



## THE CASE FOR GOLD REVISITED: A SAFE HAVEN OR A HEDGE ?

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Volume 2 (2012) | ISSN 2158-8708 (online) | DOI 10.5195/emaj.2012.28 |

### Abstract

This paper attempts to analyze the relation among gold prices and other macroeconomic and financial variables and addresses the question whether gold is a safe haven or a hedge for investors. The study investigates the relationship by using an econometric analysis for top gold exporter and importer countries, for a sample period of 11 years from 2000 to 2011. The results are twofold (i) return of silver, USD returns and change in the volatility index influences gold returns positively whereas, Swiss Franc and Canadian Dollar returns influence gold returns negatively regardless of presence of the 2008 crisis. (ii) In times of stress, our findings indicate that Swiss Franc, Norwegian Krone and Canadian Dollar function as haven whereas, on average, Swiss Franc, Canadian Dollar and 10 year US treasuries function as a hedge against gold but the results show no evidence for the US dollar.

**Keywords:** Exchange rates, Gold, Hedge, Safe Haven, GARCH



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# The Case for Gold Revisited: A Safe Heaven or A Hedge ?

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## I. Introduction

Gold is used as a standard measure up until the termination of Bretton Woods system by President Nixon in 1971 and as a precious metal for centuries throughout the world. Not more than a decade ago, gold was undermined as an investment by the investors and funds due to its relative poor return performance; most of the funds have chosen not to allocate any funds to gold and the ones that invest in gold have considered the slight diversification benefit it has offered and thus, have allocated a tiny portion of their portfolios. Turnaround for gold emerged with the global crisis of 2008 and it has gained value steadily at a period when precipitous falls in the stock markets were ubiquitous; interest rates were unattractive; the rumors about the European countries were rampant, increasing the eminent default risks. Inevitably, gold has almost tripled its value in US dollar terms and gold market train and its possible route became the center of attention for the majority of investors.

Despite the fact that gold prices are set internationally in foreign exchanges, countries like India and Turkey have significant cultural and psychological rationale in demanding gold. India, solely contributes almost one third of the world demand for gold as of jewellery, total bar and coin (World Gold Council, 2012). Therefore it may be necessary to incorporate financial data of both gold producer countries and gold consuming countries when gold prices are under study. This paper attempts to analyze the relation among gold prices and other macroeconomic and financial variables and

addresses the question whether gold is a safe haven or a hedge for investors.

## II. Literature Review

Koutsoyiannis (1983) finds a strong relation between gold prices and the state of the US economy. Similarly, US money supply and PPI announcements' impacts on gold prices have been evidenced in the study of Tandon and Urich (1987). Especially, unanticipated growth in money supply increases the gold price volatility (Bailey, 1988). According to Christie-David et al. (2000), gold prices react strongly to CPI, unemployment rate, GDP and PPI announcements but not to federal deficit announcements. Cai et al. (2001) have investigated the factors that move the gold market and have found that employment reports, GDP, CPI and personal income have an important role in moving the prices of gold.

Baker and Van-Tassel (1985) show evidence that price of the gold is determined by the future inflation rate. Levin et al. (2004) demonstrated that price of gold rises over time at the rate of inflation and be an effective hedge against inflation. However, Lawrance (2003) have found no significant relationship between gold prices and inflation, GDP and interest rates.

Existence of psychological barriers in gold prices has been examined and it is also stated that traditions play an important role in determining the demand for gold and as a store of value especially during crisis (Aggarwal and Lucey, 2007). Xu and Fung (2005) have used a bivariate asymmetric GARCH model to examine the information flow across the US and Japanese markets for gold, platinum and silver future contracts and proved that volatility spillover among the markets is strong but US market was more dominant. Nakamura and Small (2007) showed that gold prices and crude oil prices exhibit a random walk. Tully and Lucey (2007) have examined the effect of macroeconomic shocks on

gold prices with APGARCH models and show evidence that US dollar has significance on the gold price volatility.

Zhang and Wei (2010) have examined the co-integration, causality and price discovery between the gold market and crude oil market for the time period of 2000-2008. In this period, the correlation of them was significant, 0.9295, and crude oil price change linearly Granger causes the volatility of gold price but no evidence is found for the reverse. Their results also show that the influence of crude oil on global development is wider than gold and crude oil is a more interesting investment option for the investors for the period under study.

