Equity Market Hedge Potentials: Evidence from Nigeria and Malaysia

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Abstract

Despite the importance of the equity market in providing capital investments, not much has been achieved in terms of identifying a hedge instrument for the associated market risk. This paper examined the potential for volatility transmission between Nigerian stock index and gold spot and made a comparative assessment of gold spot in providing the Nigerian and Malaysian stock markets with a volatility hedge. Diagonal BEKK multivariate GARCH model was applied to examine volatility transmission between the two countries' stock indices and gold spot. Outcome of the study confirmed the existence of volatility hedge potential for the two countries stock indices from gold spot. The outcome provided a wider implication for the Nigerian banking stock index especially given its remarkable appreciation in recent time.

1. Introduction

Stock markets normally have a dominant influence on the economy of a country, this is largely due to their position in capital market investments. On the other hand, the Nigerian banking sector has in recent years become an important source of the country's stock market capitalisation (Tahir, Adegbite & Guney, 2016). Tahir et al. (2016) have found stock market indices of both Nigeria and Malaysia to have reacted positively to banking sector recapitalization. In spite of this development not much attention has been paid to identifying a risk hedge for the Nigerian stock market index and by implication the banking subsector index. A number of empirical studies examining interdependence between stock market return and gold spot have suggested various interesting outcomes. Studies in Mensi, Beljid, Boubaker and Managi (2013); Thuraisamy, Sharma and Ahmed (2013); Ciner, Gurdgiev, and Lucey (2013); Sadorsky (2014); Arouri, Lahiani and Nguyen (2015) are among few others recently added to the growing list of literature in the area.

Arouri et al. (2015) specifically focused on understanding volatility spillover between gold spot and the Chinese stock index using multivariate GARCH approach. The study found evidence of volatility spillover between gold prices and stock prices, the result thus suggested stock index volatility hedge from gold spot. Ciner et al. (2013) have found gold spot to provide safe haven against exchange rates in the UK and US and suggested the commodity as having a monetary asset role. Sadorsky (2014) examined potential for increased diversification of investment portfolio and found gold spot to jointly provide countries with stock markets safety. Given the focus of the preceding studies, expanding investigations of specific equity market's interdependence with gold spot may provide further alternative. Thus, the objectives of the current paper is to contribute to the existing literature in two major ways.

First, the current paper's objective is to examine volatility transmission between the Nigerian stock index and gold spot. Arouri et al. (2015) have found evidence of volatility transmission between the Chinese stock index and the gold spot, but we are yet to see similar endeavour in the Nigerian instance. In addition to doing this, further dimension of the current paper will examine the stock market's activities in relation to the gold spot, an approach which will measure wider implication for the economy. This could be as intermediated through the health of the banking sector, which provides a further means to address the dependence of the economy on the banking sector. Thus, the essential element of studying risk and return which is central to Markowitz's mean-variance theory (Markowitz, 1952) and largely linked to the stock market activities is relevantly extended to understanding the effect of gold price on the stock market volatility. Also, this will have implications for attaining a hedge potential for stock market's price volatility. Empirical process in Ciner et al. (2013) has already suggested gold spot as having the potential in providing investment safety. Another implication here will be to check the potential of the gold spot to provide the Nigerian banking stock subsector index with a volatility hedge.

The second objective of this paper is to examine a comparative potential of gold spot in providing different stock markets with volatility hedge. Despite the rich blend of preceding studies looking into how gold spot affect the stock markets, doing this in the context of different countries stock indices is yet to be fully realised. For instance, the application of gold spot interdependence with the stock market returns of developing economies is not much covered. Again, expanding such investigation to simultaneously include gold spot together with the equity returns of another country looking into investment alternative has not been achieved. By jointly studying the dynamic relationships of emerging markets stock prices with other commodities, Sadorsky (2014) provided the necessary common ground to seek the understanding of how gold spot could jointly provide countries with stock markets safety. Therefore, by jointly examining the Nigerian and Malaysian stock indices, this paper hopes to achieve a comparative analysis of the two countries stock indices reaction to gold spot.

Therefore, the focus of this paper is to have a broad application of gold spot interdependence with equity market indices. Broadly speaking, the investigation here will focus on understanding volatility transmission between gold spot and stock market returns and examination of the outcome to see if such information could provide a useful means of hedging stock market indices. Ciner et al. (2013) has provided us with evidence of gold spot providing a hedge potential for stock market among other tested assets. Also, the empirical process in Smales (2014) utilised the information flow inherent in the gold futures market as a source of explanation for traders selling and buying positions. These outcomes are aimed to be extended in this paper by examining the case of Nigerian and Malaysian stock indices, while highlighting the potential implications for the Nigerian banking sector recently seen making substantial contribution to the country's stock market capitalisation. In addition to this section, the remainder part of the paper is organized to include; a review of related literature which scrutinized the existing studies in the area for the purpose of expansion, methodology and model section which

presented the model of estimation, data section which explain the choice of investigated variables, data analysis and results section presented the studies' findings, lastly implication and conclusion section analysed the findings and offered relevant suggestions.

