

Motivation for Gold Price Risk Management in the Gold Mining Industry: Evidence from Australia

Christian Vallence, School of Business, Swinburne University of Technology, John Street, Hawthorn, VIC 3122. Ph 613 9214-8435, cvallence@swin.edu.au

ABSTRACT

This paper examines the gold price risk management of Australian gold mining companies for the five years to 2002. The paper derives a measure of gold price risk exposure based on the delta of the firm's hedge portfolio to assess the level of gold price exposure maintained by a sample of Australian firms. Results indicate little evidence that the level of hedging undertaken is related to taxes or financial distress, but do indicate a relationship between hedging activities and executive compensation structures. The results also indicate that the level of gold price exposure maintained by Australian firms is positively related to firm size.

Introduction:

The level of gold price exposure borne by the sample gold mining companies provides an ideal example of financial risk management. All companies in the sample share a clear and measurable revenue exposure to a single volatile commodity. This exposure can be managed through many derivative instruments trading in liquid and efficient markets. These instruments include plain vanilla forward sales of gold, gold put and call options, gold loans, gold swaps, and rolling forward commitments, amongst others.

Why do these firms hedge? Gold is a volatile, globally traded commodity, with liquid spot and derivative markets, and as such firm hedging positions can easily be replicated by shareholders. Reasonable disclosure of financial information by the industry suggests that theories of risk management based on information asymmetry are somewhat redundant. Despite this, risk management practices in the industry are prolific; 80% of sample firms undertook some form of gold price hedging.

Using data gathered from company annual reports for the period 1998 to 2002 I test whether gold price risk management is consistent with the theory explaining general financial risk management motivations. Most of these theories were first proposed by Smith and Stulz (1985) and are based on shareholder wealth maximisation arguments. The theories are 1. Financial distress costs: these costs occur when a firm approaches or reaches bankruptcy. Implicit and explicit bankruptcy costs decrease the expected payoffs to stakeholders. Therefore, by eliminating low probability, high cost outcomes (such as an unusually low gold price) through hedging increases firm value; 2. Taxes: The non-linearity of the corporate tax function penalises firms with volatile earnings. Income smoothing via hedging increases the expected payoff to equity holders by decreasing tax payable, thus increasing firm value; 3. Investment constraints: Firms can reduce their reliance on costly external sources of finance by reducing the volatility of earnings via hedging. The high cost of external financing need to undertake new or maintain existing projects reduces the expected payoffs to shareholders. Reducing or eliminating the need to raise external funds can therefore increase expected payoffs to shareholders; 4. Managerial risk aversion: Given that

many of the (risk averse) claimants of firm cash flows are unable to diversify the specific risks associated with their claims, they will demand extra compensation for bearing such risk. Thus, a creditor of a firm with more uncertain cash flows is likely to demand higher compensation or agree to less favourable credit terms (for the firm); an employee, concerned about the higher probability of redundancy, is likely to demand higher remuneration; customers, concerned about the honouring of post sales servicing and warranties, are less likely to buy products from those firms whose cash flows (and therefore existence) are less certain. Finally, given the high degree of undiversified exposure borne by management to a firm's cash flows, managerial risk aversion can influence firm hedging policies. Tufano (1996) suggests that, if firm risk management activities that impact on managerial utility can be conducted by the firm at less cost to the manager than through his own transactions, management will direct the firm to do so. Tufano identifies specifically that, where management wealth is largely stock based, managers are likely to direct firms to undertake higher levels of risk management to reduce the variability of their undiversified cash flows. However, where management wealth is largely option based, managers are likely to direct firms to undertake less risk management, to maximise volatility, and therefore the options' value and managerial wealth.

Methodology

Data on firm risk management activities are primarily sourced from annual reports of Australian gold mining firms, and from historical hedge books on their web sites. The sample consists of 45 gold mining firms for the period 1998 to 2002.

Table 1
Example of a hedge book for a typical gold mining company at 30 June 2002.

Short Forwards AUD				
<u>Year</u>	<u>Avg Fwd Price</u>	<u>Ounces</u>	<u>Delta</u>	<u>Delta Ounces</u>
2003	530	251,351	- 1.0000	(251,351)
2004	560	208,011	- 1.0000	(208,011)
Long Puts AUD				
<u>Year</u>	<u>Avg Strike per oz</u>	<u>Ounces</u>	<u>Delta</u>	<u>Delta Ounces</u>
2003	560	20,500	- 0.3868	(7,929)
Short Calls AUD				
<u>Year</u>	<u>Avg Strike per oz</u>	<u>Ounces</u>	<u>Delta</u>	<u>Delta Ounces</u>
2003	590	20,500	- 0.4540	(9,307)
Gold Loans				
<u>Year</u>		<u>Ounces</u>	<u>Delta</u>	<u>Delta Ounces</u>
2003		123,000	- 1.0000	(123,000)
Aggregate equivalent portfolio position (ounces):				- 590,291
Reserves				1,754,811
Delta Percentage				- 0.3364

The first 3 columns of table 1 show the hedge book of an Australian gold mining firm at 30 June 2002. This firm had sold forward 251,351 ounces of gold for delivery in the year to 30 June 2003. The firm had also constructed a collar strategy with put and call options on 20,500 ounces of gold with an average minimum sale price of A\$560 and an average maximum sale price of A\$590. Finally, the firm had agreed to deliver 123,000 ounces of gold in 2003 under its gold loan arrangements.

I calculate the delta of each contract using the Black-Scholes-Merton option pricing model. The inputs at 30 June 2002 for the above company were: spot price of gold A\$566.78, 90 day historical volatility 9.60%, time to maturity 1 year, risk free rate 4.78% and gold lease rate 0.78%. The delta represents the percentage change in the value of the hedge portfolio for a small change in the value of the spot position. The forwards and gold loans naturally have a delta of -1 as they form a perfect hedge. I take the product of the delta and number of ounces hedged to calculate the delta ounces for each contract, representing the equivalent number of ounces hedged forward. The sum of the delta ounces is divided by the proven reserves to derive the delta percentage, which effectively represents the percentage of future production hedged forward. This measure of risk management is superior to most previous studies, which have used volume of derivatives traded and other measures to proxy for risk management activities. The proxies for firm characteristics I use to test the theory are as follows: 1. *Financial distress costs*: debt/equity ratio; 2. *Taxes*: prior year tax losses; 3. *Investment constraints*: firm size; 4. *Managerial risk aversion*: executive option portfolio value/executive ordinary stock value ratio.

Results

A regression analysis using firm delta percentages as the dependent variable and the proxies for firm characteristics as the independent variable gave the following results: 1. P-values for prior year tax losses and debt/equity ratios were insignificant; 2. consistent with the theory, a significant negative coefficient (-0.122) for the option-to-stock ratio, indicating that the higher the level of executive remuneration through options, the less firms engage in gold price risk reduction; 3. a significant positive relationship (0.239) between firm size and the delta percentage, indicating that lower growth constraints and economies of scale in hedging costs for larger firms induce greater hedging activities.

Conclusion

The small sample size constrains the results, however the results are consistent with most other empirical studies. No consideration has been given to market factors affecting risk management decisions. The sample period included a period of historically low gold prices from 1998 to 2000, followed by a gold rally driven by slow global economic growth and other geopolitical factors. This impact of spot prices on hedging activity, constantly referred to in the sample firms' annual reports, must of course be significant. Finally, the methodology of this paper provides a more comprehensive measure of financial risk management, however ideally a more complete measure of risk exposure, measuring total economic exposure to the underlying variable, is needed to fully capture the level of risk management undertaken.

Please refer to author for references or other information.