On the Market Timing and Feedback Effect of "Hedging": Evidence from U.S. Oil and Gas Producers

Yongjia Li and Kangzhen Xie*

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*Yongjia Li, yli@walton.uark.edu, 479-575-4505, Sam M. Walton College of Business, University of Arkansas, WCOB 302, Fayetteville, AR 72701; Kangzhen Xie, kxie@walton.uark.edu, 479-575-4505, Sam M. Walton College of Business, University of Arkansas, WCOB 302, Fayetteville, AR 72701. We thank Han-Sheng Chen for FMA discussion, Oliver Entrop for SFA discussion and helpful comments from seminar participants at the University of Arkansas and Oklahoma State University. We also thank Tim Krehbiel, Wayne Lee, Pu Liu, Alexey Malakhov, Ron Miller, John Polonchek, Ramesh Rao, Craig Rennie, Shu Yan, Tim Yeager and Jun Zhang, for suggestions that improved the paper, We thank John Hill, Liu Hong, Cheng Li and Wei Yang for the excellent research assistance. Kangzhen Xie would like to thank the University of Arkansas for the financial support.

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Abstract

Using a hand-collected data, we provide evidence that U.S. oil and gas producers generate profits on average from their use of derivatives in hedging, indicating that it is a positive NPV project. The profits are positively related to the intensity of hedging. Further decomposition shows that the profits are strongly and positively related to the market timing component in hedging. The hedging profits reveal nonlinear feedback effects on the hedge ratio in the subsequent period. Winners hedge more when they gain more while losers also hedge more when they lose more.

Keywords: risk management, hedging, derivative, market timing, feedback effect

JEL Classification: G32, G11, G14

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I. Introduction

Corporate risk management is an important part of corporate finance. With the growing popularity of financial derivatives on the markets, firms are increasing their use of financial derivatives for hedging. While early studies have focused on whether hedging affects shareholder value [1], we know little about the actual impact of hedging on the corporate earnings due to the lack of data. A related and widely debated issue is whether firms should take a view on the timing of their use of derivatives in hedging and its consequence (e.g., Stulz (1996), Faulkender (2005), Adam and Fernando (2006), Brown et al. (2006), Geczy et al. (2007), Chernenko and Faulkender (2011))[2]. Also, an unexplored issue is whether and how the results of hedging affect subsequent hedging decisions. Drawing on a hand-collected data, we are able to provide new insights into these issues.

[1] The literature has proposed several channels for hedging to affect shareholder value including reducing cost of financial distress (e.g., Stulz (1984)), tax saving (e.g., Smith and Stulz (1985), Graham and Smith (2001)), alleviating under-investment (e.g., Froot, Scharfstein and Stein (1993)), and product market competition (e.g., Zhu (2011)). Smith (2008) provides a survey on corporate risk management. However, the empirical evidence is mixed. (e.g., see a review paper by Aretz and Bartram (2010)).

[2] Since the literature also uses terms such as selective hedging and speculation for market timing hedging, we use these terms interchangeably in our paper.

Recent accounting rules allow us to take a closer look at the consequence of corporate hedging. FASB 133 requires firms to disclose the details of their hedging activities. FASB 161 further requires firms to disclose the purpose of using derivatives and the outcome. We focus on the U.S. oil and gas producers in the sample period from 2007 to 2011[3] and hand-collect the gains and losses from the use of derivatives for risk management. Firms can choose to record the hedging activities and profits on hedge account and/or non-hedge account. While most users of non-hedge account claim that their derivatives positions are for hedging, the fact that they elect to use non-hedge account indicates that their use of derivatives is more related to market timing activities. We use the information in the two accounts to further identify the effects of hedging.

We find that U.S. oil and gas producers on average generate profits on their use of derivatives for hedging during our sample period. The average hedging profit is a gain of 2.03% of assets, which contrasts to an average 2.60% loss of return on assets. Thus, the hedging outcome has a big impact on corporate earnings. The mean and median of raw hedging profits are $72.02 million and $7.06 million respectively. We further investigate the outcome of hedging in each year in the sample. The positive profits hold almost in every year except 2007. The result is surprising. As we know that the use of derivatives is a zero-sum game, we should expect the hedgers to make zero profit on average. The finding indicates that the use of derivatives can be a positive NPV activity in oil and gas industry.

The question then arises: are the profits driven by favorable market condition or by market timing? Adam and Fernando (2006) find that gold mining firms earn profit in the use of derivatives due to the persistent positive risk premia in the gold futures market, so could firms in

[3] Although the effective date for FASB 161 is for the fiscal years beginning after Nov 15, 2008, most firms in our sample also reported the profits of the use of derivatives in 2007.

our sample also happen to gain for the same reason? To address this issue, we follow Jin and Jorion (2006)'s method to calculate the hedging portfolio delta and normalize it by the total production to obtain *Relative Delta Production* as the measure for hedge ratio. Our regressions show that the hedging profits are positively related to the hedge ratio and the risk premia in oil futures contracts. We then adopt three approaches to decompose the hedging activities into two parts: the true hedging component and the market timing component. We first use the industry mean hedge ratio each year as the true hedging component and the deviation from the industry mean as the market timing component. We allow variation of industry mean over time to reflect the impact of unknown market changes on hedging demand. Since each firm may have firm specific hedging demand, the second approach regresses the hedge ratio on firm characteristics and risk premia. It then uses each firm's predicted hedge ratio as true hedging component and the residual as the market timing component. There can be unknown firm factor that causes a firm to persistently hedge differently from others. Hence, the third approach uses the firm fixed effect regression to further control the unknown factor. We find that the total profits and the profits recorded on non-hedge account are positively related to the market timing component in all three decompositions while the profits recorded on hedge account are not. Hence, the positive profits are likely to be generated by the market timing activities of the firms in our sample.

To further investigate this issue, we also try to disintegrate the market timing profits from hedging profits. Assuming a firm doesn't change hedging portfolio actively, then the profits which the firm would obtain should be roughly equal to the hedging portfolio delta multiplied by the change of commodity prices during the year. The estimated profits should capture the outcome from true hedging component and favorable market condition. We then obtain the market timing profits as the difference between the actual profits and the estimated profits. Both

the mean and median of the difference are positive and large relative to firms' reported profits. We then regress the difference on the two components of hedge ratio. If the firm adjusts the hedging portfolio to time the market, then the difference will reflect the gains or losses generated from these activities. We find that the difference is positively related to the market timing component of hedge ratio. Thus, evidence again shows that firms are able to generate profits through the market timing activities.

Lastly, we find that the hedging activities are affected by the hedging profits in the preceding period. A closer look reveals that the feedback has opposite effects for winers and losers. When a firm gains from previous hedging, it tends to hedge more. On the other hand, there is a negative feedback effect when a firm suffers a loss from previous hedging. It appears that the more the firm loses, the more it will hedge in the subsequent period. When a firm only uses financial derivatives to hedge and sticks to the optimal hedge ratio, the gains or losses of hedging should be closely related to the change of market prices in current period and should not be affected by the gains or losses of preceding hedging activities. Also, the net income should not be impacted much by the result of hedging activities because any losses or gains on the revenue of production will be offset by those from the hedging positions. However, if a firm uses financial derivatives for market timing and deviates from the optimal hedge ratio, the net income will then be impacted by the outcome of the derivatives contracts. For this reason, the firm will adjust its derivatives positions given the result of hedging in the preceding period. Therefore, the current use of derivatives will vary with the consequence of previous activities. Our findings on feedback effect provide further evidence that firms use derivatives for investment and even for speculation purpose.

Our paper contributes to the literature in three ways. First, the findings on hedging profits and the positive relationship between hedging profits and hedging activities suggests that the use of derivatives can be a positive NPV investment. To our knowledge, our data is the first sample which contains the information of both hedging activities and actual hedging profits. Using Tobin's Q as proxy for firm value, Allayannis and Weston (2001) and Carter et al (2006) provide support that hedging increases shareholder wealth while Jin and Jorion (2006) don't find evidence that hedging affects firm value in the oil and gas industry. Perez-Gonzalez and Yun (2013) also shows that the use of weather derivatives in hedging increases the market-to-book ratios. Several studies (e.g., Adam and Fernando (2006), Brown et al. (2006)) use survey data on gold mining firms to estimate the cash flow outcome of derivatives contracts and show that firms on average gain from hedging. Our results confirm their finding in oil and gas industry with actual accounting data instead of estimated cash flows. Campello et al. (2011) argue that hedging can affect corporate outcome by reducing cost of borrowing and alleviating capital expenditure restriction. Our data show a direct effect of hedging on corporate earnings.

Second, we are able to decompose the performance of hedging activities and find that the positive outcome is likely to be driven by the market timing component of hedging. This is contrary to previous literature on hedging of interest rate risk and foreign exchange rate risk which states that firms (except financial firms) don't possess information advantage in general. Our research helps resolve the debate on hedging and speculation (e.g., Faulkender (2006), Adam and Fernando (2006), Brown et al. (2006), Geczy et al. (2007), Chernenko and Faulkender (2011)). Stulz (1996) suggests that selective hedging can benefit firms which possess an information advantage relative to the market and firms which have the strength to bear additional risk from market timing activities. Oil and gas producers collect information on the demand and

supply of commodities and make production decision based on their predictions on the future market prices. This information can be easily transferred to their risk management teams to make hedging decisions. Hence, our study provides evidence for the hypothesis of information advantage.

Third, our paper adds to the current research on learning and feedback effect in corporate finance. Feedback effect has been studied extensively in asset pricing. However, only recently researchers start to investigate how the market prices can affect corporate decisions[4]. For example, Luo (2005) shows that an acquisition can learn from the market's reaction to a merger announcement. Edmans, Goldstein and Jiang (2013) illustrate how market anticipation and stock price affect the probability of a firm being a takeover target. Our paper shows that learning and feedback effect also exist in corporate hedging activities. The changes of oil and gas prices affect firms' hedging decision through the channel of firms' earnings.

The remainder of the paper is organized as follows. Section 2 describes data sources, collection methods and summary statistics; section 3 discusses the empirical strategy and regression results; section 4 provides results of robustness tests, and section 5 concludes the paper.

II. Data and Sample Description

We focus on all oil and gas producers with SIC code of 1311 in the United States for which data is available from 2007 to 2011. The initial dataset contains 1029 firm-year observations. We

[4] Please see a recent survey by Bond et al (2012).

then drop 60 firm-year records with missing asset values. We further remove 362 observations for firms whose assets are less than $100 million as small firms are often not required to provide disclosure on derivatives positions and don't actively use derivatives for hedging due to the lack of expertise (e.g., Manchiraju et al. (2012)). We also require that the data on hedging contracts, hedging profits and financial information should be available. Our final sample for regression consists of 381 firm-year observations.

A. Derivatives Contracts and Hedge Ratio

In order to study firms' use of derivatives, we hand-collect derivatives contracts from the annual 10-K reports. We write a PERL program to collect the entire text of 10-K for each firm from SEC Edgar database. Using the algorithm, we search for financial hedging keywords such as "hedg", "derivative", "financial instrument", "risk management", "item 7a", "market risk", "commodity risk", "price risk", "notional", "commodity contract", "commodity option", "option contract", "forwards", "forward contract", "forward exchange", "oil forwards", "natural gas forwards", "futures", "futures contract", "commodity futures", "oil futures", "natural gas futures", "swap", "collar" , "fixed price" and "volumetric production".

We then read through surrounding texts of each highlighted keyword and manually code the contracts data. We collect all derivatives contracts for firms' crude oil, natural gas and natural gas liquids (NGL) productions (NGL contracts are converted into standard crude oil contracts and treated as oil equivalent). The types of contracts include call options, put options, ceiling and floor contracts, fixed price swaps, forward and futures contracts, two-way collars and three-way collars. As in Jin and Jorion (2006), oil and gas basis contracts are not included in our data samples.

Table 1 presents the summary statistics of firms' derivatives contracts. Panel A shows that oil and gas related derivatives have balanced representation in our samples. The numbers and notional amounts of derivatives contracts in both commodities vary over years. Panel B summarizes the contracts for each type of derivatives. Swaps are the most popular derivative instruments used by oil and gas firms. Collars come next. Firms also use put options and floors substantially. Panel C and Panel D provides contract details for natural gas and crude oil respectively.

Following Jin and Jorion (2006), we employ Black and Scholes's derivative valuation model to calculate the delta for every contract. Out of our samples, there are 381 firm-years with delta in crude oil or gas contracts. We then aggregate individual delta to portfolio delta on firm-year level and scale the firms' portfolio delta by their reported production for the year. The scaled delta represents the firm's hedge ratio in oil and gas production in that year (e.g., Tufano (1996), Jin and Jorion (2006)). [5]

$$Relative\ Delta\ Production\ = -\frac{Portfolio\ Delta}{Production}$$

As a robustness check, each firm-year's total notional amount of derivatives positions is calculated and scaled by annual production as another measure of hedge ratio.

$$Relative\ Notional\ Production\ = \frac{Total\ Notional\ Amount}{Production}$$

[5] For example, a firm lists its outstanding derivatives contracts which would be in effect from January 2010 in the 2009's annual report. These derivatives positions are actually scheduled to hedge the oil and gas production in fiscal year 2010 and forward and hence are used to calculate the portfolio delta in 2010. The portfolio delta is then scaled by the production in 2010.

Please insert Table 1 here

Panel A of Table 2 gives the summary statistics of firms' *Relative Delta Production* and *Relative Notional Production*. Our regression samples include 381 observations from 2007 to 2011. U.S. oil and gas firms hedge 85.40% of production on average every year. The value of *Relative Delta Production* appears to be greater than that in Jin and Jorion (2006) whose sample period ranges from 1998 to 2001, but it matches well with the quarterly figure in Kumar and Rabinovitch (2013). The difference may be caused by the increased disclosure of derivatives positions due to the new reporting principles and the increased use of derivatives in recent years.

Please insert Table 2 here

B. Derivative Gains and Losses

To obtain the actual gains and losses from hedging activities, we use the same PERL algorithm to locate gains and losses information in 10-K and manually compile them into our database.

With FASB 133, firms are required to disclose the outcome of derivatives positions. If a firm designates the derivatives as cash flow hedges to be treated as the hedge account, then only realized gains or losses will impact earnings. The realized gains or losses are recorded as *Reported Realized Hedge Profit* in this paper. The unrealized gains or losses will be recorded in the other comprehensive income and accumulated until actualized. A firm can also elect not to designate its derivative instruments as cash flow hedges, but then the gains or losses are recorded on income statement immediately whether they are realized or unrealized. We record this type of

profits as *Reported non-Hedge Profit*. For the cash flow hedge designated derivatives, part of them can become "ineffective" due to the change of market condition and firm's production. The gains or losses of ineffective portion of cash flow hedge will also be immediately reflected on earnings whether realized or unrealized and are recorded as *Reported Ineffective Hedge Profit*. The *Reported Total Profit* is the sum of *Reported Realized Hedge Profit*, *Reported non-Hedge Profit* and *Reported Ineffective Hedge Profit*. We hand-collect the gains and losses for the above items whenever they are available in 10-K files.

