (Burns, 1997). Third, demand as an investment asset, where it is used by the governments, fund managers, and individual as an investment (Ghosh, Levin, Macmillan, & Wright, 2004). With regard to the third demand type, exchange-traded funds (ETFs) that index gold price facilitate gold investments for several years. As a result, the investment demand for

[1] The appetite for gold arises partly from the paltry, uncertain returns from more conventional investments. Officer (2009) argues that: "There is no theoretical rationale why anyone should even want to invest in it. Gold has value only because we believe it is valuable. It is a collective hallucination".

gold exceeds the jewellery demand in 2009, while the supply of gold constant or declining (Economist, 2010). As for the supply-side factors, gold is supplied by mining, scraps of gold products and sales by central banks.

3. LITERATURE REVIEW

A large and growing body of literatures investigate the role of gold in portfolio allocation (Chua, Sick, & Woodward, 1990; Hillier, Draper, & Faff, 2006; Jaffe, 1989; McDonald & Solnick, 1977; Sherman, 1982) mainly due to the for centuries, gold is perceived to be important in providing valuable diversifying qualities beyond those achievable in a portfolio devoted solely to financial assets. Using price of gold quoted in the United Kingdom, they argue that gold can be a good asset for portfolio diversification in an American portfolio since it allows to reduce risk and increase returns. While there are substantial empirical evidence in developed market regarding the relationship between gold returns and stock returns from the portfolio diversification perspective, studies on gold as a safe haven asset rarely been tested in the literature and still less clear, particularly using data quoted in currency other than the United Kingdom and the United States.

The serious discussions and analyses of this issue demonstrated by Baur & Lucey (2010) and Baur & McDermott (2010), where they take the idea of a discontinuous relation between gold and financial assets. Interestingly, the studies distinguish between the two functions of gold, as a hedge or a safe haven, and estimate a regression by adding interactive variables to capture the specific movements between the assets under times of stress in financial markets. Baur & Lucey (2010) investigate comparative study on daily data from 1995 until 2005 for the United States, the United Kingdom and Germany. They find that gold is a hedge for stocks in the United States and United Kingdom but not in Germany. Most important, the results imply that gold only serve as a safe haven against stocks in extreme negative stock market conditions (2.5% and 1% quantiles). The results also shows that purchasing gold after an extreme stock market shock yields a positive gold returns in the United States. Baur & Lucey (2010) also divide the sample in periods of bull and bear markets, and find that the estimate regarding gold returns as a hedge or a safe haven is highly significant in bear markets for all countries. Nevertheless, these results are based upon data prior the 2007/2008 financial crisis, where the performance of gold is more impressive during this period given the losses suffered in other asset classes and it is unclear if these differences still persist.

Baur & McDermott (2010) extend the analysis of Baur & Lucey (2010) in a number of ways. They use multiple- frequency data from 1979 until 2009 and look at investor reactions to varying degrees of 'stormy weather', in terms of both the severity and the duration of shocks to the financial system. In order to examine the time-varying behaviour of gold with respect to global stock markets, this study present coefficient estimates of a rolling window regression of the gold return on the world portfolio index. Baur & McDermott (2010) report that gold is a hedge and a safe haven for all European markets and the United States but not for the BRICs, Australia, Canada and Japan. As one single day of bad stock returns does not necessarily indicate a crisis, this study also use two alternative definitions of crises, crises defined as the upper 90%, 95% and 99% quintiles of stock volatility and three crises episodes arbitrarily dated. They find that gold is a safe haven during periods of high volatility on the stock market

(90% and 95% thresholds), but not during extreme returns uncertainty (99% threshold). Looking at specific crisis periods, gold is evidenced to have a strong safe haven for markets in the United States and Canada during the 1987 stock market crash and on European and the United States stocks during the crisis of October 2008. In this context, gold can be seen as a panic buy in the immediate aftermath of an extreme negative market shock. On the other hand, the results for the Asian crisis do not clearly indicate a safe haven effect of gold for any of the markets tested. They opine that gold is a weak safe haven in some emerging markets due to investors who suffering losses in emerging market stocks, rather than seeking an alternative haven asset, may readjust their portfolios towards the average by withdrawing from emerging markets in favour of developed market stocks. The analysis of the role of exchange-rate effects also shows that a common currency denomination (the United States dollars) of both stock and gold generally increases the co-movement in all market conditions eliminating or reducing the safe haven property of gold.

