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# Are Firms Successful at Selective Hedging?*

We pursue a strategy of active risk management—that is, we will only hedge a fraction of our exposures and the percentage we choose to hedge will be subject to continuous review. . . . A reason for this approach is our belief that we can add some value by changing our hedging position when we have a view about future developments in our markets. (John van Roden, Treasurer of Lukens, Inc.[1])

We do not take speculative positions, but the extent we are hedged depends on our views. (Risk Manager, HDG [a Fortune 100 durable goods producer][2])

We analyze the corporate risk management policies of 44 companies in the gold mining industry. Firms tend to decrease hedging as prices move against them—behavior contrary to that predicted by risk management theory. These results, along with new survey evidence, suggest that firms attempt to time market prices, so-called selective hedging. Although estimates show a statistically significant ability of producers to favorably adjust hedge ratios, this can be attributed to sample-specific negative autocorrelation in gold prices. Economic gains to selective hedging are small, and no evidence suggests that selective hedging leads to superior operating or financial performance.

Recent research documents that managers' market views influence corporate financing decisions. For example, Baker and Wurgler (2002) and Baker, Greenwood, and Wurgler (2003) document that corporate financing policy decisions and the resulting capital structure largely reflect attempts by managers to time the debt and equity markets. Faulkender (2005) finds that managers attempt to time interest rates by adjusting the exposure of new debt issues to the shape of the yield curve. Consistent with these findings, Graham and Harvey (2001) provide survey evidence that managers often adjust the size and maturity of debt issues in an attempt to time interest rates. Similarly, managers time the issuance of equity according to whether they view their stock as undervalued or overvalued.

The benefits that shareholders realize from managers incorporating their market views into financing policy decisions are not clear. Conceivably, the timing of the equity or debt markets can increase shareholder value if it enables managers to exploit market inefficiencies, thus reducing a firm's cost of capital. However, as discussed by Roll (1986), Shefrin (2001), and Heaton (2002), if overconfidence leads managers to believe that they have superior information or ability when they do not, managers acting on their market views may in fact destroy value. As Baker et al. (2003) conclude, "managers are almost surely trying to time the debt markets, but despite suggestive evidence it is hard to prove that their efforts reduce the overall cost of capital" (285).

In this study, we investigate the influence of managers' views on a different aspect of corporate financial policy: risk management. More specifically, we focus on managers' attempts to time commodity markets with their risk management policy decisions. Stulz (1996) calls this practice "selective" hedging. He points out that selective hedging will increase shareholder value if managers have an informational advantage relative to other market participants. However, if managers believe they have informational advantages when they do not, selective hedging will merely result in an increase in the variability of cash flows that could potentially reduce shareholder value.

We conduct our analysis using quarterly data on the risk management practices of 44 firms in the gold mining industry between 1993 and 1998. The impact of managers' views on risk management decisions is shown in a number of different ways. First, we document substantial time-series variability in the fraction of an exposure hedged by a typical corporation. For example, the average hedge ratio for gold producers is 0.215 with a standard deviation of 0.125. Second, risk management theory suggests that changes in the hedge ratio are associated with changes in firm-specific characteristics such as the probability of financial distress. We find no evidence that changes in the hedge ratio are associated with these firm-specific characteristics. However, opposite most predictions of risk management theory, changes to the hedge ratio are positively associated with contemporaneous (and lagged) changes in gold prices. In other words, when gold prices fall and producers are presumably more likely to experience financial distress, gold producers actually hedge

less.[3] Finally, we contact many of these companies directly. Similar to the survey results described in Stulz (1996), companies in our sample frequently report adjusting derivative positions based on market views.[4]

We find that managers can generate statistically significant gross profits from varying their hedge ratios during our sample period. However, the economic magnitude of gains is quite small even before accounting for the marginal costs associated with selective hedging such as transaction costs, managerial effort, or costs of deviating from an optimal hedging policy. We estimate that these gains are similar in magnitude to those from a simple contrarian trading strategy of increasing hedge ratios (or selling gold) when prices rise and vice-versa. We also find no compelling evidence that selective hedging leads to better performance based on a wide range of operating or financial dimensions (e.g., faster growth, greater improvements in operating income, or greater market valuations).

By focusing on single-commodity (gold) producers, we are examining firms most likely to have a comparative advantage in their product market and therefore most likely to be successful at selective hedging.[5] However, survey and anecdotal evidence suggests that selective hedging is also common when firms manage FX and interest rate risk (see Bodnar et al., 1998). Because nonfinancial firms are unlikely to have superior information in these financial markets, it is even less likely that selective hedging would be successful enough to substantially increase firm value. For example, using similar techniques, we also examine the hedging policies of HDG (a durable goods manufacturer described in Brown [2001]) and its hedging of foreign exchange risk. Evidence suggests that HDG managers also incorporate their views into FX risk management decisions. In fact, we find greater variability of hedge

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3. However, some theory, such as Froot, Scharfstein, and Stein (1993), suggests that *any* relation between prices and optimal hedge ratio is feasible depending on the optimal investment policy of the firm.

4. Stulz focuses on the results of two surveys. The first is a 1995 survey of derivative usage conducted by the Wharton School of Business and the Chase Manhattan Bank in which over a third of the derivative users said that they sometimes "actively take positions" that reflect their market views. The second is a survey in Dolde (1993) in which almost 90% of derivative users indicated that they sometimes took a view. Bodnar, Hayt, and Marston (1998) survey a large sample of nonfinancial corporations about their use of derivatives. Among users of foreign exchange derivatives, about 60% state that their market views frequently or sometimes affect the timing and size of their hedges; 32% actively take positions based on their views. Users of interest rate derivatives report a similar likelihood for altering the size or timing of hedges based on views and 41% actively take positions. In addition to these surveys, Naik and Yadav (2003) provide empirical evidence on the selective hedging by bond dealers.

5. Naik and Yadav (2003) use daily observations of dealers' positions in UK government bonds and related derivative contracts to calculate the dealers' net spot risk exposures. They find that dealers' net spot risks vary over time and interpret this as evidence that dealers selectively hedge their exposure. Returns earned by dealers from selective hedging are not distinguishably different from returns earned by fully hedging exposures. Although it is commonly accepted that dealers in financial markets might possess superior information by virtue of observing order flow, it is less obvious how nonfinancial corporations could obtain an informational advantage. It is primarily for this reason that we wish to examine the risk management practices of industrial firms.

ratios at HDG than we find for gold producers. However, there is no evidence that these managers are able to time changes in foreign exchange rates.[6]

Taken together, our results imply that many managers believe they possess informational advantages in the markets where they hedge and that these beliefs affect corporate risk management decisions. Nonetheless, managers rarely have advantages that can be translated into substantial increases in shareholder value.

## I.    Data

The construction of our sample is determined by the availability of frequently reported and detailed data on firms' use of derivatives. Gold producers are unusual in that detailed data concerning the hedging of gold price risk are publicly available. To the best of our knowledge, there exists no additional transaction-level data on derivative use by nonfinancial corporations that are publicly available.