Panel A of Table 2 also provides the summary statistics of firms' derivative profits normalized by total assets[6]. Overall, our results are similar to that in Manchiraju et al. (2012). The U.S. oil and gas firms generate profits in the use of derivatives on average, with the average total profits being 2.03% of total assets and the median total profits being 0.66% of total assets. (The mean of total raw profit before normalized by assets is $72.02 million and the median is $7.06 million[7]). T-tests show that the mean of *Reported Total Profit* and all of its components are significantly greater than zero. The 25th percentile of *Reported Total Profit* is -0.64% of assets. While the 75th percentile is 3.99%, about eight times larger than the 25th percentile in absolute value. Clearly, the gains from hedging far exceed the losses.

The finding of positive profits is surprising. According to hedging theory (e.g., Stulz (1984), Stulz (1990), Smith and Stulz (1985), Froot et al. (1993), Demarzo and Duffie (1995), Mello and Parsons (2000)), the expected return on hedging activities should be around zero since the use of

[6] Out of the 381 observations, several firms only report "net of tax gains or losses". We address the tax issue by calculating the firm-year's corporate income tax rate and adding back the taxes to its gains and losses.

[7] These numbers are not obtained by multiplying the mean and median of total profit in Panel A of Table 2 by the mean of asset in Panel B due to the normalization.

derivatives is a zero-sum game. Further, Dewally et al. (2013) find that hedging profits are negative on average due to the hedging pressure and risk premia in futures contracts. However, we find that firms gain from the use of derivatives on average with substantial economic value, which is contrary to the prediction of hedging theories. In section III, we further investigate the sources of gains using regression analysis.

C. Other Control Variables

The control variables include those identified by the literature as being determinants of the hedging activities: *Log Asset*, *Market to Book Ratio*, *Leverage Ratio*, *Cash*[8], *Dividend*, *S&P Rating Dummy* (e.g., Nance et al (1993), Haushalter (2000), Stulz (1996), Adam and Fernando (2006)). Besides, we include several other variables. We collect *Lifting Cost per Boe* (production cost per barrel of oil equivalent). Jin and Jorion (2006) use lifting cost as a control for Q ratio regression. We conjecture that the hedging demand is likely to be positively related with the lifting cost. The higher the lifting cost, the higher the incentive to hedge the production. Similarly, the *Cost of Goods Sold* and *Inventory* are used as control variables. We also include *Revenue* (revenue from oil and gas production), which is a direct measure of the demand for hedging, and *ROA* (return on assets), which measures the performance of the firm. We assume that capable firms are more likely to hedge. Lastly, we include the annual *Oil Price Volatility*, *Gas Price Volatility*, *Oil Futures Risk Premia and Gas Futures Risk Premia*. Since *Oil Price Volatility* and *Gas Price Volatility* are highly correlated, we only use *Oil price Volatility*. The more volatile the oil (or gas) prices, the higher the demand for hedging. Also, we expect that the

[8] We use cash ratio instead of liquidity because we find cash has stronger effect.

hedging demands are positively related to risk premia, which are the spreads between contracted futures prices and realized spot prices (e.g., Adam and Fernando (2006)).

The data on oil and gas production and reserve, lifting cost per barrel of oil equivalent and total revenues from oil and gas production are collected from Bloomberg Financial Market platform. We manually check and correct the values and complement the missing values if we can find them from 10-Ks. Companies' fundamental data are collected from COMPUSTAT.

Panel B of Table 2 presents the summary statistics of the control variables included in regressions. We winsorize the ratio variables at the 1% level. The *Oil Futures Risk Premia* is slightly negative and *Gas Futures Risk Premia* is positive on average. The mean of annual *Oil Price Volatility* is 0.4156, which is high relative to the whole economy. *Cash*, *Inventory*, *Cost of Goods Sold*, *ROA*, *Revenue* and *Capital Expenditure* are normalized by total assets. *Dividend* is normalized by number of shares outstanding.

Panel C and Panel D of Table 2 display the yearly distribution of hedge ratio and hedging profits variables. U.S. oil and gas producers hedge a significant amount of oil and gas production while the mean and median of hedge ratio vary over years. U.S. oil and gas producers experienced a small loss only in 2007 and made profits in all other years in our samples. Panel D also provides the summary of profits on hedge account and non-hedge account. Mean and median profits on both accounts are positive. The standard deviation of profits on the non-hedge account is larger (hence more volatile) than that on the hedge account, indicating that the profits on non-hedge account are more closely related to the market timing activities than those on hedge account.

Panel E presents the yearly distribution of *Oil Futures Risk Premia* and *Gas Futures Risk Premia*. The risk premia are lagged values. For example, the average *Oil Futures Risk Premia* in 2009 is 38.871, which means the average difference between the 1-year contracted oil futures price in 2008 and the realized oil spot price in 2009 is $38.871.

Table 3 gives Pearson correlation of our key variables and control variables. Our two proxies for hedge ratio (*Relative Delta Production and Relative Notional Production*) are positively correlated with firms' *Leverage Ratio* and negatively correlated with firms' financial strength (*Dividend* and *S&P Rating Dummy*). They are also positively correlated with *Lag Oil Price Volatility*. This reflects that firms hedge according to the hedging demand. However, they are also positively correlated to the *Oil and Gas Futures Risk Premia*. The three measures of hedging profits are highly and positively correlated to the hedge ratio. The *Reported Total Profit* is slightly positively correlated to the *Oil and Gas Futures Risk Premia*. However, the *Reported Realized Hedge Profit* is strongly and positively correlated with the risk premia while the *Reported non-Hedge Profit* is negatively correlated with the risk premia.

Please insert Table 3 here

III. Empirical Design and Results

We focus on the U.S. oil and gas producers for several reasons: First, previous studies show that the industry is exposed to oil and gas price risks and uses financial derivatives to hedge the risks extensively. Second, the firms in this industry have their business concentrated in the oil and gas production and are not diversified. Therefore, we don't need to consider the effect of

diversification and natural hedge. Third, the products are quite homogeneous and hence are exposed to the same market price risks. [9]

Being able to observe both the hedging activities and the actual hedging profits allows us to investigate two issues which intrigue both researchers and practitioners. The first issue is about the extent of market timing hedging (or called selective hedging) and its effectiveness. The second issue is the feedback effect of hedging outcome on future hedging activities. The following subsections discuss the empirical methods designed to address these issues and the empirical findings.

A. Hedging Profits and Decomposition of Hedge Ratio

In previous section, we show that hedging activities generate profits. However, it is not clear how the hedging gains are linked to hedging activities. Consequently, our first step is to investigate whether the positive profits are driven by hedging activities. We employ the following regression model.

$$(1) \qquad Profit_{it} = \alpha + \beta \times Hedge_{i,t} + \gamma \times Risk\ Premia_t + \eta_t + \mu_i + \varepsilon_{i,t}$$

where subscript i refers to the firm, subscript t refers to the time in years, η_t refers to time fixed effects, and μ_i refers to firm fixed effects.

In the regression model, *Hedge* is the measure of hedge ratio. The main proxy for hedge ratio is *Relative Delta Production* which follows Jin and Jorion (2006) and is the portfolio delta in

[9] Some recent papers using data from this industry include Bakke et al. (2013), Kumar and Rabinnovitch (2013), Manchiraju et al. (2013) and Ranasinghe et al. (2013).

year t divided by total production for the year. In case there is measurement error in calculating delta, a second proxy is used: *Relative Notional Production*, which is the total notional amount of outstanding derivatives positions in year t divided by total production for the year.

If firms hedge according to the exact amount and date of future production without market timing, then profits generated from hedging activities should be around zero since derivative trading is a zero-sum game, and hence we should not expect any significant relationship between hedge ratio and hedging profits. The coefficient β for *Hedge* should not be significantly different from zero. However, if the oil and gas producers indeed possess superior information and/or skills in hedging (e.g., Stulz (1996)), firms are able to generate positive expected return from hedging. Then, we should observe a positive relationship between hedging and profits.

We include three measures of derivative profits in the regressions. As illustrated in Table 2, we are able to obtain the total profits of derivatives and the individual profit components in firms' current earnings. The *Reported Total Profit* is the sum of realized cash flow hedge profits, realized and unrealized profits from non-hedge designated derivatives and the realized and unrealized profits from ineffective portion of cash flow hedge. The measure *Reported Realized Hedge Profit* represents the outcome of the use of derivatives that a firm designates as hedge account. Generally, this item should be closely related to the true hedging activities. The third measure *Reported non-Hedge Profit* is the sum of realized and unrealized gains or losses of non-hedge designated derivatives. Although firms typically claim that the use of derivative is for hedging, it is likely for firms to conduct selective hedging since this type of hedging activities and results are not recorded on hedge account.

Adam and Fernando (2006) argue that a persistent upward biased risk premia in oil and gas futures can generate profits for short hedgers. Hence, the hedging profits may be driven by the

positive risk premia instead of firms' efforts in selective hedging. To account for this possibility, we include the annual mean oil and gas futures risk premia in regressions. If the hedging profits are caused by positive risk premia, then these two variables should have positive coefficients.

Table 4 presents estimation results for equation (1). The dependent variable in model 1, 2 and 3 is the *Reported Total Profit* on derivatives. We use the *Reported Realized Hedge Profit* for model 4, 5 and 6, and the *Reported non-Hedge Profit* for model 7, 8 and 9. Panel A reports the results using *Relative Delta Production* as proxy for hedge ratio and Panel B reports the results using *Relative Notional Production* as proxy for hedge ratio.

We find a positive relationship between profits and hedging activities. The regression coefficients in model 1, 2 and 3 are significant at the 1% level. For example, in column 1 of Panel A, the coefficient for *Relative Delta Production* is 0.018. A one standard deviation increase in *Relative Delta Production* would yield a 0.014 increase in *Reported Total Profit* on derivatives, which is greater than 50% of the average total profits.

To control for unobserved market factors which might drive firms' use of derivatives in a specific year, we add year fixed effects in model 2, 5 and 8. In model 3, 6, and 9, we add firm fixed effects in addition to year fixed effects to control for unobserved firm-level characteristics which may affect firms' demand for hedging. The results are still positive and mostly significant (except model 6).

Moreover, the differences between the coefficients for *Relative Delta Production* of column 4, 5, 6 and that of column 7, 8, 9 reveal that firms' derivatives positions create greater impact on non-hedge designated profits than on hedge designated profits. The difference indicates that a proportion of total profits is the result of market timing activities.

The *Oil Futures Risk Premia* are significant in most regressions. Consistent with the finding in Adam and Fernando (2006), the hedging outcome is positively related to *Oil Futures Risk Premia*. Thus a fraction of the hedging profits is likely to be driven by the risk premia in the futures market.

In Panel B of Table 4, we replace *Relative Delta Production* with *Relative Notional Production* and get similar results.

Please insert Table 4 here

A.1. Decomposition using Industry Mean

While the model above can help us examine the relationship between hedging and the outcome of hedging, another issue remains to be addressed: do profits come from true hedging activities or market timing activities? We adopt three approaches to decompose the hedge ratio and obtain the component which is likely related to market timing.

The first approach measures the deviation of a firm's hedge ratio from the industry's average hedge ratio. Since there exist market-level factors that cause the general shift of hedging demand for the whole industry, the hedging profits may be positively related to the hedging demand driven by these factors. The industry-level hedge ratio can help absorb this effect of hedging. The deviation from this ratio is likely to be driven by individual firm's own market timing decision in hedging. For each year, we first calculate the industry average *Relative Delta Production*. We then subtract each firm's *Relative Delta Production* by industry average *Relative Delta Production* to obtain the firm's *Relative Delta Production Deviation*. The deviation

corresponds to market timing hedging activities and the industry-level hedge ratio reflects true hedging activities.

Specifically, we estimate the following model:

$$(2) \qquad Profit_{it} = \alpha + \beta_1 \times Hedge\ Deviated_{i,t} + \beta_2 \times Industry\ Mean\ Hedge_{i,t} + \gamma \times Risk\ Premia_t + \eta_t + \mu_i + \varepsilon_{i,t}$$

Similarly, we use the three measures of hedging profits in our estimation starting with raw model, and then models with year fixed effects and models with both year and firm fixed effects. From column 1 to column 3 in Panel A of Table 5, the coefficients of the deviated hedge ratio are all positive and significant at the 1% level. The industry average hedge ratio gets omitted in column 2 and 3 due to the collinearity with fixed effects. The coefficient for industry average hedge ratio in column 1 is positive at 0.117 and also significant at the 1% level.

Interestingly, when using *Reported Realized Hedge Profit* as dependent variable in column 4, 5 and 6, the market timing effects become less significant as we expected, and the hedging effects become significant at the 5% level. This is consistent with the hypothesis that the industry average *Relative Delta Production* represents true hedging activities, while the deviation from industry average *Relative Delta Production* proxies for market timing activities.

The results using *Reported non-Hedge Profit* provide further evidence for market timing. The coefficient for *Delta Deviated from Mean* is significant at the 1% level even after controlling for *Industry Mean Delta*.

We then use industry average *Relative Notional Production* and firms' deviation from the industry-level hedge ratio as independent variables in Panel B. This measure yields consistent results.

Please insert Table 5 here

A.2. Decomposition using Regression Predicted Hedge and Residual

While the deviation from industry mean hedge ratio can be a good proxy for market timing, it can still contain the effect driven by each firm's own demand. Therefore, the second approach of decomposition uses the residual from the regression of firm's hedge ratio on factors that are likely related to hedging demand. We first estimate the following model to obtain the residual:

(3) $$Hedge_{it} = \alpha + \beta \times Industry\ Mean\ Hedge_{i,t} + \gamma \times X_{i,t} + \varepsilon_{i,t}$$

$X_{i,t}$ are the control variables including *Lifting Cost per Boe, Market to Book Ratio, Leverage Ratio, Log Asset, Cash, ROA, Revenue, S&P Rating Dummy, Capital Expenditure, Dividend, Lag Oil Price Volatility, Oil Futures Risk Premia and Gas Futures Risk Premia.*

Because these firm-specific characteristics determine firms' regular demand for derivatives, the regression predicted value is considered to be firms' true hedging activities. Similarly, the regression residual would be the proxy for firms' market timing activities. We then use these two variables as independent variables in the following regression model:

(4) $$Profit_{it} = \alpha + \beta_1 \times Residual\ Hedge_{i,t} + \beta_2 \times Predicted\ Hedge_{i,t}$$

$$+ \gamma \times Risk\ Premia_t + \eta_t + \mu_i + \varepsilon_{i,t}$$

The results are reported in Table 6. As we expected, the market timing component still plays an important role in determining hedging profits. For example, in column 1 of Panel A, the coefficient of residual (market timing component) is 0.025 and is significant at the 1% level. The result remains if we add year and firm fixed effects. The predicted value (true hedging

component) also has positive impact on the profits. However, once we include both of year fixed effects and firm fixed effects, it is no longer significant. It is possible that the firm fixed effects absorb the persistent profits generated by the predicted hedge ratio.