Coudert & Raymond-Feingold (2011) support the results of Baur & McDermott (2010), where the former estimate a time varying conditional covariance between gold and stocks returns from four countries (France, Germany, the United States, the United Kingdom) and the G-7. They find that gold qualifies as a safe haven against all these stock indices. This result holds for crises defined as recessions or bear markets, as the conditional covariance between gold and stocks returns is find negative or null in all cases. Furthermore, gold does not co-move with stock returns on average neither during recessions nor bear markets. More precisely, gold is a weak safe haven in most cases, as its correlation with stocks is not significantly different from zero during crises. This study also finds that gold can work as a hedge against stocks in most cases, though results are less clear-cut. While the results are quite convincing, one major drawback of this study is that the authors only use relatively low frequency data (monthly), where it only show gradual trend in stock markets, but cannot capture whether gold is a panic buy in the immediate aftermath of an extreme negative market shock.

Two years later, Baur & McDermott (2012) in their working paper report patterns of price changes in gold and how this asset is treated by investors during periods of market stress. They analyze the data of prices for the world stock market indices (MSCI) and gold bullion quoted in the United States dollars. Several findings can be observed from the results. First, using a graphical analysis of a small number of specific crisis events, the study find that gold tend to act as safe haven asset following stock market crises. Interestingly, during the 9/11 terrorist attacks and the recent global financial crisis, gold is the stronger and more immediate safe haven. The results of systematic analysis indicate that gold is a hedge against stock market losses and bond market losses, and the response of gold to market shock is quickly reversed. On the other hand, the results for conditional analysis show that gold is a safe haven if the stock market exhibits extreme negative returns. Nevertheless, the relatively quick reversal of gold does not occur. Therefore, while gold can act as safe haven asset, it is interesting to note that the response becomes both stronger and more persistent following the most extreme shocks.

Beside Baur & McDermott (2010), research in this area using different data sets also carried out among others by Do, Mcaleer, & Sriboonchitta (2009), Bhunia & Das (2012) and Anand & Madhogaria (2012). Nevertheless, a serious deficiency of the above studies is in term of the empirical work, where the authors fail to draw an inference and a distinction between

hedge and safe haven of gold. Do, et al. (2009) investigate the effects of gold return and gold volatility in London on the stock markets of five ASEAN countries and find that gold acts as a substitute for stocks in the Philippines and Vietnam, while it acts as a complement for stocks in Indonesia, Malaysia and Thailand. This indicates that keeping gold and stocks or selling them together might be of interest in Indonesia, Malaysia and Thailand. However, in Vietnam as the international gold market becomes more volatile, investors could be interested in changing their trading behaviours from stock exchanges to trading volatility in the gold market. In the Philippines, an increase in the international gold market return might cause a decrease in its stock market return, so part of capital in its stock market might be transferred to the gold market. Bhunia & Das (2012), on the other hand, taking into consideration domestic gold price and stock market returns based on NSE NISTY (National Stock Exchange Fifty). They find feedback causality between the selected variables and indicate that the gold prices Granger cause stock market returns and stock market returns also Granger cause the gold prices in India. Anand & Madhogaria (2012) performed a similar study in developed and developing nations. In the developing nations (India and China) the stock prices Granger cause the gold prices whereas in developed nations (the United States, the United Kingdom, Germany and Japan) the gold prices Granger cause the stock prices.

Nevertheless, Ibrahim & Baharom (2011) in their recent study investigate whether gold investment provides diversification, hedge or safe haven in Malaysia from 2001 to 2010. In contrast with Baur & Lucey (2010) and Baur & McDermott (2010), they estimate different thresholds separately and find that gold only act as diversification role and diversification seem to weaken during extreme stock market condition. To capture the period of higher volatility in stock market arising from uncertainties in western world, they equally divided the sample into two sub-periods, August 2001 – November 2005 and December 2005 – March 2010. In the first sub-sample, gold provides hedge against stock market and safe haven during extreme stock market downturns. Nonetheless, these characteristics of gold tend to disappear during the second sub-period, where gold only has been degraded to be a diversification asset. Again, the diversification benefit seems weakened during extreme market conditions.

