“An event study approach to shocks in gold prices on hedged and non-hedged gold companies”

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Abstract

The issue of whether corporate risk management strategies for gold mining firms are priced in the equity markets is explored. This study investigates how a positive (negative) shock on gold prices will affect the levels of positive (negative) abnormal returns of gold mining firms. Using a sample size of 58, the gold mining firms are divided into two categories, namely non-gold derivative and gold derivative using firms. Applying a Seemingly Unrelated Regression (SUR) Model, the event study methodology finds evidence that firms that implement gold derivative positions have considerably less variability in their returns.

Keywords: gold hedging strategies, event study, risk management, Seemingly Unrelated Regression (SUR) Model.
JEL Classification: G14, G32.

Introduction

A rich literature has emerged that explores the various channels through which risk management strategies can contribute to higher firm value[1]. While these studies have increased our understanding of the corporations' motivations to manage risk, little attention has been directed towards investigating whether the equity market prices these corporate risk management activities in an event methodology approach. Using a sample of North American gold mining firms, Tufano (1998) studied the exposure of gold mining firms to changes in the price of gold. He finds that gold exposures are significantly negatively related to the firm's hedging activities. However, Hentschel and Kothari (2001) did not find any substantial difference in the risk exposures of the users of derivative products for 425 large corporations. Koski and Pontiff (1999) also found that in the mutual fund industry the users and non-users of financial derivatives had similar risk profiles. Rajgopal (1999) investigated the SEC market risk disclosure formats and their relationship to the actual risk exposures of oil and gas producers. More recently, Jin and Jorion (2006) found that hedging did reduce stock price volatility for oil and gas producers, but the authors did not find an increase in firm value.

This study differs significantly from the previous studies in two ways. First, we examine the markets response for both users and non-users of gold derivatives when a shock is introduced in the marketplace. That is, we test the effect that positive and negative shocks have on the returns of gold derivative and non-gold derivative using firms. Secondly, we employ an event study methodology to investigate the effect of risk management strategies on firm value. This methodology provides a direct and relatively precise method to analyze the risk management effects. The dates of the events allow for the estimation of gold price fluctuations effect on the users and non-users of gold derivatives. Thus, this event study methodology makes possible the investigation of the risk management effect on unexpected changes of gold prices[2]. Applying a Seemingly Unrelated Regression (SUR) Model, we find evidence that firms with gold derivative positions gain lower abnormal returns when gold prices rise. Correspondingly, when there is a negative shock on gold prices, non-gold derivative using firms experience much greater negative abnormal returns.

The empirical results demonstrate that equity market do price risk management strategies for gold mining firms. That is, we provide important empirical evidence that corporate risk management strategies are priced in the equity market by reducing the exposure to unexpected gold price fluctuations. In particular, we examine how a common event affects the magnitude of risk exposure, the relative benefits of risk management strategies, and the costs associated with risk reduction. The pricing is consistent with gold derivative usage being for hedging purposes. Of particular interest are the linkages between corporate management strategies and firm value that can result from the motivation of risk management objectives mentioned above.

The study focuses on gold mining firms for several reasons. The sample data of gold mining stocks in this study are sensitive to changes in general gold price levels. On average, a one-percent change of gold returns leads to between 0.5 and 0.8 percent change in the firms' stock returns. This exposure has a direct impact on the firms' returns and its

[1] Smith and Stulz (1985), Froot, Scharfstein and Stein (1993) and DeMarzo and Duffie (1995).

[2] One other way might be to compare the levels of gold exposure like changes before and after the use of derivatives, which requires tracking down all the previous usage of derivatives. However, due to the lack of requirements of hedge accounting in previous years, it is extremely hard to separate firms' period into derivatives using and non-using.

magnitude is substantial. Therefore, the risk reduction effect can be easily illustrated in the gold mining industry[1].

There are well-documented price fluctuations that occurred in the gold mining industry in 1999. The first event occurred on May 7, 1999 when the British Treasury announced that the United Kingdom would sell 415 tons of the country's 715 tons of gold reserves within three to five years. In addition, the widely expected planned sales by the IMF and the belief that central banks would continue to sell an abundance of gold on the market further depressed gold prices. Gold prices subsequently fell by $11 an ounce, a decline of approximately 4 percent.