In model 4, 5 and 6, we find that the market timing component is consistently stronger than the true hedging component. It indicates that firms' profits on hedge designated derivatives positions also include market timing effect, even though firms assert that these derivatives positions are designed as cash flow hedge.

The regressions of *Reported non-Hedge Profit* yield a similar picture as previous tables. The market timing component has strong effect in predicting the profits even with both fixed effects. The true hedging component represented by predicted hedge ratio has no effect after controlling the firm fixed effects.

Using residual hedge ratio and predicted hedge ratio from the regressions with *Industry Median Notional Amount* and control variables, we get quite similar results in Panel B.

Please insert Table 6 here

A.3. Decomposition using Fixed Effect Regression Predicted Hedge and Residual

The third approach is an extension of the methods described above. We employ a stricter examination on the decomposition of hedge ratio. We regress firms' *Relative Delta Production* (or *Relative Notional Production*) on firm characteristics which might affect their derivatives positions as in equation (3). Importantly, we also include firm fixed effects in the regressions. We then obtain the regression predicted value as a proxy for true hedging component, and the regression residual as a proxy for market timing component. The firm fixed effects can absorb

part of individual firm's market timing effect if a firm conducts persistent market timing activities. For example, if a firm keeps more short positions each year during our sample period, then it will show up in the intercept of the regression and be recognized as hedging activity. Therefore, this is a quite stringent rule which leaves only the time varying speculation behavior in the residual. We use these two proxies in the regression and report the results in Table 7.

In column 1 of Panel A, the coefficient of residual (market timing component) is 0.018 and is positively significant at the 5% level. The coefficients are also positively significant for model 2 with year fixed effects, and model 3 with both year and firm fixed effects. Specifically, the coefficient of market timing component is stronger than that of true hedging component in model 3. The coefficient of true hedging component becomes not significant because the fixed effects in model 3 absorb the consistent hedging profits. When we use the *Reported Realized Hedge Profit* in model 4, 5 and 6, the coefficients of market timing component are much weaker. However, the coefficients then get much stronger for the *Reported non-Hedge Profit* in the regressions of 7, 8 and 9. Overall, with stricter rule, the results are still in support of our finding that firms are market timers and achieve large amount of derivative gains from market timing activities. Panel B provides estimates using *Relative Notional Production*.

Please insert Table 7 here

A.4. Decomposing the Profits with Estimated Profits

Lastly, we measure the difference between the reported profits from 10-K and an estimated profit and use it as proxy for market timing profits. The estimated profit is the predicted year-end profit calculated from multiplying the portfolio delta of a firm's outstanding derivatives contracts

in the end of previous year by the change of year-end commodity prices, and is then normalized by total assets. If a firm maintains its outstanding portfolio to the end of year, then the estimated profit should be a good proxy for the natural market impact on hedging profits due to the change of year-end prices. We consider the difference between reported profits and estimated profits as the market timing profits. The mean and median of the market timing profits are 1.5% and 0.5% of total assets, which are large relative to the mean and median of total profits.

We first use the same regression specification in equation (2) and replace the dependent variable with the market timing profits. The regressions outputs are provided in Table 8. Overall, the market timing component of hedging is strongly related to the market timing profits. In model 1, 2, 7 and 8, the coefficients of residual (market timing component) are significant at the 1% level. In model 3 and 9 with year and firm fixed effects, the coefficients of market timing component are also significant at the 5% level. In regard to profits designated as hedge, the coefficients of market timing component are still significant in model 4, and model 5 with year fixed effects.

Please insert Table 8 here

We then use the market timing profits as the dependent variable in equation (4) and the independent variables remain the same. The regressions outputs are in Table 9. The market timing component of hedging is consistently significant in model 3, 6, and 9 with both year and firm fixed effects. Hence, the market timing activities generate profits for the firms. Interestingly, the negative coefficients of predicted hedge ratio in model 3 and 9 indicates that the more a firm hedges according to its demand, the lower the market timing profits will be. Thus, the difference between reported profits and estimated profits is a good proxy for market timing profits.

Please insert Table 9 here

B. Feedback Effect on Hedging Activities

Our results have implied that firms are timing the market and holding corresponding derivatives contracts. Now, we turn into another issue about whether firms' current derivatives positions are affected by the outcome of previous experience. Feedback effect is defined as the impact transmitted from the change of prices to corporate decisions. The issue is part of current topic of the real effects of financial markets (e.g., Bond et al. (2012)). The empirical findings shed light onto the debate in extant literature about whether firms are truly hedging their future production, or are using derivatives as investment (or speculation) tools and seeking for positive returns. In this section, the key question of interest is: how current gains or losses on derivatives contracts affect firms' future hedging decisions?

We run the following regression:

$$Hedge_{it} = \alpha + \beta \times Profit_{i,t-1} + \gamma \times X_{i,t\ or\ t-1} + \eta_t + \mu_i + \varepsilon_{i,t} \quad (5)$$

where subscript i refers to the firm, subscript t refers to the time in years, η_t refers to time fixed effects, and μ_i refers to firm fixed effects. Again, we use two proxies for hedge ratio and the three measures of hedging profits as discussed above.

It is in our interest to examine the significance and sign of the coefficient β. If hedging activities are solely driven by hedging demand, then the coefficient on hedging gains should be zero. However, if current period's hedging is influenced by the hedging outcome of previous period, then the coefficient β should be significantly different from zero.

Table 10 examines the feedback effect on hedging activities. In Panel A, the dependent variable is *Relative Delta Production*. Model 1 studies the determinant of *Relative Delta Production* without looking at previous derivative profits. The independent variables in column 1 are firm specific characteristics. Consistent with literature, we find that the coefficient on previous year's *Oil Price Volatility* is positively significant at the 1% level (*Oil Price Volatility* and *Gas Price Volatility* are collinear variables so we only include *Oil Price Volatility*). *Dividend*, which is a commitment on future payments, is positively significant at the 1% level, suggesting that the greater amount of committed future payments, the more likely for the firm to hedge. *Cash*, which proxies for liquidity, is negatively significant at the 1% level. Firm size is negatively correlated with *Relative Delta Production*. Interestingly, the *Leverage Ratio*, which is related to financial constraints, exhibits positive and significant relationship with hedge ratio.

We then introduce *Lag Reported Total Profit* in model 2, 3 and 4, *Lag Reported Realized Hedge Profit* in model 5, 6 and 7, and *Lag Reported non-Hedge Profit* in model 8, 9, 10. Model 3, 6, 9 includes year fixed effects, and model 4, 8, 10 includes both year fixed effects and firm fixed effects.

As given in column 2, 3, 5, 6, 7, 8 and 9, in spite of the types of profits (total profit, realized hedge profit, or non-hedge profit), firms' current *Relative Delta Production* is positively correlated with previous profits on derivatives contracts. For instance, in column 3, the coefficient of preceding year's *Reported Total Profit* is significant at the 5% level. The result suggests strong feedback effect on hedging activities. Past successful experience on derivatives positions encourage firms to pursue higher hedge ratio. However, the results are not significant in most of other models when year fixed effects and firm fixed effects are included. We use *Relative Notional Production* as dependent variable in Panel B and get similar patterns.

Please insert Table 10 here

Would previous gains on derivatives contracts affect firms' current hedging activities differently than previous losses? This is a reasonable assumption because winners and losers are likely to hedge differently. To answer this question, we divide our samples into two sub-groups and repeat the regressions with year and firm fixed effects. In Panel A of Table 11, model 1, 2 and 3 are based on firms with gains on derivatives during the past year, and model 4, 5 and 6 are based on firms with losses on derivatives during the past year. As expected, we discover different feedback effects for different sub-groups.

For firms with positive derivative profits, the feedback effect is positive, suggesting that firms benefit from past year's derivatives positions tend to hold more derivatives relative to production in current year.

Nevertheless, for firms with derivative losses, the feedback effect is on the opposite direction. For these firms, the losses on preceding year's derivatives positions lead to greater hedge ratio in current year. For example, the coefficient of *Lag Reported Total Profit* in column 4 is -8.188 and is significant at the 5% level, and a one standard deviation decrease in previous *Reported Total Profit* leads to a 0.2243 (22.43%) increase in current *Relative Delta Production*. The coefficient of *Lag Reported non-Hedge Profit* in column 6 is -6.415 and significant at the 5% level. It indicates a gambling behavior when firms bear a loss from previous derivatives positions. This result strongly contradicts traditional views on corporate hedging. It further strengthens our findings that some oil and gas firms behave as investors, and they are timing the market, holding large amount of derivatives positions as a speculation. We run regressions using *Relative Notional Production* in Panel B. Again, results are consistent with that in Panel A.

Please insert Table 11 here

IV. Robustness Tests

In this section, we conduct robustness check for the key regressions in previous sections.

A. Change of Profits and Change of Hedge Ratio

To capture the dynamics of hedging profits and hedging activities, we modify equation (1) and run the following model:

$$\Delta\, Profit_{it} = \alpha + \beta \times \Delta\, Hedge_{i,t} + \gamma \times Risk\ Premia_t + \eta_t + \mu_i + \varepsilon_{i,t} \quad (6)$$

where subscript i refers to the firm, subscript t refers to the time in years, η_t refers to time fixed effects, and μ_i refers to firm fixed effects. We use the change of profits, which is the difference between current year's profits and last year's profits, as the dependent variable. The independent variables include the change of hedge ratio, risk premia and fixed effects.

As noted in Table 12, the positive relationship between hedging profits and hedging activities is still noteworthy. Firms' change of hedging activities has a greater impact on non-hedge designated profits than on hedge designated profits. Furthermore, for hedge designated profits, the coefficients of risk premia are all significant at the 1% level, with and without fixed effects, showing that regular hedging profits are closely linked to market risk premia.

Please insert Table 12 here

B. Decomposition of Hedge Ratio using Industry Median Hedge ratio

In section 3, based on industry average hedge ratio, we conduct various tests to decompose hedge ratio into market timing and true hedging components. In the event that the industry mean is affected by outliers, we use industry median hedge ratio as proxy for general hedging demand.

Table 13 replicates Table 5 and yield similar results. The market timing component of hedge ratio deviated from the industry median, and the industry median hedge ratio represents the true hedging component.

Please insert Table 13 here

Table 14 repeats the regressions in Table 6. The residuals and predicted values are calculated through equation (3) using industry median hedge ratio. The market timing effect remains considerable.

Please insert Table 14 here

C. Upstream Oil and Gas Producers

To identify firms in the upstream oil and gas sector and not to include midstream and downstream oil and gas firms, Doshi et al. (2014) utilize four different industry classification codes from Compustat: National American Industry Classification System (NAICS), Standard Industry Classification (SIC), S&P Industry Sector Code (SPCINDCD) and Global Industry Classification Sector Code (GSECTOR).

We add NACIS and SPCINDCD as additional filtering criteria. In addition, we use GSUBIND (the fourth level in the hierarchy of the Global Industry Classification Standard) instead of GSECTOR (the first level in the hierarchy of the Global Industry Classification Standard). Specifically, we require that each firm included in our regression samples must fulfill the following standards: SIC equals 1311 (Crude Petroleum and Natural Gas), NAICS equals 211111 (Crude Petroleum and Natural Gas Extraction), SPCINDCD equals 380 (Oil & Gas

Exploration & Production), GSUBIND equals 10102020 (Oil & Gas Exploration & Production). Since there are many missing values for SPCINDCD, to avoid accidentally excluding qualified oil and gas producers, we also allow SPCINDCD to be null if a firm meet all the other three criteria.

By applying these criteria, 13 firms are excluded from our original samples, and the filtered samples include 88 unique firms. We rerun all the regressions in section 3 and get robust and consistent results.

D. Contracts Mature in the Succeeding Year

At the end of each fiscal year, oil and gas firms report their derivatives positions scheduled for the following years. The derivatives positions could be matured in different years in the near future. In this test we only consider firms' derivatives contracts scheduled for the following one year. To get firms' hedge ratio, we then aggregate the delta (or notional amount) of these outstanding contracts and normalize it by annual production for the following year.

The results are similar to those in the key regressions of predicting profits in section 3. All of the regressions in Table 15 include both of year fixed effects and firm fixed effects. The coefficients of hedge ratio and market timing activities are still positively correlated with *Reported Total Profit* and economically significant.

Please insert Table 15 here

The findings in Table 16 are also consistent with previous regressions evaluating feedback effect. All of the regressions include both of year fixed effects and firm fixed effects. Column 1 and 4 examine the feedback effect on hedging activities. The coefficients on *Lag Reported Total Profit* are not significant. However, after dividing the samples into two sub-groups base on the

sign of their profits, we find similar feedback effects as that in section 3. Column 2 and 5 include firms with positive profits in previous year. The greater the profit they gained in the past year, the greater the hedge ratio they maintain in current year. Column 4 and 6 include firms with negative profits in previous year. The greater the loss they suffered in last year, the greater the hedge ratio they maintain in current year. The conflicting direction of feedback effects for these two groups suggests that firms behave as market timers and speculators in the derivatives market.

Please insert Table 16 here

E. Sub-period from 2008 to 2011

We also revisit the feedback effect of hedging by using a sub-period from 2008 to 2011. The reason we exclude the 2007 samples is that crude oil price rose sharply during 2007, and firms' derivatives positions generated a loss on average. This brings us to the question about how firms changed their hedging strategies after the initial price shock in our sample period. As displayed in Panel D of Table 2, the average total loss on derivatives in 2007 is 1.14% of total assets. The reported total gains or losses then become positive during all years afterwards, even if oil price rose again in 2009. Do firms react differently after the abrupt price movement? As seen from Table 2 of Panel C, firms indeed increase their hedge ratio after 2007. To further answer this question, we reexamine the feedback effect of hedging by focusing on the 2008-2011 sub-period.

Table 17 reports the feedback effect of hedging for 2008-2011 and the results are quite consistent with Table 10. The risk premia become less significant while the feedback effect becomes more significant.

