Economics Bulletin

Volume 31, Issue 2

The Relationship of the value of the Dollar, and the Prices of Gold and Oil: A Tale of Asset Risk

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Abstract

This paper investigates the relationship between the value of the dollar and the prices of two commodities, gold and oil. Granger causality is used on monthly data from January of 1970 through July of 2008. The empirical results show that the hypothesis that there is no causal relation between the value of the dollar and the prices of gold and oil is not supported by the evidence. There are causal relations between each of the prices, and there is a negative relation between the value of the dollar and the price of each of the commodities, as predicted by standard economic theory. Also consistent with the predictions of classical economic theory is that there is a positive statistical association between the prices of gold and oil. The implication is that gold and oil represent safe havens from fluctuations in the value of the dollar.

Citation: Myeong Hwan Kim and David A. Dilts, (2011) "The Relationship of the value of the Dollar, and the Prices of Gold and Oil: A Tale of Asset Risk", *Economics Bulletin*, Vol. 31 no.2 pp. 1151-1162.
Submitted: Feb 11 2011. **Published:** April 15, 2011.

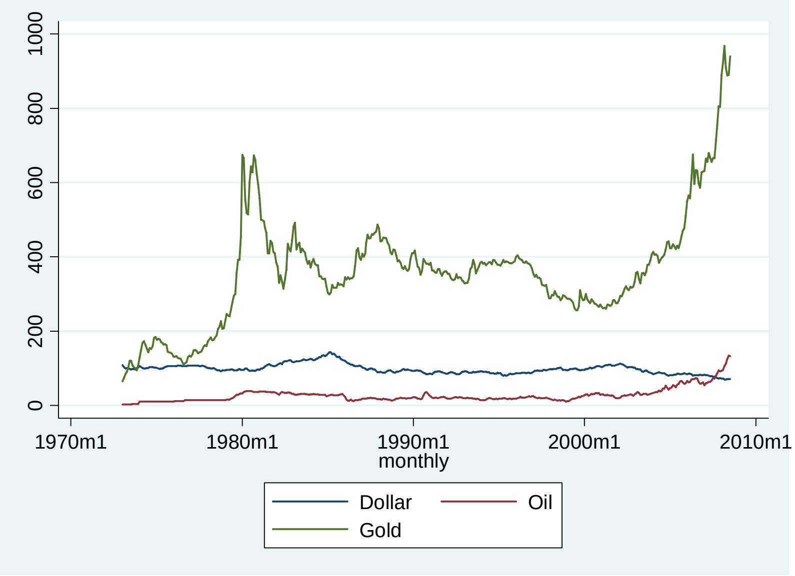
1. Introduction

Economists have long recognized the role of currency valuation in pricing commodities, particularly imported commodities, such as oil and gold (Marshall, 1920). Alfred Marshall also recognized that precious metals were the foundation upon which the value of all things may revert because of several factors, not the least of which was risk which is endemic to one asset class, and not others. As Marshall observed:

> Stock exchanges then are the pattern on which markets have been, and are being formed for dealing in many kinds of produce which can be easily and exactly described, are portable and in general demand. The material commodities however which possess these qualities in the highest degree are gold and silver. For that very reason they have been chosen by common consent for use as money, to represent the value of other things: the world market for them is most highly organized, and will be found to offer many subtle illustrations of the actions of the laws which we are now discussing. (Marshall, 1920, p. 144).

While the scribblings ancient economists are in vogue as motivations for various studies of the inner workings of markets, Alfred Marshall did posit an interesting question. Marshall suggests that there is a necessary relationship between the prices of commodities and money. Money being of two specific forms: fiat money and species. That as the volatility arises in the value of fiat money, those investors seeking safer shores may place their capital in gold or other commodities whose value may rise as the value of the currency falls, or at least is not dependent on the value of the currency.

Figure 1: Dollar, Gold and Oil (Nominal)



In recent months the price of gold has risen hyperbolically while the dollar has lost significant value (See figure 1). Last fall the price of crude oil topped \$147 for the first time in history and has found support in the upper forties (Again, see figure 1). These events have lead to speculation that oil exporting nations may likely seek a different currency in which to price crude oil.

Gold, in Marshall's day, was not questioned as a close substitute for fiat money. What the events of recent days have shown is that Marshall's assertions about the relationship between money, gold and commodities may actually be discoverable in the recent market data. In other words, there may well be empirical evidence to support Marshall's conjecture that gold, commodities, and fiat money are intertwined.