Joy (2011) defines an asset as *haven* when it is uncorrelated or negatively correlated to an underlying asset in times of stress. Whereas when it is uncorrelated or negatively correlated to an underlying asset on average, it is called a *hedge*. He has studied the period between 1986 and 2008 and has used the DCC-GARCH model to indicate that gold is a hedge against the US dollar especially in the recent times of the study but provide no evidence of gold being the safe haven for US dollar. Baur & Lucey (2010) investigated the existence of a hedge and a safe haven in US, UK and German stock and bond prices and returns and their relationship with gold prices. They found that gold is a hedge against stocks and gold is a safe haven in extreme stock market conditions and lastly gold is a safe haven for stocks only for 15 trading days after an extreme shock occurred. Capie, Mills and Wood (2005) analyzes the role of gold as a hedge against the dollar and found a negative relationship between gold and other foreign exchange rates.

### III. Data and Methodology

#### 3.1 Data

Data consists of daily gold prices per ounce as a dependent variable and to explain the change in the dependent variable, a set of exchange rates of top

gold exporter and gold importer countries, a subset of alternative assets including bond returns, return of oil prices and silver prices, and credit default swaps of some emerging countries are used. Independent variables are refined after eliminating the insignificant ones. Two periods are used: one had 2768 observations, between 24.10.2000 – 07.10.2011; and the other period starts with the global crisis up until 07.10.2011 with 1074 observations.

This study employs currencies of countries that are the leading gold exporters and importers. Namely, India, China, Turkey, Russia, USA, Indonesia, Euro zone countries, Switzerland and UK are among the top gold demanding countries whereas, China, Australia, USA, South Africa, Russia, Canada and Indonesia are among the significant producers in World gold production according to the reports of World Gold Council (2011). Our data are sourced from Thompson Reuters. Closing prices are used for the independent variables and daily returns are analyzed in natural logarithms as follows:

$$R_{j,t} = \ln(p_{j,t}/p_{j,t-1}) \quad (1)$$

where  $R_{j,t}$  is the return of variable  $j$  at time  $t$  and  $p_t$  is the price of variable  $j$  at time  $t$ .

#### 3.2 Methodology

GARCH (1,1) model has been applied for both of the periods as both the model assumes volatility arising from innovations in the market is symmetrical (Tully and Lucey, 2007) and a likelihood ratio test supports this model. Tables 3 and 4 are derived from the GARCH(1,1) model.

The GARCH model is a general autoregressive conditional heteroskedastic model. GARCH regresses on lagged terms. The conditional variance is dependent upon its own lags. The equation for GARCH(1,1) is:

$$\sigma_t^2 = \alpha_0 + \alpha_1 \mu_{t-1}^2 + \beta \sigma_{t-1}^2 \quad (2)$$

where  $\alpha_0$  is the weighted long run variance and the updated forecast of variance is a function of the most recent variance forecast  $\sigma_{t-1}^2$ , and the most recent squared prediction error,  $\mu_{t-1}^2$ . In this case, if there is an unexpectedly large increase or decrease in asset return at time  $t$  then this will generate an increase in the expected variability in the next period. In this study, STATA<sup>®</sup> software is used to compute the summary statistics and the GARCH models.

## IV. Result

### 4.1 Summary Statistics

Summary statistics of the data are displayed in Table 1 for the entire period and for the crisis period. Augmented Dickey-fuller test has been conducted for the unit root test and stationary of the data are evidenced for both of the periods. Normality tests show that data is normal and kurtosis amounts are reasonable.

### 4.2 Results: 2000 – 2011

Tests have been applied to select the significant currencies either among major currencies or among the leading gold importing/exporting countries and credit default swaps (CDS) of emerging countries; Russian and South African credit default swaps' returns are found to be significant and are incorporated into the model whereas, Swiss franc's, US Dollar's, Norwegian Krone's, Canadian Dollar's, Chinese Yuan's and South African Rand's returns are incorporated into the model with a similar fashion. The remaining significant independent variables were namely; return of 10 year US treasury bonds, return of oil prices, return of silver and a volatility index, VIX.