Please insert Table 17 here

Table 18 investigates the feedback effect on hedging for winners and losers respectively during 2008-2011. Past gains impact current hedging activities significantly, and past losses still motivate losers to increase hedge ratio as we found before. The positive correlations between risk premia and hedge ratio for winners in model 1, 2 and 3 indicate that winners successfully predict the direction of risk premia after 2007 and adjust their hedge ratio accordingly. Current hedge ratio is also positively correlated with past reported total profits and the coefficient is significant at the 5% level. On the other hand, the coefficients of risk premia for losers are negative in model 4, 5 and 6, showing that losers fail to bet on the right direction of risk premia for their short positions. In addition, despite the past losses, they still raise hedge ratio. The coefficients of profit variables in model 4 and 6 are both negative and are significant at the 5% level.

Please insert Table 18 here

V. Conclusion

Recent literature studies how companies use market-timing in corporate financing and payout decisions (e.g., Bolton et al. (2013)). However, the literature has been debating whether management should incorporate their view of the market in risk management. Hedging the price exposure to product market risk is quite different from hedging interest rate risk and foreign exchange risk. Due to the investment on the information of product market, firms may possess information advantage on hedging the market risk of their products (e.g., Stulz (1996)). Cheng and Xiong (2013) find that commodity hedgers act like speculators and trade actively on derivatives markets. All together, the practice warrants more investigations.

While the U.S. oil and gas producers have been extensively studied by researchers, we provide new evidence on hedging in the industry. Based on our samples and sample period from 2007 to 2011, we show that the U.S. oil and gas producers on average gain from their hedging activities. Such gains are positively related to the hedge ratio and the market timing activities. Gains in previous period will also have impact on the hedging decision next period. Overall, our findings show that the new data on hedging profits can help us understand more about corporate hedging.

Appendix A. Glossary of Variables

A.1 Profit Related Variables:

Reported Total Profit
It is the sum of realized gain/loss of commodity cash flow hedge, realized and unrealized gain/loss of non-hedge designated commodity derivatives and realized and unrealized gain/loss of ineffective portion of commodity cash flow hedge.

Reported Realized Hedge Profit
It is the realized gain/loss of commodity cash flow hedge.

Reported non-Hedge Profit
It is the sum of realized and unrealized gain/loss of non-hedge designated commodity derivatives.

Reported Realized non-Hedge Profit
It is the realized gain/loss of non-hedge designated commodity derivatives.

Reported Ineffective Hedge Profit
Effectiveness is defined as the part of the gain (or loss) on the hedging instrument that offsets a loss (or gain) on the hedged item. For cash flow hedges, changes in the fair market value of a derivative are separated into an effective portion and an ineffective portion. The net gain or loss on the effective portion of the hedging instrument should be reported in OCI. The gain or loss on the ineffective portion is reported in current earnings (Baker & Lembke, Advanced Financial Accounting).

A.2 Hedging Related Variables:

Relative Delta Production
It is the total delta of derivatives scaled by annual production.

Relative Notional Production
It is the total notional amount of derivatives scaled by annual production.

Industry Mean Delta
It is the average value of all sample firms' relative delta production in a year.

Industry Median Delta
It is the median value of all sample firms' relative delta production in a year.

Industry Mean Notional
It is the average value of all sample firms' relative notional production in a year.

Industry Median Notional
It is the median value of all sample firms' relative delta production in a year.

Delta Deviated from Mean
It is the difference between a firm's relative delta production and the average value of all sample firms' relative delta production in a year.

Delta Deviated from Median
It is the difference between a firm's relative delta production and the median value of all sample firms' relative delta production in a year.

Notional Deviated from Mean
It is the difference between a firm's relative notional production and the average value of all sample firms' relative notional production in a year.

Notional Deviated from Median
It is the difference between a firm's relative notional production and the median value of all sample firms' relative notional production in a year.

Residual from Industry Mean Delta
It is the regression residual value calculated by regressing a firm's relative delta production on the average value of all sample firms' relative delta production.

Residual from Industry Median Delta
It is the regression residual value calculated by regressing a firm's relative delta production on the median value of all sample firms' relative delta production.

Residual from Industry Mean Notional
It is the regression residual value calculated by regressing a firm's relative notional production on the average value of all sample firms' relative notional production.

Residual from Industry Median Notional
It is the regression residual value calculated by regressing a firm's relative notional production on the median value of all sample firms' relative notional production.

Predicted from Industry Mean Delta
It is the regression predicted value calculated by regressing a firm's relative delta production on the average value of industry relative delta production.

Predicted from Industry Median Delta
It is the regression predicted value calculated by regressing a firm's relative delta production on the median value of all sample firms' relative delta production.

Predicted from Industry Mean Notional
It is the regression predicted value calculated by regressing a firm's relative notional production on the average value of all sample firms' relative notional production.

Predicted from Industry Median Notional
It is the regression predicted value calculated by regressing a firm's relative notional production on the median value of all sample firms' relative notional production.

Residual Delta Fixed Effect
It is the regression residual value calculated by regressing a firm's relative delta production on firm fixed effects and other key control variables.

Predicted Delta Fixed Effect
It is the regression predicted value calculated by regressing a firm's relative delta production on firm fixed effects and other key control variables.

Residual Notional Fixed Effect
It is the regression residual value calculated by regressing a firm's relative notional production on firm fixed effects and other key control variables.

Predicted Notional Fixed Effect
It is the regression predicted value calculated by regressing a firm's relative notional production on firm fixed effects and other key control variables.

A.3 Other Control Variables:

Oil Futures Risk Premia
It is the spread between the 1-year contracted oil futures price at year t-1, denoted by F(t-1), and the realized spot price at year t, denoted by S(t).

Gas Futures Risk Premia
It is the spread between the 1-year contracted gas futures price at year t-1, denoted by F(t-1), and the realized spot price at year t, denoted by S(t).

Lag Oil Price Volatility
It is the average of annualized volatility of past year's oil futures prices.

Lag Gas Price Volatility
It is the average of annualized volatility of past year's gas futures prices.

Lifting Cost per Boe
It is the average cost to produce one barrel of oil equivalent (BOE). It is calculated as production costs divided by oil and gas production for the year.

Market to Book Ratio
It is a firm's total market value (product of shares outstanding and fiscal year closing price) scaled by total common equity.

Leverage Ratio
It is a firm's total debt (sum of total debt in current liabilities and total long-term debt) scalded by total assets.

Log Asset
It is the log value of a firm's total assets.

Cash
It is a firm's cash and cash equivalents.

Inventory
It is the merchandise bought for resale and materials and supplies purchased for use in production of revenue.

Cost of Goods Sold
All costs directly allocated by the company to production, such as material, labor and overhead.

ROA
Return on assets. It is a firm's net income scaled by total assets.

Revenue
It is the gross income received from all divisions of the company.

Dividend
It is the total amount of dividends (other than stock dividends) declared on the common/ordinary capital of the company, based on the current year's net income.

Capital Expenditure
The funds used for additions to property, plant, and equipment, excluding amounts arising from acquisitions.

S&P Rating Dummy
It is a dummy variable indicating whether a firm has a debt rating from Standard & Poor's.

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Table 1: Summary Statistics of Natural Gas and Crude Oil Contracts

The table presents the summary statistics of natural gas and crude oil contracts. Panel A gives the number and the notional amount of contracts. The notional amount is in Bcf (billion cubic feet) for natural gas contracts and in Mmbbl (million barrels) for crude oil contracts. Panel B summarizes the types of contracts, which include call options, put options, ceilings, floors, collars, three-way collars, forwards and swaps contracts. The notional amount is in Mmboe (million barrels of oil equivalent). Panel C and Panel D provides contracts information for natural gas and crude oil respectively.

Panel A: Commodity Contracts

	Gas Contracts		Oil Contracts	
Year	Number	Notional (Bcf)	Number	Notional (Mmbbl)
2006	454	3189.17	440	385.58
2007	603	5775.00	621	511.47
2008	640	6400.91	474	433.86
2009	695	7400.00	555	559.69
2010	473	7209.96	610	649.28
2011	392	7277.25	624	648.40

Panel B: Contract Types (notional amount in Mmboe)

		Call	Put	Ceiling	Floor	Collar	Three	Forward	Swap
2006	N	15	32	0	17	393	35	8	394
	Notional	4.44	49.27	0.00	16.40	280.44	116.65	4.61	445.30
2007	N	29	54	10	87	424	26	20	574
	Notional	90.20	74.38	2.42	38.69	389.42	171.38	19.89	687.59
2008	N	34	52	8	54	429	35	8	494
	Notional	130.43	95.73	1.94	24.92	415.05	129.58	4.31	698.72
2009	N	20	59	18	36	410	37	5	665
	Notional	187.39	56.18	26.00	48.17	365.90	278.09	1.84	829.45
2010	N	44	57	7	15	321	68	2	569
	Notional	359.94	84.81	1.93	4.14	352.36	265.53	1.07	781.16
2011	N	44	47	0	5	247	96	1	576
	Notional	495.25	57.78	0.00	0.29	326.26	202.26	0.23	779.21

Table 1 Cont.: Summary Statistics of Natural Gas and Crude Oil Contracts

Panel C: Natural Gas Contracts (notional amount in Bcf)

		Call	Put	Ceiling	Floor	Collar	Three	Forward	Swap
2006	N	10	5	0	12	207	16	8	196
	Notional	17.65	3.23	0.00	41.73	971.89	229.07	27.64	1897.96
2007	N	12	26	4	26	197	13	10	315
	Notional	382.56	76.72	4.10	20.24	1409.01	633.98	51.63	3196.76
2008	N	13	23	4	22	251	25	3	299
	Notional	571.95	205.93	4.39	20.08	1680.32	614.76	9.67	3293.81
2009	N	8	39	6	14	211	21	2	394
	Notional	1000.39	193.19	7.16	40.05	1182.08	1187.37	5.62	3784.15
2010	N	8	19	3	5	122	18	2	296
	Notional	1658.80	268.74	6.59	7.39	990.29	827.72	6.39	3444.04
2011	N	25	19	0	1	89	19	1	238
	Notional	2344.55	242.47	0.00	0.60	1123.78	505.29	1.37	3059.19

Panel D: Crude Oil Contracts (notional amount in Mmbbl)

		Call	Put	Ceiling	Floor	Collar	Three	Forward	Swap
2006	N	5	27	0	5	186	19	0	198
	Notional	1.50	48.73	0.00	9.45	118.46	78.47	0.00	128.98
2007	N	17	28	6	61	227	13	10	259
	Notional	26.44	61.59	1.74	35.32	154.58	65.72	11.28	154.80
2008	N	21	29	4	32	178	10	5	195
	Notional	35.10	61.41	1.21	21.58	135.00	27.12	2.70	149.75
2009	N	12	20	12	22	199	16	3	271
	Notional	20.66	23.99	24.81	41.50	168.88	80.19	0.90	198.76
2010	N	36	38	4	10	199	50	0	273
	Notional	83.47	40.02	0.83	2.91	187.31	127.58	0.00	207.15
2011	N	19	28	0	4	158	77	0	338
	Notional	104.49	17.36	0.00	0.19	138.96	118.04	0.00	269.34

Table 2: Summary Statistics of Key Variables and Control Variables

This table provides summary statistics of key variables and control variables. Panel A reports the summary statistics for key dependent variables including hedge ratio variables and reported profits variables. Reported profits variables are normalized by total assets. Panel B lists the summary statistics for major control variables. Number of observations, mean, standard deviation, 25 percentile, median, and 75 percentile are reported. Cash, Inventory, Cost of Goods Sold, ROA, Revenue and Capital Expenditure are normalized by total assets. Dividend is normalized by number of shares outstanding. Panel C provides summary statistics of Relative Delta Production and Relative Notional Production during sample period from 2007 to 2011. Panel D provides summary statistics of Reported Total Profit, Reported Realized Hedge Profit and Reported non-Hedge Profit during sample period from 2007 to 2011.

Panel A - Key Variables

	N	Mean	SD	P25	Median	P75
Relative Delta Production	381	0.8540	0.7880	0.2866	0.6257	1.1635
Relative Notional Production	381	1.0260	0.8919	0.3930	0.7780	1.4188
Reported Total Profit	381	0.0203	0.0518	-0.0064	0.0066	0.0399
Reported Realized Hedge Profit	186	0.0160	0.0395	-0.0030	0.0018	0.0232
Reported non-Hedge Profit	276	0.0164	0.0519	-0.0063	0.0051	0.0361
Reported Realized non-Hedge Profit	263	0.0159	0.0444	-0.0046	0.0066	0.0265
Reported Ineffective Hedge Profit	195	0.0009	0.0068	0.0000	0.0000	0.0000

Panel B - Control Variables

	N	Mean	SD	P25	Median	P75
Oil Futures Risk Premia	381	-1.9802	22.4176	-10.3318	-8.8114	-1.3862
Gas Futures Risk Premia	381	1.9690	1.9087	1.2635	1.7179	2.1531
Lag Oil Price Volatility	381	0.4156	0.1150	0.2902	0.4281	0.4572
Lifting Cost per Boe	358	13.9142	8.7858	8.8527	11.9674	16.5286
Market to Book Ratio	365	2.0997	5.9983	1.0837	1.8684	2.7981
Leverage Ratio	381	0.3536	0.2149	0.2185	0.3230	0.4567
Log Asset	381	7.3301	1.4896	6.2111	7.2808	8.2119
Cash	381	0.0352	0.0517	0.0030	0.0156	0.0466
Inventory	359	0.0061	0.0110	0.0000	0.0010	0.0080
Cost of Goods Sold	381	0.1812	0.2448	0.0602	0.0942	0.1707
ROA	381	-0.0260	0.1939	-0.0554	0.0186	0.0622
Revenue	381	0.3021	0.1742	0.1991	0.2680	0.3632
Dividend	379	0.4037	0.9176	0.0000	0.0000	0.3011
Capital Expenditure	381	0.2359	0.1425	0.1298	0.2202	0.3257
S&P Rating Dummy	381	0.5381	0.4992	0.0000	1.0000	1.0000

Table 2 Cont.: Summary Statistics of Key Variables

Panel C – Relative Delta Production and Relative Notional Production, 2007 to 2011