Ibrahim (2012) later investigates the issue by adapting the framework used by Capie, Mills, & Wood (2005) and Nam, Washer, & Chu (2005) and finds significant positive relation between gold return and once-lagged stock return. Nevertheless, the coefficient of the once-lagged stock return in gold return equation is small and far from unit, thus support the diversification properties of gold. The relation also has not strengthened during times of consecutive days of market declines. To the contrary, he finds some evidence that gold return tends to break from its positive relation with stock market return following four consecutive stock market returns. At best, with evidence pointing to the negative relation between gold return and stock market return after four consecutive negative market returns, gold tends to possess a hedging property in times of market declines.

In recent study, Miyazaki & Hamori (2013) investigate the causal relationships between the gold return and stock market performance or uncertainty using non-uniform weighting cross-correlations developed by Hong (2001). They find that there exists unidirectional causality in mean from the S&P 500 index to gold, but no causality in variance for the full sample period. Causality in mean exists due to the persistent increases in the gold price regardless of the

stock market behaviour. The authors then divided the sample into two sub-periods. For the first sample period (before the actualization of the subprime mortgage problem), bidirectional causality in mean, though there exists no causality in variance. For the second sample period (after the actualization of the subprime mortgage problem), there exists not just a unilateral causality in mean but also a unidirectional causality in variance from the S&P 500 index to gold. For sub-sample before and after Lehman Brothers' bankruptcy, this study obtains qualitatively similar results. Miyazaki & Hamori (2013) then concludes that investors are driven to flight-to-quality by fear of financial collapse, and consequently, rush into purchasing gold-linked assets, such as ETFs, as a hedge or a safe haven. This result show that gold does not always act as a hedge or a safe haven for stocks. Nonetheless, one of the limitations with this explanation is that it does not explain clearly the hedge and safe haven characteristics, since according to the authors hedge and safe haven exist if causality in variance exists from stock to gold. Furthermore, this article examines the causality only from the perspective of the agents holding assets in the United States dollars. It is ambiguous whether the findings applied to agents holding assets in different currencies.

The findings of prior studies prove that the role of gold as a hedge or a safe haven is inconsistent and contradictory, suggesting further studies are needed to shed light on the issue. Specifically, the role of gold as an asset hedge and a safe haven is confirmed by most of the studies in develop countries. Nevertheless, some studies show that the co-movement relationship between gold and stock, suggesting that the role of gold as a hedge or a safe haven was not always guaranteed. Moreover, our sample at 2001 - 2013 is also the most up-to-date and takes into account the recent period of significant financial crisis.

4. EMPIRICAL ANALYSIS

4.1. Data

Data are gathered from various sources for the sample period from July 18, 2001 to February 22, 2013 which comprises 2980 observations in total. The selling price of one troy ounce Kijang Emasis used to represent domestic gold price and Kuala Lumpur Composite Index (KLCI) is used to embody stock price. Kijang Emas prices are collected from Central Bank of Malaysia and KLCI is from *Datastream.* Gold return and stock return rate are computed using continuous compounded return. A problem arises with missing observations due to different holidays in stock market and gold market. This study follows Jeon & Furstenberg (1990) and Hirayama & Tsutsui (1998) by adopting the method of Occam's razor (using the previous day's price). Thus, it is desirable to fill in estimate-based information from an adjacent day.

4.2. Descriptive Analysis

Descriptive statistics for gold return and stock return are presented in Table 1 and show that on average over the sample period, the daily gold returns significantly outperforms stock returns index (average daily returns of 0.0528% for domestic gold price and 0.0308% for domestic stock index). It must be emphasized that though the return on gold is, on average higher than the mean stock return, this is not sufficient for gold to be considered an effective hedge against stock return. Stock return exhibits more extreme positive value (19.8605) than

the gold return (12.4645) and also more extreme negative values (-19.2464) compared to gold return (-7.8182). While the volatility of stock returns is significantly lower than gold returns (standard deviation of daily returns of 1.0812 for stock, versus 1.1619 for the domestic gold price). Kurtosis exhibits a leptokurtic distribution, and as clearly shown by the Jarque–Bera test statistic, the series of both the gold return and the stock index return are not normal at the 1% significance level. On average over our sample period, there is a negative - albeit relatively weak - correlation between stock return and gold return, indicating the potential for gold to act as hedge on average.

