An Empirical Analysis between Macroeconomic Variables and Gold Prices

Vu Thi Lan, Gao Lei Fu, Sobia Naseem, Muhammad Mohsin

Abstract--- ***This study based on the relationship between a specific set of macroeconomic variables (stock market, crude oil & exchange rate) and gold prices. This study contains 18 years secondary data (annually) from 2001 to 2018. Regression equation implemented to check the relationship of the gold price return with particular set of macroeconomic variables and correlation matrix, Breusch-Godfrey serial correlation and heteroskedasticity test utilize to check the accuracy as well as normality of series data. This research concluded that gold price return with crude oil prices positively as well as with KSE-100 index negatively significant at 1% & 10% level respectively. The gold prices and exchange rate negative but insignificantly related to each other. This study will important and valuable for policy makers, investors and researchers.***

Keywords: Gold prices, Crude oil, Stock Returns and Exchange rate.

I. Introduction

Gold has been confrontational as of late because of sharp increment in gold cost. Economic crises of 2008 achieved worldwide economic vulnerability. Adornments, human services, and mechanical solicitations include utilization of gold. The interest level of organizations, people and government in gold is another utilization of gold. Much research was animated on gold costs with the finish of the Bretton Woods framework. The Bretton Woods framework was on a universal concurrence on how regularly assistant was the keeps inflator low, helping business and economy injuries to remember exchange rates would be set up after World War II. It was a financial standard dependent on the U.S. dollar and gold. The framework stipulates that the dollar would be connected to gold, and the monetary standards issued by IMF individuals would keep up a fixed swapping scale with the U.S. dollar. In 1971, the United States left the Bretton Woods money related framework. Be that as it may, the convention of fixing an official cost of gold in the United States remained. From that point forward, the cost of gold has soared with the huge increment in the measure of U.S. dollars. Market analysts have seen that gold costs are connected with swelling. So they started to examine how the cost of gold was identified with the United States GDP, expansion, the US dollar list, the S and P 500 record, the Dow Jones Industrial Average and other macroeconomic factors, and even the connection between oil costs, trying to locate a general relationship. Gold progressed toward becoming protection in financial vulnerability. In questionable and delicate macroeconomic conditions, security expansion can get through gold. The gold prices are decent assessment markers of a soundness economy (Tufail & Batool, 2013; Nadeem et al., 2014). In a detrimental economy gold cost turns out to be high, in light of the fact that the speculators begin amassing gold to shield them from expansion. Drop in gold value implies economy is solid, as financial specialists change from gold to other increasingly gainful ventures like bonds, stocks, genuine bequest, and so forth (Hyder & Shah, 2004).

The government gives high incentive to gold. Because of this reason national banks keep gold reserves for further circulation money. In the adverse condition of economy, war, instable political condition and in the time of estimated paper cash fluctuation gold keeps up its incentive in the midst of the national emergency. Gold is kept in their own possession by individual mindful political and macroeconomic susceptibilities everywhere. In the twenties, Pound, Franc, the dollar had stabilized position which changed by Gold prices. The Gold ornaments and unfriendly investment venture has been generally utilized in Pakistan since occasions (Choudhri & Khan, 2002).

Due to consistent expansion of Gold price since numerous previous years, investors can depend on gold for speculation because its profit is more prominent than a testament of stock. Khalid (2005) explained in his research the speculators and investors are of the visual finance specialist may not return the Gold investment till Pakistan Mercantile operationally ends up dealing with trade of planned items. Gold ornaments and bars both are equally important and interesting for Pakistani people which effect the fluctuation of gold prices. According to Khan & Schimmelpfenning (2006) and Haque & Qayyum, (2006), financial specialist avoid to invest more in gold due to high volatility rate of gold prices. Natives finance specialist put cash and other resources in gold when they observed the stability in price of gold. Gold is as yet considered the best investment alternative for a long-run reason because of increment in its costs throughout the years (Dooley et al., 1995; Akbari, 2005; Kemal, 2006; Khan & Schimmelpfenning, 2006).