		Relative Delta Production						Relative Notional Production				
Year	N	Mean	SD	P25	Median	P75	N	Mean	SD	P25	Median	P75
2007	68	0.6396	0.7172	0.1950	0.4305	0.8656	68	0.8183	0.8512	0.2632	0.5873	1.0710
2008	83	0.8863	0.8758	0.2813	0.5239	1.1817	83	1.0868	1.0012	0.3757	0.7762	1.4399
2009	78	0.9576	0.8359	0.3409	0.7225	1.3995	78	1.0964	0.9339	0.4223	0.8300	1.4906
2010	79	0.9690	0.7637	0.3953	0.8593	1.3344	79	1.1536	0.8514	0.4640	0.9939	1.7055
2011	73	0.7820	0.6853	0.2977	0.6257	0.9841	73	0.9368	0.7670	0.4249	0.7163	1.1856
Total	**381**	**0.8540**	**0.7880**	**0.2866**	**0.6257**	**1.1635**	**381**	**1.0260**	**0.8919**	**0.3930**	**0.7780**	**1.4188**

Panel D – Reported Total Profit, Reported Realized Hedge Profit and Reported non-Hedge Profit, 2007 to 2011

		Reported Total Profit						Reported Realized Hedge Profit				
Year	N	Mean	SD	P25	Median	P75	N	Mean	SD	P25	Median	P75
2007	68	-0.0114	0.0331	-0.0200	-0.0037	0.0060	42	0.0062	0.0162	-0.0011	0.0039	0.0152
2008	83	0.0322	0.0603	-0.0072	0.0119	0.0634	43	-0.0063	0.0183	-0.0152	-0.0048	0.0012
2009	78	0.0290	0.0641	-0.0139	0.0168	0.0641	40	0.0511	0.0559	0.0032	0.0304	0.0858
2010	79	0.0256	0.0464	0.0004	0.0114	0.0422	32	0.0185	0.0388	-0.0012	0.0039	0.0415
2011	73	0.0212	0.0322	-0.0003	0.0074	0.0350	29	0.0122	0.0266	-0.0026	0.0014	0.0211
Total	**381**	**0.0203**	**0.0518**	**-0.0064**	**0.0066**	**0.0399**	**186**	**0.0160**	**0.0395**	**-0.0030**	**0.0018**	**0.0232**

		Reported non-Hedge Profit				
Year	N	Mean	SD	P25	Median	P75
2007	37	-0.0283	0.0395	-0.0329	-0.0155	-0.0030
2008	61	0.0477	0.0637	0.0011	0.0355	0.0792
2009	58	0.0017	0.0478	-0.0249	-0.0013	0.0149
2010	63	0.0223	0.0434	-0.0011	0.0100	0.0381
2011	57	0.0203	0.0285	0.0010	0.0067	0.0336
Total	**276**	**0.0164**	**0.0519**	**-0.0063**	**0.0051**	**0.0361**

Panel E – Oil and Gas Futures Risk Premia, 2007 to 2011

		Oil Futures Risk Premia						Gas Futures Risk Premia				
Year	N	Mean	SD	P25	Median	P75	N	Mean	SD	P25	Median	P75
2007	68	-1.386	14.400	-14.710	5.280	9.160	68	2.153	1.161	1.320	1.840	2.790
2008	83	-27.010	34.241	-50.530	-36.040	-21.220	83	-0.441	2.198	-2.138	0.049	1.247
2009	78	38.871	29.656	25.900	48.020	59.190	78	5.287	1.668	4.081	5.676	6.395
2010	79	-8.811	10.544	-19.250	-4.975	-0.310	79	1.718	0.613	1.208	1.613	2.085
2011	73	-10.332	7.604	-17.080	-9.770	-5.130	73	1.264	0.611	0.793	1.022	1.816
Total	**381**	**-1.980**	**19.744**	**-15.595**	**0.018**	**8.083**	**381**	**1.969**	**1.272**	**1.008**	**2.031**	**2.859**

Table 3 - Correlation Matrix

This table provides the correlation among key variables and control variables.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
(1) Relative Delta Production	1																			
(2) Relative Notional Production	0.929	1																		
(3) Reported Total Profit	0.601	0.509	1																	
(4) Reported Realized Hedge Profit	0.343	0.303	0.624	1																
(5) Reported non-Hedge Profit	0.501	0.416	0.794	0.021	1															
(6) Oil Futures Risk Premia	0.039	0.034	0.023	0.436	-0.310	1														
(7) Gas Futures Risk Premia	0.045	0.044	0.020	0.448	-0.323	0.994	1													
(8) Lag Oil Price Volatility	0.096	0.103	0.146	0.141	0.077	0.098	0.137	1												
(9) Lifting Cost per Boe	-0.154	-0.169	-0.173	-0.251	-0.025	-0.120	-0.128	-0.131	1											
(10) Market to Book Ratio	-0.338	-0.377	-0.313	0.047	-0.437	0.033	0.077	-0.015	-0.102	1										
(11) Leverage Ratio	0.367	0.497	0.241	0.097	0.235	0.031	0.011	-0.034	0.074	-0.388	1									
(12) Log Asset	-0.499	-0.497	-0.356	-0.238	-0.270	-0.025	-0.022	-0.048	0.007	0.229	-0.295	1								
(13) Cash	-0.160	-0.139	-0.156	-0.112	-0.113	-0.008	0.014	0.092	-0.147	0.246	-0.137	-0.036	1							
(14) Inventory	-0.302	-0.276	-0.164	-0.173	-0.075	-0.001	-0.011	-0.006	-0.079	-0.013	-0.124	0.478	-0.003	1						
(15) Cost of Goods Sold	-0.115	-0.070	0.066	-0.061	0.132	-0.074	-0.101	-0.043	-0.022	-0.207	0.199	0.087	-0.05	0.753	1					
(16) ROA	-0.411	-0.457	-0.376	-0.165	-0.354	-0.112	-0.116	-0.133	0.080	0.224	-0.556	0.387	-0.067	0.132	-0.260	1				
(17) Revenue	-0.169	-0.184	0.051	-0.078	0.125	-0.168	-0.190	-0.066	0.054	-0.219	-0.068	0.238	-0.137	0.814	0.874	0.036	1			
(18) Dividend	-0.062	-0.123	-0.112	-0.222	0.030	-0.147	-0.156	-0.089	0.012	-0.005	-0.218	0.361	0.031	0.343	0.140	0.244	0.258	1		
(19) Capital Expenditure	0.072	0.133	-0.041	-0.070	0.007	-0.318	-0.330	-0.212	-0.109	0.007	0.301	-0.412	0.057	-0.240	0.081	-0.149	-0.125	-0.143	1	
(20) S&P Rating Dummy	-0.310	-0.260	-0.200	-0.015	-0.243	0.076	0.086	-0.043	-0.132	0.093	0.098	0.684	-0.059	0.348	0.092	0.154	0.156	0.112	-0.259	1

Table 4: Hedging Profits and Hedging Activities

The dependent variables include Reported Total Profit, Reported Realized Hedge Profit and Reported non-Hedge Profit. The key independent variable is Relative Delta Production in Panel A and Relative Notional Production in Panel B. Oil Risk Premia and Gas Risk Premia are also included. Please see Appendix A for detailed definition of the variables. We control for year fixed effect in column 2, 5 and 8. We control for both year and firm fixed effect in column 3, 6 and 9. We report t-statistics in parentheses. ***, ** and * represents 1%, 5% and 10% significant levels.

Panel A – Hedging Profits and Relative Delta Production

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Reported Total Profit	Reported Total Profit	Reported Total Profit	Reported Realized Hedge Profit	Reported Realized Hedge Profit	Reported Realized Hedge Profit	Reported non-Hedge Profit	Reported non-Hedge Profit	Reported non-Hedge Profit
Relative Delta Production	0.018***	0.016***	0.022***	0.007**	0.006*	0.009	0.022***	0.019***	0.026***
	(5.59)	(5.02)	(3.73)	(2.02)	(1.77)	(1.64)	(6.02)	(5.63)	(4.22)
Oil Futures Risk Premia	0.002**	0.001***	0.001***	0.000	0.001***	0.001***	0.003**	0.001**	0.000*
	(2.40)	(4.38)	(3.82)	(0.38)	(5.72)	(6.81)	(2.54)	(2.54)	(1.69)
Gas Futures Risk Premia	-0.028**			0.005			-0.040***		
	(-2.45)			(0.45)			(-3.18)		
Observations	381	381	381	186	186	186	276	276	276
R-squared	0.091	0.144	0.477	0.254	0.273	0.714	0.209	0.285	0.558

Panel B – Hedging Profits and Relative Notional Production

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Reported Total Profit	Reported Total Profit	Reported Total Profit	Reported Realized Hedge Profit	Reported Realized Hedge Profit	Reported Realized Hedge Profit	Reported non-Hedge Profit	Reported non-Hedge Profit	Reported non-Hedge Profit
Relative Notional Production	0.014***	0.012***	0.016***	0.006**	0.005*	0.007	0.016***	0.014***	0.018***
	(4.74)	(4.23)	(3.14)	(1.99)	(1.74)	(1.59)	(4.91)	(4.60)	(3.10)
Oil Futures Risk Premia	0.002**	0.001***	0.001***	0.000	0.001***	0.001***	0.003**	0.001***	0.001**
	(2.42)	(4.56)	(4.16)	(0.47)	(5.78)	(7.02)	(2.45)	(2.73)	(2.11)
Gas Futures Risk Premia	-0.029**			0.004			-0.039***		
	(-2.45)			(0.36)			(-3.06)		
Observations	381	381	381	186	186	186	276	276	276
R-squared	0.071	0.128	0.470	0.253	0.273	0.713	0.176	0.259	0.540

Table 5: Hedging Profits, Hedging Activities and Market Timing Activities – Deviated from Industry Mean

The dependent variables include Reported Total Profit, Reported Realized Hedge Profit and Reported non-Hedge Profit. In Panel A, the independent variables are Industry Mean Delta and Delta Deviated from Industry Mean. In Panel B, the independent variables are Industry Mean Notional Amount and Notional Amount Deviated from Industry Mean. Oil Risk Premia and Gas Risk Premia are also included. Please see Appendix A for detailed definition of the variables. We control for year fixed effect in column 2, 5 and 8. We control for both year and firm fixed effect in column 3, 6 and 9. We report t-statistics in parentheses. ***, ** and * represents 1%, 5% and 10% significant levels.

Panel A – Hedging Profits and Market Timing Activities Based on Industry Mean Relative Delta Production

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Reported Total Profit	Reported Total Profit	Reported Total Profit	Reported Realized Hedge Profit	Reported Realized Hedge Profit	Reported Realized Hedge Profit	Reported non-Hedge Profit	Reported non-Hedge Profit	Reported non-Hedge Profit
Delta Deviated from Mean	0.014***	0.014***	0.023***	0.005*	0.005*	0.008	0.016***	0.016***	0.026***
	(4.81)	(4.82)	(4.28)	(1.66)	(1.66)	(1.63)	(5.23)	(5.27)	(4.65)
Industry Mean Delta	0.117***			0.048**			0.144***		
	(4.98)			(2.05)			(5.36)		
Oil Futures Risk Premia	0.001	0.001***	0.001***	-0.000	0.001***	0.001***	0.002*	0.001***	0.001**
	(1.36)	(5.00)	(4.73)	(-0.22)	(5.98)	(7.45)	(1.72)	(3.15)	(2.39)
Gas Futures Risk Premia	-0.017			0.012			-0.031**		
	(-1.50)			(0.98)			(-2.48)		
Observations	381	381	381	186	186	186	276	276	276
R-squared	0.128	0.140	0.485	0.265	0.272	0.713	0.257	0.276	0.565

Panel B – Hedging Profits and Market Timing Activities Based on Industry Mean Relative Notional Production

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Reported Total Profit	Reported Total Profit	Reported Total Profit	Reported Realized Hedge Profit	Reported Realized Hedge Profit	Reported Realized Hedge Profit	Reported non-Hedge Profit	Reported non-Hedge Profit	Reported non-Hedge Profit
Notional Deviated from Mean	0.011***	0.010***	0.020***	0.006*	0.005*	0.007	0.012***	0.012***	0.023***
	(4.33)	(4.15)	(4.16)	(1.91)	(1.74)	(1.59)	(4.43)	(4.45)	(4.43)
Industry Mean Notional	0.081**			0.027			0.096***		
	(2.56)			(0.81)			(2.80)		
Oil Futures Risk Premia	0.002**	0.001***	0.001***	0.000	0.001***	0.001***	0.002**	0.001***	0.000**
	(2.05)	(4.77)	(4.24)	(0.31)	(5.87)	(7.21)	(2.16)	(2.97)	(2.02)
Gas Futures Risk Premia	-0.025**			0.006			-0.036***		
	(-2.11)			(0.49)			(-2.80)		
Observations	381	381	381	186	186	186	276	276	276
R-squared	0.078	0.127	0.483	0.255	0.273	0.713	0.186	0.256	0.561

Table 6: Hedging Profits, Hedging Activities and Market Timing Activities – from Residual Perspective on Industry Mean

The dependent variables include Reported Total Profit, Reported Realized Hedge Profit and Reported non-Hedge Profit. In Panel A, the independent variables are regression Residuals representing market timing activities, and Predicted values representing hedging activities (we regress firm's Relative Delta Production on industry mean, firm characteristics, and risk premia to get the Residual and Predicted value). In Panel B, the independent variables are Residuals representing market timing activities, and Predicted values representing hedging activities calculated from industry mean Notional Amount. Please see Appendix A for detailed definition of the variables. We control for year fixed effect in column 2, 5 and 8. We control for both year and firm fixed effect in column 3, 6 and 9. We report t-statistics in parentheses. ***, ** and * represents 1%, 5% and 10% significant levels.