We use quarterly data for 44 gold producers that describe the fraction of production each producer hedges against price risk from 1993 to 1998. The raw data are provided by Ted Reeve, formerly a financial analyst for Scotia Capital Markets. The companies included in Mr. Reeve's database are publicly traded gold producers based in the United States and Canada. The database provides information on the derivative instruments held by these firms, including the amount of the firm's expected future production and specific information regarding each of the firm's derivative contracts, for example, the strike price and maturity of each option. Further descriptions of this database are provided in Tufano (1996) and Adam (2002).

These data are used to calculate the fraction of future production a producer has hedged at the end of each quarter—our proxy for the companies' hedge ratio. This measure is consistent with how companies generally view the extent of their hedging. To estimate the fraction of future production hedged in each quarter, we measure hedging as the "delta-equivalent" number of ounces hedged against price fluctuations using financial derivatives that mature within 3 years.[7] We scale this value by the projected production, measured as the number of ounces of gold that the company expects to produce in the next

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6. The results of this analysis are not reported but are available upon request.

7. More specifically, we measure the amount of production hedged using the aggregate dollar delta of outstanding derivative contracts. The aggregate delta value can be thought of as the equivalent ounces hedged. Delta is an estimate of the rate at which the value of a financial instrument will change as the value of the asset underlying the instrument changes. Typically, the delta ranges between 0 and 1 if the derivative creates a position that is effectively long the underlying asset and between 0 and $-1$ if the derivative creates a position that is effectively short the underlying asset. Because our companies are almost always shorting their exposures as hedges, we reverse the sign for exposition. Hence, our hedge ratio or "fraction of production hedged" reflects the dollar increase in hedge portfolio value for each dollar decrease in underlying exposure value. For example, assume a gold producer has hedged 20% of production, then if the value of the next 3 years of gold production declines by $1, the hedge portfolio will increase in value $0.20.

**TABLE 1**    **Summary Statistics of Hedging Policies**

| | Hedge Ratio | | SD of Hedge Ratio | | % Observations with Change in Hedge Ratio >0.1 | |
|---|---|---|---|---|---|---|
| | Mean | Median | Mean | Median | Mean | Median |
| Gold producers (all) | .215 | .126 | .125 | .096 | 23.1 | 18.8 |
|   Active hedgers | .339 | .279 | .191 | .165 | 36.2 | 30.6 |
|   Inactive hedgers | .091 | .051 | .059 | .067 | 10.0 | 8.7 |

NOTE.—This table reports summary statistics for the extent of hedging ("Hedge Ratio") by sample firms as measured by absolute hedge portfolio deltas. The first two columns show mean and median hedge ratios. The second two columns show mean and median standard deviation (SD) of hedge ratios. The last two columns show the mean and median fraction of observations for which the change in hedge ratio is greater than 0.1. Means and medians are calculated using individual firm values. The sample consists of quarterly observations for the extent to which 44 gold producers hedged gold production from 1993 to 1998. Firms are divided into two subgroups: active (inactive) hedgers are firms with a hedge ratio standard deviation above (below) the industry median.

3 years. We use a 3-year window in our calculations because projected production beyond this point is often not available. However, this window accounts for nearly all of the gold derivatives held by the sample firms. For example, approximately 94% of the derivative positions in the database mature within 3 years.

The hedge ratio can change quarterly as firms adjust their production estimates, although most of the quarter-to-quarter variation in production hedged is a result of changes to derivative positions. The coefficient of variation during the sample period is 2.95 for the deltas hedged and only 1.48 for the expected level of production. In addition, in a survey that we describe below, companies generally report altering the amount of gold they hedge (rather than altering production) in response to changes in their outlook for gold prices.

Finally, for a producer to be included in our study, we also require that information on its hedging practices be available for at least half of the quarters during the sample period and that financial data for the producer are available in COMPUSTAT. Our final sample consists of 658 quarterly observations for 44 gold producers.

## II.    Time-Series Variation in Hedging Policies

### A.    Summary Characteristics

Hedging is a common practice among the firms in our sample. Only two gold producers did not hedge at all in the sample period. Table 1 reports the average and median hedge ratio and the standard deviation of hedge ratios. The mean (median) hedge ratio is 0.215 (0.126) for gold producers. Hedge ratios through time are plotted in figure 1.

Our primary interest is the time-series variation in the extent of hedging. In particular, table 1 and figure 1 reveal substantial time-series variability in the hedge ratios of these firms. The standard deviation of quarterly hedge

Panel A: Gold Producers (Median Absolute Delta of Hedge Portfolios)
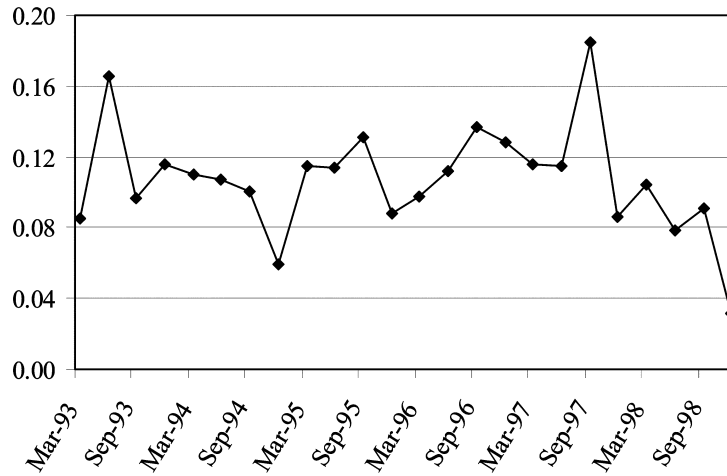


Panel B: Gold Producers, Active vs. Inactive Hedgers
(Median Absolute Delta of Hedge Portfolios)



FIG. 1.—This figure plots absolute portfolio deltas for gold producers. Panel B separates firms into two groups of 22 firms labeled as active and inactive hedgers (based on the standard deviation of each firm's hedge ratio).
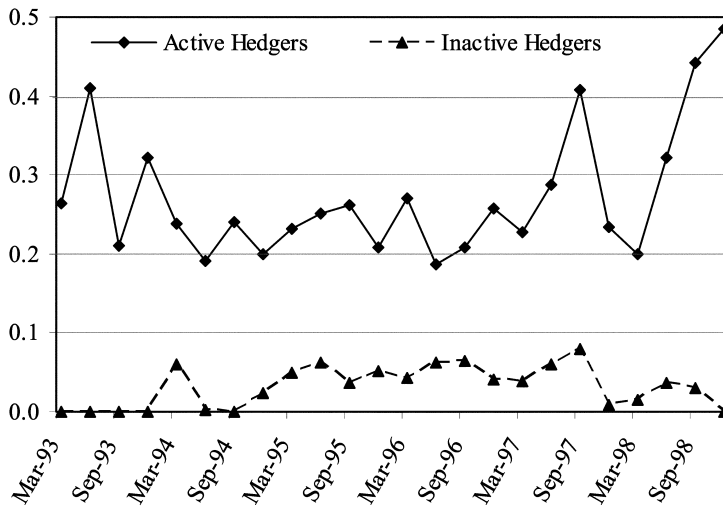
ratios for the average (median) gold producer is 0.125 (0.096). To further reveal the extent of this variability, we calculate the fraction of observations in which the change in the hedge ratio from the previous period is at least 0.10. The mean value is 23.1%. In other words, based on the average hedge ratio of 0.215, the average gold producer changes its hedge ratio by roughly one-half about once every four quarters.

