Stock market returns and the price of gold

ABSTRACT

Contrarian investors buy low and sell high in stock markets and may demand gold when they sell winning portfolios, as they need marketable securities. On the other hand, when investors find an opportunity to buy stocks at lower prices, they may demand less gold because they need capital to buy losing portfolios. Unlike the traditional view, this study predicts the price of gold to increase/decrease subsequent to positive/negative shocks. We provide some evidence against the traditional view arguing that investors may demand gold to take advantage of market fluctuations.

1 Introduction

Since the early 2000s not only has the price of gold quadrupled, but the volatility of it has also increased significantly (See Figure 1). The traditional explanation of this increase, in both academia and the popular media, is constructed around the perception that gold is a safer asset and investors demand gold because it is a hedge or a safe haven against macroeconomic shocks[1].

However, a fact that seems to be overlooked in literature regarding gold is that during the period of 2000 to 2013, there were significant daily drops in the price of gold. The dataset that is used in this study shows that in 46 trading days the price of gold dropped by three percent or more and in 24 trading days it dropped five percent or more. We argue that these drops in the price of gold, low risk asset, in one day are mysterious[2] because people do not necessarily become optimistic about the future of the economy overnight.

Mainly, this study examines the idea that an almost 500% increase over the past decade in the price of gold is due to gold being a safer asset and proposes an alternative view. In this view, short-term investors use gold as a temporary asset during stock market fluctuations, therefore

[1] This is a common belief among investors as stated in The Economist: "People have long viewed gold, rightly or wrongly, as a hedge against high inflation and a weak dollar." (Haring away, 26th Feb 2009, URL: http://www.economist.com/node/13185396/print) Also, Baur and Lucey[2010, Pg. 218]propose that "while there is no theoretical model which explains why gold is usually referred to as a safe haven asset, one major explanation could be that it was among the first forms of money and was traditionally used as an inflation-hedge."

[2] Chris Preston of Wyatt Research defines sudden overnight drops in the price of gold as a mystery because there is no legitimate explanation to these drops other than speculations. (URL: http://www.wyattresearch.com/article/overnight-gold-price-drop-a-mystery/29057) In fact, regarding to the price of gold, some forecasts are speculative and somewhat sentimental. For instance, some comments of 'professionals' regarding price of gold are as follows "I remain short-term positive, but get nervous at the $1,520-$1,530 level…" or "I'm bearish for next week…" (See The Kitco News April 26, 2013 survey URL:http://www.forbes.com/sites/kitconews/2013/04/26/gold-survey-majority-of-participants-see-higher-gold-prices-next-week-2/) Related to the mysteriousness of the price of gold, the other aspect is that there are conflicting views about the price of gold in a given week among analysts. For instance, The Kitco News surveys the opinions of professionals in the industry every week. An overview of the results of surveys that are employed in May 2013 is presented in Table 1. On average, 46 %of the responses predict an increase while 34 %predicted a decrease in the price of gold. However, the data shows that the price of gold decreased by around 3.5% in May 2013. That is, even the majority of professionals (56%) failed to correctly anticipate the change in the price of gold.

driving the demand for gold even when the market is on the rise. That is, short-term contrarian[3] investors sell the winning portfolios (i.e. sell high) and herd to gold; conversely, when they find losing portfolios, they liquidate their gold position to buy these portfolios (i.e. buy low). It is possible, and advantageous, to use gold as a temporary asset because 1) in the past decade, returns on government bonds are nearly zero percent due to the stimulating efforts of the US government; 2) gold has been appreciating since the early 2000s; and 3) buying and selling gold is more convenient (especially since mid-2000s) than it used to be due to the availability of physically-backed gold exchange traded funds.[4]

In order to test this view, we examined the spillovers from stock returns to the price of gold. Our analysis consists of more than three thousand daily observations in the period of 2000 thorough the first half of 2013. We collected data from the Global Financial Database and the Kenneth French's website. All of our models are estimated with a Generalized Autoregressive Conditional Heteroskedasticy method (GARCH), which is the standard method used in the current literature when analyzing the price of gold. For robustness, we used the US Dollar Index as the control variable throughout our empirical analysis because Tully and Lucey (2007) argue that it is the only macroeconomic variable which consistently has an affect on the price of gold.

In our regression models, the change in the price of gold is the dependent variable, while the independent variables are the returns of portfolios' formed firm size, book-to-market ratio, and industry. If the traditional view holds, the price of gold should decrease subsequent to high portfolio returns. According to the view that is developed in this study, however, a positive shock

[3] The contrarian strategy consists of buying losing portfolios or stocks and selling winning ones. The general idea is that the stock market overreacts to new information and thus it is assumed that winning portfolios or stocks are overvalued and expected to reverse down back to their intrinsic values while losing portfolios are assumed to be undervalued and expected to rise back to their intrinsic value.

[4] Kevin Bahn of Forbes argues that the SPDR Gold Shares make gold more 'user-friendly' to buy and thus easier to trade. (URL: http://www.forbes.com/sites/advisor/2013/01/14/what-will-influence-the-price-of-gold-in-2013/)

increase in a stock market may motivate contrarian strategists to sell their winning portolios and buy gold until they find a losing portfolio in which to invest. Conversely, after a negative shock in the stock market, they are predicted to demand less gold, decreasing the price of gold. Thus, unlike the prediction of the traditional view, positive/negative shocks in the stock market, which are captured via dummy variables, may increase/decrease the price of gold.

Our results show evidence that the price of gold reacts differently to shocks than it does to small stock market swings. Namely, when the stock market generates high returns (i.e. positive shock), the price of gold increases, whereas it decreases subsequent to high losses (i.e. negative shock). While the latter finding is more persistent and significant, both of these findings are in contrast with the traditional view. The implication of this finding for investors is that gold may not serve as a hedge against large stock market swings and it may not be a good portfolio diversifier.

To examine whether the 2008 financial crisis had an effect on the relations between stock returns and the price of gold, we compared the pre and post financial crisis eras. The traditional view predicts higher demands for gold due to a lower sentiment in the post-financial crisis era. Confirming this, we found that the negative relation between the stock market returns and the price of gold became stronger after the crisis. However, we also found that negative/positive shocks in the stock market affected the price of gold negatively/positively with a higher magnitude and significance after the financial crisis. This may suggest that in order to take advantage of stock market fluctuations the demand for gold increased as well, as risk-taking resulted in higher returns in the post-crisis era[5].