Table 1: Descriptive Statistics

	Gold Return	**Stock Return**
Mean	0.0528	0.0308
Maximum	12.4645	19.8605
Minimum	-7.8182	-19.2464
Standard Deviation	1.1619	1.0812
Skewness	0.0897	-0.1769
Kurtosis	11.6884	120.6106
Jarque-Bera	9374.112***	1716943.***

Note: *** denotes significant at 1%.

We also analyze the relationship between these asset classes by quantiles of stock returns, to see if the results differ from the average during periods of strong stock market declines. The descriptive statistics in Table 2 show that the daily gold returns always outperforms stock returns during extreme negative stock market returns (10%, 5%, 2.5% and 1%). Gold return also less volatile than the stock return during very extreme stock market returns (5%, 2.5% and 1%). In this sense, gold is a more efficient asset relative to stock during this period.

Table 2: Descriptive Statistics Conditional on Extreme Stock Market Returns (KLCI)

		Obs.	**Mean**	**Max**	**Min**	**Std. Dev.**
Panel A						
Stock Return < 10% Quantile	Stock Return	298	-1.5929	-0.8137	-19.2464	1.6996
	Gold Return	298	0.0292	12.4645	-7.8182	1.7762
Panel B						
Stock Return < 5% Quantile	Stock Return	149	-2.2081	-1.2035	-19.2464	2.2411
	Gold Return	149	-0.0176	7.5457	-7.8182	1.8758
Panel C						
Stock Return < 2.5% Quantile	Stock Return	75	-3.0185	-1.6233	-19.2464	2.9484
	Gold Return	75	-0.0547	6.725	-7.8182	1.8149
Panel D						
Stock Return < 1% Quantile	Stock Return	30	-4.7181	-2.3872	-19.2464	4.1409
	Gold Return	30	-0.0017	6.725	-4.3971	2.0517

Note: Obs. is observation.

When we look correlations sorted by the quantiles of stock returns, a more interesting pattern appears. Table 3 shows that gold return is positively correlated with stock return when stock returns are below the 10% quantile. Nevertheless, during very extreme stock market declines (5%, 2.5% or 1%), gold returns is negatively correlated with stock returns indicating the potential for gold to act as a safe haven in the face of stock market losses. On the basis of these correlations, gold appear to offer a stronger safe haven, that is gold returns are more negatively correlated with stock returns during periods when stock markets are falling, during significant decline in stock returns[2].

Table 3: Conditional correlation analysis (conditional on extreme stock market returns)

	Stock Return
Panel A: KLSE return < 10% Quantile	
Gold Return	0.0016
Panel B: KLSE return < 5% Quantile	
Gold Return	-0.0051
Panel B: KLSE return < 2.5% Quantile	
Gold Return	-0.0269
Panel B: KLSE return < 1% Quantile	
Gold Return	-0.0344

4.3. Performance of Gold during Financial Turmoil

Table 4 presents a summary of aggregate returns for specific period of financial crisis to assess the performance of gold as a safe haven asset. The specific crisis episodes are the September 11th, 2001 terrorist attacks and the global financial crisis in 2008. Gold returns seem to rise particularly strongly and do not lose its value in reaction to the September 11th attacks and the culmination of the global financial crisis in September 2008 consistent with the safe haven characteristics. The September 11th terrorist attacks and the subprime crisis in 2008 also exhibit some details that are very significant in the context of safe haven asset and investor behaviour. Gold is a short-run safe haven following the September 11th event in 2001. On the other hand, the turmoil in late 2008 representing the peak of the global financial crisis displays a positive evolution of the gold price from on September 2008 consistent with a safe haven asset, but a negative return of gold one month after the crisis.

The pinnacle of the financial crisis in late 2008 reveals that a safe haven cannot be a safe haven in the long-run or at all times. If investors buy gold in response to a negative shock, this initial shock is followed by a sequence of similar or even larger negative shocks. Hence, some investors may be forced to sell gold, thus eventually depressing the price of gold and bringing the safe haven status of gold for that particular event to an end.