Panel A – Hedging Profits and Market Timing Activities Based on Industry Mean Relative Delta Production

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Reported Total Profit	Reported Total Profit	Reported Total Profit	Reported Realized Hedge Profit	Reported Realized Hedge Profit	Reported Realized Hedge Profit	Reported non-Hedge Profit	Reported non-Hedge Profit	Reported non-Hedge Profit
Residual from Industry Mean Delta	0.025***	0.025***	0.024***	0.014***	0.013***	0.008	0.024***	0.024***	0.028***
	(5.49)	(5.56)	(3.74)	(3.12)	(2.97)	(1.31)	(4.76)	(4.84)	(4.18)
Predicted from Industry Mean Delta	0.025***	0.015**	0.004	0.015**	0.010	0.001	0.029***	0.021***	0.011
	(3.60)	(2.13)	(0.18)	(2.06)	(1.39)	(0.04)	(3.91)	(2.83)	(0.52)
Oil Futures Risk Premia	0.002**	0.001***	0.001***	0.000	0.001***	0.001***	0.003**	0.001**	0.001
	(2.19)	(3.86)	(3.24)	(0.31)	(5.54)	(5.15)	(2.35)	(2.01)	(1.58)
Gas Futures Risk Premia	-0.028**			0.006			-0.040***		
	(-2.23)			(0.52)			(-2.98)		
Observations	342	342	342	165	165	165	248	248	248
R-squared	0.131	0.174	0.484	0.307	0.327	0.711	0.233	0.292	0.563

Panel B – Hedging Profits and Market Timing Activities Based on Industry Mean Relative Notional Production

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Reported Total Profit	Reported Total Profit	Reported Total Profit	Reported Realized Hedge Profit	Reported Realized Hedge Profit	Reported Realized Hedge Profit	Reported non-Hedge Profit	Reported non-Hedge Profit	Reported non-Hedge Profit
Residual from Industry Mean Notional	0.019***	0.018***	0.016***	0.011***	0.010***	0.006	0.017***	0.016***	0.018***
	(4.60)	(4.57)	(2.89)	(2.94)	(2.68)	(1.28)	(3.64)	(3.63)	(2.86)
Predicted from Industry Mean Notional	0.017***	0.010*	0.001	0.010	0.007	0.001	0.022***	0.016***	0.008
	(3.03)	(1.82)	(0.08)	(1.64)	(1.12)	(0.08)	(3.53)	(2.71)	(0.45)
Oil Futures Risk Premia	0.002**	0.001***	0.001***	0.001	0.001***	0.001***	0.003**	0.001**	0.001*
	(2.23)	(4.13)	(3.69)	(0.49)	(5.76)	(5.92)	(2.31)	(2.26)	(1.95)
Gas Futures Risk Premia	-0.028**			0.004			-0.040***		
	(-2.25)			(0.34)			(-2.89)		
Observations	342	342	342	165	165	165	248	248	248
R-squared	0.096	0.145	0.472	0.296	0.317	0.710	0.191	0.257	0.540

Table 7: Hedging Profits, Hedging Activities and Market Timing Activities – with Residual Fixed Effect

The dependent variables include Reported Total Profit, Reported Realized Hedge Profit and Reported non-Hedge Profit. In Panel A, the key independent variables are regression Residuals representing market timing activities, and Predicted values representing hedging activities (we regress firm's Relative Delta Production on industry average, risk premia, firm characteristics and firm fixed effect to get the Residual and Predicted value). In Panel B, the key independent variables are regression Residuals representing market timing activities, and Predicted values representing hedging activities (we regress firm's Relative Notional Production on industry average, risk premia, firm characteristics and firm fixed effect to get the Residual and Predicted value). Please see Appendix A for detailed definition of the variables. We control for year fixed effect in column 2, 5 and 8. We control for both year and firm fixed effect in column 3, 6 and 9. We report t-statistics in parentheses. ***, ** and * represents 1%, 5% and 10% significant levels.

Panel A – Hedging Profits and Market Timing Activities Based on Relative Delta Production

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Reported Total Profit	Reported Total Profit	Reported Total Profit	Reported Realized Hedge Profit	Reported Realized Hedge Profit	Reported Realized Hedge Profit	Reported non-Hedge Profit	Reported non-Hedge Profit	Reported non-Hedge Profit
Residual Delta Fixed Effect	0.018**	0.018**	0.018***	0.005	0.006	0.011*	0.024***	0.022***	0.019***
	(2.33)	(2.35)	(2.86)	(0.56)	(0.68)	(1.71)	(2.84)	(2.72)	(2.68)
Predicted Delta Fixed Effect	0.026***	0.023***	-0.026	0.021***	0.019***	-0.028	0.019***	0.016***	-0.035
	(5.38)	(4.61)	(-1.13)	(4.10)	(3.55)	(-1.26)	(3.61)	(3.06)	(-1.40)
Oil Futures Risk Premia	0.002	0.001***	0.001***	0.000	0.001***	0.002***	0.001	0.000*	0.001***
	(1.46)	(3.68)	(4.75)	(0.15)	(5.27)	(5.62)	(1.24)	(1.89)	(3.37)
Gas Futures Risk Premia	-0.018			0.009			-0.024*		
	(-1.38)			(0.71)			(-1.77)		
Log Asset	-0.002	-0.002	0.022**	-0.003	-0.003	0.034***	-0.002	-0.003	0.003
	(-1.08)	(-1.27)	(2.11)	(-1.49)	(-1.60)	(2.99)	(-1.07)	(-1.31)	(0.24)
ROA	0.025	0.030*	0.036**	0.008	0.010	-0.007	0.017	0.025	0.048**
	(1.54)	(1.87)	(2.12)	(0.53)	(0.63)	(-0.52)	(0.81)	(1.24)	(2.00)
leverage	0.032**	0.032**	0.034	0.006	0.007	0.019	0.046***	0.046***	0.047
	(2.08)	(2.08)	(1.06)	(0.37)	(0.45)	(0.68)	(2.65)	(2.76)	(1.20)
Revenue	0.086***	0.079***	0.292***	0.043***	0.041***	0.187***	0.063***	0.054***	0.211***
	(5.07)	(4.69)	(7.36)	(3.07)	(2.87)	(5.27)	(3.21)	(2.83)	(5.03)
Observations	320	320	320	153	153	153	228	228	228
R-squared	0.216	0.248	0.619	0.408	0.418	0.790	0.303	0.362	0.677

Table 7 Cont.: Hedging Profits, Hedging Activities and Market Timing Activities – with Residual Fixed Effect

Panel B – Hedging Profits and Market Timing Activities Based on Relative Notional Production

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Reported Total Profit	Reported Total Profit	Reported Total Profit	Reported Realized Hedge Profit	Reported Realized Hedge Profit	Reported Realized Hedge Profit	Reported non-Hedge Profit	Reported non-Hedge Profit	Reported non-Hedge Profit
Residual Notional Fixed Effect	0.015**	0.015**	0.015***	0.004	0.004	0.007	0.019**	0.018**	0.015**
	(2.25)	(2.26)	(2.70)	(0.69)	(0.70)	(1.51)	(2.53)	(2.49)	(2.40)
Predicted Notional Fixed Effect	0.020***	0.017***	-0.026	0.016***	0.014***	-0.026	0.016***	0.013**	-0.036
	(4.49)	(3.82)	(-1.09)	(3.30)	(2.82)	(-1.12)	(3.01)	(2.53)	(-1.39)
Oil Futures Risk Premia	0.002	0.001***	0.001***	0.000	0.001***	0.001***	0.002	0.001**	0.001***
	(1.63)	(3.97)	(4.79)	(0.34)	(5.60)	(5.58)	(1.33)	(2.08)	(3.41)
Gas Futures Risk Premia	-0.020			0.007			-0.026*		
	(-1.54)			(0.52)			(-1.84)		
Log Asset	-0.002	-0.003	0.022**	-0.003*	-0.003*	0.034***	-0.002	-0.003	0.003
	(-1.24)	(-1.43)	(2.08)	(-1.81)	(-1.91)	(2.93)	(-1.14)	(-1.39)	(0.23)
ROA	0.027*	0.033**	0.040**	0.007	0.009	-0.004	0.018	0.027	0.053**
	(1.65)	(1.99)	(2.25)	(0.48)	(0.61)	(-0.28)	(0.89)	(1.33)	(2.18)
leverage	0.034**	0.033**	0.040	0.002	0.004	0.021	0.046***	0.047***	0.054
	(2.14)	(2.14)	(1.17)	(0.13)	(0.26)	(0.70)	(2.60)	(2.71)	(1.35)
Revenue	0.084***	0.077***	0.291***	0.043***	0.040***	0.185***	0.063***	0.053***	0.211***
	(4.90)	(4.51)	(7.29)	(2.99)	(2.76)	(5.15)	(3.13)	(2.75)	(4.98)
Observations	320	320	320	153	153	153	228	228	228
R-squared	0.194	0.232	0.617	0.386	0.399	0.788	0.286	0.351	0.674

Table 8: Estimated Profits, Hedging Activities and Market Timing Activities – from Residual Perspective on Industry Mean

The dependent variables include the differences between reported profits and estimated profits. In Panel A, the independent variables are regression Residuals representing market timing activities, and Predicted values representing hedging activities (we regress firm's Relative Delta Production on industry mean, firm characteristics, and risk premia to get the Residual and Predicted value). In Panel B, the independent variables are Residuals representing market timing activities, and Predicted values representing hedging activities calculated from industry mean Notional Amount. Please see Appendix A for detailed definition of the variables. We control for year fixed effect in column 2, 5 and 8. We control for both year and firm fixed effect in column 3, 6 and 9. We report t-statistics in parentheses. ***, ** and * represents 1%, 5% and 10% significant levels.

Panel A – Market Timing Profits and Market Timing Activities Based on Industry Mean Relative Delta Production

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	(Reported - Estimated) Total Profit	(Reported - Estimated) Total Profit	(Reported - Estimated) Total Profit	(Reported - Estimated) Realized Hedge Profit	(Reported - Estimated) Realized Hedge Profit	(Reported - Estimated) Realized Hedge Profit	(Reported - Estimated) non-Hedge Profit	(Reported - Estimated) non-Hedge Profit	(Reported - Estimated) non-Hedge Profit
Residual from Industry Mean Delta	0.031***	0.031***	0.037**	0.018*	0.018*	0.024	0.037***	0.037***	0.048**
	(3.06)	(3.08)	(2.29)	(1.75)	(1.71)	(1.28)	(3.01)	(3.01)	(2.33)
Predicted from Industry Mean Delta	0.014	-0.000	-0.025	0.015	0.009	-0.025	0.022	0.008	-0.005
	(0.93)	(-0.03)	(-0.47)	(0.94)	(0.53)	(-0.44)	(1.22)	(0.43)	(-0.07)
Oil Futures Risk Premia	0.008***	0.000	0.000	0.004	0.000	0.001	0.009***	-0.000	-0.000
	(3.46)	(0.18)	(0.60)	(1.51)	(0.86)	(1.36)	(3.33)	(-0.19)	(-0.17)
Gas Futures Risk Premia	-0.112***			-0.044			-0.139***		
	(-4.20)			(-1.62)			(-4.25)		
Observations	341	341	341	164	164	164	248	248	248
R-squared	0.165	0.186	0.285	0.043	0.052	0.221	0.264	0.292	0.365

Panel B – Market Timing Profits and Market Timing Activities Based on Industry Mean Relative Notional Production

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	(Reported - Estimated) Total Profit	(Reported - Estimated) Total Profit	(Reported - Estimated) Total Profit	(Reported - Estimated) Realized Hedge Profit	(Reported - Estimated) Realized Hedge Profit	(Reported - Estimated) Realized Hedge Profit	(Reported - Estimated) non-Hedge Profit	(Reported - Estimated) non-Hedge Profit	(Reported - Estimated) non-Hedge Profit
Residual from Industry Mean Notional	0.025***	0.025***	0.032**	0.017**	0.016*	0.021	0.030***	0.029***	0.039**
	(2.85)	(2.83)	(2.20)	(1.99)	(1.90)	(1.49)	(2.67)	(2.64)	(2.11)
Predicted from Industry Mean Notional	0.007	-0.003	-0.021	0.010	0.006	-0.021	0.015	0.005	-0.005
	(0.58)	(-0.26)	(-0.49)	(0.77)	(0.43)	(-0.46)	(0.99)	(0.32)	(-0.10)
Oil Futures Risk Premia	0.008***	0.000	0.000	0.004	0.000	0.001	0.009***	-0.000	-0.000
	(3.47)	(0.21)	(0.57)	(1.63)	(0.91)	(1.43)	(3.30)	(-0.14)	(-0.16)
Gas Futures Risk Premia	-0.113***			-0.047*			-0.138***		
	(-4.21)			(-1.74)			(-4.21)		
Observations	341	341	341	164	164	164	248	248	248
R-squared	0.160	0.183	0.284	0.046	0.056	0.226	0.255	0.285	0.362

Table 9: Estimated Profits, Hedging Activities and Market Timing Activities – with Residual Fixed Effect

The dependent variables include the differences between reported profits and estimated profits. The key independent variables are regression Residuals representing market timing activities, and Predicted values representing hedging activities (we regress firm's Relative Delta Production on industry average, risk premia, firm characteristics and firm fixed effect to get the Residual and Predicted value). Please see Appendix A for detailed definition of the variables. We control for year fixed effect in column 2, 5 and 8. We control for both year and firm fixed effect in column 3, 6 and 9. We report t-statistics in parentheses. ***, ** and * represents 1%, 5% and 10% significant levels.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	(Reported - Estimated) Total Profit	(Reported - Estimated) Total Profit	(Reported - Estimated) Total Profit	(Reported - Estimated) Realized Hedge Profit	(Reported - Estimated) Realized Hedge Profit	(Reported - Estimated) Realized Hedge Profit	(Reported - Estimated) non-Hedge Profit	(Reported - Estimated) non-Hedge Profit	(Reported - Estimated) non-Hedge Profit
Residual Delta Fixed Effect	0.057***	0.057***	0.058***	0.027	0.028	0.039**	0.081***	0.078***	0.062***
	(3.35)	(3.34)	(3.33)	(1.53)	(1.55)	(2.61)	(3.79)	(3.71)	(2.83)
Predicted Delta Fixed Effect	0.023**	0.018	-0.155**	0.024**	0.022*	0.019	0.025*	0.019	-0.225***
	(2.09)	(1.59)	(-2.43)	(2.14)	(1.86)	(0.37)	(1.81)	(1.39)	(-2.93)
Oil Futures Risk Premia	0.006**	0.000	0.002**	0.003	0.000	0.001	0.007**	-0.000	0.002**
	(2.59)	(0.01)	(2.58)	(1.30)	(0.93)	(1.58)	(2.42)	(-0.32)	(1.99)
Gas Futures Risk Premia	-0.090***			-0.036			-0.112***		
	(-3.16)			(-1.33)			(-3.18)		
Log Asset	0.001	0.000	0.068**	-0.001	-0.001	0.102***	0.000	-0.000	0.043
	(0.19)	(0.11)	(2.42)	(-0.22)	(-0.30)	(3.68)	(0.03)	(-0.03)	(1.27)
ROA	-0.023	-0.010	0.012	-0.026	-0.022	-0.038	-0.056	-0.037	-0.041
	(-0.62)	(-0.26)	(0.25)	(-0.79)	(-0.68)	(-1.21)	(-1.07)	(-0.71)	(-0.55)
leverage	0.045	0.047	0.118	0.043	0.043	0.024	0.038	0.043	0.117
	(1.31)	(1.37)	(1.34)	(1.24)	(1.24)	(0.36)	(0.88)	(0.99)	(0.97)
Revenue	0.095**	0.083**	0.494***	0.030	0.027	0.302***	0.091*	0.073	0.417***
	(2.54)	(2.19)	(4.58)	(1.00)	(0.88)	(3.55)	(1.83)	(1.47)	(3.22)
Observations	319	319	319	152	152	152	228	228	228
R-squared	0.197	0.210	0.409	0.122	0.125	0.604	0.296	0.318	0.514

Table 10: Feedback Effect on Hedging Activities

The dependent variable is Relative Delta Production in Panel A, and Relative Notional Production in Panel B. In Panel A and Panel B, the key independent variables are Lag Reported Total Profit, Lag Reported Realized Hedge Profit and Lag Reported non-Hedge Profit. Risk premia and firm characteristics are also included as control variables. We control for year fixed effect in column 3, 6 and 9. We control for both of year and firm fixed effect in column 4, 7 and 10. Please see Appendix A for detailed definition of the variables. We report t-statistics in parentheses. ***, ** and * represents 1%, 5% and 10% significant levels.