[5] See, Lord Abbett Market View (01/07/13), URL: https://www.lordabbett.com/advisor/commentary/marketview/010713/).

Overall, this study develops an alternative view to the mainstream argument that gold is demanded due to investor pessimism and questions the unexpected increase in the price of gold by proposing that investors may use gold as a temporary asset until they find losing portfolios. The findings of this study show some evidence that when the stock market goes up, the demand for gold may be fueled by investors who are selling winning portfolios and looking for a short-term asset that is liquid and keeps its value.

This paper is organized as follows: section 2 is a literature review on the behavior of the price of gold and formulates the hypothesis regarding the relationship between stock market fluctuations and the demand for gold. In section 3, empirical analysis investigates the relationship between the price of gold and stock market fluctuations. Finally, section 4 summarizes and concludes the study.

2 Literature review

There is a general belief that gold is a safe asset because it is a hedge, or a safe haven, against macroeconomic shocks[6,7]. However, empirical findings in the literature do not necessarily concur. For instance, Ghosh, Levin, MacMillan and Wright (2004) show that investors hedge themselves against US inflation by investing in gold. Cai, Cheung and Wong (2001) found that employment, gross domestic product (GDP), consumer price index (CPI), and personal income are the most significant determinants of the volatility of the gold price, while Lawrence (2003) found no relation between the price of gold and inflation, growth rate of GDP, interest rate, real rate of return on 10-year US bond, and money supply. However, Levin and Wright (2006) argue that there is a direct

[6] In Abken [1980, Pg. 4] it is concluded that people may demand more gold in the presence of "political and economic uncertainty."

[7] As summarized in Lawrence [2003] this is because "firstly assayed gold is homogeneous; secondly, [it] is indestructible and fungible; and thirdly, the inventory above-ground stocks is astronomically large relative to changes in flow demand"

link between the general price level in the US and the price of gold. Even though there is conflict between most findings regarding the impact of macroeconomic variables on the price of gold, there is a consensus about the relationship between the behavior of the dollar against other currencies and the price of gold. For example, Capie, Mills and Wood (2005) show that gold works as a hedge against the dollar (See also Pukthuanthong and Roll (2011)), and Tully and Lucey (2007) concludes that the only macroeconomic variable affecting gold is the US dollar.

The other vein of literature, which is closely related to this paper, provides an analysis on the effect of stocks and bonds on the price of gold. Baur and Lucey (2010) investigate whether a return on stocks and bonds affects the demand for gold in the US, U.K., and Germany. Their empirical analysis examines whether gold is a hedge, a diversifier, or a safe haven[8]. They conclude that gold is moslty demanded during market crashes and sold when the confidence in markets is restored. Similarly, using international data, Baur and McDermott (2010) confirm that stock market panics increase the demand for gold. Lastly, this study is also related to the contrarian investment literature; some examples are DeBondt and Thaler (1985) and Cooper (1999).

2.1 Motivation and hypothesis development

To our knowledge, empirical findings regarding the effect of stock returns on the price of gold are scarce, and limited to gold's ability to decrease portfolio risk. In this study, we investigate the possibility of using gold to take advantage of market fluctuations. Specifically, some investors follow contrarian strategies and liquidate winning portfolios. In such a case, gold could be used as a temporary asset, as it holds its value, especially, in the short run. Empirically speaking, in this

[8]Baur and Lucey [2010] define hedge "…as an asset that is uncorrelated or negatively correlated with other asset or portfolio on average," a diversifier "…as an asset that is positively (but not perfectly correlated) with another asset or portfolio on average," and safe heaven "as an asset that is uncorrelated or negatively correlated with another asset or portfolio in times of market stress or turmoil."

scenario, investors have a counter cyclical investment behavior; thus, they sell high and buy low in stock markets. We propose that these investors may demand less gold when the market is at the bottom in order to exploit abnormal returns in stock markets. This hypothesis contradicts the traditional view, which posits that negative shocks in stock markets depress investors and make them seek safer assets. In reality, however, some investors are risk-takers and try to take advantage of market swings. The reason for this behavior is that some investors overreact to current information and cause asset prices to deviate from their true value (See DeBondt and Thaler (1985)). This study investigates whether arbitrageurs use gold as a temporary asset, which is safe and liquid, to take advantage of these misvaluations.

Finally, we examine whether the recent near-collapse of the financial system permanently impacted the demand for gold. In the traditional view, investors demand gold when there is less confidence in the economy. After the crisis, it is expected that investors will be more sensitive to market fluctuations and demand more gold after negative market shocks. On the other hand, the post-crisis era can be a window for risk takers to realize above average returns, as conservative investors may overreact to economic developments, thus causing larger market imperfections. Related to this proposition, Lord Abbett's weekly market view (01/07/13)[9] shows that in the post-crisis era risk-taking results in higher returns. The article suggests that this is because many investors played it less risky due to the pessimism in the economy, which in turn created extraordinary investment opportunities. Therefore, the comparison of pre- and post-crisis eras is among the empirical analyses of this study.

[9] URL: https://www.lordabbett.com/advisor/commentary/marketview/010713/

2.2 The contribution of this study

Overall, this study contributes to the literature in several ways, as it: 1) investigates the possibility of using gold as a temporary asset to supplement contrarian strategies; 2) examines the reactions of the price of gold to returns on portfolios formed on firm industry, size, and growth opportunities; and 3) examines the effect of the recent near collapse of financial system on the price of gold.