[2] Another way to look at correlations is to condition on time, which is to use a rolling window to calculate the correlation

Table 4: Summary: aggregate returns for specific crisis episodes

Crisis	Stock Return	Gold Return
2001 September 11 attacks: Sept. and Oct.	-0.276573	0.053011
2001 September 11 attacks: Sept. (only)	-0.501783	0.318551
2001 September 11 attacks: Oct. (only)	-0.093069	-0.163355
2008 Financial crisis: Sept. and Oct.	-0.591216	-0.190393
2008 Financial crisis: Sept. (only)	-0.36789	0.496765
2008 Financial crisis: Oct. (only)	-0.825708	-0.91191

4.4. Econometric Model

The correlation analysis conducted in previous section is informative on understanding the general relations between variables. Nevertheless, it is not useful to determine whether the properties of gold are short-lived or persistent. This section presents the econometric framework to analyze the behaviour of investors with regard to safe haven asset. We expect that the decision of investors to buy gold depends on the economic and financial uncertainty. In the first step, we analyze how gold react to shocks in the stock market on average, that is a systematic analysis. The findings will provide evidence for a hedge. In the second step, we examine the reaction of gold to shocks under extreme conditions that is conditional analysis. Since the analysis condition on extreme events, the empirical framework examines the existence of a safe haven characteristic.

4.4.1. Systematic Analysis

This study adapted the autoregressive distributed lag (ARDL) model used by Capie, et al. (2005) in their analysis of gold returns response to changes in exchange rates, as follows:

$$r_{g,t} = \alpha_0 + \alpha_1 \sum_{i=1}^{k} r_{g,t-i} + \beta_1 \sum_{j=0}^{l} r_{s,t-j} + \varepsilon_t \qquad (1)$$

where $r_{g,t}$ denotes gold return at time t. The returns were regressed on a constant α_0 and its own lagged returns. The contemporaneous and lagged stock market shocks were captured by the variable r_s. Since residuals from ordinary least square (OLS) estimation of this model show strong evidence of time varying conditional error variance, thus rendering statistical inference problematic, the conditional variances were then modeled as ARCH processes. Therefore, the error term or innovations ε_t follows a threshold-asymmetric GARCH (1,1) process. The parameters to be estimated were α_0, α_1 and β_1. The lag lengths k and l were included to capture the evolution of the gold return through time. The model selection follows general to specific estimation process which starts with a longer lag length and then reduces the number of lags by one if the highest lag order is not statistically significant. Whether gold is hedge asset for stock was tested via the parameter β_1. If β_1 is negative or zero, it implies that gold is a hedge for stock since the assets are negatively correlated or uncorrelated with each other on average.

4.4.2. Conditional Analysis

The conditional analysis was based on the model utilized for the systematic analysis but conditional on different market conditions. In order to analyze the safe haven properties of gold, we assumed that the relationship was not systematic, but was influenced by extreme market conditions as suggested by Baur & Lucey (2010):

$$r_{g,t} = \alpha_0 + B_1 \sum_{k=0}^{m} r_{s,t-k} + B_2 \sum_{l=0}^{n} r_{s,t-l\,(q)} + \in_t \qquad (2)$$

where $r_{g,t}$ denotes gold return at time t and was regressed on a constant α_0 and the contemporaneous and lagged stock market shocks captured by the term $r_{s,t-k}$. The terms $r_{s,t-l\,(q)}$ account for extreme stock market movements and was included in order to focus on falling stock market. Specifically, we analyze the role of gold in times of stress in stock market and include regressors that contain stock return that are in the q% lower quantile, such as the 10%, 5%, 2.5% and 1% quantiles. If the stock market return exceeds a certain (lower tail) threshold, given by the q%, the value of $r_{s,t-l\,(q)}$ is one. If different thresholds are estimated simultaneously, the parameters B_2 can be viewed as vectors.

Similar with the equation 1, if B_1 is zero or negative, it implies that gold is a hedge for stocks since the assets are uncorrelated or negatively correlated with each other on average. Whether gold is a safe haven asset for stock is verified via the parameters B_2. If the total effect in (extremely) falling stock markets is non-positive (sum of B_1 and B_2), gold serves as a safe haven asset for stock since they are uncorrelated (sum of coefficients is zero) or negatively correlated (sum of coefficients is negative) with each other.