The purpose of this paper is to examine the relationship between the prices of the U.S. dollar, gold and oil. Granger causality will be applied to monthly price data for January 1970 through July 2008 to determine whether there exists evidence which permits us to reject casual relations between these three variables. The next section of the paper will examine the methodology utilized, the third section will present the empirical results, while the last section provides conclusions.

2. Methodology

The Augmented Dickey-Fuller (ADF) and Philippe-Perron (PP) unit root tests are considered to determine the order of integration of the variables. These unit root tests are conducted for both levels and first differences. The ADF unit root tests are generated by the following equation:

$$y_t = \beta^{'} D_t + \phi y_{t-1} + \sum_{j=1}^{p} \gamma_j \Delta y_{t-j} + \varepsilon_t \qquad (1)$$

where y_t is a variable (e.g., dollar, gold and oil), ε_t is the error term, D_t is a vector of deterministic terms, and p indicates the number of differenced terms used.

Since Dickey and Fuller published their first proposed tests, numerous other tests have been proposed. Phillips and Perron (1988) developed a number of unit root tests that have become popular in the analysis of time series. The intent of the PP test is to improve the finite sample properties of the ADF test. The PP unit root tests differ from the ADF tests mainly in how they deal with serial correlation and heteroskedasticity in the errors. Specifically, where the ADF tests use a parametric autoregression to approximate the ARMA structure of the errors in the test regression, the PP tests ignore any serial correlation in the test regression. The test regression for the PP tests is

$$\Delta y_t = \beta^{'} D_t + \pi y_{t-1} + u_t \qquad (2)$$

where u_t is $I(0)$ and may be heteroskedastic. The PP tests correct for any serial correlation and heteroskedasticity in the errors u_t of the test regression by directly modifying the test statistics $t_{t=0}$ and $T_{\pi}^{\wedge}$. Under the null hypothesis that $\pi = 0$, the PP test statistics have the same asymptotic distributions as the ADF t-statistic and normalized bias statistics. One advantage of the PP tests over the ADF tests is that the PP tests are robust to general forms of heteroskedasticity in the error term u_t. Another advantage is that the user does not have to specify a lag length for the test regression.

This study employs vector autoregression (VAR)[1] in order to examine the evolution and the interdependencies between dollar, gold and oil. VAR is used to study systems of interrelated time series in which all variables in a system are expressed as a linear function of the lagged values of every variable in the system:

A p^{th} order VAR, say VAR(p) ,is

$$y_t = \alpha + A_1 y_{t-1} + ... + A_p y_{t-p} + \varepsilon_{it} \qquad (3)$$

where y_t is a variable (e.g., gold, dollar and oil), α is $k \times 1$ vector of constant, A is $k \times k$ matrix and ε_t is $k \times 1$ vector of error terms satisfying

$$E(\varepsilon_t) = 0, E(\varepsilon_t \varepsilon_t^{'}) = \Omega \text{ and } E(\varepsilon_t \varepsilon_{t-k}^{'}) = 0 \qquad (4)$$

A VAR model describes the evolution of a set of k variables over the same sample period (t = 1, ..., T) as a linear function of only their past value. The variables are collected in a k×1 vector y_t, which has as the i^{th} element $y_{i,t}$ the time t observation of variable y_i.

For the cointegration test, Johansen's multivariate cointegration tests were used, which involve a maximum likelihood estimation procedure that provides estimates of cointegrating vectors for a given number of variables. Engle and Granger (1987)'s cointegration test requires prior knowledge about cointegrating vectors, which are usually unknown. However, Johansen (1988) and Johansen and Juselius (1990) cointegration tests can resolve this problem. These tests are multivariate extensions of the usual unit root tests for autoregressive processes and use canonical correlation of residuals from a reparameterized model to estimate the space of cointegration vectors. The cointegration tests are generated by the equation:

$$X_t = \Pi_1 X_{t-1} + \Pi_2 X_{t-2} + ... + \Pi_k X_{t-k} + \varepsilon_t \qquad t=1, 2, \ldots, \mathrm{T} \qquad (5)$$

where X_t is a vector of variables with p elements, Π_i is a $p \times p$ matrix (t=1, 2, …, k) and ε_t is a vector with p elements composed of independently and normally distributed random disturbances with mean zero. An impact matrix can be defined as follow:

$$\Pi = \Pi_1 - \Pi_2 - ... - \Pi_k \qquad (6)$$

where the dimension of the entire matrix is $p \times p$ and I is the identity matrix. If the Π has rank r then there exist r cointegrating vectors in X_t and p-r common stochastic trends. The impact matrix can be written as follow:

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[1] Sims (1980) advocates the use of VAR models as a theory-free method to estimate economic relationships.

$$\Pi = \alpha\beta^{'} \tag{7}$$

where α and β are $p \times r$ matrix. The space spanned by β is called the cointegration space and represents the space spanned by the rows of matrix Π.