**Table 2** GARCH model estimation results for the 2000-2011 period

Number of obs =	2768			
Wald chi2(10) =	1994.88			
Log likelihood =	9067.567			
<b>rusdgold</b>	<b>Coef.</b>	<b>Std. Err.</b>	<b>z</b>	<b>P&gt; z </b>
ruscds	-0.00933	0.005779	-1.62	0.106
rsacds	0.01109	0.006310	1.76	0.079
rus10tr	-0.09258	0.039239	-2.36	0.018
roil	0.01637	0.006376	2.57***	0.010
rsilver	0.13094	0.008498	15.41***	0.000
rvix	0.01250	0.002904	4.31***	0.000
rchfud	-0.33795	0.049016	-6.89***	0.000
rusd	1.22207	0.197929	6.17***	0.000
rnokusd	-0.06396	0.042051	-1.52	0.128
rcadusd	-0.10465	0.033691	-3.11***	0.002
rcnyusd	-0.22568	0.197633	-1.14	0.253
rzarusd	-0.01852	0.016136	-1.15	0.251
cons	0.00018	0.000153	1.22	0.221
<b>ARCH</b>				
arch L1.	0.08053	0.006760	11.91	0.000
garch L1.	0.90720	0.008064	112.49	0.000
cons	1.41e-06	3.14e-07	4.48	0.000

\* Indicates statistical significance at the 10% level

\*\* Indicates statistical significance at the 5% level

\*\*\* Indicates statistical significance at the 1% level

A GARCH (1,1) model shows us the estimated coefficients in Table 2. Silver, as a substitute, has the largest influence on the gold prices with a z-statistic of 15.41 (99 % significant). USD returns are conforming to the earlier studies and it is the most influencing currency on gold prices with a z-statistic of 6.17 (99 % significant). Volatility index is also significant with a z-statistic of 4.31 (99 % significant) which may indicate that at times of uncertainty, gold prices gain value. Return of oil prices with a z-statistic of 2.57 is hardly significant at 99 % but South African CDSs with a z- statistic of 1.76 is significant at 90 %. Swiss Franc has the most significant negative coefficient with a z-statistic of -6.89 (99 % significant), Canadian Dollar has a significant (99 %) negative coefficient of -3.11 and

10 year US treasuries has a significant negative coefficient of -2,36 (95 %).

### 4.3 Results: 2008 – 2011

Similarly, numerous tests have been applied to select the significant currencies either among major currencies or among the leading gold importing/exporting countries and credit default swaps (CDS) of emerging countries; Russian and South African credit default swaps' returns are found to be significant and are incorporated into the model whereas, Swiss franc's, US Dollar's, Norwegian Krone's, Canadian Dollar's, Chinese Yuan's and South African Rand's returns are incorporated to the model with a similar fashion. The remaining significant independent variables were namely; return of 10 year US treasury bonds, return of oil prices, return of silver and a volatility index, VIX.

**Table 3** GARCH model estimation results for the 2008-2011 period

Number of obs =	1074			
Wald chi2(10) =	773.82			
Log likelihood =	3393.523			
<b>rusdgold</b>	<b>Coef.</b>	<b>Std. Err.</b>	<b>z</b>	<b>P&gt; z </b>
ruscds	0.0207681	0.0118665	1.75*	0.080
rsacds	0.0157120	0.0118541	1.33	0.185
rus10tr	0.0355800	0.6220940	0.57*	0.056
roil	0.0237889	0.0144552	1.65*	0.100
rsilver	0.1797550	0.0133826	13.43***	0.000
rvix	0.0139063	0.0051861	2.68**	0.007
rchfusd	-0.2967927	0.0657169	-4.52***	0.000
rusd	1.4345070	0.2602825	5.51***	0.000
rnokusd	-0.1988765	0.0661018	-3.01***	0.003
readusd	-0.2547862	0.0605062	-4.21***	0.000
rcnyusd	-0.5694361	0.2606366	-2.18**	0.029
rzarusd	-0.0277312	0.0351942	-0.79	0.431
cons	0.0003865	0.0002850	1.36	0.175
<b>ARCH</b>				
arch L1.	0.0783626	0.012625	6.21	0.000
garch L1.	0.9071669	0.0145162	62.49	0.000
cons	1.76e-06	6.31e-07	2.78	0.005