3 Data and Methodology

The variables used in this study are as follows: the price of gold is USD per troy ounce in New York and the USD exchange rate index is prepared by the Federal Reserve and consists of major currencies. This information, as well as the Standard and Poor's 500 index, are obtained from the Global Financial database. Lastly, portfolio returns are constructed on firm size, market-to-book ratio, and five industry classifications (i.e. consumer goods, manufacturing and energy, technology, healthcare, and others), and are obtained from Kenneth French's website[10]. Daily data is used in order to scrutinize short term swings and to investigate if gold is used to take advantage of short-term market fluctuations. More importantly, we derive dummy variables based on the magnitude of returns to capture shocks i.e. large positive shock (LPS), positive shock (PS), negative shock (NS), negative large shock (NLS). To derive these dummy variables, we rank all portfolio returns into quintiles and refer to the fall in returns in the middle quintile as normal returns. The dummy variable *large positive shock* is 1.0 for returns that fall into the fifth quintile and 0.0 for all other returns. The dummy variable *positive shock* is 1.0 for returns that fall into the fourth or the fifth quintile and 0.0 for all other returns. The dummy variable *negative shock* is 1.0

[10] URL: http://mba.tuck.darthmouth.edu/pages/faculty/ken.french/

for returns that fall into the second or the first quintile and 0.0 for all other returns. The dummy variable *large negative shock* is 1.0 for returns that fall into the first quintile and 0.0 for all other returns. Note that even though the negative shock dummy variables capture negative returns[11], the variable itself can only be 1.0 or 0.0. While our main concern is to test the effect of positive and negative shocks, we also use dummy variables to account for large shocks, allowing us to examine whether the market reactions to larger shocks is higher.

Following prior literature (e.g. Capie, Mills and Wood (2005), Tully and Lucey (2007), Baur and Lucey (2010) etc.), all estimations are done by Generalized Autoregressive Conditional Heteroskedasticity (GARCH) models. GARCH (1,1) models are specifically estimated to examine the link between the stock market and gold, where the control variable is the change in the USD index. To capture positive and negative shocks, each model is estimated with the addition of four dummy variables, as defined above.

Based on the traditional view, when stock returns are high (returns in the fourth or the fifth quintile or positive shock), the demand for gold should be low, decreasing the price of gold. Conversely, when investors realize large losses with stock portfolios (returns in the first or the second quintile or negative shocks), they may panic and demand gold, which increases the price of gold. Hence, in a regression in which the dependent variable is the return on gold, the signs of the dummy variables *positive shock* and *negative shock* should be negative and positive, respectively.

Unlike the traditional view, the scenario offered in the current study predicts investors to sell winning portfolios and demand marketable securities, one of which may be gold. That is, if the

[11] In untabulated results we confirm that all observations that are classified as negative/positive shocks are negative/positive returns.

view is that we develop holds, the coefficient of the dummy variable *positive shock* will be positive. When the stock market generates a large loss, however, investors may demand losing portfolios, which may decrease the demand and as a result the price of gold. Therefore, the sign of the dummy variable *negative shock* should be positive.

3.1 Descriptive statistics and preliminaries

Table 2 shows descriptive statistics of all variables used in this study. The main variable of interest is the price of gold. Results show that the standard deviation of gold prices is almost as high as that of the market. Median, minimum, and maximum values of gold and the market are very close as well. That is, gold acts very similar to the stock market. While these statistics do not constitute statistically significant evidence, they cast doubt on the perception that gold is a safe asset.

Similar to previous studies, correlation coefficients, which are presented in Table 2, show that the price of gold is negatively correlated with the US dollar. The results also show that the return on gold is not correlated with the return on S&P500 index (i.e. the market), but is correlated with portfolio returns formed on industries. Note that the return on gold is positively correlated with some portfolios and negatively with the others. Hence, gold may not be a hedge or a safe haven against all types of portfolios. Our study helps scrutinize this finding as we capture larger returns and larger losses via dummy variables.

4 Multivariate analyses

In our first multivariate analysis we examine the effect of the control variable USD index, return on S&P500 index, and positive and negative shocks on the change in the price of gold. Results in Table 4, Panel A, confirm the prior literature as we find a one-to-one negative

relationship between the USDI and returns on gold (*t-stats:*-29.74). The rest of the study uses the USDI variable. Results in Panel B of Table 4 show that there is a negative relationship between the return on the S&P500 and gold, indicating that investors buy/sell gold when the stock market goes down/up. Namely, when the S&P500 decreases by 1% the price of gold increases by .15%. This finding coincides with the traditional view that investors demand more gold when there is fear in the stock markets.

Next we test the scenario we developed in which investors sell winning portfolios and buy gold or sell gold to buy losing portfolios. To test this, four dummy variables are added to the model to proxy positive and negative shocks, i.e. positive shocks (PS), negative shocks (NS), large positive shocks (LPS), and large negative shocks (LNS), in S&P 500. If the signs of PS or LPS are positive, this will suggest that when the market generates high returns, the price of gold increases. If the signs of NS or LPS are positive, this will indicate that when the marker generates high losses the price of gold increases.

Results presented in Table 4, Panel C, show that after adding dummy variables, the significance and magnitude of both the USD index and returns on market increased. The dummy variable NS has a negative coefficient and is significant at the 1% level. Hence, after a negative shock, the price of gold decreases by .22%. This is evidence indicating investors do not necessarily demand gold subsequent to drops in the stock market. The coefficient of LNS is insignificant, suggesting investors do not react differently with *large negative shock* than they react with *negative shock*. More importantly, the dummy variables *positive shock* and *large positive shock* are insignificant, which does not add to the view we developed based on contrarian strategies. It may be that the price of gold does not react symmetrically to positive shocks as it does to negative shocks. Last but not least, in all the models, USDI has the largest coefficient, which is consistently

negative and with the highest significance. On average, 1% increase in USDI, decreases the price of gold by 1%.

4.1 Industry portfolio returns and the price of gold

Next, we examine the link between returns on a variety of portfolios and the returns on gold to test whether gold is a hedge or a safe haven against all portfolios. We assume investors hold portfolios depending on their risk preferences and, consequently, the link between portfolios and the price of gold may vary depending on the riskiness of portfolios. In particular, we use the portfolios formed on[12] 1) Consumer Durables, Non-durables, Wholesale, Retail, and Some Services; 2) Manufacturing, Energy, and Utilities; 3) Business Equipment, Telephone and Television Transmission; 4) Healthcare, Medical Equipment, and Drug firms; 5) other firms. The change in the price of gold is regressed on these portfolios' returns. As before, four dummy variables were added to each model, the results of which are presented in Table 5 in five panels.