Engle and Granger (1987) have shown that if two variables are cointegrated, they can be written in an error correction form. The cointegrating linear combination of the variables is interpreted as an equilibrium relationship. So, cointegrated variables must have an Error Correction Model (ECM) representation since the variables have been shown to be cointegrated. The ECM is a dynamic system in which an error correction term represents deviations from a long run equilibrium relationship, while short run dynamics are represented by lagged difference terms. The ECM embodies the restriction implied by cointegration, and also separates the short run dynamics and the long run equilibrium condition of the variables.[2] The following error correction model is estimated here:

$$\Delta Dollar_t = \alpha_0 + \alpha_1 \varepsilon_{t-1} + \sum_{t=1}^{p} \alpha_{2i} \Delta Dollar_{t-i} + \sum_{t=1}^{p} \alpha_{3i} \Delta Gold_{t-i} + \eta_{1t} \tag{8}$$

where $\varepsilon_{t-1} = Dollar_{t-i} - \hat{\delta}_1 Gold_{t-i}$ with $\hat{\delta}_1$ being the least squares estimates of an equation, $Dollar_t = \hat{\delta}_1 Gold_t + \zeta_t$, and η_{1t} and ζ_t are the error terms and Δ is a difference operators.

The existence of causality is tested using Granger causality tests. The auto-regression assuming for *T* periods is.

$$y_t = \alpha_0 + \sum_{l=1}^{m} \beta_{lt} y_{t-l} + \sum_{l=1}^{m} \gamma_{lt} x_{t-l} + \varepsilon_t \qquad t=1, , T \tag{9}$$

where, α, β and γ are parameters, *m* is a lag length, and ε_t is supposed to be white-noise errors that may be correlated for a given country, but not across countries. Further, it is assumed that y_t and x_t are integrated so, depending on the time-series properties of the data, they might denote the level, the first difference or some higher difference of dollar and gold price, respectively. Granger causality tests are conducted through the following procedure. If the null hypothesis "*x* does not cause *y*" is not rejected, *x* does not Granger-causes *y*. That is, if the null hypothesis $\gamma_1 = \gamma_2 = ... = \gamma_m = 0$ is not rejected, we conclude that *x* does not affect *y*. We can apply a standard *F*-test into testing the hypothesis.

Conduct impulse response functions (IRF) and variance decomposition is used to examine the dynamic relationships among these variables. The IRF analysis is used to describe the impact of an exogenous shock (innovation) in one variable on the other variables of the system in dynamic models (e.g. VAR). For example, a one standard deviation (one unit) increase in the *j*th variable innovation (residual) is introduced at a time *t* and it is then returned to zero thereafter. The variance decomposition shows the percentage of the total variance that can be

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[2] Phillips (1991) compares the statistical properties of the ECM and the Vector Autoregressive Model (VAR), and concludes that the causality test based on ECMs is more suitable than the one based on VARs.

explained by each component. In other words, the variance shows which proportion of the variability of one variable can be explained by the other variable and which proportion should be attributed to other factors.

3. Empirical Results

Following the methodology outlined earlier, each series is first examined to determine whether or not it is integrated of order one. The ADF and PP unit root tests are applied to determine the order of integration of variables. The test is conducted under the null hypothesis of a unit root. Using the critical values calculated by Dickey and Fuller and Phillips Perron, if the calculated ratio is significantly different from zero, the null hypothesis is rejected. The results of unit root tests are given in Table 1.