The time-series variability in gold firms' hedging policies becomes more apparent when we separate gold producers into groups according to the standard deviation of their hedge ratios during the sample period. Firms with a standard deviation above the median producer in the sample are considered "active" hedgers. Other gold producers are "inactive" hedgers. By defining active hedgers in this manner we create a bias toward selecting firms that hedge more. However, results from our analysis are similar when we segment the sample using alternative measures of the variability in the hedger ratio, such as the variance of the hedge ratio divided by the mean hedge ratio.

As shown in table 1 and figure 1 (panel B), the gold producers that are classified as "active" hedge more extensively than the other producers. The mean hedge ratio equals 0.339 for the active hedgers and 0.091 for the inactive hedgers. By construction there exists greater variability in the policies of active hedgers than for other producers. The standard deviation of hedge ratios is 0.191 for the active hedgers and 0.059 for the inactive hedgers. Also, the average active hedger changes its hedge ratio by at least 0.10 in 36.2% of the observations. Inactive hedgers only make a change of this magnitude 10.0% of the time.

### B. Determinants of Selective Hedging

An interesting aspect of these data is the degree of variation in hedge ratios across firms. If these differences reflect varying degrees of selective hedging, we may be able to identify firm characteristics that explain which firms selectively hedge. Stulz (1996) suggests that firms that can afford to be wrong are more likely to selectively hedge. For example, firms that are less financially constrained or have fewer growth opportunities should be in a better position to absorb losses from incorrect market calls. Stulz also argues that only firms with an informational advantage should selectively hedge. If larger firms are more likely to have an informational advantage, we should observe a positive relation between selective hedging and firm size or market share. Tufano (1996) concludes that managerial risk aversion explains cross-sectional differences in the level of hedge ratios for gold producers. Consequently, we conjecture that factors related to managerial ownership and compensation could explain cross-sectional differences in the variation of hedge ratios.

We estimate regressions with the standard deviation of quarterly hedge ratios of gold producers as the dependent variable. As independent variables, we include firm size (log of total assets), share of projected gold production in our sample as a proxy for market share, Altman's $Z$-score to measure financial

flexibility, operating margin as another possible measure of financial flexibility, and the market-to-book ratio as a proxy for growth or investment opportunities.

The estimation results, which we do not report here, indicate few significant relations between these variables and the variability of hedge ratios. The only coefficient significantly different from zero at conventional levels is the market-to-book ratio with a coefficient of -0.039 and $p$-value of .038. This is evidence consistent with the hypothesis that firms with greater growth opportunities do less selective hedging.

We also collect data regarding companies' ownership structure and compensation policy similar to the variables used by Tufano (1996). Because these data are available for only a subset (38) of our firms, we estimate a separate regression including these factors. (These results are also not presented.) We examine whether the cross-sectional differences in the variation in firms' hedging policies are associated with difference in firms' ownership structure or compensation policy. We regress the standard deviation in the fraction of production a company hedges on the percentage ownership of officers and directors, the percentage of the board made up of outsiders, and option compensation as a percent of total compensation. We find no consistent relations between these variables and variation in firms' hedge ratios. Furthermore, in this specification the coefficient on market-to-book is no longer significant at the 10% level. In summary, it is not possible to determine from our analysis what characteristics, if any, account for differences in the variation of hedge ratios across gold producers.

## C. How Important Are Managerial Views?

Although there is a great deal of time-series variation in hedge ratios, this evidence alone is not sufficient to conclude that firms are selectively hedging. Financial theory offers a wide range of factors that can influence a company's optimal hedge ratio.[8] As these factors change, a firm is expected to change its hedging policy. However, from an empirical standpoint, measuring the importance of these factors on the choice of a hedge ratio is a daunting task. For example, although strategic concerns related to changes in estimated long-term supply or industry consolidation might lead to a large change in a given firm's preferred hedge ratio, accurately measuring changes (or perceived changes) in these factors can be difficult. Also, although data on other factors that likely influence the hedge ratio are more readily available, financial theory does not provide precise predictions on how changes in these factors are related to changes in hedge ratios. For example, changes in the likelihood of financial distress might have an effect on a manager's decision before becoming apparent from accounting measures. Other factors might have a lagged effect.

8. Financial theorists have focused on how corporate risk management can increase shareholder value by reducing costs associated with market imperfections, such as bankruptcy costs, taxes, informational asymmetries, and managerial risk aversion; for example, see Stulz (1984), Smith and Stulz (1985), Campbell and Kracaw (1990), Bessembinder (1991), Froot et al. (1993), DeMarzo and Duffie (1995), and Mello and Parsons (2000).

Given the difficulties in correctly specifying a regression that would disentangle these effects, we examine the importance of managerial views by directly contacting managers with a survey inquiring about risk management practices. The survey is modeled after Bodnar et al. (1998) and Graham and Harvey (2001). We mailed this survey to 30 gold producers identified as currently operating. Companies' responses support the conclusion that for many firms managers' market views have a significant effect on hedge ratios.

The results for the 13 responding gold producers are presented in the appendix. Seven (nine) of 13 gold producers report sometimes altering the timing (size) of their hedges due to an outlook for future gold prices. Seven (54%) of these firms sometimes or frequently "actively take positions in gold derivatives" based on market views. When asked "how important are each of the following factors in determining the extent to which your company hedges?" the two most important factors cited are "a long-term market view on gold prices" and "a near-term market view on gold prices." Third and fourth most important are "a recent increase or decrease in gold prices" and "pricing of derivative contracts (e.g., implied volatility)." Least important are "competitors' hedging strategies" and "the outcome of prior hedges." Only two respondents believed gold prices were never predictable and that gold is never "either significantly undervalued or overvalued in the market." We also used the survey response to check our classification of gold producers as active versus inactive hedgers by creating a 10-point scale designed to capture how actively a firm selectively hedges.[9] The correlation between this measure and the standard deviation of the hedge ratio is 0.79, indicating that the standard deviation of the hedge ratio is a good measure of the degree of selective hedging.

Despite the aforementioned limitations of statistically explaining changes in hedge ratios, we also run regressions (not reported) to determine which firm characteristics are associated with quarterly changes in hedge ratios. This allows for including a more complete sample of gold producers, rather than just those that responded to the survey. As explanatory variables we include changes in financial, operating, and market conditions.[10] Consistent with risk

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9. The scale is calculated using survey questions 1a–c and 2a–d. For questions 1a–c, 1.0 (2.0) points are given for responding sometimes (frequently). For questions 2a–d, points of 2.0, 1.5, 1.0, 0.5, 0.0 are given for responses of 1, 2, 3, 4, and 5, respectively. Thus a firm that responded "frequently" to questions 1a–c and "very important" to questions 2a–d would receive a score of 10.0 and a firm that responded "never" and "not at all important" to the same questions would receive a score of 0.0.