\* Indicates statistical significance at the 10% level

\*\* Indicates statistical significance at the 5% level

\*\*\* Indicates statistical significance at the 1% level

A GARCH (1,1) model shows us the estimated coefficients in Table 3. Silver, as a substitute, has the largest influence on the gold prices with a z-statistic of 13.43 (99 % significant). USD returns are conforming to the earlier studies and it is the most influencing currency on gold prices with a z-statistic of 5.51 (99 % significant). Volatility index is also significant with a z-statistic of 2.68 (99 % significant) which may indicate that at times of uncertainty, gold prices gain value. Oil prices with a z-statistic of 1.65 and Russian CDSs with a z-statistic of 1.75 are also significant yet, 90 %. It is worth to note that for hedging purposes, Swiss Franc, Norwegian Krone and Canadian Dollar have significant (99 %) negative coefficients -4,52, -3,01 and -4,21 respectively and Chinese Yuan has a significant negative coefficient of -2,18 (95 %).

## V. Conclusion

This paper has examined the fit of the GARCH model for gold returns and provides evidence that return of silver, USD returns and change in the volatility index influences gold returns positively whereas, Swiss Franc and Canadian Dollar returns influence gold returns negatively regardless of presence of the 2008 crisis.

In times of stress, our findings indicate that Swiss Franc, Norwegian Krone and Canadian Dollar function as haven whereas, on average, Swiss Franc, Canadian Dollar and 10 year US treasuries function as a hedge against gold but we provide no evidence for the US dollar therefore our findings support the study of Joy (2011).

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**Table 1** Summary Statistics