2. A Review of Related Literature

The main concerns for a capital market investor are risk minimisation and guaranteeing efficient return. However, the problem of return volatility makes the associated risk issue of enormous concern. These related issues are central to the mean-variance efficiency consideration of Markowitz (1952), an issue which Sharpe (1964) effectively tried to solve with the Capital Assets Pricing Model (CAPM). To this date, the essential element of studying risk and return is largely linked to stock market activities, and this interest has been extended in several studies. Karolyi (1995) when estimating the volatility transmissions between the United States and Canada, highlighted the implication of such study for the asset pricing. Also, Smales (2014) utilised market information, specifically news sentiment to determine returns in gold futures market. However, despite the contributions of the extant studies, there is an apparent need for the understanding of wider economic implications of stock index and gold spot spillover, particularly in the way it may provide hedge for stock index volatility and by implication for the banking subsector index.

Studies focusing on the relationship between stock price and gold spot are in the increase, Agyei-Ampomah, Gounopoulos and Mazouz (2014); Degiannakis, Filis, and Kizys (2014); Arouri et al. (2015); Kang, Ratti and Yoon (2015) are among few others . For instance, Arouri et al. (2015) have found evidence of volatility transmission between the Chinese stock index and the gold spot. In the same vain, Agyei-Ampomah et al. (2014) have found gold to be useful hedge of stock price volatility. A possible deduction here could focus on understanding if investing in gold spots could provide an alternative to stock market investments. This is given the empirical study in Tully and Lucey (2007) focused on the interdependence between gold price and stock market behaviour. Roache and Rossi

(2010) examined gold as an investment alternative by analysing the responses of other commodities' prices associated with bad news in relation to gold, especially during economic downturn. Understandably, the analysis focused on gold providing other commodities with the necessary hedge, as gold is perceived to be the deposit of last resort. Empirical evidence in Ciner et al. (2013) suggested that gold spot could be used as safe haven for exchange rate and can also have monetary policy role. The essential element here is that of inferring alternative investment potential.

Using a multivariate GARCH approach, Malik and Ewing (2009) have found a potential for cross-market hedging when they investigated volatility transmission between oil prices and Dow Jones equity sectors and claimed to have found evidence in support of cross-market hedging. Their approach of single market focus is limiting and should be expanded in the direction of cross-country context and also to look at gold spot in place of oil price. This is particularly given the approach in Sadorsky (2014) which paid attention to the financial integration between countries with the potential for investment diversification. Thus, it is essential to investigate volatility transmission between stock indices of similar jurisdiction against gold spot and a further dimension to the development will be an examination of the outcome to see if such information could provide a useful hedging for stock index volatility. Baur and Lucey (2010) have attempted something similar when they examined the potential of gold providing stock indices of US, UK and Germany with volatility hedge, but we are yet to witness such a study in the context of developing countries like Nigeria and Malaysia.

Although extant studies have covered the interdependence between gold spot and stock markets of other countries (Tully & Lucey, 2007; Mensi et al., 2013; Thuraisamy et al., 2013; Arouri et al., 2015), still not much has been achieved in terms of studying the impacts of such interdependences on the stock market returns of developing economies. Jointly examining different counties situation will create an avenue to contrast the ability

of different economies stock markets reaction to gold price changes, particularly as we know that countries are endowed with different economic characteristics. For instance, Nigeria as a developing economy has a different mode of stock market development as compared to another developing country like Malaysia. While the Malaysian economy has a better developed stock market with wider sectorial capitalisation, the country parades a smaller size economy compared with Nigeria. Nigeria with a population of over 180 million is a bigger economy with potentially broader activities than Malaysia. Thus, given this diverse nature of the two countries' economies, their stock markets could be examined for a potential variety of reactions to changes in gold spot. Hence, the essential elements of business activities and health of the different economies under stock indices and gold price changes could be understood by this means.

3. Methodology and Model

Given the current paper's target of examining volatility transmission between stock indices and gold spot, the empirical process being adopted is the multivariate GARCH model of diagonal BEKK first proposed by Engle and Kroner (1995). The BEKK model is applied because of its ability to restrict the parameter space volatility while remaining sufficiently flexible in data generating process (positive definite parameterisation).