10. We include variables commonly used in other empirical studies examining risk management by nonfinancial firms. Specifically, we include the ratio of working capital to assets, retained earnings to assets, earnings before interest and taxes to assets, market value of equity to debt, sales to assets (all components of Altman's Z-score), the book value of assets, the market-to-book value of equity, and the change in the implied volatility of options on the near-term gold futures contract. The data used to calculate these proxies for firm-specific financial characteristics come from COMPUSTAT. The data on implied volatility and prices for gold are from Bridge Data. To account for probable nonlinear associations between changes in these variables and changes in hedging policies, we also include the square of these variables in our regressions.

management theory, several of the other proxies for variables related to changes in financial conditions are shown to be associated with changes in the hedge ratio. For example, both changes in EBITDA (earnings before interest, taxes, and depreciation) and changes in sales are negatively correlated with changes in the hedge ratio. In contrast to predictions that companies hedge to reduce the expected costs of financial distress, there is positive correlation between changes in hedge ratio and concurrent changes in gold prices. The results are consistent with managers attempting to lock in high prices and waiting out low prices in hope of a rebound, an approach similar to "equity market timing" discussed by Baker and Wurgler (2002). This interpretation implies that managers are selectively hedging and view gold prices as mean-reverting. As discussed below, there is little empirical evidence of reliable mean-reversion in gold prices across quarters. In summary, market views seem to have an important effect on companies' risk management policies, although we can not determine precisely how much of the variability in gold producers' hedge ratios is a reflection of selective hedging.

## III.    Hedging and Subsequent Market Returns

We find that changes in hedge ratios are positively associated with changes in gold prices. In other words, companies hedge more when gold prices increase and hedge less when gold prices decrease. To earn excess returns from using such a strategy, gold prices must be mean-reverting. We conduct our own time-series analysis of gold prices over a long time period (from 1978 to 1998) and find some evidence that gold prices mean-revert very slowly.[11] However, the characteristics of gold price changes are very sample-specific. For example, during the latter part of the period coinciding with our sample (1992–98), the percent changes in quarterly gold prices are significantly negatively autocorrelated (correlation coefficient $= -0.296$), but quarterly price changes over the 15 years predating our sample (1978–92) are significantly positively autocorrelated (correlation coefficient $= 0.294$). Cheung and Lai (1993) and Schwartz (1997) have explored this issue and find little evidence to indicate that gold prices mean-revert or that the gold market is not weak-form efficient. Recent studies from broad cross-sections of commodity futures markets generally support (at least) weak-form efficient commodity markets. For example, Kellard et al. (1999) provide evidence that commodities futures markets are long-run efficient, and short-run inefficiencies are relatively small. Irwin, Zuluaf, and Jackson (1996) find no support for the existence of mean-reversion in commodity futures prices. These studies suggest that over the long run a firm can only expect to earn excess returns from trading if it possesses an informational advantage.

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11. We estimate a GARCH model of monthly gold prices using data from January 1978 to December 1998 and find an AR(1) coefficient of 0.944, which is significantly less than 1.0 at the 1% level in a two-tailed test.

Although our sample is determined by data availability, a case can be made for why the companies in the sample might possess valuable private information. The gold producers in our sample include many of the largest producers in the world. Consequently, they may have superior insights into the supply of gold as well as demand from large customers.

Anecdotal evidence suggests an informational asymmetry exists between producers and the market. Specifically, gold prices react when producers announce changes in their hedging strategies. For example, the price of gold shot up almost 8% on February 6, 2000, the day Placer Dome, a relatively large gold producer, announced it was reducing the extent of its hedging. The following day, prices dropped by almost 3% when Barrick Gold, another large producer, announced that it would maintain its strategy of hedging extensively.[12] The standard deviation of daily returns for the preceding 200 trading days prior to these events is 1.2%. Although these returns are consistent with the notion that gold producers have superior information about gold prices, an alternative interpretation is that investors believe hedging has an effect on prices. For example, a reduction in hedging by producers reduces the supply of gold for which buyers can lock in future prices. This reduction in the known future supply of gold potentially increases the probability that higher prices for gold can be realized. We cannot differentiate between these stories. To directly examine whether producers indeed have informational advantages, we now turn to analyzing the statistical and economic importance of the gains from selective hedging.

## A. Univariate Analysis

We first examine whether companies have a comparative advantage by testing their ability to time hedging decisions. We use a method similar to that suggested by Henriksson and Merton (1981). Our tests examine whether changes in firms' hedging policies are in the "correct" direction relative to the changes in gold prices in the subsequent period. If firms have a comparative advantage in predicting future prices relative to other market participants, we expect to find that firms increase the extent of hedging before price decreases (and decrease their extent of hedging before price increases).

We examine the relation between a change in the hedge ratio and subsequent changes in gold prices. In table 2 we report success rates for the pooled sample and the median firm for the entire sample period. For all gold producers, we find that on average the changes companies make to their hedging policies are in the correct direction 55.2% of the time. The median gold producer makes changes in the correct direction 53.7% of the time. This value is significantly greater than 50% ($p$-value = .019). We also examine the success of the subset of gold producers that we classify as active hedgers. The per-

12. See "Placer Dome alters hedging strategy, giving gold a lift," *Wall Street Journal*, February 7, 2000 and "Gold sinks after Barrick's strategy disappoints," *Wall Street Journal*, February 8, 2000.

**TABLE 2    Fraction of Periods with Correct Directional Change in Hedge Ratio**

| | One-Period Change | | Material Changes | | Two-Period Change | |
|---|---|---|---|---|---|---|
| | Mean (Pooled) | Median (by Firm) | Mean (Pooled) | Median (by Firm) | Mean (Pooled) | Median (by Firm) |
| All gold producers (%): | 55.2 | **53.7** | **66.1** | **66.7** | 50.5 | 52.2 |
| Observations | 658 | 42 | 127 | 40 | 658 | 42 |
| p-value | (.288) | (.019) | (.053) | (.010) | (.474) | (.900) |
| Active hedgers only (%): | 54.6 | **53.7** | **69.2** | **66.7** | 50.3 | 52.2 |
| Observations | 366 | 22 | 91 | 22 | 366 | 22 |
| p-value | (.283) | (.037) | (.037) | (.000) | (.453) | (.775) |

NOTE.—This table shows the mean and median fraction of periods for which firms changed their hedge ratio in the profitable direction relative to the change in gold prices in the subsequent period(s). Means are calculated using pooled data across all firms for nonzero changes in the hedge ratio. Medians are calculated from firm averages of success rates using nonzero changes in the hedge ratio. The columns labeled "One-Period Change" report success rates for one-quarter-ahead price changes. "Material Changes" conditions on periods when the absolute change in prices or rates is greater than 3 percentage points and the absolute change in the hedge ratio is at least 0.05. The columns labeled "Two-Period Change" report success rates for two-quarter-ahead price changes. Two firms are excluded from the calculation because their hedge ratios are always zero. Active hedgers are gold producers with a hedge ratio standard deviation above the industry median. Values significantly different from 50% at the 10% level are displayed in bold text. P-values for the pooled sample are from a Henriksson-Merton (1981) test. For medians by firm, p-values are from a (nonparametric) sign test against a null of 0.5.

formance of the active hedgers is not better than that of the total sample. Active hedgers make a change that is in the correct direction 54.6% of the time. The median active hedger is also correct 53.7% of the time.

Table 2 also reports values for tests based on two alternative measures. We do this because success rates may be muddied by inconsequential changes in hedge ratios and prices, or the one-period horizon may be too short. For example, in six of the 24 quarters from 1993 to 1998 the absolute change in gold prices was less than 1%. First, we reestimate how often firms are correct by only considering larger "material" changes in hedging and prices. A material change in the hedge ratio is defined as an absolute change in excess of 5 percentage points. In addition, the absolute change in prices must exceed 3 percentage points to be considered material. These values are roughly the average quarterly absolute change in hedge ratios and prices during the sample period. Second, we recalculate the fraction of firms making changes in the correct direction through a two-period—6 month—window.