In all models, portfolio returns (i.e. Cnsmr, Manuf, HiTech, Hlth, and Other), regardless of the industry classification, negatively affect the price of gold, which is consistent with the traditional hedging related argument. Among these, the portfolios formed on firms that produce consumer goods and services (variable Cnsmr) have the higher significance (*t-stats*=-7.83) and the largest coefficient (-.2140). In general, 1% decrease in the value of portfolios based on industry classification increases the price of gold by .6% to .21%. However, the dummy variables in the models paint a different picture, showing a negative relation between negative shocks and the price of gold. In all five models, coefficients of negative shocks (NS) are negative and in four out of five models, they are significant at the 1% level, while the other one is also significant at the 5% level.

[12]These portfolio definitions and returns are obtained from Kenneth French's website URL:http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/

Unlike the traditional view, the dummy variables indicate a decrease in the price of gold, subsequent to higher decreases in portfolio values. However, the effect of positive shocks in portfolio returns do not provide as much significant evidence, as we only found statistically significant results in two out of five models (See panels B and D of Table 5). Nevertheless, a higher increase in the value of a portfolio formed on manufacturing, energy, and utility companies, or on firms in the healthcare industry, increases the price of gold by .11% and .08% respectively.

While our findings do not rule out using gold as a hedge against stock portfolios, so far we provide some evidence in support of the view based on contrarian strategies. We especially found more evidence regarding the effect of negative shocks on the price of gold.

4.2 Firm size and the market-to-book ratio portfolio returns and the price of gold

The subsample analysis is continued with the investigation of the relationship between portfolios formed on firm market-to-book ratio (BtM) and firm size. The goal is to examine whether investors react differently to market fluctuations depending on the portfolio riskiness. Generally speaking, smaller, high BtM firms are riskier and yield higher returns than larger, low BtM firms (See Fama and French (1992) and Fama and French (1993)). In Panels A through F of Table 6, variables 'Small (Big) Low BtM,''Small (Big) Mid BtM,' and 'Small (Big) High BtM' represent the returns on portfolios. As before, in addition to the portfolio returns, we also used dummy variables to capture the effect of positive and negative shocks on the price of gold.

Similar to the previous findings, the results in Table 6 indicate an increase in the value of portfolios formed on smaller or larger firms with low, medium, and high BtM ratios affecting the price of gold negatively at the 1% level. In economic terms, 1% increase in the value of a portfolio, based on firm size and book-to-market ratio, decreases the price of gold by .11% to .15%. This

finding is in line with the traditional view predicting investors to demand more gold when stock returns plummet.

However, the dummy variable NS is negative and significant at the 1% level in all six models, indicating that the price of gold decreases subsequent to higher decreases in portfolio values. Further, in five out six models, positive shocks (PS) affect the price of gold positively, four of which are significant at the 1% level, while the other is significant at the 5% level. Economically speaking, higher returns in portfolios based on size and book-to-market ratio decrease the price of gold by .10% to .15%. Different than the previous findings, large negative shocks affect the price of gold significantly in three models, as shown in panels B, C, and F at the 1%, 5%, and 10%, respectively. This may be evidence indicating investors react even more to larger shocks and demand more losing portfolios, which decreases the demand for gold even more.

Finally, the reactions of the price of gold to stock market swings before and after the 2008 near collapse of the financial system are compared and results are presented in Table 7. First, note that the magnitude USDI's effect on the price of gold is lower in the post-crisis period (-1.08 compared to -.74) with a lower t-value (-26.75 compared to -11.72), implying that gold is not as good of a hedge against USDI in the post-crisis era as it was in the pre-crisis era. Second, the coefficient of the return on S&P500 is more significant and larger in the post-recession era. While a 1% increase in S&P500 decreases the price of gold by .12% in the pre-recession era, after the recession it decreases the price of gold by .19%. This suggests that the link between the stock market and the price of gold is strengthened after the crisis, and gold may have become a better hedge against the stock market. However, while the price of gold was affected only by negative shocks in the pre-crisis era, large positive shocks, negative shocks, and large positive shocks have a statistically significant effect on the price of gold after the crisis. Namely, a large positive shock

increases the price of gold by at least .2%,[13] and a negative shock decreases the price of gold by .38%. If the negative shock is large, the effect of it increases another .23%, implying that the price of gold decreases by .61% subsequent to large negative shock.

The comparison of pre and post-crisis periods indicate that while gold may still be a hedge against the USDI and S&P500, it started reacting to stock market shocks with a higher significance. While our results do not reject the traditional view that suggests gold may serve as a hedge against the stock market, we find evidence showing that the price of gold may react differently to large swings, especially in the post crisis era. These findings coincide with the central argument of this paper that some investors may use gold to take advantage of stock market fluctuations.

4.3 Summary of findings

We examined the link between the stock market and the price of using dummy variables for capturing positive and negative shocks. Of the 14[14] models we estimated, all 14 of them show that a decrease in the US Dollar index (USDI) and portfolio value increase the price of gold at the 1% significance level, lending support to the traditional view that gold is a hedge against the stock market and USDI. However, in all 14 models a negative shock in portfolio returns decreased the price of gold, among which 13 out of 14 findings are significant at the 1% level and the other one is significant at the 5% level. In 7 out of 14 models, positive shocks in portfolio returns increased the price gold, 6 of which are significant at the 1% level while the other one is significant at the 5% level. Also, large positive and large negative shocks affect the price of gold positively and negatively in a few models.

[13] Note in table 7 in the post-recession panel that the dummy variable S&P PS is significant at only 10% level. To be conservative, we state that the effect of the S&P LPS is at least .2093%.
[14] We estimate 16 models however the first two do not have our dummy variables.

While our findings do not rule out that gold may serve a hedge against the stock market, we provide a fair amount of evidence showing that gold may react to shocks, especially negative shocks, in a way that the traditional view does not foresee.