A speculation made by (Sharpe, 1964) the time series data of action and plenitude return hazard which resolved by Jeffe (1989) conceptualism of ordinary return portfolio with increasing return of gold stock and portfolios investment. Amidst crises the gold got worthiness as compare to paper money (Harmston, 1998). Many researches support the

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value of gold in oppose of currency or paper money like as (Jeffe, 1989; Harmston, 1998; Randson, 2005a; Randson, 2005b). Europe, US, and Switzerland hold particular quantity to publish currency and send it into the circulation. Income and return of an economy can easily perceive by the fluctuation of gold prices there (Saidi & Scacciavillani, 2010; Diewert, 1999; Pollak, 1980; Gillingham, 1974; Dubey et al., 2003). At a specific point people preffered to hold the gold for carving extension and increasing demand of gold can control the inflation from the country (Harmston, 1988). A positive relation is observed by (Dempster, 2009) that gold prices and macroeconomic variables by using Vector Auto Regressive (VAR) model and an in signification relation exist between exchange rate, interest rate. By using CAPM Jaffe (1989) examined holding of gold never unprofitable for investors as his colossal outcomes perceived that beta of gold is around zero.

The decrease in acquiring force and ascend in average cost for basic items has widely influenced the closeout of gold. Purchasers still have a similar proportion of visiting gem dealers; however, they buy lighter gems. The gold cost in Pakistan has expanded by Rs 17,600 for every 10 gram since February 2012 (Nadeem, 2014), because of the ascent of gold in the worldwide market. Long-run financial specialists are keenly interested in gold in light of fact that the investment is productive for a long period (Khan & Rashid, 2010). For instance, speculators who acquired gold at Rs 19,622 for every 10 Grams five years back (Sep-2008) have earned an anomalous benefit as gold costs have hopped to Rs 52,828 for every 10 Grams (Sep-2012) (Hashim et al., 2017; Nadeem, 2014).

Numerous researchers worked on the relationship of gold prices and divergent macroeconomic variables in different ages (Fortune, 1987; Sjaastad & Scacciallani, 1996; Khan & Schimmelpfenning, 2006; Wang & Lee, 2011; Nadeem et, al., 2014; Sherman, 1983; Hashim et al., 2017). Le & Chang (2011) & Samanta & Zadeh (2012) explained a co-integration relation in his study between gold price, crude oil prices and some other macroeconomic variables by using the monthly data from 1986-2011 with different econometric techniques. Hashim et al., (2017) determined the positive relationship of gold and crude oil and negative relationship of GDP, interest, exchange, and inflation rate by using the data of most gold consuming countries (India, US, China, Turkey and Saudi Arabia). Choong et al., (2012) conducted a study to investigate about the relationship of gold price and macroeconomic variables (inflation, silver prices, USA dollar trade and Brent crude oil). This study concluded that inflation, silver prices and Brent crude oil are positively correlated with gold price. By using monthly gold prices data from 2000 to 2013 in Malaysia with POLS methodology, concluded that inflation, interest and exchange rate related to gold prices with different direction and magnitude (Zakaria et al., 2015). The objectives of study are given below:

$$H_1 = A\ relationship\ exists\ between\ Gold\ prices\ and\ Karachi\ stock\ exchange\ (KSE - 100).$$

$$H_2 = A\ relationship\ exists\ between\ Gold\ prices\ and\ Crude\ oil.$$

$$H_3 = A\ relationship\ exists\ between\ Gold\ prices\ and\ Exchange\ rate.$$

In this study we assess the relationship nature of Gold prices and a specific set of macroeconomic variables (Stock prices, Crude oil & Exchange rate) by using time-series data over the period of 2001-2018 with implementation of regression equation and correlation matrix. Furthermore, either the gold prices in Pakistan influenced by a particular set of macroeconomic variables or not.