The second event occurred in the last week of September 1999, when the members of the European Central Banks announced that they would limit gold sales to 400 tons annually, and 2,000 tons over a five-year period. Gold prices increased by $75 an ounce following this announcement, an increase of approximately 20 percent. Fluctuations in gold prices over most parts of the 1990s have been attributed to the numerous gold sales by central banks as well as the Asian financial crisis of 1997-1998. The levels of production of gold mining firms as well as the sale of gold holdings by nations' central banks can affect the supply of gold in the world market. In July 1997, Australia announced that it had sold 167 tons of its holdings. The market reacted markedly, albeit belatedly, and gold prices fell. In recent years, Belgium, the Netherlands, Canada, Argentina, the Czech Republic, and Switzerland have also reported central bank sales.

1. Sample selection

The sample was constructed through identifying publicly traded gold mining companies belonging to a four-digit 1040 SIC industry code covered by COMPUSTAT and Yahoo! Finance site. The initial screening criteria produced 83 firm observations including four firms that were not available on COMPUSTAT, but are identified by Yahoo! Finance. Further requirements were that the gold mining firm be trading on the event date and the sample was restricted to firms with daily stock prices over the period of July 20, 1998 through December 10, 1999. Firms that had a sample period of less than 100 trading days were deleted from the study. Sixty-seven firms remained in the sample. Daily stock prices were collected from CRSP. The firms' derivatives information was obtained by reading accounting footnotes to 10-K, 10-Q, and 6-K filings, or periodic reports, to determine whether a firm is a user or non-user of gold derivative products. The criteria were noting if the firm made specific reference to the use of gold derivatives in the 10-K, 10-Q, and 6-K filings. Only companies that made a specific reference to gold derivatives were categorized as hedging firms. This eliminated eight firms from the sample because the periodic reports could not be obtained. Financial data constraints from COMPUSTAT limited the entire final sample to 58 firms. Twenty-two out of the final 58 firms did not report any use of gold derivatives, while 36 firms did report details on gold derivatives usage. The majority of the firms that were categorized as hedging firms used both a combination of linear and non-linear gold derivatives.

2. Methodology

A Seemingly Unrelated Regression (SUR) Model is used to estimate the impacts that risk management strategies have on firm value. There have been numerous applications of using seemingly unrelated regression (SUR) models in an event study methodology. Karafiath (1988) discusses the use of dummy variables in conjunction with the SUR model to address their application in financial event studies. Kane and Wilson (1998) investigated the origins of the Federal Deposit Insurance using the SUR method in an event study methodology. Mamun, Hassan, and Lai (2004) use the SUR approach to analyze the impact of the Gramm-Leach-Bliley Act on the financial services industry using an event methodology approach. Tanuwidjaja (2007) uses the SUR approach in an event framework to analyze merger and acquisition activity in Singapore.

Following the multi-factor market model approach of Jorion (1990), the gold beta (β) for each firm is calculated to estimate the exposure of gold mining firms to changes in gold prices by empirically estimating the following market model:

$$R_{i,t} = \alpha + \beta_1 R_{m,t} + \beta_2 R_{g,t} + \eta_{i,t},$$

where $R_{i,t}$ is the daily return on stock i from time t-1 to time t; $R_{m,t}$ is the daily return on the S&P 500 Index; and $R_{g,t}$ is the total return on gold as measured by changes in the world commodity gold prices. The coefficient, β_2 or the gold beta, represents the sensitivity of stock i's return to changes in gold prices after controlling for movements in broad equity indices that affect the return on these stocks independent of gold price movements.