5 Conclusion

Prior studies concur that gold is demanded as a hedge against macroeconomic variables since it is a safer asset. If gold is a safe asset, why has the price of gold increased immensely since early 2000s? Some investors sell winning portfolios and buy losing portfolios, requiring them to demand marketable securities. Gold is suitable for such a purpose because gold is an easy-to-trade liquid asset and has been appreciating over the past decade. If there is a demand for gold for reasons other than gold being safe asset, perhaps one of them is buying gold temporarily between market shocks. This would mean that large swings in the stock market may affect the demand, and as a result the price gold.

We found fair amounts of evidence that indicate when the market, or portfolios formed on firm size, book-to-market ratio, and industry, generate higher negative returns, the price of gold decreases. We also found some evidence that the price of gold increases subsequent to positive shocks. Our results do not reject the traditional view that gold is demanded as it is a safe asset, however, the results also show that gold maybe demanded by investors who sell high and buy low. This may impact the riskiness of portfolios holding gold for hedging and diversification purposes.

6 References

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7 Figures

Figure 1

The price of gold and the S&P 500 Index which are scaled by the left axis and the USD Index are plotted for the period of 1/1/2000 through 6/30/2013. All data is obtained from the Global Financial Database.

8 Tables

Table 1 Survey on the price of gold

The Kitco News Gold Surveys on May 3rd, May 10th, May 24th, and May 31st of 2013 are summarized. The Kitco News surveys opinions of professionals in the industry. In the month of May of 2013 four surveys are published. *Participants* are the professionals that are invited to participate to the surveys. *Responses* show the number of professionals who agreed to participate to the survey. *Up/Down* is the number of participants who expect an increase/decrease in the price of gold in the next seven days. *Neutral/Sideways* is the number of participants who do not expect a change in the price of gold.

Participants	Responses	Up		Neutral/Sideways		Down	
35	27	10	(37%)	5	(19%)	12	(44%)
36	25	8	(32%)	6	(24%)	11	(44%)
36	28	14	(50%)	5	(18%)	9	(32%)
36	27	17	(63%)	6	(22%)	4	(15%)
Avg. 35.75	*26.75*	*12.25*	*(46%)*	*5.5*	*(21%)*	*9*	*(34%)*

Table 2 Descriptive Statistics

Descriptive statistics of all the variables that are used in this study are presented. All numbers are in percentages. Change in the price of gold, the S&P 500 index, and the USD (i.e. *ΔGold ΔS&P500,* and *ΔUSDI*) are the percentage changes in the value of the variables from time *t-1* to time *t*. *Cnsmr*, *Manuf*, *HiTech*, *Hlth*, and *Other* are portfolios formed on Consumer Durables, NonDurables, Wholesale, Retail, and Some Services; Manufacturing, Energy, and Utilities; Business Equipment, Telephone and Television Transmission; Portfolios on Healthcare, Medical Equipment, and Drug firms; and Mines, Construction, Building Materials, Transportation, Hotels, Business Services, Entertainment, and Finance firms, respectively, which are obtained from Kenneth French's website. Finally other six variables represent the returns on portfolios formed on firm size (Small and big) and market-to-book ratio (low, mid, and high) (i.e. *Small Low BtM, Small Mid BtM, Small Big BtM, Big Low BtM, Big Mid BtM,* and*Big High BtM),*which are also obtained from French's website.

	N	Std Dev	Min	Q1	Median	Q3	Max	Skew.	Kurt.
ΔGold	3472	1.14	-8.49	-0.50	0.04	0.67	10.95	-0.16	6.17
ΔS&P500	3240	1.33	-9.03	-0.58	0.05	0.61	11.58	0.06	7.83
ΔUSDI	3248	0.46	-3.98	-0.27	0.00	0.24	2.13	-0.25	3.52
Cnsmr	3269	1.15	-7.28	-0.57	0.07	0.62	9.88	0.08	6.08
Manuf	3269	1.39	-11.85	-0.61	0.07	0.75	14.52	-0.03	10.88
HiTec	3269	1.75	-8.52	-0.80	0.08	0.80	14.23	0.37	5.20
Hlth	3269	1.19	-6.700	-0.54	0.06	0.64	11.09	0.00	6.01
Other	3269	1.69	-12.43	-0.70	0.03	0.73	11.26	0.02	7.71
Small Low BtM	3329	1.61	-9.97	-0.82	0.06	0.91	9.50	-0.15	3.07
Small Mid BtM	3329	1.45	-10.19	-0.72	0.09	0.84	8.19	-0.17	4.05
Small Big BtM	3329	1.49	-10.97	-0.65	0.11	0.82	8.36	-0.28	5.19
Big Low BtM	3329	1.28	-8.37	-0.58	0.05	0.62	12.00	0.21	6.84
Big Mid BtM	3329	1.34	-9.22	-0.55	0.06	0.63	11.09	-0.07	8.00
Big High BtM	3329	1.54	-12.38	-0.58	0.10	0.70	11.16	-0.26	10.73

Table 3 Pearson Correlation Coefficients

Change in the price of gold, the S&P 500 index, and the USD (i.e. *ΔGold ΔS&P500,* and *ΔUSDI*) are the percentage changes in the value of the variables from time *t-1* to time *t*. *Cnsmr, Manuf, HiTech, Hlth,* and *Other* are portfolios formed on Consumer Durables, NonDurables, Wholesale, Retail, and Some Services; Manufacturing, Energy, and Utilities; Business Equipment, Telephone and Television Transmission; Portfolios on Healthcare, Medical Equipment, and Drug firms; and Mines, Construction, Building Materials, Transportation, Hotels, Business Services, Entertainment, and Finance firms, respectively, which are obtained from Kenneth French's website. Finally other six variables represent the returns on portfolios formed on firm size (Small and big) and market-to-book ratio (low, mid, and high) (i.e. *Small Low BtM, Small Mid BtM, Small Big BtM, Big Low BtM, Big Mid BtM,* and*Big High BtM),*which are also obtained from French's website. Numbers in the parentheses are *p-values*.