Table 1: Augmented Dickey-Fuller and Phillips-Perron Tests for Unit Root

	Level	First Difference		
	Test Statistics	Test Statistics	Critical Value*	Lag**
Augmented Dickey-Fuller				
Dollar	-0.851	-9.272	-3.446	4
Gold	-1.600	-8.413	-3.446	4
Oil	-1.814	-10.446	-3.446	2
Phillips-Perron				
Dollar	-1.337	-15.486	-3.446	4
Gold	-2.011	-15.565	-3.446	4
Oil	-1.706	-15.631	-3.446	2

Note: * 1 percent significance level. ** Optimum lag length is selected by using Akaike information criterion (AIC).

According to the results in Table 1, the null hypothesis of a unit root is accepted for the level series at the 1 percent level of significance, leading to the conclusion that each series is nonstationary by using ADF and PP tests. Unit root tests for the first differences of the variables are also given in Table 1. According to the results in Table 1, the null hypotheses of a unit root for dollar, gold and oil are rejected for the first differenced series at the 1 percent level of significance. These results suggest that variables are integrated of order one for dollar, gold and oil.

Table 2 shows the VAR coefficient matrix in terms of lag 1 and 2, the parameter estimates, and their significances that indicate how well the model fits the data. The parameter names which indicate the $(i,j)^{th}$ element of the lag l and 2 autoregressive coefficients. The first, second and third columns, the regressor corresponding to its parameter.

Table 2: Vector Auto Regression (VAR)

		Coefficients	
	Dollar	Gold	Oil
Dollar			
lag1	1.281^{***}	-0.029	0.216
	(0.049)	(0.150)	(0.245)
lag2	-0.282^{***}	0.036	-0.216
	(0.049)	(0.150)	(0.244)
Gold			
lag1	-0.015	1.228^{***}	0.124
	(0.017)	(0.051)	(0.083)
lag2	0.015	-0.256^{***}	-0.112
	(0.016)	(0.050)	(0.082)
Oil			
lag1	-0.022^{**}	0.044	1.159^{***}
	(0.010)	(0.030)	(0.048)
lag2	0.022^{**}	-0.032	-0.182^{***}
	(0.010)	(0.030)	(0.049)
Constant	-0.004	0.051^{***}	-0.045
	(0.006)	(0.020)	(0.032)
RMSE	0.016	0.049	0.080
R^2	0.999	0.980	0.969

Note: Standard error in parenthesis. *** denotes significant at 1 percent. ** denotes significant at 5 percent. Optimum lag length (2) is selected by using Akaike information criterion (AIC).

Table 3: Multivariate Cointegration

		Dollar & Gold	Dollar & Oil	Gold & Oil	Critical Value*
Trace Test	Null Hypothesis				
	$H_o : r = 0$	5.04	4.91	18.06	15.41
	$H_o : r \leq 1$	0.84	1.04	2.21	3.76
Maximal	Null Hypothesis				
Eigenvalue Test	$H_o : r = 0$	4.20	3.87	15.85	14.07
	$H_o : r = 1$	0.84	1.04	2.21	3.76

Note: * 5 percent significance level.

We apply Johansen and Juselius (1990) multivariate trace and maximal eigenvalue cointegration tests to the variables under null hypotheses with respect to the number of cointegrating vectors (i.e., $r = k$, where k = 0, 1). The results are shown in Table 3. In the Johansen and Juselius multivariate trace test, the null hypotheses are $H_0 : r = 0$ or $H_0 : r \leq k$, where k = 1 and alternative hypotheses are $H_A : r > k$, where k = 0, 1. The null and alternative hypotheses for the maximal eigenvalue test are $H_0 : r = k$ and $H_A : r = k + 1$, where k = 0, 1 and r is the number of cointegrating vectors. Only for gold and oil, both trace and eigenvalue tests yield identical results: the null hypothesis is rejected for $r = 0$, and accepted for $r = 1$. That is, there is a single cointegrating vector. These results show that long run movements of the variables are determined by one common driving fundamental. Yet, dollar and gold, and dollar and oil the null hypothesis is accepted for $r = 0$, implying that there is no single cointegrating vector.