Previous studies have used market models to measure exposures applying weekly, monthly, or quarterly return data over a multi-year horizon. However, this paper uses higher frequency (daily) data to

[1] Tufano (1996) notes that the extensive risk managing practices of the gold mining industry are well known in the capital markets.

measure firm exposure because these exposures are not stationary (see Tufano, 1998). A drawback to this approach as noted by Scholes and Williams (1977), is that using daily data to calculate exposures can introduce meaningful biases into reported exposure measures, especially for infrequently traded stocks. This drawback would be particularly severe in this sample because the observed "closing gold price" from the COMEX (a division of the New York Mercantile Exchange) is set at 2:30 p.m. (EST), which is well before the close of the American or Canadian stock exchanges. In addition, a few firms in the sample trade infrequently, with some firms not trading every day[1]. The firm's exposure is therefore based on the unadjusted method. The paper also employs a market return with several leads and lags as an explanatory variable to minimize the non-synchronous trading problem, as used in Scholes and Williams (1977) and Cornett and Tehranian (1990). The paper only reports the results based on the unadjusted method with no leads and lag variables[2].

The stock price impact of the events is estimated by employing a Multivariate Regression Model (MVRM) similar to that used in Schipper and Thompson (1983), Smith, Bradley, and Jarrell (1986), Millon-Cornett and Tehranian (1989), and Cornet and Tehranian (1990). The MVRM is used explicitly to consider heteroscedasticity across equations and contemporaneous dependence of the disturbances in the specified tests[3]. The MVRM model uses a system of SUR equations, which specifies the return generating process on the occurrence or non-occurrence of an event. This specification is accomplished by adding a dummy variable. The dummy variable is set equal to 1 if an event occurred and equal to 0 otherwise. The coefficient of the event dummy variable captures the impact on stock returns of the gold derivative and non-gold derivative using firms. The model establishes a system of portfolio return equations for each of the two portfolios: gold derivative (d) using firms and non-gold derivative (n) using firms[4].

$$(R_{dt} - rf_t) = \alpha + \beta_M (R_{mt} - rf_t) + \beta_G (R_{gt} - rf_t) + \\ + \beta_{D1} D1 + \beta_{D2} D2 + \eta_{ht}, \quad (1)$$

$$(R_{nt} - rf_t) = \alpha + \beta_M (R_{mt} - rf_t) + \beta_G (R_{gt} - rf_t) + \\ + \beta_{D1} D1 + \beta_{D2} D2 + \eta_{ut}, \quad (2)$$

where $R_{j,}t$ = the return on a portfolio, $j(=d \text{ and } n)$, gold derivative (d) or non-gold derivative (n) firms on day t (T = 350 daily observations from July 20, 1998 through December 6, 1999); $R_{m,t}$ = the return on the S&P 500 Index on day t; α_j = an intercept coefficient for portfolio j (=d and n); R_{gt} = total return on gold; D_i = dummy variable which equals o one during the period of k^{th} announcement, which is -1 to +1, and zero otherwise; $D1$ (representing the event of May, 1999) and $D2$ (denoting the event of September, 1999) are equal to 1 during the three-day (t= -1, 0, and 1 relative to the announcement day) announcement period and zero otherwise, respectively; $\eta_{j,t}$ = random disturbances for j^{th} portfolio; rf_t = daily return on 3 month treasury bills.

3. Hypotheses

Gold mining stocks are very sensitive to changes in general gold price levels. The impact of a high gold exposure is such that a decline in gold prices is expected to cause large declines in the price of gold stocks. Similarly, an increase in gold prices would lead to large increases in the price of gold stocks. It follows that if a market environment of falling gold prices was anticipated, a firm would be motivated to hedge by locking in a favorable price to ensure a stable future income flow. Therefore, in a sudden price upturn, the firm that has a hedging strategy in place would lose some of the expected benefits from the higher prices. Using the two main events of this study, the paper tests the following two hypotheses:

Hypothesis 1: Given a positive shock on gold prices, gold derivative using firms will experience relatively lower levels of positive abnormal returns.

Hypothesis 2: Given a negative shock on gold prices, gold derivative using firms will experience relatively lower levels of negative abnormal returns.

Empirical support for both hypotheses 1 and 2 implies that the equity market does price risk management strategies and that risk management strategies do affect firm value.