Panel A – Dependent Variable: Relative Delta Production

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Lag Reported Total Profit		1.526**	1.503**	-0.065						
		(2.08)	(2.04)	(-0.10)						
Lag Reported Realized Hedge Profit					2.266	2.388	1.695			
					(1.35)	(1.40)	(1.04)			
Lag Reported non-Hedge Profit								0.886	1.108	-0.342
								(0.87)	(1.09)	(-0.38)
Lag Oil Price Volatility	1.073***	1.066***			0.235			0.990**		
	(3.45)	(2.88)			(0.44)			(2.09)		
Oil Futures Risk Premia	0.009	0.011	0.007	0.013***	0.001	-0.002	0.004	0.000	0.013**	0.024***
	(0.66)	(0.66)	(1.63)	(3.55)	(0.04)	(-0.44)	(0.76)	(0.01)	(2.18)	(4.50)
Gas Futures Risk Premia	-0.124	-0.139			-0.039			0.000		
	(-0.73)	(-0.73)			(-0.14)			(0.00)		
Lifting Cost per Boe	0.003	0.005	0.005	-0.006	-0.009	-0.008	-0.016	0.011*	0.013*	0.000
	(0.67)	(1.08)	(1.08)	(-0.67)	(-1.27)	(-1.25)	(-1.49)	(1.69)	(1.96)	(0.02)
Market to Book Ratio	-0.002	-0.002	-0.003	-0.002	-0.001	-0.001	0.015	-0.003	-0.004	-0.004
	(-0.43)	(-0.45)	(-0.49)	(-0.48)	(-0.05)	(-0.06)	(0.81)	(-0.58)	(-0.67)	(-0.88)
Leverage Ratio	1.068***	0.975***	0.961***	0.102	0.400	0.395	0.583	1.060***	0.994***	-0.470
	(5.71)	(4.80)	(4.72)	(0.27)	(1.28)	(1.26)	(1.12)	(4.19)	(3.91)	(-0.99)
Log Asset	-0.069**	-0.075**	-0.074**	0.164	-0.123**	-0.124**	0.142	-0.080*	-0.086*	0.066
	(-2.13)	(-2.06)	(-2.04)	(1.10)	(-2.32)	(-2.32)	(0.56)	(-1.79)	(-1.92)	(0.40)
Cash	-2.313***	-2.084***	-2.108***	-0.425	-2.644**	-2.600**	0.024	-2.175***	-2.284***	-1.200
	(-3.65)	(-3.08)	(-3.11)	(-0.54)	(-2.47)	(-2.41)	(0.02)	(-2.79)	(-2.94)	(-1.33)
Inventory	-4.700	-5.401	-5.197	-3.304	-6.844	-7.006	-8.037	-5.973	-5.183	-3.692
	(-1.22)	(-1.34)	(-1.29)	(-0.52)	(-1.02)	(-1.04)	(-0.86)	(-1.20)	(-1.05)	(-0.48)
Cost of Goods Sold	-0.070	-0.120	-0.128	-0.215	-0.392	-0.360	0.269	-0.166	-0.165	-0.363
	(-0.22)	(-0.35)	(-0.38)	(-0.60)	(-0.60)	(-0.54)	(0.47)	(-0.45)	(-0.45)	(-0.98)
ROA	0.174	0.063	0.043	-0.168	-0.700	-0.676	-0.085	0.112	0.054	-0.160
	(0.50)	(0.17)	(0.12)	(-0.44)	(-1.18)	(-1.13)	(-0.16)	(0.25)	(0.12)	(-0.36)
Revenue	-0.496	-0.432	-0.437	0.711	0.052	0.029	-0.255	-0.208	-0.258	0.830
	(-1.51)	(-1.23)	(-1.25)	(1.38)	(0.08)	(0.05)	(-0.34)	(-0.50)	(-0.62)	(1.48)
Dividend	0.348***	0.451***	0.456***	-0.330**	0.348***	0.348***	-0.420*	0.430***	0.461***	-0.140
	(6.62)	(7.11)	(7.15)	(-2.41)	(2.91)	(2.90)	(-1.93)	(5.94)	(6.22)	(-0.80)
Capital Expenditure	-0.224	-0.032	0.020	-0.629*	-1.058*	-1.095*	-1.386***	0.001	0.188	-0.092
	(-0.84)	(-0.11)	(0.06)	(-1.91)	(-1.87)	(-1.91)	(-2.72)	(0.00)	(0.51)	(-0.23)
S&P Rating	-0.008	0.003	-0.005	0.101	0.002	0.010	-0.253	0.026	0.024	0.314*
	(-0.09)	(0.03)	(-0.05)	(0.69)	(0.01)	(0.07)	(-1.20)	(0.19)	(0.18)	(1.96)
Observations	320	277	277	277	136	136	136	196	196	196
R-squared	0.340	0.365	0.366	0.782	0.314	0.315	0.807	0.377	0.388	0.833

Table 10 Cont.: Feedback Effect on Hedging Activities

Panel B – Dependent Variable: Relative Notional Production

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Lag Reported Total Profit		1.600*	1.589*	0.181						
		(1.93)	(1.91)	(0.22)						
Lag Reported Realized Hedge Profit					1.271	1.406	1.192			
					(0.60)	(0.66)	(0.56)			
Lag Reported non-Hedge Profit								1.208	1.391	0.151
								(1.09)	(1.25)	(0.15)
Lag Oil Price Volatility	1.129***	1.115***			0.367			1.020*		
	(3.27)	(2.67)			(0.55)			(1.97)		
Oil Futures Risk Premia	-0.001	0.000	0.004	0.011**	-0.026	-0.005	0.002	-0.016	0.010	0.019***
	(-0.05)	(0.01)	(0.94)	(2.50)	(-0.84)	(-0.73)	(0.31)	(-0.70)	(1.54)	(3.19)
Gas Futures Risk Premia	-0.008	-0.020			0.266			0.186		
	(-0.04)	(-0.09)			(0.74)			(0.69)		
Lifting Cost per Boe	0.007	0.010*	0.010*	-0.009	-0.006	-0.006	-0.025*	0.019***	0.020***	-0.001
	(1.49)	(1.76)	(1.76)	(-0.84)	(-0.71)	(-0.69)	(-1.76)	(2.66)	(2.84)	(-0.13)
Market to Book Ratio	-0.000	-0.001	-0.001	0.000	0.021	0.021	0.053**	-0.002	-0.002	-0.004
	(-0.06)	(-0.11)	(-0.13)	(0.04)	(0.83)	(0.82)	(2.16)	(-0.31)	(-0.38)	(-0.83)
Leverage Ratio	1.289***	1.208***	1.201***	0.364	1.009**	1.003**	1.243*	1.248***	1.194***	-0.203
	(6.20)	(5.26)	(5.20)	(0.82)	(2.58)	(2.56)	(1.82)	(4.50)	(4.27)	(-0.38)
Log Asset	-0.076**	-0.070*	-0.069*	0.276	-0.123*	-0.124*	0.317	-0.079	-0.084*	0.171
	(-2.11)	(-1.70)	(-1.69)	(1.55)	(-1.85)	(-1.86)	(0.94)	(-1.61)	(-1.70)	(0.93)
Cash	-2.550***	-2.305***	-2.316***	-0.633	-3.198**	-3.149**	-0.054	-2.338***	-2.428***	-1.535
	(-3.62)	(-3.02)	(-3.02)	(-0.67)	(-2.38)	(-2.33)	(-0.04)	(-2.74)	(-2.84)	(-1.52)
Inventory	-6.964	-8.052*	-7.951*	-2.050	-6.955	-7.134	-8.502	-10.097*	-9.447*	0.584
	(-1.63)	(-1.77)	(-1.74)	(-0.27)	(-0.83)	(-0.85)	(-0.69)	(-1.86)	(-1.73)	(0.07)
Cost of Goods Sold	0.079	0.021	0.017	-0.032	0.105	0.140	0.731	-0.028	-0.027	-0.293
	(0.22)	(0.05)	(0.04)	(-0.07)	(0.13)	(0.17)	(0.98)	(-0.07)	(-0.07)	(-0.70)
ROA	0.266	0.158	0.148	0.099	-0.227	-0.201	0.443	0.157	0.110	0.048
	(0.69)	(0.38)	(0.35)	(0.22)	(-0.31)	(-0.27)	(0.65)	(0.32)	(0.23)	(0.10)
Revenue	-0.617*	-0.484	-0.486	0.625	-0.406	-0.431	-0.906	-0.099	-0.140	0.807
	(-1.69)	(-1.22)	(-1.22)	(1.02)	(-0.51)	(-0.54)	(-0.92)	(-0.22)	(-0.31)	(1.28)
Dividend	0.393***	0.454***	0.457***	-0.462***	0.325**	0.325**	-0.612**	0.428***	0.454***	-0.150
	(6.73)	(6.32)	(6.32)	(-2.84)	(2.17)	(2.16)	(-2.14)	(5.40)	(5.57)	(-0.76)
Capital Expenditure	-0.276	-0.073	-0.048	-0.714*	-1.106	-1.146	-1.540**	-0.023	0.131	-0.228
	(-0.93)	(-0.22)	(-0.14)	(-1.82)	(-1.56)	(-1.59)	(-2.29)	(-0.06)	(0.33)	(-0.51)
S&P Rating	0.027	0.031	0.026	0.077	-0.019	-0.011	-0.392	0.087	0.086	0.292
	(0.26)	(0.26)	(0.22)	(0.44)	(-0.11)	(-0.06)	(-1.42)	(0.59)	(0.58)	(1.62)
Observations	320	277	277	277	136	136	136	196	196	196
R-squared	0.361	0.357	0.357	0.756	0.281	0.282	0.777	0.390	0.396	0.829

Table 11: Feedback Effect on Hedging Activities – Gain or Loss Status

The dependent variable is Relative Delta Production in Panel A, and Relative Notional Production in Panel B. In Panel A and Panel B, the key independent variables are Lag Reported Total Profit, Lag Reported Realized Hedge Profit and Lag Reported non-Hedge Profit. Risk premia and firm characteristics are also included as control variables. Column 1, 2 and 3 include firm-years with positive profits only. Column 4, 5 and 6 include firm-years with negative profits only. We control for both of year and firm fixed effect in all regressions. Please see Appendix A for detailed definition of the variables. We report t-statistics in parentheses. ***, ** and * represents 1%, 5% and 10% significant levels.

Panel A – Dependent Variable: Relative Delta Production

	(1)	(2)	(3)	(4)	(5)	(6)
Lag Reported Total Profit	1.145			-8.188**		
	(0.94)			(-2.61)		
Lag Reported Realized Hedge Profit		1.954			-4.673	
		(0.62)			(-0.26)	
Lag Reported non-Hedge Profit			0.166			-6.415**
			(0.09)			(-2.24)
Oil Futures Risk Premia	0.008	0.009	0.023**	0.005	0.018	0.022
	(1.59)	(0.96)	(2.68)	(0.41)	(0.42)	(1.32)
Lifting Cost per Boe	0.024	0.124*	0.017	-0.018	-0.001	-0.011
	(1.13)	(1.75)	(0.80)	(-1.10)	(-0.01)	(-0.59)
Market to Book Ratio	-0.003	-0.009	-0.002	-0.001	-0.153	-0.015
	(-0.52)	(-0.22)	(-0.45)	(-0.11)	(-0.14)	(-1.12)
Leverage Ratio	-0.115	0.924	-0.155	0.413	2.650	-0.686
	(-0.23)	(1.10)	(-0.22)	(0.37)	(0.64)	(-0.63)
Log Asset	0.201	0.244	0.193	0.075	-1.290	0.147
	(0.83)	(0.54)	(0.73)	(0.21)	(-0.60)	(0.37)
Cash	-0.988	1.785	-3.205	-1.211	-0.891	-0.911
	(-0.82)	(0.88)	(-1.47)	(-0.77)	(-0.20)	(-0.66)
Inventory	-15.414*	-20.978	-21.066*	7.775	-39.914	26.419
	(-1.74)	(-1.30)	(-1.84)	(0.40)	(-0.47)	(1.11)
Cost of Goods Sold	-0.253	0.354	-0.421	1.260	-0.213	0.890
	(-0.60)	(0.43)	(-0.98)	(0.90)	(-0.03)	(0.55)
ROA	-0.599	-0.135	-0.335	1.849	3.714	1.160
	(-1.34)	(-0.19)	(-0.61)	(1.25)	(0.52)	(0.70)
Revenue	1.213	-1.129	1.638	-1.851	1.455	-0.672
	(1.30)	(-0.87)	(1.34)	(-0.97)	(0.27)	(-0.30)
Dividend	-0.096	-0.415	0.083	-0.540	0.050	-0.035
	(-0.45)	(-1.38)	(0.21)	(-1.05)	(0.02)	(-0.06)
Capital Expenditure	-1.987***	-1.451	-1.080	0.100	-0.750	0.498
	(-3.68)	(-1.21)	(-1.41)	(0.12)	(-0.24)	(0.54)
S&P Rating	0.219	-0.220	0.255	-0.078	0.053	0.190
	(1.05)	(-0.53)	(0.97)	(-0.24)	(0.05)	(0.49)
Observations	163	74	109	114	62	86
R-squared	0.853	0.862	0.918	0.914	0.924	0.947