Table 4: Estimation of Error Correction Model

Δ Dollar		Δ Dollar		Δ Gold	
Variable	Coeff.	Variable	Coeff.	Variable	Coeff.
e_{t-1}	0.0002	e_{t-1}	0.00003	e_{t-1}	-0.0156
	(0.6650)		(0.6900)		(0.0480)
Dollar		Dollar		Gold	
Δ *t-1.*	0.3150	Δ *t-1.*	0.32467	Δ *t-1.*	0.2830
	(0.0000)		(0.0000)		(0.0000)
Δ *t-2*	-0.0999	Δ *t-2*	-0.11802	Δ *t-2*	-0.1475
	(0.0510)		(0.0140)		(0.0020)
Gold		Oil		Oil	
Δ *t-1.*	-0.0231	Δ *t-1.*	-0.02217	Δ *t-1.*	0.0335
	(0.1700)		(0.0230)		(0.2670)
Δ *t-2*	0.0197	Δ *t-2*	-0.00352	Δ *t-2*	0.0216
	(0.2420)		(0.7200)		(0.4750)
Constant	-0.0037	*Constant*	-0.00377	*Constant*	0.0028
	(0.0000)		(0.0000)		(0.2630)
Δ Gold		Δ Oil		Δ Oil	
Variable	Coeff.	Variable	Coeff.	Variable	Coeff.
e_{t-1}	0.0027	e_{t-1}	0.00067	e_{t-1}	0.0199
	(0.0610)		(0.0720)		(0.1240)
Dollar		Dollar		Gold	
Δ *t-1.*	-0.0412	Δ *t-1.*	-0.02913	Δ *t-1.*	0.1075
	(0.7940)		(0.9050)		(0.1790)
Δ *t-2*	-0.0305	Δ *t-2*	0.22730	Δ *t-2*	-0.0669
	(0.8460)		(0.3450)		(0.4000)
Gold		Oil		Oil	
Δ *t-1.*	0.2917	Δ *t-1.*	0.19239	Δ *t-1.*	0.1860
	(0.0000)		(0.0000)		(0.0000)
Δ *t-2*	-0.1422	Δ *t-2*	-0.04314	Δ *t-2*	-0.0459
	(0.0060)		(0.3830)		(0.3580)
Constant	0.0003	*Constant*	0.00017	*Constant*	0.0022
	(0.9140)		(0.9730)		(0.5950)

Note: *p*-values in parenthesis.

The cointegration between the two variables allows to estimate a vector error correction model (VECM) in order to describe the dynamic adjustment of the variables to long-run equilibrium. The VECM estimation is reported in Table 4. The results show that the error correction term has a significant impact on gold price variations. Therefore, there is a mean-reverting process of the gold price to its long-term target. However, the adjustment speed is quite high (0.0156), meaning that about 16% of the adjustment to equilibrium is achieved each month.[3]

Table 5: Granger Causality Test

	Excluded		
Equation	Dollar	Gold	Oil
Dollar		0.978	0.894
Gold	0.012*		0.016*
Oil	0.737	0.335	

Note: *p*-values from the F-tests of joint significance of the lagged difference terms in the VEC equations.

We perform Granger causality. The results are shown in Table 5. The null and alternative hypotheses for causality test are H_o: *Dollar* does not cause *Gold* and H_A: H_o is not true. Table 5 presents the *F*-statistics of the causality tests. According to the results in Table 5, *F*-test statistics of causality from dollar to gold and oil to gold are statistically significant which suggests that we should not reject alternative hypotheses for the causality. However, no causal relation was found between dollar and oil.

Table 6: Impulse Response Function

	Response								
	Dollar			Gold			Oil		
Time	Coef	Lower	Upper	Coef	Lower	Upper	Coef	Lower	Upper
Dollar									
t-1	1.320	1.220	1.420	-0.021	-0.329	0.287	0.106	-0.404	0.615
t-2	1.303	1.134	1.472	-0.043	-0.546	0.461	0.361	-0.430	1.152
t-3	1.278	1.063	1.493	0.011	-0.607	0.629	0.509	-0.466	1.485
t-4	1.273	1.028	1.518	0.066	-0.622	0.753	0.535	-0.543	1.612
t-5	1.271	1.019	1.523	0.086	-0.597	0.769	0.523	-0.543	1.590
t-6	1.267	1.013	1.521	0.098	-0.577	0.774	0.513	-0.530	1.557
t-7	1.262	1.005	1.519	0.113	-0.559	0.785	0.506	-0.518	1.530
t-8	1.259	1.001	1.516	0.127	-0.535	0.788	0.497	-0.507	1.501
Gold									
t-1	-0.025	-0.058	0.008	1.267	1.165	1.369	0.143	-0.025	0.312
t-2	-0.008	-0.064	0.048	1.144	0.979	1.310	0.166	-0.094	0.425
t-3	-0.036	-0.106	0.035	1.131	0.928	1.335	0.198	-0.124	0.519