4. Empirical results

4.1. Univariate results: gold exposures and gold derivative usage. Table 1 presents comparisons of gold exposure for gold mining firms disclosing the use and non-use of gold derivatives. Non-gold derivative using firms have higher exposure (higher gold beta). The mean level of gold exposure for non-gold derivative using firms is 0.294 compared

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[1] Tufano (1998) uses Fowler, Rorke and Jog (1989) in order to obtain unbiased beta estimates. Also Scholes and Williams (1977) or Dimson (1979) could be applicable.

[2] The results are almost the same with and without leads and lag variables of the market return.

[3] See Cornett and Tehranian (1990) for details.

[4] The model employs the market return at several leads and lags as explanatory variables to minimize the problem of non-trading days in the sample (see Cornett and Tehranian, 1990). The paper also includes gold returns as another explanatory variable since gold mining stock returns are very sensitive to gold price changes (e.g., see Tufano, 1998).

to 0.185 for gold derivative using firms. However, the difference-in-means for these two groups are insignificant with p-value of 0.672. The higher beta of non-gold derivative using firms is consistent with gold derivative usage for hedging gold exposure. Gold betas for 33 (91.67%) of the 36-gold derivative using firms are statistically significant, while 16 (72.70%) of the 22 non-gold derivative firms have a significant relation between gold returns and stock returns.

Table 1. Description of gold exposures of gold mining firms

Panel A		
	β_M	Gold exposure: β_G
Number of firms	58	58
% significance at the 10% level [Number of firms]	44.74% [26/58]	86.84% [50/58]
Mean	0.906	0.222
Standard deviation	0.624	0.738
Minimum	-0.102	-2.601
Median	0.825	0.406
Maximum	3.018	1.537
Panel B		
	Gold exposure: β_G	
	Non-users	Users
Number of firms	22	36
% significance at the 10% level	72.70% [16/22]	92% [33/36]
Mean	0.294	0.185
Standard deviation	0.534	0.833
Minimum	-1.044	-2.600
Median	0.448	0.288
Maximum	0.857	1.537
Difference in means	0.427 [p= 0.672]	
Difference in medians	0.492 [p= 0.623]	

Notes: This table provides comparisons of the gold exposure for firms disclosing the use and non-use of derivatives to hedge their exposure to fluctuating gold price over the period of July 20, 1998 through December 10, 1999. Mean values, median values, minimum values, first and third quartile values, maximum, standard deviation, number of firms having statistically significant gold exposure, difference-in-means tests, and non-parametric tests are reported. The final sample is 58 gold mining firms. This sample consists of 36 firms (Users) reporting the use of gold derivatives and 22 firms (Non-users) reporting no use of gold derivatives as of fiscal year-end 1998. All the sample firms have primary SIC code of 1040, which represents the gold mining industry. Gold exposure for each firm to changes in gold prices is estimated in the following market model; $(R_{it} - rf_t) = \alpha + \beta_M (R_{mt} - rf_t) + \beta_G (R_{gt} - rf_t) + \eta_{it}$, where $R_{i,t}$ is the daily return on stock i, rf_t is daily return on the 3 month treasury bills, $R_{m,t}$ is the daily return on the S&P 500 Index, and $R_{g,t}$ is the total return on gold.

Table 2 provides the mean and median levels of the selected financial characteristics for firms disclosing the use and non-use of gold derivatives. Firm size is measured by the natural log of total book value of assets as of fiscal year-end 1998 and is significantly greater (at the 1 percent significance level) for gold derivative using firms than non-gold derivative using firms, as predicted by the economies of scale argument. The significance of size is consistent with the results of Nance, Smith, and Smithson (1993), Mian (1996), and Geczy, Minton, and Schrand (1997).