II. Research Data & Methodology

Asia has many emerging economies but in this study we chose one of them like Pakistan because Pakistan is an arising emerging economy. The research data consists of 17 Gold prices observations from December 2001 to December 2018 annually. These sources of data collection are used in this study i.e. Yahoo Finance for gold prices, secondary data regarding crude oil gathered from Trading Economics and exchange rate prices for PKR/USD collected from X-rates. The Gold prices return taken as the dependent variable for conversion of data series into stationary, and it is calculated through annually prices data using the following formula:

$$\boldsymbol{R_{Gt} = \frac{P_t}{P_{t-1}} * 100}$$

Where, $\boldsymbol{R_{Gt}}$ = gold price return at period t; $\boldsymbol{P_t}$ = price at period t; $\boldsymbol{P_{t-1}}$ = the price at period $t - 1$.

This equation indicated the linear affiliation between dependent and independent variables. Variables are determined through regression analysis and implications be drawn which based on regression analysis (Kurihara & Nezu 2006). The nature of relationship between gold prices and macroeconomic variables (Crude oil, Stock Market Prices & Exchange rate) is checked in this research.

Table – 1 List of Variables

Sr. No.	Variable	Abbreviation	Unit of Variable
1	Gold Price	GP	Per Troy Ounce
2	Stock Price	KSE	100 Index
3	Crude oil	CO	Gallon Barrel
4	Exchange rate	EX	PKR/USD

To check the relationship between the Gold prices and macroeconomic variables the multiple regression econometric technique is used. A combination of one and three (one dependent and three independent) variables id used in this study, the Dependent variable is Gold prices, and independent variables are Stok market, Crude oil, and Exchange rate. The econometric regression equation is given below:

$$\boldsymbol{GP_t = \beta_0 + \beta_1 KSE + \beta_2 CO + \beta_3 EX + e_t}$$

In this equation β_0 is constant, $\boldsymbol{\beta_1, \beta_2, \beta_3}$ show the relationship of dependent variable with a particular independent variable and e_t represents error term as Ouma & Muriu (2014).

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III. Empirical Results

Descriptive analysis of this study is presented in table-2, related to mean, maximum, minimum, standard deviation, skewness, kurtosis, Jarque-Bera and observations of endogenous and exogenous variables. Numeric figures develop an easy understating; stock market return displays mean value & standard deviation of Gold prices is 1.149 and 0.161 respectively which pointed out the fluctuation in the stock market. The maximum value is 1.479, and the minimum value is 0.798. Figurative details of independent variables are also given in table such as Gold prices.

Table – 2 Descriptive Statistics

	GP	KSE	CO	EX
Mean	1.149	1.288	1.188	1.052
Median	1.157	1.391	1.235	1.019
Maximum	1.479	2.122	1.910	1.265
Minimum	0.798	0.417	0.531	0.964
Std. Dev.	0.161	0.392	0.354	0.079
Skewness	-0.304	-0.183	-0.317	1.375
Kurtosis	3.274	3.292	2.989	4.270
Jarque – Bera	0.315	0.156	0.285	6.502
Observations	18	18	18	18

The negative value of skewness shows data is negatively skewed in all variables except Exchange rate. Value of Kurtosis is more >3 under a specific set of variables except for Exchange rate, so Exchange rate is platykurtic and remaining variables are shown leptokurtic or fat-tailed behavior (Abdullah, 2017). Except for exchange rate, all data series are normally distributed.

Table – 3 Correlation

	GP	KSE	CO	EX
GP	1	-0.054	0.492	0.158
KSE	-0.054	1	0.524	-0.448
CO	0.492	0.524	1	0.08
EX	0.158	-0.448	0.08	1

Table 3 presented the outcomes of the correlation matrix. Multiple regression model found no linear relationship exists between the independent variables. Rules of multicollinearity are, more than 0.8 regressors value between two variables, so there is a serious problem of multicollinearity in series (Ahmet, 2010; Shafana, 2012). Presenting table is shown the values of the correlation matrix lie between 0.524 to -0.054. The existence of multicollinearity is checked via Pearson's correlation analysis and concluded that a series of data free from the multicollinearity.