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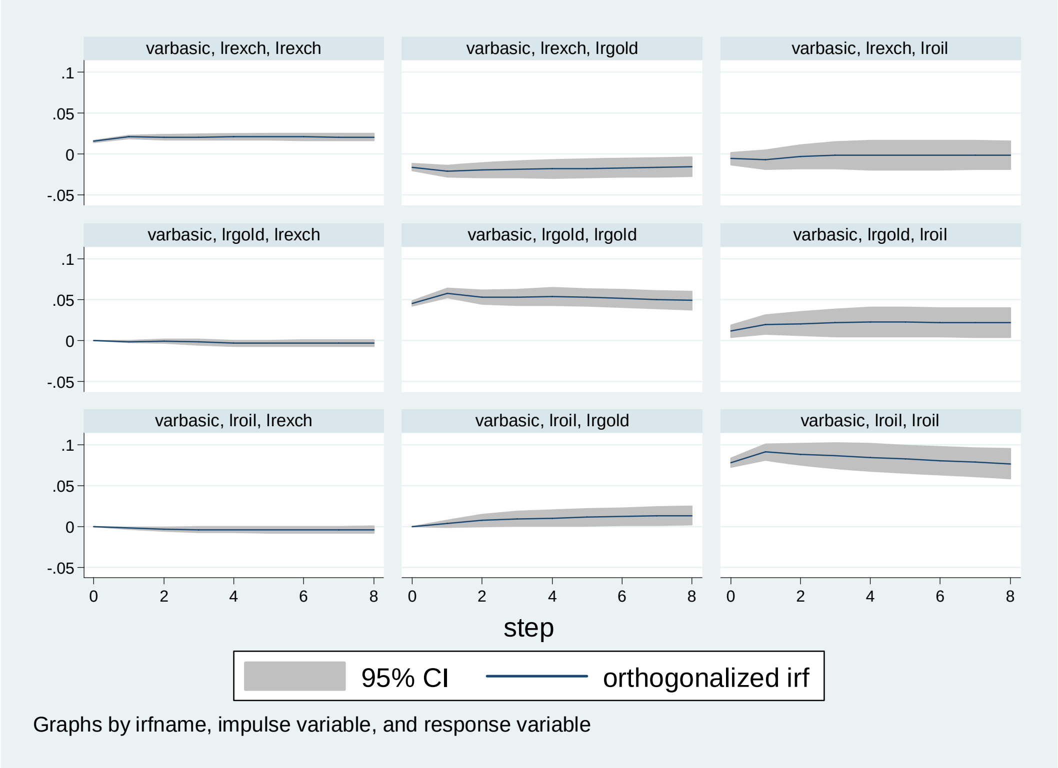
[3] Note that a positive error correction term meaning that there is no mean-reverting process.

t-4	-0.065	-0.145	0.015	1.150	0.926	1.374	0.232	-0.119	0.583
t-5	-0.067	-0.149	0.015	1.125	0.902	1.348	0.234	-0.115	0.582
t-6	-0.064	-0.149	0.021	1.089	0.862	1.316	0.228	-0.123	0.579
t-7	-0.064	-0.153	0.024	1.059	0.825	1.294	0.231	-0.129	0.590
t-8	-0.064	-0.157	0.028	1.031	0.790	1.273	0.236	-0.134	0.605
Oil									
t-1	-0.023	-0.042	-0.004	0.048	-0.011	0.106	1.165	1.068	1.261
t-2	-0.038	-0.070	-0.006	0.099	0.004	0.194	1.130	0.981	1.279
t-3	-0.044	-0.084	-0.003	0.125	0.008	0.242	1.106	0.921	1.291
t-4	-0.045	-0.091	0.001	0.136	0.008	0.265	1.081	0.880	1.282
t-5	-0.047	-0.094	0.001	0.147	0.017	0.277	1.055	0.852	1.258
t-6	-0.047	-0.097	0.003	0.158	0.024	0.292	1.030	0.822	1.238
t-7	-0.047	-0.100	0.006	0.167	0.027	0.307	1.006	0.790	1.221
t-8	-0.046	-0.102	0.009	0.175	0.029	0.321	0.982	0.758	1.206

Figure 2: Impulse Response Function



In order to further investigate the comovement of the price series, say dollar, gold and oil, this study estimates the IRF and performs variance decomposition on these variables. For this purpose, this study uses the bivariate VEC model employed earlier to test Granger causality among the price series. The estimated IRF of the variables may be found in Table .6. The results in the table indicate that there is a negative relationship between dollar and gold, and dollar and oil, but positive relationship between gold and oil. In addition, this effect can be seen in Figure 2.