The diagonal BEKK model presentation typically begins with the specification in equation (1) below:

$$H_t = B_0^{'} B_0 + B_i^{'} \varepsilon_{(t-i)} \varepsilon_{(t-i)}^{'} B_i + C_j^{'} H_j^{'} C_j \qquad (1)$$

Where; B_0 = n x n symmetric parameter matrices. B_i and C_j = n x n unrestricted parameter matrices. The model specification in equation (1) has a dynamic feature that enables the conditional variances and covariance to influence each other, again requiring estimation of smaller number of parameters. This enables the model to meet the restriction condition of the parameterisation, where p = q = 1. In its practical implementation, the BEKK is normally applied given a diagonal representation which avoids complications related to large parameterisation, as specified below.

$h_{11,t}=\alpha_{01}+\alpha_{11}\varepsilon_{1,t-1}^2+\beta_{11}h_{11,t-1}$ (2a)

$h_{12,t}=\alpha_{02}+\alpha_{22}\varepsilon_{1,t-1}\varepsilon_{2,t-1}+\beta_{22}h_{12,t-1}$ (2b)

$h_{22,t}=\alpha_{03}+\alpha_{33}\varepsilon_{2,t-1}^2+\beta_{33}h_{22,t-1}$ (2c)

Where; $h_{11,t}$and $h_{22,t}$ = conditional variances for the different series, here stock index and gold prices. Each represents the GARCH process used in assessing the impact of one series shock on the volatility of itself. $h_{12,t}$ = conditional covariance equation. This could simultaneously assess the effect of the shocks and volatility impact on both series, thereby capturing the impact of cross volatility or volatility spillover between the two series of gold price and stock market return, as against the one direction test exhibited by the conditional variance process.

α_{01},α_{02} and α_{03}= are the constant coefficient matrices testing the mean return of the different series, given as indefinite matrices. α_{11} ⟦,α⟧ $_{22}$ and α_{33} = coefficient matrices for the series ARCH terms, given as diagonal matrices. β_{11},β_{22} and β_{33} = coefficient matrices for the series GARCH terms, also given as diagonal matrices. All coefficients capture the level of impact of the shocks being measured. Here, the restriction imposed based on the parameters B_i and C_j in equation (1) above will see $\alpha_{22}=\alpha_{11}*\alpha_{33}$ and $\beta_{22}=\beta_{11}*\beta_{33}$ in equations (2a) and (2c), resulting into the covariance coefficients in equation (2b). ε_1^2 and ε_2^2 = unexpected volatility or shock, capturing the effect of news on each model or series and seen as a direct effect of shock. ε_{t-1}^2 = past volatility news or shock. $\varepsilon_{1,t}\varepsilon_{2,t}$ = cross effects of news, as originated from any of the series and affecting the other, seen as indirect effect of news.

4. Data Presentation

The applied data in this paper is from Gold spot (GLD), the closing prices of Malaysian stock index (MAS) and Nigerian stock index (NIS). All data are in daily (weekdays) frequencies beginning from March 1996 to November 2016, translating to over 20 years daily observations and were accessed from the Thomson Reuters Datastream. The stock

indices and gold spot used is the Standard and Poor's index whose choice was based on wider application in the extant literature, see Mensi et al. (2013) for evidence of past application. Stock market indices are being applied against the stock market returns approach in the existing literature given that the chosen BEKK model in this study allow for the freedom to make such choice. This logic is against other Multivariate GARCH modelling processes which assume returns are generated by conditionally heteroskedastic underlying factors. The Nigerian data is applied being the primary country of interest in this paper, whereas the Malaysian data is being applied to get a contrasting view of the study outcome. Thus, for common comparison and generalisation, data for the Malaysian stock market is also employed.

Further justification for the countries of choice in this research is that both Nigeria and Malaysia have experienced banking sector recapitalisation in recent time. This has led to extensive capital market borrowing activities by the countries' banks (Sufian, & Habibullah, 2013; Tahir et al., 2016). Again, like Nigeria, Malaysia is a developing country with a stock market that is at similar age of development. This combination is purposely intended to give room for comparative analysis of the different countries' equity markets reaction to gold spot, thus creating an avenue for broader comparison. However, in as much as we draw a motivation to jointly examine the different countries given their similar economic situation, we will create an avenue to control for the ability of the different economies reaction to different situations. For instance, we have already seen how Nigeria as a developing economy can have a different mode of stock market development as compared to Malaysia. Thus, the choice of the two countries is due to their status of being at similar level of economic development and other close characteristics.