Variable	Summary Statistics for the Entire Period (2000-2011)							Summary Statistics for the Crisis Period (2008-2011)						
	Obs	Mean	Std. Dev.	Min	Max	Skewness	Kurtosis	Obs	Mean	Std. Dev.	Min	Max	Skewness	Kurtosis
ruscde	2768	-0.000435	0.0382	-0.2885	0.4330	0.000	0.000	1074	0.001184	0.0479	-0.2885	0.4330	0.000	0.000
rsacde	2768	-3.87e-06	0.0337	-0.2716	0.2805	0.000	0.000	1074	0.000928	0.0441	-0.2716	0.280	0.019	0.000
rtrede	2768	-0.000185	0.0343	-0.2363	0.2281	0.000	0.000	1074	0.000212	0.0389	-0.2363	0.2241	0.084	0.000
rus10tr	2768	0.000085	0.0043	-0.0262	0.0353	0.000	0.000	1074	0.000171	0.0050	-0.0262	0.0353	0.600	0.000
roil	2768	0.000444	0.0245	-0.1872	0.1796	0.001	0.000	1074	0.000320	0.0251	-0.1670	0.1796	0.305	0.000
rsilver	2768	0.000676	0.0209	-0.1732	0.1392	0.000	0.000	1074	0.000822	0.0255	-0.1692	0.1392	0.000	0.000
rvix	2768	0.000144	0.0631	-0.3505	0.4960	0.000	0.000	1074	0.000512	0.0737	-0.3505	0.4054	0.000	0.000
rusdgold	2768	0.000641	0.0124	-0.0794	0.0771	0.000	0.000	1074	0.000842	0.0144	-0.0794	0.0771	0.001	0.000
rusd	2768	0.000159	0.0062	-0.0373	0.0346	0.000	0.000	1074	-0.000024	0.0066	-0.0373	0.0346	0.000	0.000
rjpyusd	2768	0.000025	0.0071	-0.0495	0.0519	0.000	0.000	1074	-0.000435	0.0086	-0.0495	0.0519	0.031	0.000
rdkkusd	2768	-3.61e-07	0.0008	-0.0180	0.0179	0.001	0.000	1074	-2.79e-07	0.0001	-0.0012	0.0005	0.000	0.000
rsekusd	2768	0.000019	0.0039	-0.0227	0.0265	0.032	0.000	1074	-3.17e-06	0.0047	-0.0227	0.0265	0.012	0.000
rnokusd	2768	-8.60e-06	0.0041	-0.0393	0.0245	0.072	0.000	1074	-0.000016	0.0048	-0.0393	0.0245	0.008	0.000
rribusd	2768	0.000214	0.0065	-0.0355	0.0517	0.005	0.000	1074	0.000197	0.0074	-0.0331	0.0517	0.000	0.000
rtryusd	2768	0.000519	0.0135	-0.1016	0.3916	0.000	0.000	1074	0.000325	0.0087	-0.0638	0.0438	0.039	0.000
raudusd	2768	-0.000063	0.0066	-0.0429	0.0525	0.000	0.000	1074	-0.000135	0.0077	-0.0429	0.0525	0.000	0.000
rbrlusd	2768	0.000134	0.0129	-0.1053	0.0809	0.000	0.000	1074	-0.000048	0.0116	-0.0680	0.0665	0.001	0.000
readusd	2768	0.000018	0.0061	-0.0339	0.0278	0.010	0.000	1074	-0.000042	0.0064	-0.0339	0.0278	0.029	0.000
rcnyusd	2768	0.000065	0.0062	-0.0369	0.0335	0.000	0.000	1074	-0.000184	0.0065	-0.0369	0.0335	0.000	0.000
rhdusd	2768	0.000159	0.0064	-0.0359	0.0325	0.024	0.000	1074	-0.000026	0.0073	-0.0359	0.0325	0.113	0.000
ridrusd	2768	0.000137	0.0093	-0.1030	0.7560	0.000	0.000	1074	-0.000056	0.0087	-0.0476	0.0756	0.000	0.000
rinrusd	2768	0.000182	0.0067	-0.0444	0.0279	0.000	0.000	1074	0.000168	0.0076	-0.0444	0.0279	0.000	0.000
rkrvusd	2768	0.000155	0.0106	-0.0878	0.0834	0.000	0.000	1074	0.000212	0.0112	-0.0878	0.0834	0.000	0.000
rmyrusd	2768	0.000096	0.0095	-0.1403	0.1406	0.003	0.000	1074	-0.000101	0.0085	-0.0382	0.0362	0.043	0.000
rnzdusd	2768	-0.000072	0.0069	-0.0332	0.0418	0.000	0.000	1074	-0.000022	0.0076	-0.0332	0.0418	0.000	0.000
rsgdusd	2768	0.000052	0.0052	-0.0305	0.0258	0.065	0.000	1074	-0.000162	0.0048	-0.0267	0.0258	0.062	0.000
rzarusd	2768	0.000170	0.0104	-0.1000	0.0771	0.000	0.000	1074	0.000085	0.0096	-0.0585	0.0759	0.000	0.000
rgbpusd	2768	0.000131	0.0047	-0.0430	0.0290	0.000	0.000	1074	0.000232	0.0055	-0.0430	0.0290	0.000	0.000
rplnusd	2768	0.000046	0.0068	-0.0382	0.0534	0.007	0.000	1074	0.000136	0.0074	-0.0373	0.0335	0.006	0.000
rchfusd	2768	-0.000072	0.0037	-0.02460	0.0515	0.000	0.000	1074	-0.000270	0.0053	-0.0246	0.0515	0.000	0.000

*Note:* The letter “r” at the beginning of each variable stands for the term “return”. The abbreviations used for the variables are: ruscds: the US credit default swaps (CDS), rsacds: the South African CDS, rtrcds: the Turkish CDS, rus10tr: US 10 year treasury, roil: oil, rsilver: silver, rvix: VIX Index, rusdgold: USD and gold, rusd: USD, rjpyusd: Japanese yen to USD, rdkkusd: Danish krone to USD, rsekusd: Swedish sek to USD, rnokusd: Norwegian kroner to USD, rrubusd: Russian ruble to USD, rtryusd: Turkish lira to USD, raudusd: Australian dolar to USD, rbrlusd: Brazilian real to USD, readusd: Canadian dollar to USD, rnyusd: Chinese renminbi to USD, rhkdusd: Hong kong dollar to USD, ridrusd: Indonesian rupiah to USD, rinrusd: Indian rupee to USD, rkrwusd: South Korean won to USD, rmyrusd: Malaysian ringgit to USD, rnzdusd: New Zealand dollar to USD, rsgdusd: Singapore dollar to USD, rzarusd: South African rand to USD, rgbpusd: British Pound Sterling to USD, rplnusd: polish zloti to USD, rchfusd: Swiss francs to USD