4.5. Empirical Results

This section provides the estimation results obtained from the preliminary models. The results of the systematic model are presented followed by a conditional analysis of that model.

4.5.1. Systematic Analysis

Table 5 present the results of the systematic analysis using the full sample of daily observations from 2001 until 2013. The model specifications include the lagged dependent variable, contemporaneous and lagged of stock market returns and a constant. The heteroscedasticity of the returns is also modeled and the coefficient estimates of threshold-asymmetric GARCH (1,1) model are reported. The estimation results can be summarized and interpreted as follows. The lagged gold returns are negative and highly significant, indicating overreaction to past shocks or a reversal. The relationship between stock return and gold return is represented by a contemporaneous and a one-day and two-day lagged effect. The contemporaneous effect is negative and the lagged effects are both positive. This suggests that the reaction of gold to shocks is consistent with a hedge but the property is short-lived since the initial effect is reversed within one and two days. In the lower portion of Table 5 we analyze the coefficient

estimates of the process representing the conditional volatility of gold. The negative threshold coefficient indicates that positive shocks increase the volatility of gold return by more than negative shocks.[3]

Table 5: Estimation Results of Systematic Analysis

Variables	Coefficient	Std. Err.	z-stat.	P > |z|
Mean Equation				
Constant.	0.0572	0.0146	3.9138***	0.0001
$r_{g,t-1}$	-0.0537	0.0159	-3.3755***	0.0007
$r_{g,t-2}$	-0.0346	0.0160	-2.1658**	0.0303
$r_{s,t}$	-0.0042	0.0150	-0.2798	0.7796
$r_{s,t-1}$	0.0030	0.0146	0.2033	0.8389
$r_{s,t-1}$	0.0267	0.0144	1.8542*	0.0637
Variance Equation				
α_1	0.0140	0.004734	2.9493***	0.0032
$\alpha_2\ \varepsilon^2_{t-1}$	0.0738	0.011788	6.2628***	0.0000
$\alpha_3\ d_{t-1}\varepsilon^2_{t-1}$	-0.0503	0.01384	-3.6320***	0.0003
$\alpha_4\ h_{t-1}$	0.9413	0.00903	104.2458***	0.0000
No. of obs..	2977			
Log-likelihood	-4216.792			
GED parameter[4]	1.1470 (35.2399)			

Notes: Asterisk (***), (**) and (*) denote that a test statistic is significant at the 1%, 5% and 10% significance level, respectively.

4.5.2. Conditional Analysis

This section analyzes specifically the properties of gold with respect large negative stock market shocks or uncertainty. An explicit econometric treatment of crisis periods would be somewhat arbitrary due to the difficulties associated with a definition of start and end dates for a given crisis. Instead of attempting to define crisis periods in an ad-hoc manner, this study allow the data speak for itself, by investigating the relationship between gold return and stock return implicitly, conditional on stock returns at the lower end of the returns distribution (that is in or below the 10%, 5%, 2.5%, and 1% quantiles).

Table 6 presents the results for Equation (2). The estimated coefficient for the average effect of stock return on gold return is -0.0198. This coefficient implies that gold is a hedge for stocks in Malaysia, in line with previous result in the systematic analysis. For extreme negative stock

[3] This finding is also reported in Baur (2012). The paper argues that the inverted asymmetric effect is related to the safe haven characteristic of gold. If investors buy gold during periods of increased uncertainty or turmoil in other markets - especially the stock market – investors transmit the heightened volatility to the gold market.

[4] Nelson (1991) proposed to use the generalized error distribution (GED) to capture the fat tails usually observed in the distribution of financial time series.

returns, the estimated coefficients are positive for the 10% and 2.5% quantiles and negative for the 5% and 1% quantiles. The overall effect of all quantiles is given by the sum of all coefficients up to the chosen quantile. For example, the overall effect of the 10%, 5%, 2.5% and 1% quantiles is the sum of all coefficients that involve stock returns that leads to a value of 0.0682, -0.0614, 0.0072 and 0.0020, respectively. These results indicate that for more extreme returns the overall effect becomes positive, where gold return increases for 5% quantile, and fall in 1% quantile. The fact that the sum of coefficients is non-positive for the 5% quantile but positive for the 10%, 2.5% and 1% quantiles implies that gold only serves as a safe haven at the 5% threshold, while for more extreme returns, stocks and gold move in tandem if stocks fall.