Gold spot is applied to capture the alternative investment avenue and for consideration of a commodity which may not be serially correlated with stock return. The applied data were equally chosen with specific consideration of their ability to fit into the empirical model specified in the above empirical section and also to adequately provide for the

research contribution in this paper. For instance, to address the question relating to finding volatility transmission between gold spot and stock market indices, both Malaysian and Nigerian stock indices are employed. Extant studies have approached the issue of data selection based on the research questions being answered. Basher and Sadorsky (2006) applied the closing stock index of selected emerging stock markets and world stock index. Thus, significant consideration was paid to the data type in extant studies. Preceding studies have applied gold spot and a mixture of different stock market indices. See additional examples in Tully and Lucey (2007), Mensi et al. (2013) and Thuraisamy et al. (2013), Arouri et al. (2015).

5. Data Analysis and Results

The applied data in this paper will be analysed in their natural log form. This is partly to help address the issue of applied variables being not near to normal distribution and also, the different datasets being far apart from each other in absolute values. The data analysis begins with preliminary analysis within which the applied data series' descriptive statistics and correlation matrix are reported. Tables 1 and 2 below present the results for data series descriptive statistics and correlation matrix. Table 1 presents descriptive statistics of variables in our data sample. All data series seems generally stable given the range of deviation from minimum to maximum. Again other indicators like probability values are significant.

Table 1: Variables Descriptive Statistics

Series	Mean	Median	Maximum	Minimum	Std. Dev.	Probability
GLDt	6.0511	6.2338	7.0044	5.0066	0.6253	0.0000
MASt	5.6797	5.7784	6.2829	4.8653	0.3996	0.0000
NISt	10.0506	10.1168	11.1030	8.5933	0.5343	0.0000

In Table 2 it can be seen that all variables in the dataset are significantly correlated. For instance, the relationship between gold spot (GLDt) and that of Malaysian stock index (MASt) returned a coefficient of 0.9324 which is highly significant. This means that both gold spot and the Malaysian stock index move together in the same direction.

Table 2: Variables Correlation Matrix

	GLDt	MASt	NISt
GLDt	1.0000		
MASt	0.9324*	1.0000	
NISt	0.6645*	0.6769*	1.0000

*indicates statistical significance

The main data analysis is construed given relationships which measures interactions between; gold spot against Nigeria stock index and gold spot against Malaysian stock index. The process examined the conditional mean, variance and covariance between gold spot and Nigerian stock index and gold spot and Malaysian stock index. Table 3 reports the data series conditional mean. Given the level of significance of coefficients in the conditional mean equations of the data series, we have established them as being mean efficient. This signifies that, given gold spot influences in the considered countries, stock market returns are at the efficient level, as the conditional means are significant in each case.

Table 3: Conditional mean

Estimated Equation	Coefficient	Std. Error	z-Statistic	p-Value
〖NIS〗_t = α_01	10.0435	0.0021	4672.0346	0.0000
〖GLD〗_t = α_03	6.1185	0.0059	1038.2210	0.0000
〖MAS〗_t = α_01	5.8519	0.0016	3640.9138	0.0000
〖GLD〗_t = α_03	6.4776	0.0021	3104.1200	0.0000

Estimated relationships are based on equation (2a and c); 〖Δly〗_t = α_01, where α_01=Indefinite matrix. **indicates significance at 1% and *indicates significance at 5%.

Turning to examining volatility transmission among the tested variables, Table 4 below presents the summary of conditional variance and covariance of our data series. Panels A and B in column 1 of the Table presents series' interactions between gold spot and stock indices of Nigeria and Malaysia respectively. In all instances of conditional variance and covariance equations we have the coefficients' z-statistics written in parenthesis. The

observed z-statistics relating to the GARCH 1 (Nigerian stock index series) and GARCH 2 (gold spot series) in Panel A returned significant relationships. Also, in Panel B, the GARCH 1 (Malaysian stock index series) and GARCH 2 (gold spot series) returned significant relationships in all instance. Thus, we can conclude given the level of significance in all the conditional variance coefficients of the series' equations, that the conditional variances of each series has influence on itself. Hence, the effect of volatility in the gold market and both of the examined stock markets has self-impact.