The variance decomposition results in Table 7 indicate that overall, only 3.2 percent of the variance in own price can be explained by itself, while 93.6 percent is due to the prices of the other countries.

Table 7: Forecast-error Variance Decompositions

	Dollar			Gold			Oil		
	Response								
Time	Dollar	Gold	Oil	Dollar	Gold	Oil	Dollar	Gold	Oil
t-1	1.000	0.110	0.005	0.000	0.890	0.020	0.000	0.000	0.975
	(0.000)	(0.029)	(0.007)	0.000	(0.029)	(0.013)	0.000	0.000	(0.015)
t-2	0.993	0.113	0.005	0.003	0.885	0.034	0.005	0.002	0.961
	(0.005)	(0.033)	(0.008)	(0.003)	(0.033)	(0.020)	(0.004)	(0.003)	(0.021)
t-3	0.987	0.114	0.004	0.002	0.878	0.039	0.011	0.008	0.957
	(0.009)	(0.037)	(0.007)	(0.003)	(0.038)	(0.024)	(0.009)	(0.008)	(0.025)
t-4	0.981	0.112	0.003	0.004	0.874	0.044	0.015	0.014	0.953
	(0.014)	(0.041)	(0.006)	(0.006)	(0.042)	(0.028)	(0.013)	(0.013)	(0.028)
t-5	0.973	0.109	0.002	0.009	0.873	0.048	0.018	0.018	0.949
	(0.019)	(0.043)	(0.005)	(0.011)	(0.046)	(0.032)	(0.016)	(0.016)	(0.032)
t-6	0.968	0.107	0.002	0.013	0.871	0.051	0.020	0.022	0.947
	(0.023)	(0.045)	(0.005)	(0.014)	(0.048)	(0.034)	(0.018)	(0.020)	(0.035)
t-7	0.964	0.105	0.002	0.015	0.869	0.054	0.021	0.026	0.945
	(0.026)	(0.047)	(0.004)	(0.016)	(0.051)	(0.037)	(0.020)	(0.022)	(0.037)
t-8	0.962	0.103	0.002	0.016	0.867	0.056	0.022	0.030	0.943
	(0.028)	(0.048)	(0.004)	(0.018)	(0.053)	(0.039)	(0.021)	(0.025)	(0.039)

Note: Standard error in parenthesis.

4. Conclusions

The evidence reported here does not permit the rejection of causal relationships between the dollar, gold and oil prices. The fact that the evidence suggests that there is a negative relationship between the value of the dollar and gold and between the dollar and oil suggests that as the dollar loses value the price of both commodities increases, as is consistent with recent experience in those markets. The fact that both gold and oil are commodities bought and paid for in dollars, in the main, we should not be surprised by these results. Further, the positive relationship between the price of gold and oil is also consistent with recent experience in those markets and suggests that these are two commodities which are close substitutes in the role of maintenance of value of assets.

As Marshall suggested at the beginning of the twentieth century there is a casual relationship between the price of gold, the value of fiat money (the U.S. dollar) and the prices of other commodities (herein crude oil). The evidence presented here does not allow us to reject Marshall’s conjecture, and is very much consistent with his scribblings of the 1920s. This conjecture has become common wisdom in the allocation of assets in financial markets. When there is volatility in the price of the dollar, investors appear to seek safer assets, primarily commodities. In this study, the negative statistical association of the value of the dollar and the prices of the two commodities, and the inability to reject the notion that these three values do not

Granger cause one another is support for the standard economic view of the relationship of the dollar, the price of gold and the price of oil. In other words, as the value of the dollar falls, the price of gold and of oil increase, thereby providing the basis for a flight to quality.

Appendix 1. Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Dollar	427	97.8874	13.21274	70.32	143.91
Gold	427	359.6014	149.5228	65.14	968.43
Oil	427	27.2066	18.8046	3.56	133.93

Appendix 2. Correlation

Variable	Dollar	Gold	Oil
Dollar	1.0000		
Gold	-0.4371	1.0000	
Oil	-0.3573	0.8182	1.0000

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