The fact that gold is not a safe haven for stocks indicates that investors that hold domestic gold in times of financial stress and anxiety will find it difficult to receive compensation for losses caused by negative stock returns. Nonetheless, what will happen if investors purchase gold after an extreme stock market shock? The overall effect (0.0177) including the lagged effect is stronger than the contemporaneous effect of 0.0020. The sum of the parameters of lagged

Table 6: Estimation Results of Conditional Analysis

Variables	Coefficient	Std. Err.	z-stat	P > |z|
Mean Equation				
constant	0.0614	0.0159	3.8586***	0.0001
$r_{s,t}$	-0.0198	0.0207	-0.955	0.3396
$r_{s,t(10\%)}$	0.088	0.0767	1.1466	0.2515
$r_{s,t(5\%)}$	-0.1296	0.1074	-1.2074	0.2273
$r_{s,t(2.5\%)}$	0.0686	0.1099	0.624	0.5326
$r_{s,t(1\%)}$	-0.0051	0.0802	-0.0638	0.9491
1 lag				
$r_{s,t-1}$	-0.0117	0.0154	-0.7578	0.4486
$r_{s,t-1(10\%)}$	0.0902	0.1034	0.8723	0.383
$r_{s,t-1(5\%)}$	0.2545	0.1381	1.8433*	0.0653
$r_{s,t-1(2.5\%)}$	-0.53	0.1965	-2.6979***	0.007
$r_{s,t-1(1\%)}$	0.2147	0.2114	1.0156	0.3098
Variance Equation				
α_1	0.0155	0.0051	3.0454***	0.0023
$\alpha_2 \varepsilon^2_{t-1}$	0.0768	0.0123	6.2516***	0.0000
$\alpha_3\ d_{t-1}\ \varepsilon^2_{t-1}$	-0.0502	0.0148	-3.4028***	0.0007
$\alpha_4\ h_{t-1}$	0.9370	0.0096	97.3684***	0.0000
No. of Obs.	2978			
Log-likelihood	-4222.078			
GED parameter	1.1590 (35.6799)			

Notes: Asterisk (***) and (*) denote that a test statistic is significant at the 1% and 10% significance level, respectively.

stock returns and extreme lagged stock returns is negative for the 2.5% quantile shows that negative stock returns at *t*-1 result in positive gold returns at t for this threshold. Nevertheless, for the 10%, 5% and 1% quantiles, negative stock returns in the previous period associated with negative gold return in the current period. Therefore, we find evidence that purchasing gold after an extreme stock market shock (2.5% threshold) yields positive gold returns, suggest that investors buy gold if uncertainty remains high one day after the shock, though this is not occurred for all quantiles. The finding shows that it is possible that gold is negatively correlated with stock on average (gold is a hedge) but mixed correlated with stock in extreme market conditions (gold is a weak safe haven).

5. CONCLUSION

This study empirically investigates the role of gold in Malaysia, specifically whether gold can be used to hedge risks on average, or works as a safe haven asset against losses in financial markets. Our primary result is that domestic gold plays an important role as a hedge, but its characteristic is short-lived, consistent with specific crisis periods analysis, where gold cannot preserve its positive returns a month after the crisis. The role of gold as a hedge against the conclusions of Ibrahim & Baharom (2011) perhaps stems from the fact that our data cover a more recent period, in which gold price has jumped in valuation. While we find little evidence that gold is a safe haven in some quantiles via contemporaneous and lagged stock market shock analysis as well as during specific periods; gold, at best, is a weak safe haven during financial stress for stockholders. This means that investors seek out the safe haven during stock market collapse, but under extreme stock market shock, gold co-moves with stock market establishing a market of one, that is both assets move in tandem. These results indicate that gold plays a minor role in emerging market like Malaysia when stock market enters a slump, in line with the contention of Baur & McDermott (2010). When investors suffer losses in emerging market stocks, rather than seeking an alternative haven asset, they may readjust their portfolios by withdrawing from emerging markets to developed markets. Therefore, despite that gold became popular in the recent few decades as an investment vehicle, holding a well-diversified portfolio may provide reasonable return and protection from economic collapse.

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