Table 2. Univariate results comparing firm's financial characteristics for gold derivative and non-gold derivative using firms

	Users		Non-users		Difference test	
Variables	Mean	Median	Mean	Median	t-statistics	Z-statistics
SIZE	5.425 (1.509)	5.149	2.462 (1.738)	2.238	5.357 ***	4.117 ***
DEBT	0.331 (0.222)	0.293	0.215 (0.195)	0.161	1.565	1.647 *

Table 2 (cont.). Univariate results comparing firm's financial characteristics for gold derivative and non-gold derivative using firms

	Users		Non-users		Difference test	
Variables	Mean	Median	Mean	Median	t-statistics	Z-statistics
MKTBK	3.118 (3.756)	3.045	7.679 (9.085)	4.849	1.592	1.672 *
OPER	-0.087 (1.175)	0.229	-0.685 (0.837)	-0.579	1.604	3.806 ***
GROWTH	0.359 (0.255)	0.354	0.689 (0.413)	0.883	2.607 **	2.207 **
NPM	-0.228 (1.141)	0.052	-0.256v (1.328)	-0.618	0.067	2.407 ***

Notes: This table provides comparisons of selected financial characteristics for firms disclosing the use and non-use of gold derivatives for fiscal year-end 1998. The final sample is 58 gold mining firms. This sample consists of 36 firms (Users) reporting the use of gold derivatives and 22 firms (Non-users) reporting no use of gold derivatives as of fiscal year-end 1998. All the firms in the sample have primary SIC code of 1040, which represents gold mining industry. The number of users and non-users are reported in parentheses. SIZE is measured as the natural log of total book value of asset as of fiscal year-end 1998. DEBT is the ratio of the book value of total debt to firm's book value of total asset, measured as of fiscal year-end 1998. MKTBK is the ratio of market value of equity to the book value of equity, measured as of fiscal year-end 1998. Firm's market value is the sum of market value of equity, the book value of preferred stock, and the book value of total debt, measured as of fiscal year-end 1998. OPER is the ratio of earning before interest and taxes after depreciation plus depreciation to sales as of fiscal year-ends; GROWTH is the ratio of sales minus cost of good sold to sales; NPM is the ratio of net income to sales as of fiscal year ends; Statistics reported include number of observations, mean values, median values, t-statistics for differences in means, and Nonparametric Wilcoxon signed-rank z-statistics for differences in medians. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

Many of the results for the other selected financial variables are consistent with existing theories of risk management. The firm's debt ratios are significantly higher for gold derivative using firms, which is consistent with the financial distress hypothesis of Smith and Stultz (1985). The measure of the intensity of capital expenditures is significantly higher for gold derivative using firms, which supports the under-investment hypothesis similar to Geczy, Minton, and Schrand (1997). However, the market to book ratio is significantly higher for non-gold derivative using firms, contradicting the results for the under-investment hypothesis, similar to the results of Mian (1996).

4.2. Multivariate results. The univariate results in the previous section demonstrate a correlation between gold derivative usage and lower levels of gold exposure. The empirical results are consistent with firms using gold derivatives for hedging purposes because to do otherwise would expose them to a greater risk of changing gold prices. However, the results do not compare the levels of gold exposure before and after the use of gold derivatives. Therefore, the findings do not provide evidence that hedging reduces a firm's gold exposure. It is possible that gold derivative using firms had much higher gold exposure and thus, started using gold derivatives for hedging purposes.

To examine whether hedging can reduce a firm's exposure, event methodology was employed to assess the impact that the two gold incidents had on all the gold mining firms. The event methodology thus enables the authors to clearly investigate the relationship between the hedging effect and unexpected changes of market exposure. Applying the SUR model, Table 3 provides evidence that both gold derivative and non-gold derivative using firms gained significant and positive abnormal returns after a positive shock to gold prices. Gold derivative firms gained approximately a 5.1 percent abnormal return after the September event after controlling for their long-term gold exposure. On the other hand, non-gold derivative using firms gained approximately a 7.8 percent abnormal return, which is considerably higher than that of the gold derivative using firms. This result is consistent with hypothesis 1, which states that given a positive shock on gold prices, gold derivative using gold mining firms will exhibit relatively lower levels of positive abnormal returns.