The results using material changes show that firms are better at predicting material changes. The mean pooled success rates for all producers and active hedgers increase to 66.1% and 69.2%, respectively. Both of these values are significantly greater than 50% at about the 5% level. Median success rates are 66.7% for each group (both significant at the 1% level). As before, there is little evidence to indicate that active hedgers are better at anticipating changes in gold prices than other producers. However, success rates using price changes over the two-periods reveals a substantial drop in predictive ability by gold producers to near 50%. Overall, these results indicate that gold producers may have an ability to predict short-run changes in gold prices and are better at predicting and acting on changes of larger magnitudes. However, active hedgers are not significantly better than inactive hedgers.

## B. Multivariate Analysis

The univariate Henriksson-Merton test statistic relies critically on the assumption that the probability of a correct forecast is independent of the magnitude of subsequent asset returns. Given the overall stronger results for material changes presented in the previous section, we turn to more general tests of market-timing ability. Specifically, we utilize tests similar to the regression methods proposed by Cumby and Modest (1987) and Graham and Harvey (1996). In addition to considering the magnitude of changes in hedge ratios and prices, these methods can account for the effects of the other potential determinants of time-series variation discussed in Section II. Specifically, we estimate the multivariate model

$$\Delta h_{i,t} = \beta_1 * \Delta gold_{t+1} + \beta_2 * \Delta \mathbf{z}_{i,t} + \varepsilon_{i,t}.$$

For these regressions, $\Delta h_{i,t}$ is the change in hedge ratio by firm $i$ from period $t-1$ to period $t$; $\Delta gold_{t+1}$ is the return on gold between period $t$ and a future period; $\Delta z_{i,t}$ measures changes in the other financial, operating, and market

**TABLE 3**        **Success of Selective Hedging**

| Gold Producers | $\beta_1$ | |
| --- | --- | --- |
| | One Period Ahead | Two Periods Ahead |
| All producers | | |
| (N = 537) | −**.333** (.030) | −**.207** (.080) |
| Active hedgers | | |
| (N = 305) | −**.488** (.055) | −.247 (.168) |

NOTE.—This table reports coefficients and *p*-values from Cumby and Modest (1987) tests of market timing ability. The analysis estimates hedgers' success at changing hedge ratios in anticipation of subsequent changes in prices. Regressions are estimated for the model

$$\Delta h_{i,t} = \beta_1(\Delta exp_{t+1}) + \beta_2(\Delta z_{i,t}) + \varepsilon_{i,t}.$$

$\Delta h_{i,t}$ is the change in hedge ratio by firm $i$ from period $t-1$ to period $t$. $\Delta exp_{t+1}$ is the percentage change in gold price from period $t$ to the next period(s). $\Delta z_{i,t}$ is the change in other characteristics of the firm between period $t-1$ to period $t$. The regressions are estimated using random-effects models (based on Hausman specification tests). However, the results are insensitive to the fixed-effect or random-effects specification. The sample is described in the text and tables 1 and 2. The second column reports coefficients from regressions using the two-period change in prices or rates as described in table 4. *P*-values (reported in parentheses) are from one-tailed *t*-tests using heteroskedastic-consistent standard errors against a null of zero. Coefficients significantly different from zero at the 10% level are displayed in bold text. *N* reports the total number of observations.

conditions between period $t-1$ and period $t$, described in section II.C. The regressions are estimated using a random-effects model. The coefficient of primary interest is $\beta_1$. If a company has the ability to forecast future returns, $\beta_1$ will be negative. In other words, the change in hedging will be opposite the change in prices, so firms will be hedged less when prices increase and vice-versa.

Coefficients ($\beta_1$) and *p*-values from estimating regressions are reported in table 3. Estimating the model using all gold producers results in a $\beta_1$ coefficient that is negative and statistically significant. The results are consistent with the univariate tests showing that changes in hedge ratios are in the correct direction in a majority of cases. These results suggest that even after accounting for other factors, on average, changes in gold producers' hedge ratios can predict future price changes. When the sample is restricted to only active hedgers, the coefficient $\beta_1$ is slightly larger in magnitude but less statistically significant due to the reduced number of observations. As in the univariate analysis, we also estimate these regressions using two-quarter-ahead changes in gold prices. Table 3 also reports these results. In this case, only the coefficient for the regression with all gold producers is significantly negative. In both cases, the coefficients are smaller than the one-period estimates suggesting firms are better at near-term forecasts.

Although the results presented in tables 2 and 3 are consistent with the idea that producers have valuable private information about prices, an alternative explanation is that this association between hedging and subsequent changes in gold prices is self-fulfilling. This view has been offered by critics of hedging by gold producers who contend that changes in hedging programs can exert

pressure on the market that leads to changes in gold prices.[13] In part, this pressure is exacerbated by the structure of the gold derivatives market. When gold producers sell contracts forward, the common practice of bullion banks (who are often on the other side of these trades) is to offset their long position in the forward contract by borrowing gold from a central bank and selling it on the spot market. Therefore, the more extensively that gold producers hedge, the greater the amount of gold the bullion banks sell into the spot markets. Similarly, when gold producers cut back on their hedging, bullion banks buy gold in the spot markets.

The effect of bullion banks is compounded by the fact that a relatively large fraction of the gold producers change their hedging in the same direction. In calculations not shown here, we find that gold producers tend to change their hedging in the same direction. For example, among active hedgers, an average of 59% of the producers change the extent of their hedging in the same direction. In two of the quarters during the sample period, 77% of the active hedgers changed the extent of their hedging in the same direction. So the increase of hedging by one producer, which leads to the selling of gold into the spot market by a bullion bank, is generally not entirely offset by the decrease in hedging by another producer. If this argument is true, we would need to examine hedging and price changes in a more general economic setting. This is because we cannot determine if the apparent success that gold producers have realized in predicting gold prices is a function of comparative advantages or simply due to the market impact of their changes in hedging policy.[14]

## IV.  Do Shareholders Benefit from Selective Hedging?

Although the mechanism linking hedging and gold prices is not entirely clear, the issue of primary concern to shareholders is the economic implications of selective hedging. For example, it could be that firms only rarely have superior information about future prices, but when this occurs, they can profit greatly. We estimate the benefits shareholders realize from selective hedging in two general ways. First, we focus on the direct gains or losses from selective hedging. Second, we look at the association between selective hedging and subsequent changes in operating characteristics and financial performance. This second approach should incorporate any direct and indirect benefits from selective hedging.

13. For a discussion of this argument and the structure of the gold market, see "New rules needed for gold hedging," *RISK*, July 2000, and Cross (2000).

14. We examine the possibility that the spot prices are particularly sensitive to the temporary shocks to the gold supply caused by changes in hedging by gold producers by reestimating the regressions shown in table 3 using the change in the value of the futures contract that expires in the subsequent quarter, rather than the spot price, as the dependent variable. The results using this alternative specification are qualitatively similar to those shown in table 5.