Table – 4 Regression Equation

Dependent Variable: GP

Method: Least Squares

Variable	C	KSE	CO	EX
Coefficient	1.304	-0.215*	0.353*	-0.284
Std. Error	0.62	0.128	0.127	0.544
t – Statistic	2.102	-1.683	2.786	-0.521
R – squared		0.39		
F – statistic		2.766		
Probability		0.084		

Table-4 comprises the results of regression analysis in which C is constant. Regression analysis generated the coefficient of all variables (Pervaiz et al., 2018). Only crude oil positively affects gold prices at the level of 1%, KSE-100 index negative significantly prejudiced gold price at 10% level and Exchange rate is negatively insignificant correlated with gold prices as (Hashim, 2017).

Table – 5 Breusch – Godfrey Serial Correlation LM Test:

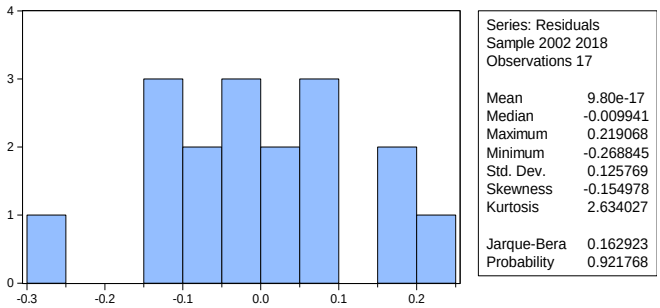
F – statistic	1.573	Prob.	0.251
R – squared	3.781	Prob.	0.151

Table 5 encompasses the results of serial correlation by using Breusch Pagan Godfrey test. F-statistics has a value of 1.573 with 25% of probability which indicates that data is free from serial correlation.

Table – 6 Heteroskedasticity Test: ARCH

F – statistic	0.448	Prob.	0.514
R – squared	0.496	Prob.	0.481

Table 6 encompasses the results of heteroskedasticity by using Breusch Pagan Godfrey test. F-statistics has a value of 0.448 with 51% of probability which clearly indicates that data is free from heteroskedasticity.



Graphical representation of normality test is shown in figure-1. The value of Jarque-Bera is 0.162923, and corresponding probability value is approximately 92% is

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more than 5% level of confidence. We can't reject the distribution normality null hypotheses, and it's an assumption of good regression line as (Ouma & Muriu, 2014). The Jarque-Bera test in present analysis indicates toward the normal distribution of series.

Conclusion

Gold has greater liquidity, contrasted with other resource classes like real estate and stocks, particularly in the midst of an emergency. Its valuation did not depend on the execution of the economy and money related markets. This study basically observed and measures the nature of relationship between the gold price returns and specific macroeconomic variables with regression equation. For the investigation annually series data from 2001 to 2018 is used and check the serial correlation and heteroskedasticity of data for appropriate and accurate results. The serial correlation of all variables is checked by correlation matrix so that the result of this study surely accurately interpreted. The results indicated Crude oil and gold prices are significantly related to each other with sign of positivity and KSE-100 index significant with negative direction of relationship in line (Nadeem, 2017). Exchange rate also related to gold prices negatively but in significant. The imperative commitment of this examination is its accentuation on macroeconomic factors and gold costs execution in a developing country, since most investigations have focused on gold prices and its effects in monetary development in cutting edge economies. The examination likewise gives the forefront data of the share trading system and chose macroeconomic markers. The government should monitor and regulate the gold market with policies and strategies for economic growth as well as the enhanced working of stock market (Tufail & Batool, 2013).

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