Table 3. Multivariate results of the announcement impact of gold price changes using SUR regression

Variables	User		Non-user	
	Parameter estimate	T-statistics	Parameter estimate	T-statistics
Intercept	0.001	1.153	0.006***	2.762
Market return	0.773***	5.518	0.500*	1.827

Table 3 (cont.). Multivariate results of the announcement impact of gold price changes using SUR regression

Variables	User		Non-user	
	Parameter estimate	T-statistics	Parameter estimate	T-statistics
Gold exposure	0.678***	21.268	0.392***	6.291
D1: May	0.008	0.634	-0.017*	1.671
D2: September	0.051***	3.738	0.078***	3.571

Notes: This table presents results from seemingly unrelated regression model that relate a portfolio returns for gold derivative and non-gold derivative using gold mining firms to market return, lead and lag market return, gold return, and dummy variables corresponding to the two events. The final sample consists of 36 firms (Users) reporting the use of gold derivatives as of fiscal year-end 1998 and 22 firms (Non-users) reporting no use of gold derivatives. All the firms in the sample have primary SIC code of 1040, which represents gold mining industry. The stock price impact of the events is estimated by employing a Multivariate Regression Model (MVRM), which uses a system of SUR Model as follows:

$(R_{dt} - rf_t) = \alpha + \beta_M (R_{mt} - rf_t) + \beta_G (R_{gt} - rf_t) + \beta_{D1} D1 + \beta_{D2} D2 + \eta_{ht}$,

$(R_{nt} - rf_t) = \alpha + \beta_M (R_{mt} - rf_t) + \beta_G (R_{gt} - rf_t) + \beta_{D1} D1 + \beta_{D2} D2 + \eta_{ht}$,

where $R_{j,}t$ = the return on a portfolio, *j(=d and n),* of gold derivative (d) or non-gold derivative (n) using firms on day t (T = 350 daily observations from July 20, 1998 through December 6, 1999); $R_{m,t}$ = the return on S&P 500 Index on day t; $R_{g,t}$ is the total return on gold; α_j = an intercept coefficient for portfolio j (=*d and n*); D_i = dummy variable which equals one during the period of kth announcement, which is -1 to +1, and zero otherwise; $\eta_{j,t}$ = random disturbances for jth portfolio. $D1$ (representing the event of May, 1999) and $D2$ (denoting the event of Sept, 1999) are equal to 1 during the three-day (t = -1, 0, and 1 relative to the announcement day) announcement period and zero otherwise, respectively. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

The other event, which occurred on May 7, which represented a negative shock to gold prices, does not provide any significant result for gold derivative using firms. This may be due to length of tenure and the magnitude of the gold price shock, as well as the fact that several central banks had already been selling large quantities of bullions without public announcement. However, non-gold derivative using firms experienced a negative 1.7 percent abnormal return. This result is also consistent with hypothesis 2, which states that given a negative shock on gold prices, gold derivative using firms will exhibit lower negative abnormal returns. It was not possible to test directly if the motivation of the firm to use gold derivatives was for hedging or speculation. FASB 133 which increased the disclosure information for derivative usage was enacted after the sample period tested in the paper. Our empirical results though are consistent with hedging in that the gold derivative hedging firms in our sample exhibited lower levels of volatility.

4.3. Multivariate results: controlling for the size effect. Existing studies show that there is a size effect on stock returns. Smaller firms tend to have higher abnormal returns than larger firms with other conditions held constant. The results in the paper might also be affected by this size effect. Non-gold derivative using firms in the sample are considerably smaller than the gold derivative using firms. Thus, the higher abnormal return for non-gold derivative using firms might result from this size effect. To investigate further this relationship the firms are matched by size. The result of the hedging impact after controlling for size is illustrated in Table 4. The sample consists of 22 non-gold derivative using firms and 22 gold derivative using firms. Considering only the September event, gold derivative using firms generate abnormal returns of 6.8 percent compared with 9.4 percent for non-gold derivative using firms, after controlling for size. The result is again consistent with the hypothesis that given a positive shock on gold prices, gold derivative using gold mining firms will exhibit relatively lower levels of positive abnormal returns. For the May event, gold derivative firms did not provide any significant market reaction, while non-gold derivative firms experienced a negative 1.9 percent abnormal return. Given a negative shock on gold prices, non-gold derivative using firms experience larger negative abnormal returns. Thus, the results held even when the sample was controlled for size.