*A.    Estimating the Gains from Selective Hedging*

To estimate the gains and losses from selective hedging, we develop four alternative proxies for the extent of a firm's selective hedging each period. We do this because we cannot determine exactly which part of the variation in hedge ratios is due to selective hedging, and we want to limit the chance of not finding significant gains from selective hedging if they, in fact, exist. The different measures are designed to capture variation through time, across firms, and net of other factors that may determine hedge ratios—in short, nearly any type of variation that could be attributed to selective hedging.

   The first measure is the change in the hedge ratio from the previous period. This measure assumes that the entire change in the hedge ratio from the previous period reflects changes in the managers' outlook for prices. The second proxy is the difference between a company's hedge ratio for the period and the industry average hedge ratio for the period. We include this measure to account for the possibility that a corporation's hedging strategy largely depends on its competitor's hedging strategy (despite the survey evidence presented in Section II) as discussed in Froot et al. (1993). Technically, this measure assumes that the company can observe contemporaneous changes in its competitors' hedge ratios. However, the results are very similar when we use deviations from the prior quarter's average hedge ratio (but this lagged measure results in a smaller sample, so we focus on the contemporaneous measure).

   Our third proxy for the extent of selective hedging is the difference between a firm's hedge ratio and its average hedge ratio during the entire sample period. This measure assumes that the average amount of hedging is a suitable proxy for the extent to which a company would hedge if managers did not incorporate their views into the company's hedging policy. It uses the companies' hedge ratios in future periods (for all but the last period of the sample). The fourth proxy is the residual for each observation from the random-effects regressions discussed in Section II, in which the change in hedge ratio is regressed on changes in firm-specific and market characteristics. This measure assumes that changes in hedging that cannot be explained by these factors are attributable to selective hedging. Estimation of this proxy also uses information from future periods.

   To calculate the change in the number of ounces hedged that can be attributed to selective hedging, we multiply our proxy for the extent of selective hedging by the projected production in the next 3 years. We call this product the "unexplained" change in the hedging policy. Gains from selectively hedging are calculated by multiplying the unexplained change in hedging by the dollar change in gold prices in the following period. For example, consider our third proxy of the extent of selective hedging. Assuming that a company's average hedge ratio for the full sample period is 30%, its hedge ratio at the end of quarter $t$ is 45%, and its projected production for the next 3 years is 1,000,000 ounces, we attribute 15% of the company's hedge ratio to selective

hedging (45% minus 30%). Therefore, the unexplained change in the hedge ratio is an increase of 150,000 ounces (15% × 1,000,000). If the price of gold decreases by \$20 in quarter $t + 1$, the estimated gain from selective hedging in quarter $t$ is \$3,000,000 (150,000 × \$20).

Estimated average gains (per quarter) from selective hedging for the median firm are reported in table 4. The gains are positive and statistically significant in many cases. In fact, for the active hedgers, these values are positive and statistically significant using all four of our proxies for the degree of selective hedging. For example, gains based on the deviation from the industry average (col. 2) increase the cash flow by \$204,900 per quarter for the median active hedger. Using the residual method (col. 4) yields an estimate of increases in cash flow of \$93,700 per quarter. We note that in every case the estimated gains for all gold producers are less than the gains for active hedgers, but differences between active and inactive hedgers are statistically significant at the 10% level only for the industry-deviation and residual methods (cols. 2 and 4).

Although the precise magnitudes of estimated gains depend on the proxy employed, the average economic significance is always small. The median gains per quarter among all gold producers are always less than 0.05% of total assets and 0.5% of sales.[15] For active hedgers, gains always amount to less than 0.1% of total assets and 1.0% of sales. The median values mask substantial variation across firms, and for a few firms, the nominal gains (or losses) are economically large. Using results from the residual method (col. 4), the worst company in the sample loses an average of \$2.2 million per quarter over the sample period by selectively hedging. Six of 42 gold producers (14.3%) realized gains of more than \$500,000 per quarter. Still, no gold producer has average gains or losses of more than 1% of total assets or 10% of sales. Results from other methods also reveal substantial variation in estimated gains.

To better interpret these values, we compare them to estimated gains from a simple contrarian trading strategy. Specifically, during quarters in which gold prices increase, we assume the company will increase its hedge ratio for the following quarter (and vice versa). This trading strategy is consistent with a firm that believes in mean-reverting gold prices and is attempting to trade the market, or selectively hedge.[16] We set the quarterly change in a company's hedge ratio equal to the standard deviation of its hedge ratio during our sample period.[17] As discussed in Section II.B, changes in the hedging policies of gold producers are positively associated with the contemporaneous price changes.

15. We do not scale these profits by operating profits, because operating income is negative for some gold producers during this sample period.

16. We note that the opposite approach (a momentum strategy that reduces the hedge ratio following price increases) would be more consistent with hedging to reduce risks of financial distress.

17. This is an intuitive benchmark because it results in hypothetical hedge ratio volatility very similar to actual hedge ratio volatility and is the simplest possible contrarian strategy.

**TABLE 4    Gains from Selective Hedging**

| | | | Change in Cash Flows for the Median Firm | | |
| --- | --- | --- | --- | --- | --- |
| | Change from Period t − 1 (1) | Deviation from Cross-Section Average at t (2) | Deviation from Firm's Sample Average (3) | Residual (4) | Naïve Strategy (5) |
| Gold producers: | | | | | |
| All producers ($1,000s):[a] | 64.6 | 8.1 | 93.6 | 18.7 | 188.2 |
| % Assets | .045 | .004 | .030 | .003 | .098 |
| % Sales | .419 | .039 | .379 | .039 | 1.008 |
| | (<.001) | (.439) | (.024) | (.256) | (<.001) |
| Active hedgers ($1,000s):[b] | 125.7 | 204.9 | 157.4 | 93.7 | 304.4 |
| % Assets | .077 | .082 | .078 | .049 | .205 |
| % Sales | .763 | .884 | .731 | .441 | 2.115 |
| | (.008) | (.008) | (.067) | (.058) | (<.001) |
| P-value (active > inactive) | (.276) | (.003) | (.311) | (.053) | (.046) |

NOTE.—This table reports estimates for the median firm of the average quarterly change in cash flow from changes in hedge ratios. We assume these changes are due to selective hedging and calculate gains from trading. Results from four different methods are reported. Column 1 calculates gains using changes from the previous period hedge ratio. Column 2 calculates gains using the deviation of a firm's hedge ratio from the industry average for that period. Column 3 calculates gains using the difference between the extent a company hedged for the quarter and the average fraction it hedged during the sample period. Column 4 calculates gains using the residuals from regressions reported in table 3 as a proxy for unexplained hedging. The change in cash flows for each measure is estimated by multiplying the measure for the unexplained change in the hedge ratio in period t by the amount of the exposure in period t. This value is multiplied by the dollar change of gold prices in the following period. Column 5 shows the average and median gains in quarter t from a benchmark technical trading strategy of changing the hedge ratio for quarter t by a standard deviation in the same direction as the returns on gold in quarter t − 1. The gains from this strategy are calculated by multiplying this change in the hedge ratio by the amount of the exposure in period t and the dollar change in the gold price in period t + 1. Reported under these values are results scaled by the average book value of total assets and sales at the end of quarter t + 1. P-values are reported in parentheses for (nonparametric) sign tests against a null of zero. N reports the minimum number of firms in each category and varies slightly across columns for all producers (to a maximum of 42) because of availability of data necessary for the calculations.