	ΔGold	**ΔS&P**	**ΔDI**	**Cnsmr**	**Manuf**	**HiTec**	**Hlth**	**Other**	**Small Low BtM**	**Small Mid BtM**	**Small High BtM**	**Big Low BtM**	**Big Mid BtM**
ΔS&P	0.00818												
	(0.6417)												
ΔUSDI	-0.39955	-0.12320											
	(<.0001)	*(<.0001)*											
Cnsmr	-0.04830	0.90488	-0.08675										
	(0.0058)	*(<.0001)*	*(<.0001)*										
Manuf	0.11815	0.89991	-0.20646	0.81939									
	(<.0001)	*(<.0001)*	*(<.0001)*	*(<.0001)*									
HiTec	-0.02822	0.88842	-0.07248	0.72841	0.70601								
	(0.1069)	*(<.0001)*	*(<.0001)*	*(<.0001)*	*(<.0001)*								
Hlth	-0.01691	0.78762	-0.08499	0.75037	0.71841	0.61140							
	(0.3342)	*(<.0001)*	*(<.0001)*	*(<.0001)*	*(<.0001)*	*(<.0001)*							
Other	-0.03080	0.93093	-0.11421	0.84520	0.81088	0.75513	0.69502						
	(0.0784)	*(<.0001)*	*(<.0001)*	*(<.0001)*	*(<.0001)*	*(<.0001)*	*(<.0001)*						
Small	0.01826	0.87555	-0.11569	0.79205	0.78487	0.86729	0.68860	0.82394					
Low BtM	*(0.2924)*	*(<.0001)*	*(<.0001)*	*(<.0001)*	*(<.0001)*	*(<.0001)*	*(<.0001)*	*(<.0001)*					
Small	0.02144	0.88803	-0.13391	0.83271	0.83688	0.79723	0.69057	0.87504	0.95734				
Mid BtM	*(0.2164)*	*(<.0001)*	*(<.0001)*	*(<.0001)*	*(<.0001)*	*(<.0001)*	*(<.0001)*	*(<.0001)*	*(<.0001)*				
Small	0.01519	0.86748	-0.14696	0.81913	0.82091	0.74890	0.66670	0.88299	0.91822	0.97684			
High BtM	*(0.3813)*	*(<.0001)*	*(<.0001)*	*(<.0001)*	*(<.0001)*	*(<.0001)*	*(<.0001)*	*(<.0001)*	*(<.0001)*	*(<.0001)*			
Big Low	-0.01310	0.98036	-0.10541	0.88727	0.85556	0.93041	0.78735	0.86906	0.88463	0.86214	0.82196		
BtM	*(0.4500)*	*(<.0001)*	*(<.0001)*	*(<.0001)*	*(<.0001)*	*(<.0001)*	*(<.0001)*	*(<.0001)*	*(<.0001)*	*(<.0001)*	*(<.0001)*		
Big Mid	0.02325	0.96328	-0.15200	0.88473	0.92150	0.78699	0.74682	0.94956	0.84832	0.89618	0.88946	0.90770	
BtM	*(0.1801)*	*(<.0001)*	*(<.0001)*	*(<.0001)*	*(<.0001)*	*(<.0001)*	*(<.0001)*	*(<.0001)*	*(<.0001)*	*(<.0001)*	*(<.0001)*	*(<.0001)*	
Big High	-0.00021	0.90701	-0.14098	0.82661	0.86212	0.71952	0.69475	0.93513	0.79727	0.86474	0.88809	0.82629	0.94241
BtM	*(0.9904)*	*(<.0001)*	*(<.0001)*	*(<.0001)*	*(<.0001)*	*(<.0001)*	*(<.0001)*	*(<.0001)*	*(<.0001)*	*(<.0001)*	*(<.0001)*	*(<.0001)*	*(<.0001)*

Table 4 The dollar index, the stock market return, and the price of gold

The return on gold (*ΔGold*), the return on S&P500 index (*ΔS&P*), and the change in the US Dollar index (*ΔUSDI*) are percentage changes from time *t-1* to time *t*. The returns on S&P500 Index are divided into quintiles. The observations that fall into the middle quintile are considered as normal returns. The observations that are above/below the middle quintile are considered as positive/negative shocks and are assigned dummy variables (i.e. *S&P PS* and *S&P NS*). The observations that fall into the top/lowest quintile are considered as large positive/negative shocks and assigned dummy variables (i.e. *S&P LPS* and *S&P LNS*). ***, **, and * indicate significance at 1%, 5%, and 10%, respectively.

Following models are estimated respectively:

$$\Delta Gold = c + \beta_1 \Delta USDI_t + e_t,$$

$$\Delta Gold = c + \beta_1 \Delta USDI_t + \beta_2 \Delta S\&P + e_t,$$

$$\Delta Gold = c + \beta_1 \Delta USDI_t + \beta_2 \Delta S\&P + \beta_3 S\&P\ PS_{t-1} + \beta_4 S\&P\ LPS_{t-1} + \beta_5 S\&P\ NS_{t-1} + \beta_6 S\&P\ LNS_{t-1} + e_t,$$

where the conditional volatility is estimated as follows:

$$h = \omega + \alpha\, e_{t-1}^2 + \gamma\, h_{t-1}$$

Panel A				Panel B				Panel C			
	Coeff.	*t-stat*			*Coeff.*	*tValue*			*Coeff.*	*t-stat*	
c	0.0351	*2.25*	***	c	0.0310	*1.97*		c	0.1093	*3.14*	***
ΔUSDI	-1.0038	*-29.74*	***	ΔUSDI	-1.0145	*-29.35*	***	ΔUSDI	-1.0182	*-29.62*	***
				ΔS&P	-0.0411	*-3.38*	***	ΔS&P	-0.1569	*-6.38*	***
								S&P PS (1,0)	0.0551	*1.10*	
								S&P LPS (1,0)	0.0358	*0.62*	
								S&P NS (1,0)	-0.2237	*-4.59*	***
								S&P LNS (1,0)	-0.0889	*-1.56*	
Conditional volatility				Conditional volatility				Conditional volatility			
ω	0.0107	*5.93*	***	ω	0.0106	*6.00*	***	ω	0.0101	*5.53*	***
α	0.0566	*19.45*	***	α	0.0575	*19.12*	***	α	0.0580	*18.42*	***
γ	0.9353	*267.96*	***	γ	0.9345	*265.29*	***	γ	0.9345	*256.43*	***

Table 5 Industry portfolio returns and the price of gold

The return on gold (*ΔGold*) and the change in the US Dollar index (*ΔUSDI*) are percentage changes from time *t-1* to time *t*. Variables 'Cnsmr', 'Manuf', 'HiTech', 'Hlth', and 'Other' represent portfolio returns and are obtained from Kenneth French's website. The returns of portfolios which are formed on firm industry are divided into quintiles. The observations that fall into the middle quintile are considered as normal returns. The observations that are above/below the middle quintile are considered as positive/negative shocks (e.g. *Cnsmr PS and Cnsmr NS*). The observations that fall into the top/lowest quintile are considered as large positive/negative shocks (e.g. *Cnsmr LPS and Cnsmr LNS*). ***, **, and * indicate significance at 1%, 5%, and 10%, respectively.