Table 4. Multivariate results of the announcement impact of gold price changes using SUR regression: after controlling for size effect

Variables	User		Non-user	
	Parameter estimate	T-statistics	Parameter estimate	T-statistics
Intercept	0.003	1.422	0.007 ***	2.510
Market return	0.096	0.565	0.052	0.260

Table 4 (cont.). Multivariate results of the announcement impact of gold price changes using SUR regression: after controlling for size effect

Variables	User		Non-user	
	Parameter estimate	T-statistics	Parameter estimate	T-statistics
Gold exposure	1.917 ***	6.888	0.919 ***	2.781
D1: May	-0.009	-0.357	-0.019 *	1.679
D2: September	0.068 ***	3.461	0.094 ***	2.848

Notes: This table presents results from seemingly unrelated regression model that relate portfolio returns for gold derivative and non-gold derivative using gold mining firms to market return, lead and lag market return, gold return, and dummy variables corresponding to the two events, after controlling for the size effect. The final sample consists of 22 firms (Users) reporting the use of gold derivatives as of fiscal year-end 1998 and 22 firms (Non-users) reporting no use of gold derivatives. All the firms in the sample have primary SIC code of 1040, which represents gold mining industry. The stock price impact of the events is estimated by employing a Multivariate Regression Model (MVRM), which uses a system of SUR Model as follows:

$(R_{dt} - rf_t) = \alpha + \beta_M (R_{mt} - rf_t) + \beta_G (R_{gt} - rf_t) + \beta_{D1} D1 + \beta_{D2} D2 + \eta_{ht}$,

$(R_{nt} - rf_t) = \alpha + \beta_M (R_{mt} - rf_t) + \beta_G (R_{gt} - rf_t) + \beta_{D1} D1 + \beta_{D2} D2 + \eta_{ht}$,

where $R_{j,}t$ = the return on a portfolio, *j(=d and n),* of gold derivative (d) and non-gold derivative (n) using firms on day t (T = 350 daily observations from July 20, 1998 through December 6, 1999); $R_{m,t}$ = the return on S&P 500 *I*ndex on day *t;* $R_{g,t}$ is the total return on gold; α_j = an intercept coefficient for portfolio j (=*d and n*)*;* D_i = dummy variable which equals one during the period of *k*th announcement, which is -1 to +1, and zero otherwise; $\eta_{j,t}$ = random disturbances for *j*th portfolio. *D*1 (representing the event of May 1999) and *D*2 (representing the event of Sept 1999) are equal to 1 during the three-day (t = -1, 0, and 1 relative to the announcement day) announcement period and zero otherwise, respectively. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

Conclusion

This paper investigates whether gold derivative usage reduces the equity return variability of participating gold mining firms. In particular, whether given a positive (negative) shock on gold prices, gold derivative using mining firms will exhibit relatively lower levels of return variability than non-gold derivative using firms. The paper considers two major events, which occurred on May 7, 1999 and September 27, 1999. With the first event, The British Treasury announced that the United Kingdom would embark on the sale of a large part of its gold reserves to be carried out within three to five years. The second event, which had not been experienced in the gold market before, occurred in the week of September 27th, 1999. Gold prices increased by US $75 per ounce following a surprise announcement that members of the European Central Banks would limit their gold sales and leasing programs over a five-year period. These two events are expected to cause substantially different reactions to the changes in gold prices for the gold derivative and non-gold derivative using firms.

Applying an SUR model, the authors provide supporting evidence that gold derivative using firms, which have lower long-term sensitivities to gold price changes, gain lower levels of abnormal returns due to their hedging position when gold prices went up. When gold prices fell, the gold derivative using firms experienced little to no change in firm value while the non-gold derivative using firms experienced negative abnormal returns. These results also held when the sample was controlled for a firm size effect. The results suggest that risk management strategies are indeed priced in the marketplace and they affect firm value. The paper is also consistent with gold derivative usage in the gold mining industry being for hedging purposes.

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