[a] N ≥ 37.
[b] N ≥ 20.

Therefore, the changes in the hedge ratio made using this naive contrarian strategy will often be in the same direction as the changes made by some of the companies in the sample.

We estimate the gains from this contrarian strategy for a company in quarter $t$ as the product of the change in prices in quarter $t$, the amount of forecasted production in period $t$, and this change in the hedge ratio for period $t$ (based on change in prices in quarter $t-1$). Results from these calculations are reported in column 5 of table 4. The estimated gains from using this strategy are \$188,200 for the median gold producer and roughly \$304,400 for the median active hedger. Hence, the median gains from this benchmark strategy are greater than those realized by the companies using any of the four proxies we develop. For example, for 74% of the firms in the entire sample (and 73% of the active hedgers), the gains from this strategy exceed the estimated gains from the most profitable selective hedging strategy we examine (the deviations from the firm's sample average). The reason for the success of this contrarian strategy is the negative autocorrelation in quarterly gold price changes during our sample period. In summary, the changes firms made result in underperformance relative to this simple mechanical benchmark even though the median company followed a strategy that would benefit from negative autocorrelation.

We note several important caveats to the results in this section. First, our estimates do not incorporate any transaction costs the producers incurred in making changes to hedge ratios, nor do we subtract the marginal costs of running a selective hedging program (e.g., increased accounting, personnel, oversight costs, and costs of deviating from an optimal hedging policy). These costs might be substantial and could erode or exceed the magnitude of the estimated gains from selective hedging. Second, the potential impact of hedging by gold producers on the gold market (as described above) makes it difficult to estimate the extent that gold prices would have changed if producers did not adjust their policies. The third and final caveat suggests a still more cautious interpretation of our point estimates. Implicitly, we assume that selective hedging accounts for only the unexplained variation in hedge ratios and not the level of the average hedge ratio. It could also be that selective hedging is responsible for differences in average hedge ratios that are appreciably above or below the average hedge ratios managers would choose if they did not selectively hedge. For example, because gold prices decreased during the sample period, and these companies tend to reduce the extent of their hedging when prices decrease, the average amount of hedging we observe might be less than it would have been if companies were not selectively hedging. Therefore, the cash flows from hedging could have been even greater (or less). We are not aware of any method that would let us account for this potential bias, so we only note the possible effect on our results.

TABLE 5     **Other Potential Benefits from Selective Hedging**

|  | Inactive Hedgers | | Active Hedgers | |
|---|---|---|---|---|
|  | Mean | Median | Mean | Median |
| Size: | | | | |
|   Change in production | .027 | .026 | .017 | .011 |
|   Change in total reserves | .029 | .015 | .025 | .024 |
|   Change in sales | .024 | .015 | .026 | .026 |
|   Change in total assets | .036 | .023 | .021 | .026 |
| Operating performance: | | | | |
|   Operating margin | .125 | .174 | .099 | .037* |
|   Change in operating margin | −.013 | −.004 | −.036 | −.007 |
|   Change in return on assets | −.251 | −.019 | −.444 | −.046 |
| Market value of equity: | | | | |
|   Change in market-to-book | −.014 | −.016 | −.039 | −.029* |
|   Total market return on equity | −.027 | −.018 | −.059 | −.050 |

NOTE.—The table reports summary statistics for quarterly changes in various performance characteristics for 44 gold producers during the sample period (January 1993 to December 1998). Inactive (active) hedgers are firms with a hedge ratio standard deviation below (above) the industry median. Values are based on firm level averages. "Change in poduction" is quarterly percent change in forecasted production for the subsequent 3 years. "Change in total reserves" is quarterly percent change in the next 3 years. "Change in sales" is the quarterly percent change in sales. "Change in total assets" is the quarterly percent change in total assets. "Operating margin" is the average operating income before depreciation, interest, and taxes divided by sales. "Change in market-to-book" is the quarterly percent change in market-to-book ratio where market value is defined as the market value of equity plus total debt and book value is the total book value of assets. "Total market return on equity" is defined as the total quarterly market return on the firm's common stock.

  * Significantly different from inactive hedgers at the 10% level.

## B.     Selective Hedging and Differences in Operating and Financial Performance

We further investigate the benefits shareholders realize from selective hedging by focusing on the changes in operating and financial performance. These changes should reflect both the direct and the indirect benefits from selective hedging. For example, we might expect to observe faster growth or better performance for active hedgers if selective hedging provides some strategic gain not properly captured by average dollar estimates (e.g., a one-time large payoff in a very low price state that allows an active hedger to acquire an inactive hedger at a fire-sale price).

In table 5 we present the average and median quarterly changes during the sample period for measures of firm size, profitability, and market value of equity. Our primary interest is whether there are significant differences in these characteristics between active and inactive hedgers. We examine the changes in firms' size using the changes in production, reserves, sales, and total assets. Values are similar for inactive and active hedgers. For example, the average inactive hedger increases sales by 2.4% per quarter. By comparison, the average quarterly change in sales for active hedgers is a statistically indistinguishable 2.6%.[18] Overall, there exists no statistically significant evi-

18. Change in sales is the only measure in which the average change is greater for active hedgers than inactive hedgers, although this difference is not statistically significant. In addition, this difference is of a much smaller magnitude than the differences in the change in assets or changes in the measures of operating performance.

dence that the producers we classify as active hedgers grew at a faster rate than the other producers.

We examine changes in operating performance by looking at the return on assets (ROA) and operating margins. Again, we find no evidence that the operating performance of active hedgers exceeded that of inactive hedgers. In contrast, median operating margins for active hedgers are significantly lower than for inactive hedgers. The changes in operating performance during the sample period are typically negative for both groups. For example, the median quarterly change in ROA is $-1.9\%$ for the inactive hedgers and $-4.6\%$ for the active hedgers.

We estimate the changes in the market value of these firms using changes in the market-to-book ratio and the quarterly market return to the common stock. The market value of these firms generally decreases during the sample period; for both groups of firms the mean and median market return and change in the market-to-book ratio are negative. If anything, inactive hedgers appear to have outperformed active hedgers because the median change in the market-to-book ratio is only $-1.6\%$ for the inactive hedgers and $-2.9\%$ for the active hedgers, a difference significant at the 10% level. Altogether, the results shown in table 5 provide little evidence suggesting that the additional variability in the hedge ratios of active hedgers enables them to outperform inactive hedgers.

## C.    Characteristics of "Successful" Selective Hedgers

Given the apparent statistical success of some gold producers at selective hedging, it is interesting to examine what firm traits might be responsible. If traits suggested by theory or intuition are related to success, this would suggest that some firms actually could add substantial value even though the median firm cannot. We conjecture that greater market share may lead to superior information about the future supply or demand for gold. However, larger firms may have greater market impact and therefore less ability to profitably trade on their information. Returning to the analysis in Section III, Stulz (1996) suggests that firms with more financial flexibility and fewer growth or investment opportunities will be more likely to selectively hedge. Consequently, these firms may be the ones that can best take advantage of information and therefore obtain the greatest profits. To examine these hypotheses, we estimate regressions with the average gains from the four proxies for selective hedging methods as the dependent variables. We include as independent variables the standard deviation of quarterly hedge ratios because this variable may reveal firms that are more likely to be selective hedgers, firm size (log of total assets), share of forecasted production as a proxy for market share, Altman's Z-score to measure financial flexibility, operating margin as another potential measure of financial flexibility, and the market-to-book ratio as a proxy for growth or investment opportunities.