The coefficients significance measured by the z-statistics in conditional covariance equation (h12,t) are applied in measuring volatility transmission between stock indices and gold spot. In Table 4, we have conditional covariance coefficients in respect of the α11, α22 and α33 (ARCH terms coefficient matrices) in all relationships (Panels A and B) having significant z-statistics. Thus, there are volatility transmissions between the data series relationships characterised in Panel A (Nigerian stock index and gold spot) and Panel B (Malaysian stock index and gold spot). Again, the conditional covariance interactions of the GARCH terms (β11, β22 and β33) in all relationships seen from Panel A and B have significant z-statistics measure of their coefficient. Therefore, we can conclude that there is a volatility transmission between the data series relationships seen from Panel A and B. Consistent with past studies (e.g. Arouri et al., 2015) the outcome of this papers empirical process has confirmed the existence of volatility transmissions between the tested series and thus suggesting a hedge potential for the stock indices of the examined countries (Nigeria and Malaysia). Hence as Roache and Rossi (2010) found gold spot to be able to act as an investment alternative and the outcome in Ciner et al. (2013) which suggested gold spot could be used as safe haven, the outcome of the current paper has found the potential of volatility hedge in gold spot.

Table 4: Conditional Variance and Covariance

Series Interactions	Equation	α01, α02, α03	α11, α22, α33	β11, β22, β33
1 2 3 4 5				
Panel A:	GARCH1 (h11)	6. 8x10-5 (22.12)	0.9127 (5.78)	0.1092 (7.53)
Nigeria Stock Index and	Covariance (h12)	0.0001 (23.73)	0.9647 (5.88)	0.0841 (7.20)
Gold spot	GARCH2 (h22)	0.0003 (18.60)	1.032 (6.06)	0.0553 (6.77)
Panel B:	GARCH1 (h11)	0.0001 (26.95)	0.9062 (8.14)	0.1102 (8.91)
Malaysia Stock Index and	Covariance (h12)	5.1x10-5 (13.12)	0.9051 (8.13)	0.1113 (8.96)
Gold spot	GARCH2 (h22)	0.0001 (23.77)	0.9047 (8.12)	0.1118 (8.95)

Notes: h11 and h22 are conditional variances for the estimates with each representing the GARCH (1,1); h12,t is conditional covariance; α01, α02 and α03 are the constant coefficient matrices; α11, α22 and α33 are coefficient matrices for the ARCH terms; β 11, β22 and β33 are coefficient matrices for the GARCH terms. Figures in parentheses are z-statistics which measures level of significance. All other non-substituted elements of the regressions are as defined in the model specification in equations 2a, 2b and 2c.

6. Conclusion

This paper examined the potential for volatility transmission between Nigerian stock index and gold spot, the paper also made a comparative assessment of gold spot in providing different stock markets (Nigeria and Malaysia) with a volatility hedge. The overall outcome confirmed the existence of volatility transmission between gold spot and stock market indices of Nigeria and Malaysia, thus indicating a volatility hedge potential for the two countries stock indices from gold spot. This outcome is consistent with extant studies which found gold spot as suitable volatility hedge/safe haven (Roache & Rossi, 2010;

Ciner et al., 2013). The comparative assessment of volatility transmission between the Nigerian and Malaysian stock indices to gold spot is also suggestive of similar pattern of responses of the two countries stock indices to gold spot. However, the covariance transmission between the Nigerian stock index and gold spot seems to be more responsive than the one between the Malaysian stock index and gold spot. These varying outcomes should be expected given the different characteristics of the two countries' economies. In the case of Nigeria, the outcome is expected given that the country has a less developed stock market with a lot of room for expansion. This situation is different as compared to the case of Malaysia which has a better diversified economy with flourishing manufacturing and services sectors, this is in addition to the presence of other viable export commodities like palm oil and tin. This situation could explain why the Malaysian stock market return may not have responded to the gold spot the way the Nigerian stock index did.

The outcome of this study has wider implication on the economies of the examined countries, economic policy and further academic engagements. That is to say, in addition to providing hedging information for the examined countries stock markets, other sectors of the examined countries' economies can also benefit from the outcome of this study. For instance, the uncovered hedge potential of gold spot on the Nigerian stock index will be useful for hedging the banking subsector stock index of the country. This is given its remarkable appreciation in recent time, an achievement which led the subsector to becoming the biggest gainer of the market. Thus, the practical presence of the Nigerian banking sector as a financial intermediator could be better protected by taking advantage of the outcome in this study. Thus, policy makers and regulators of the Nigerian banking sector must focus on the identification of hedge mechanism capable of managing the volatility risk associated with the unusual growth of the country's banking subsector stock index which happened in resent time. In this regard, future studies in this area should be geared towards utilising banking specific variables in measuring the potential direct effect

of stock market volatility on the banking sector and its rising stock market investment. Hence, a further dimension here shall include wider business activity measured by stock indices. This could be as intermediated through the health of the banking sector, which provides a further means to address the dependence of the economy on the sector. Other extensions will be to assemble and study portfolio of other assets with gold spot included, this will be geared towards determining other assets capable of optimally hedging the volatility risk for banking subsector stock index.

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