The following model is estimated:

$$\Delta Gold = c + \beta_1 USDI_t + \beta_2 r_{p,t} + \beta_3 r_{p,t}\, PS_{t-1} + \beta_4 r_{p,t} LPS_{t-1} + \beta_5 r_{p,t}\, NS_{t-1} + \beta_6 r_{p,t} LNS_{t-1} + e_t,$$

where the conditional volatility is estimated as follows:

$$h = \omega + \alpha\, e_{t-1}^2 + \gamma\, h_{t-1}$$

Panel A. Consumer Durables, NonDurables, Wholesale, Retail, and Some Services				**Panel B. Manufacturing, Energy, and Utilities**				**Panel C. Business Equipment, Telephone and Television Transmission**			
	Coeff.	*t-stat*			*Coeff.*	*t-stat*			*Coeff.*	*t-stat*	
c	0.1028	*2.86*	***	c	0.0797	*2.14*	***	c	0.0712	*2.09*	***
ΔUSDI	-1.0152	*-29.86*	***	ΔUSDI	-1.0001	*-29.12*	***	ΔUSDI	-1.0061	*-29.56*	***
Cnsmr	-0.2140	*-7.83*	***	Manuf	-0.1074	*-4.45*	***	HiTec	-0.0620	*-3.60*	***
Cnsmr PS (1,0)	0.0249	*0.49*		Manuf PS (1,0)	0.1160	*2.16*	***	HiTec PS (1,0)	0.0586	*1.19*	
Cnsmr LPS (1,0)	0.1560	*2.74*	***	Manuf LPS (1,0)	0.0623	*1.14*		HiTec LPS (1,0)	-0.0405	*-0.70*	
Cnsmr NS (1,0)	-0.2268	*-4.56*	***	Manuf NS (1,0)	-0.1755	*-3.36*	***	HiTec NS (1,0)	-0.1700	*-3.37*	***
Cnsmr LNS (1,0)	-0.0487	*-0.85*		Manuf LNS (1,0)	-0.1346	*-2.37*	***	HiTec LNS (1,0)	0.0831	*1.45*	
Conditional volatility				Conditional volatility				Conditional volatility			
ω	0.008115	*4.86*	***	ω	0.008297	*5.02*	***	ω	0.008110	*4.95*	***
α	0.0495	*14.06*	***	α	0.0491	*15.24*	***	α	0.0489	*14.65*	***
γ	0.9434	*237.77*	***	γ	0.9438	*255.27*	***	γ	0.9441	*248.57*	***

Panel D. Healthcare, Medical Equipment, and Drug firms				**Panel E. Other firms**			
	Coeff.	*t-stat*			*Coeff.*	*t-stat*	
c	0.0481	*1.42*		c	0.0912	*2.67*	***
ΔUSDI	-1.0084	*-29.35*	***	ΔUSDI	-1.0165	*-29.91*	***
Hlth	-0.0946	*-3.64*	***	Other	-0.1112	*-6.18*	***
Hlth PS (1,0)	0.0891	*1.76*	**	Other PS (1,0)	0.0370	*0.72*	
HlthLPS (1,0)	-0.0237	*-0.40*		Other LPS (1,0)	0.0287	*0.50*	
Hlth NS (1,0)	-0.0895	*-1.79*	**	Other NS (1,0)	-0.1510	*-3.08*	***
HlthLNS (1,0)	-0.0225	*-0.40*		Other LNS (1,0)	-0.0739	*-1.31*	
Conditional volatility				Conditional volatility			
ω	0.008209	*5.13*	***	ω	0.007932	*5.02*	***
α	0.0484	*14.28*	***	α	0.0479	*14.27*	***
γ	0.9446	*246.35*	***	γ	0.9453	*252.43*	***

Table 6 Firm size and the market-to-book ratio portfolio returns and the price of gold

The return on gold (*ΔGold*) and the change in the US Dollar index (*ΔUSDI*) are percentage changes from time *t-1* to time *t*. *Small (Big) Low BtM, Small (Big) Mid BtM, and Small (Big) High BtM* represents the returns on portfolios which are formed on small and low market-to-book ratio firms, small and medium market-to-book ratio firms, and small and high market-to-book ratio firms, respectively. The returns of portfolios which are formed on firm size and market-to-book ratio are divided into quintiles. The observations that fall into the middle quintile are considered as normal returns. The observations that are above/below the middle quintile are considered as positive/negative shocks (e.g. *Small Low BtM PS* and *Small Low BtM NS*). The observations that fall into the top/lowest quintile are considered as positive/negative large shocks (e.g. *Small Low BtM LPS* and *Small Low BtM LNS*)***, **, and * indicate significance at 1%, 5%, and 10%, respectively.
The following model is estimated:

$$\Delta Gold = c + \beta_1 USDI_t + \beta_2 r_{p,t} + \beta_3 r_{p,t}\, PS_{t-1} + \beta_4 r_{p,t} LPS_{t-1} + \beta_5 r_{p,t}\, NS_{t-1} + \beta_6 r_{p,t} LNS_{t-1} + e_t,$$

where the conditional volatility is estimated as follows:

$$h = \omega + \alpha\, e_{t-1}^2 + \gamma\, h_{t-1}$$

Panel A. Small and low BtM firm				**Panel B. Small and medium BtM firm**				**Panel C. Small and high BtM firm**			
	Coeff.	*t-stat*			*Coeff.*	*t-stat*			*Coeff.*	*t-stat*	
c	-0.00113	*-0.03*		c	0.0398	*1.16*		c	0.0633	*1.88*	**
ΔUSDI	-1.0074	*-29.88*	***	ΔUSDI	-1.0105	*-29.56*	***	ΔUSDI	-1.0100	*-29.25*	***
Sml Low BtM	-0.1296	*-5.96*	***	Sml Mid BtM	-0.1537	*-6.45*	***	Sml High BtM	-0.1055	*-4.90*	***
Sml Low BtM PS (1,0)	0.2202	*4.49*	***	Sml Mid BtM PS (1,0)	0.1843	*3.67*	***	Sml High BtM PS (1,0)	0.0999	*2.06*	***
Sml Low BtM LPS (1,0)	0.0899	*1.62*		Sml Mid BtM LPS (1,0)	0.0776	*1.39*		Sml High BtM LPS (1,0)	0.0457	*0.81*	
Sml Low BtM NS (1,0)	-0.1102	*-2.18*	***	Sml Mid BtM NS (1,0)	-0.1420	*-2.73*	***	Sml High BtM NS (1,0)	-0.1240	*-2.44*	***
Sml Low BtM LNS (1,0)	-0.1065	*-1.77*		Sml Mid BtM LNS (1,0)	-0.1456	*-2.47*	***	Sml High BtM LNS (1,0)	-0.1098	*-1.91*	**
Conditional volatility				Conditional volatility				Conditional volatility			
ω	0.007729	*4.91*	***	ω	0.007958	*5.03*	***	ω	0.007940	*4.89*	***
α	0.0476	*14.37*	***	α	0.0470	*14.29*	***	α	0.0468	*14.12*	***
γ	0.9456	*250.09*	***	γ	0.9459	*251.00*	***	γ	0.9461	*244.55*	***
Panel D. Big and low BtM firm				**Panel E. Big and medium BtM firm**				**Panel F. Big and high BtM firm**			
	Coeff.	*t-stat*			*Coeff.*	*t-stat*			*Coeff.*	*t-stat*	
c	0.0789	*2.36*	***	c	0.0777	*2.22*	***	c	0.0798	*2.34*	***
ΔUSDI	-1.0077	*-29.78*	***	ΔUSDI	-1.0106	*-29.71*	***	ΔUSDI	-1.0140	*-29.81*	***
Big Low BtM	-0.1397	*-5.82*	***	Big Mid BtM	-0.1517	*-6.73*	***	Big High BtM	-0.1196	*-6.40*	***
Big Low BtM PS (1,0)	0.0781	*1.57*		Big Mid BtM PS (1,0)	0.0959	*1.90*	**	Big High BtM PS (1,0)	0.1069	*2.15*	***
Big Low BtM LPS (1,0)	-0.002981	*-0.05*		Big Mid BtM LPS (1,0)	0.0641	*1.17*		Big High BtM LPS (1,0)	-0.0188	*-0.34*	
Big Low BtM NS (1,0)	-0.1526	*-3.16*	***	Big Mid BtM NS (1,0)	-0.1990	*-4.02*	***	Big High BtM NS (1,0)	-0.1581	*-3.20*	***
Big Low BtM LNS (1,0)	-0.0649	*-1.12*		Big Mid BtM LNS (1,0)	-0.0485	*-0.88*		Big High BtM LNS (1,0)	-0.0884	*-1.63*	*
Conditional volatility				Conditional volatility				Conditional volatility			
ω	0.007895	*4.99*	***	ω	0.007714	*4.97*	***	ω	0.007894	*5.06*	***
α	0.0486	*14.18*	***	α	0.0471	*14.57*	***	α	0.0469	*14.44*	***
γ	0.9445	*246.71*	***	γ	0.9461	*260.95*	***	γ	0.9461	*259.98*	***

Table 7 The comparison of pre and post 2008 financial crisis eras

The return on gold (*ΔGold*), the return on S&P500 index (*ΔS&P*), and the change in the US Dollar index (*ΔUSDI*) are percentage changes from time *t-1* to time *t*. The returns on S&P500 Index are divided into quintiles. The observations that fall into the middle quintile are considered as normal returns. The observations that are above/below the middle quintile are considered as positive/negative shocks (i.e. *S&P PS* and *S&P NS*). The observations that fall into the top/lowest quintile are considered as positive/negative large shocks (i.e. *S&P LPS* and *S&PLNS*). ***, **, and * indicate significance at 1%, 5%, and 10%, respectively.

Following model is estimated for both pre and post-recession eras:

$$\Delta Gold = c + \beta_1 \Delta USDI_t + \beta_2 \Delta S\&P + \beta_3 S\&P\ PS_{t-1} + \beta_4 S\&P\ LPS_{t-1} + \beta_5 S\&P\ NS_{t-1} + \beta_6 S\&P\ LNS_{t-1} + e_t,$$

where the conditional volatility is estimated as follows:

$$h = \omega + \alpha\, e_{t-1}^2 + \gamma\, h_{t-1}$$

Pre-recession era				**Post-recession era**			
	Coeff.	*t-stat*			Coeff.	*t-stat*	
c	0.1115	*2.82*	***	c	0.1086	*1.54*	
ΔUSDI	-1.0864	*-26.75*	***	ΔUSDI	-0.7467	*-11.72*	***
ΔS&P	-0.1098	*-3.64*	***	ΔS&P	-0.2535	*-5.94*	***
S&P PS (1,0)	-0.007250	*-0.13*		S&P PS (1,0)	0.2146	*2.02*	*
S&P LPS (1,0)	-0.0122	*-0.18*		S&P LPS (1,0)	0.2093	*1.86*	***
S&P NS (1,0)	-0.1602	*-2.72*	***	S&P NS (1,0)	-0.3839	*-4.43*	***
S&P LNS (1,0)	-0.0695	*-0.99*		S&P LNS (1,0)	-0.2396	*-2.18*	***
Conditional volatility				Conditional volatility			
ω	0.004608	*3.31*	***	ω	0.0211	*4.06*	***
α	0.0446	*12.64*	***	α	0.0787	*11.69*	***
γ	0.9528	*247.33*	***	γ	0.9099	*113.15*	***