For the sake of brevity, the results from these regressions are not presented.

Overall, the results indicate weak and inconsistent relations between these variables and success at selective hedging. We find a weak significantly positive relation between size and gains when gains from the residual method are the dependent variable. This result is consistent with the predictions of Stulz. However, the result is not present when gains from the other methods are the dependent variable. As noted previously, Tufano (1996) finds that variables related to manager compensation and tenure explain cross-sectional differences in the hedging behavior of gold producers. As before, the variables used by Tufano are available for only a subset of our firms, so we include them in separate regressions (also not reported). However, we again find no consistent relations between these variables and gains from hedging.[19] In summary, we do not find reliable evidence that predicted firm characteristics account for the apparent success of some gold producers at selectively hedging.

## V.     Conclusions

In this study we investigate the impact of managerial views on corporate policies by examining the time variation in hedge ratios of gold producers. Our evidence is consistent with the notion that gold producers selectively hedge (and can have limited success), yet we find no that evidence that shareholders benefit substantially from this practice.

Although our analysis is confined to gold producers' risk management policies, the results of the analysis have more widespread implications. First, because selective hedging is common practice for nonfinancial firms in financial markets (e.g., foreign exchange and interest rates) where companies are unlikely to have an informational advantage, successful selective hedging is probably very uncommon in wider samples of firms. Second, our results lend further support to the findings that managers' market views influence broader financial policy decisions. These tendencies are documented in recent studies, including Baker and Wurgler (2002) and Faulkender (2005), as well as survey evidence reported by Graham and Harvey (2001). Again, it is not clear that managers actually have advantages in the markets that influence the success of these other policy decisions.[20]

Empirical researchers in the risk management field should also consider the effect of managerial views on their tests of theory. For example, relatively high-frequency selective hedging may introduce significant noise into hedge ratios that lowers the power of single-period cross-sectional tests. Researchers may benefit from measuring average hedge ratios over a longer sample period to get more accurate indications of the level of hedging excluding the effects of managers' short-term market views. Widespread selective hedging could

19. Option compensation as a percent of total compensation is negative and significant in the deviation gains equation and positive and significant in the residual gains equation.
20. The ability of managers to time equity and debt markets when making capital structure decisions is still under debate. For example, see Butler, Grullon, and Weston (2005, 2006) and Baker et al. (2003).

be one explanation for the lack of strong (and differing) results in many widely cited empirical risk management papers.

Our most direct recommendation is that corporations undertake a detailed analysis of whether they have an advantage relative to other market participants that justifies incorporating market views into financial decisions. Our findings suggest that gold producers only rarely have advantages that can be translated into significant increases in firm value. This evidence is particularly compelling because gold producers, unlike firms hedging financial risks, are potentially better informed about gold prices than other market participants. Interestingly, some firms appear to have already reached this conclusion from their own experiences. Recently, a representative from Procter and Gamble (a company that lost over $100 million in 1994 through speculative use of interest rate derivatives) noted that, "We don't do a lot of hedging because, if we were smart enough to hedge, there is actually more money to be made in that than there is in selling soap."[21]

Finally, we propose several possible explanations for why selective hedging (or, more generally, the practice of managers incorporating market views into corporate policy decisions) is so widespread. First, risk managers may use selective hedging to justify their positions or identify their value added. Second, success in directional adjustment of hedge ratios, such as that experienced by many of the firms in our sample, may give the impression to senior managers that selective hedging adds significant value. This may be accentuated if the costs of selective hedging are difficult to identify, for example, if selective hedging creates a suboptimal risk exposure for the firm. Third, the lack of guidance from financial theory concerning optimal hedge ratios for nonfinancial companies may allow any hedge ratio to be justified, and, after all, it is certainly more fun to battle wits with the market than to follow a passive or mechanical hedging strategy.

## Appendix

### Survey of Gold Producers

We mailed the survey reproduced below to the 30 gold producers in our sample identified as currently operating. (At least seven firms in our sample had been acquired or merged since 1998; the remaining seven were bankrupt or we were not able to locate a current address.) Thirteen companies (43%) responded. For one respondent, the answers to question 1 were inferred from a letter to be "never" for all parts. Two additional companies that never hedge did not answer question 2. The number of respondents selecting each answer is provided. For question 2, we calculate an average for each part and (inverse) rank these averages. An "other" response was also available for question 2. However, only one respondent utilized this alternative, citing "strength of balance sheet" with an importance of 2.

21. Scott Miller, Procter and Gamble's director of national government relations, as quoted in the *Wall Street Journal*, April 14, 2001.

In answering the following questions, consider a "hedge" to be any financial contract that changes exposure to gold prices. Please circle the response that best describes your actions on average.

1. How often does your outlook for future gold prices cause your company to . . .

| | Never | Sometimes | Frequently |
|---|---|---|---|
| a. Alter the timing of hedges | 6 | 7 | |
| b. Alter the size of hedges | 4 | 9 | |
| c. Actively take positions in gold derivatives | 6 | 5 | 2 |
| d. Alter the amount of gold produced | 11 | 2 | |

2. If your company has hedged its exposure to gold prices, how important are each of the following factors (on a scale of 1–5) in determining the extent to which your company hedges?

| | Very Important | | Somewhat Important | | Not at All Important | Average Score/ Rank |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | |
| a. A near-term market view on gold prices (< 1 year) | 3 | 4 | 1 | 2 | | 2.2/1 |
| b. A long-term market view on gold prices (> 1 year) | 3 | 3 | 3 | 1 | | 2.2/1 |
| c. A recent increase or decrease in gold prices | 1 | 4 | 5 | 1 | | 2.5/3 |
| d. Pricing of derivative contracts (e.g., implied volatility) | 1 | 4 | 3 | 2 | | 2.6/4 |
| e. A change in short-term debt levels | | | 2 | 4 | 4 | 4.2/10 |
| f. A change in long-term debt levels | 2 | 1 | 2 | 2 | 3 | 3.3/8 |
| g. A change in the overall debt-to-equity ratio | 1 | 1 | 2 | 3 | 3 | 3.6/9 |
| h. A change in cash reserves | 1 | 3 | 4 | 1 | 1 | 2.8/7 |
| i. A change in expected production | 1 | 3 | 4 | 2 | | 2.7/5 |
| j. A change in operating costs | 1 | 2 | 6 | 1 | | 2.7/5 |
| k. Competitors' hedging strategies | | | | 2 | 8 | 4.8/12 |
| l. The outcome of prior hedges | | | | 1 | 4 | 5 | 4.3/11 |

3. On average, would you say future gold prices are:

| Never Predictable | Infrequently Predictable | Often Predictable | Always Predictable |
|---|---|---|---|
| 2 | 9 | 1 | |

4. How often do you believe that gold is *either* significantly undervalued or overvalued in the market?

| Never | Sometimes | Frequently | Almost Always |
|---|---|---|---|
| 2 | 6 | 4 | |

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