Table 11 Cont.: Feedback Effect on Hedging Activities – Gain or Loss Status

Panel B – Dependent Variable: Relative Notional Production

	(1)	(2)	(3)	(4)	(5)	(6)
Lag Reported Total Profit	1.258			-9.200**		
	(0.98)			(-2.06)		
Lag Reported Realized Hedge Profit		2.679			-7.628	
		(0.72)			(-0.37)	
Lag Reported non-Hedge Profit			0.099			-6.609*
			(0.05)			(-1.73)
Oil Futures Risk Premia	0.006	0.007	0.019**	0.002	0.011	0.016
	(1.00)	(0.64)	(2.21)	(0.11)	(0.23)	(0.73)
Lifting Cost per Boe	0.024	0.057	0.028	-0.029	0.005	-0.018
	(1.08)	(0.67)	(1.25)	(-1.25)	(0.09)	(-0.72)
Market to Book Ratio	-0.002	-0.023	-0.002	0.012	-0.523	-0.017
	(-0.39)	(-0.50)	(-0.33)	(0.70)	(-0.41)	(-0.95)
Leverage Ratio	-0.234	0.904	-0.188	1.403	2.981	-0.211
	(-0.44)	(0.90)	(-0.26)	(0.89)	(0.62)	(-0.14)
Log Asset	0.366	0.184	0.304	0.070	-0.952	0.182
	(1.44)	(0.34)	(1.12)	(0.13)	(-0.38)	(0.34)
Cash	-1.160	0.611	-2.366	-1.744	0.440	-0.634
	(-0.91)	(0.25)	(-1.05)	(-0.78)	(0.09)	(-0.34)
Inventory	-12.984	-12.720	-17.657	-6.203	-45.564	28.845
	(-1.39)	(-0.66)	(-1.49)	(-0.22)	(-0.46)	(0.91)
Cost of Goods Sold	-0.108	0.440	-0.372	2.373	1.904	1.361
	(-0.24)	(0.44)	(-0.84)	(1.18)	(0.23)	(0.64)
ROA	-0.494	-0.083	-0.238	3.586	5.310	2.080
	(-1.05)	(-0.10)	(-0.42)	(1.69)	(0.63)	(0.94)
Revenue	1.876*	-1.568	2.160*	-3.204	1.134	-1.652
	(1.92)	(-1.01)	(1.71)	(-1.17)	(0.18)	(-0.55)
Dividend	-0.122	-0.361	-0.028	-1.266*	-0.837	-0.091
	(-0.54)	(-1.01)	(-0.07)	(-1.73)	(-0.30)	(-0.12)
Capital Expenditure	-2.087***	-1.609	-1.149	-0.414	-1.367	0.318
	(-3.68)	(-1.13)	(-1.46)	(-0.35)	(-0.37)	(0.26)
S&P Rating	0.245	-0.302	0.397	-0.306	0.308	0.171
	(1.12)	(-0.61)	(1.47)	(-0.67)	(0.25)	(0.33)
Observations	163	74	109	114	62	86
R-squared	0.867	0.867	0.928	0.868	0.932	0.925

Table 12: Change of Hedging Profits and Change of Hedging Activities

The dependent variables include change of Reported Total Profit, change of Reported Realized Hedge Profit and change of Reported non-Hedge Profit. The key independent variable is change of Relative Delta Production in Panel A and change of Relative Notional Production in Panel B. Oil Risk Premia and Gas Risk Premia are also included. Please see Appendix A for detailed definition of the variables. We control for year fixed effect in column 2, 5 and 8. We control for both year and firm fixed effect in column 3, 6 and 9. We report t-statistics in parentheses. ***, ** and * represents 1%, 5% and 10% significant levels.

Panel A – Change of Hedging Profits and Change of Relative Delta Production

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Δ Reported Total Profit	Δ Reported Total Profit	Δ Reported Total Profit	Δ Reported Realized Hedge Profit	Δ Reported Realized Hedge Profit	Δ Reported Realized Hedge Profit	Δ Reported non-Hedge Profit	Δ Reported non-Hedge Profit	Δ Reported non-Hedge Profit
Δ Relative Delta Production	0.030***	0.027***	0.039***	0.007	0.008	0.018*	0.036***	0.031***	0.038***
	(4.26)	(3.83)	(3.58)	(1.22)	(1.27)	(1.88)	(4.82)	(4.17)	(3.39)
Oil Futures Risk Premia	0.002	-0.001***	-0.001***	0.007***	0.001***	0.001***	-0.001	-0.002***	-0.002***
	(1.46)	(-3.32)	(-2.81)	(5.43)	(7.90)	(6.64)	(-0.40)	(-8.10)	(-6.44)
Gas Futures Risk Premia	-0.035*			-0.067***			-0.010		
	(-1.75)			(-4.50)			(-0.45)		
Observations	273	273	273	132	132	132	194	194	194
R-squared	0.108	0.117	0.195	0.467	0.468	0.557	0.313	0.340	0.390

Panel B – Change of Hedging Profits and Change of Relative Notional Production

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Δ Reported Total Profit	Δ Reported Total Profit	Δ Reported Total Profit	Δ Reported Realized Hedge Profit	Δ Reported Realized Hedge Profit	Δ Reported Realized Hedge Profit	Δ Reported non-Hedge Profit	Δ Reported non-Hedge Profit	Δ Reported non-Hedge Profit
Δ Relative Notional Production	0.024***	0.022***	0.028***	0.005	0.006	0.012	0.028***	0.025***	0.026***
	(4.09)	(3.67)	(3.47)	(1.09)	(1.15)	(1.58)	(4.46)	(3.88)	(3.09)
Oil Futures Risk Premia	0.003	-0.001***	-0.001***	0.007***	0.001***	0.001***	-0.000	-0.002***	-0.002***
	(1.58)	(-3.34)	(-2.69)	(5.59)	(7.86)	(6.57)	(-0.25)	(-8.04)	(-6.20)
Gas Futures Risk Premia	-0.037*			-0.069***			-0.013		
	(-1.87)			(-4.66)			(-0.58)		
Observations	273	273	273	132	132	132	194	194	194
R-squared	0.104	0.114	0.192	0.466	0.467	0.552	0.302	0.332	0.381

Table 13: Hedging Profits, Hedging Activities and Market Timing Activities – Deviated from Industry Median

The dependent variables include Reported Total Profit, Reported Realized Hedge Profit and Reported non-Hedge Profit. In Panel A, the independent variables are Industry Median Delta and Delta Deviated from Industry Median. In Panel B, the independent variables are Industry Median Notional Amount and Notional Amount Deviated from Industry Median. Oil Risk Premia and Gas Risk Premia are also included. Please see Appendix A for the detailed definitions. We control for year fixed effect in column 2, 5 and 8, for both year and firm fixed effect in column 3, 6 and 9.

Panel A – Hedging Activities and Market Timing Activities Based on Industry Median Relative Delta Production

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Reported Total Profit	Reported Total Profit	Reported Total Profit	Reported Realized Hedge Profit	Reported Realized Hedge Profit	Reported Realized Hedge Profit	Reported non-Hedge Profit	Reported non-Hedge Profit	Reported non-Hedge Profit
Delta Deviated from Median	0.014***	0.014***	0.023***	0.005	0.005*	0.008	0.016***	0.016***	0.026***
	(4.82)	(4.82)	(4.28)	(1.64)	(1.66)	(1.63)	(5.27)	(5.27)	(4.65)
Industry Median Delta	0.116***			0.048**			0.150***		
	(5.64)			(2.44)			(6.15)		
Oil Futures Risk Premia	0.004***	0.001***	0.001***	0.001	0.001***	0.001***	0.006***	0.001***	0.001**
	(4.16)	(5.06)	(4.85)	(0.96)	(6.00)	(7.49)	(4.93)	(3.21)	(2.49)
Gas Futures Risk Premia	-0.055***			-0.003			-0.081***		
	(-4.37)			(-0.26)			(-5.63)		
Observations	381	381	381	186	186	186	276	276	276
R-squared	0.140	0.140	0.485	0.271	0.272	0.713	0.276	0.276	0.565

Panel B – Hedging Activities and Market Timing Activities Based on Industry Median Relative Notional Production

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Reported Total Profit	Reported Total Profit	Reported Total Profit	Reported Realized Hedge Profit	Reported Realized Hedge Profit	Reported Realized Hedge Profit	Reported non-Hedge Profit	Reported non-Hedge Profit	Reported non-Hedge Profit
Notional Deviated from Median	0.010***	0.010***	0.020***	0.005*	0.005*	0.007	0.012***	0.012***	0.023***
	(4.16)	(4.15)	(4.16)	(1.72)	(1.74)	(1.59)	(4.46)	(4.45)	(4.43)
Industry Median Notional	0.118***			0.048**			0.156***		
	(5.60)			(2.41)			(6.12)		
Oil Futures Risk Premia	0.004***	0.001***	0.001***	0.001	0.001***	0.001***	0.005***	0.001***	0.001**
	(3.90)	(4.95)	(4.64)	(0.85)	(5.96)	(7.39)	(4.65)	(3.13)	(2.37)
Gas Futures Risk Premia	-0.048***			-0.000			-0.071***		
	(-3.96)			(-0.03)			(-5.25)		
Observations	381	381	381	186	186	186	276	276	276
R-squared	0.127	0.127	0.483	0.272	0.273	0.713	0.256	0.256	0.561

Table 14: Hedging Profits, Hedging Activities and Market Timing Activities – from Residual Perspective on Industry Median

The dependent variables include Reported Total Profit, Reported Realized Hedge Profit and Reported non-Hedge Profit. In Panel A, the independent variables are regression Residuals representing market timing activities, and Predicted values representing hedging activities (we regress firm's Relative Delta Production on industry median, firm characteristics, and risk premia to get the Residual and Predicted value). In Panel B, the independent variables are Residuals representing market timing activities, and Predicted values representing hedging activities calculated from industry median Notional Amount. Please see Appendix A for detailed definition of the variables. We control for year fixed effect in column 2, 5 and 8. We control for both year and firm fixed effect in column 3, 6 and 9. We report t-statistics in parentheses. ***, ** and * represents 1%, 5% and 10% significant levels.

Panel A – Hedging Activities and Market Timing Activities Based on Industry Median Relative Delta Production

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Reported Total Profit	Reported Total Profit	Reported Total Profit	Reported Realized Hedge Profit	Reported Realized Hedge Profit	Reported Realized Hedge Profit	Reported non-Hedge Profit	Reported non-Hedge Profit	Reported non-Hedge Profit
Residual from Industry Median Delta	0.025***	0.025***	0.024***	0.014***	0.013***	0.008	0.024***	0.024***	0.028***
	(5.49)	(5.56)	(3.74)	(3.12)	(2.97)	(1.31)	(4.76)	(4.84)	(4.18)
Predicted from Industry Median Delta	0.025***	0.015**	0.004	0.015**	0.010	0.001	0.029***	0.021***	0.011
	(3.60)	(2.13)	(0.18)	(2.06)	(1.39)	(0.04)	(3.91)	(2.83)	(0.52)
Oil Futures Risk Premia	0.002**	0.001***	0.001***	0.000	0.001***	0.001***	0.003**	0.001**	0.001
	(2.19)	(3.86)	(3.24)	(0.31)	(5.54)	(5.15)	(2.35)	(2.01)	(1.58)
Gas Futures Risk Premia	-0.028**			0.006			-0.040***		
	(-2.23)			(0.52)			(-2.98)		
Observations	342	342	342	165	165	165	248	248	248
R-squared	0.131	0.174	0.484	0.307	0.327	0.711	0.233	0.292	0.563

Panel B – Hedging Activities and Market Timing Activities Based on Industry Median Relative Notional Production

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Reported Total Profit	Reported Total Profit	Reported Total Profit	Reported Realized Hedge Profit	Reported Realized Hedge Profit	Reported Realized Hedge Profit	Reported non-Hedge Profit	Reported non-Hedge Profit	Reported non-Hedge Profit
Residual from Industry Median Notional	0.019***	0.018***	0.016***	0.011***	0.010***	0.006	0.017***	0.016***	0.018***
	(4.60)	(4.57)	(2.89)	(2.94)	(2.68)	(1.28)	(3.64)	(3.63)	(2.86)
Predicted from Industry Median Notional	0.017***	0.010*	0.001	0.010	0.007	0.001	0.022***	0.016***	0.008
	(3.03)	(1.82)	(0.08)	(1.64)	(1.12)	(0.08)	(3.53)	(2.71)	(0.45)
Oil Futures Risk Premia	0.002**	0.001***	0.001***	0.001	0.001***	0.001***	0.003**	0.001**	0.001*
	(2.23)	(4.13)	(3.69)	(0.49)	(5.76)	(5.92)	(2.31)	(2.26)	(1.95)
Gas Futures Risk Premia	-0.028**			0.004			-0.040***		
	(-2.25)			(0.34)			(-2.89)		
Observations	342	342	342	165	165	165	248	248	248
R-squared	0.096	0.145	0.472	0.296	0.317	0.710	0.191	0.257	0.540

Table 15 - Regression on Reported Total Profit – Contracts for Next Year Only

For all models, the dependent variable is Reported Total Profit, and both year fixed effect and firm fixed effect are included. The independent variables in column 1, 2, 3 and 4 are delta related variables and replicate the key regressions to predict profits in Section 3. The independent variables in column 5, 6, 7 and 8 are notional amount related variables and replicate the key regressions to predict profits in Section 3. Please see Appendix A for detailed definition of variables. We report t-statistics in parentheses. ***, ** and * represents 1%, 5% and 10% significant levels.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Reported Total Profit	Reported Total Profit	Reported Total Profit	Reported Total Profit	Reported Total Profit	Reported Total Profit	Reported Total Profit	Reported Total Profit
Relative Delta Production	0.033***							
	(4.61)							
Delta Deviated from Mean		0.031***						
		(4.80)						
Residual from Industry Mean Delta			0.034***					
			(4.27)					
Predicted from Industry Mean Delta			0.012					
			(0.45)					
Residual Delta Fixed Effect				0.030***				
				(3.45)				
Predicted Delta Fixed Effect				0.066***				
				(2.75)				
Relative Notional Production					0.026***			
					(4.98)			
Notional Deviated from Mean						0.027***		
						(5.35)		
Residual from Industry Mean Notional							0.028***	
							(5.13)	
Predicted from Industry Mean Notional							-0.016	
							(-1.00)	
Residual Notional Fixed Effect								0.017**
								(2.49)
Predicted Notional Fixed Effect								0.060***
								(2.78)
Oil Futures Risk Premia	0.001***	0.001***	0.001***	0.001**	0.001***	0.001***	0.001***	0.001**
	(4.06)	(5.03)	(3.50)	(2.06)	(4.19)	(4.47)	(4.52)	(1.99)
Observations	363	363	325	303	363	363	325	303
R-squared	0.497	0.500	0.499	0.535	0.504	0.510	0.523	0.524

Table 16 - Regression on Feedback Effect – Contracts for Next Year Only

The dependent variable is Relative Delta Production in column 1, 2, and 3, and Relative Notional Production in column 4, 5 and 6. For all models, both year fixed effect and firm fixed effect are included. The independent variables are Lag Reported Total Profit and firm characteristics. These regressions replicate the key feedback effect regressions in Section 3. Column 1 and 4 examine the feedback effect on hedging activities without dividing the samples into sub-groups. Column 2 and 5 include firms with positive profit in previous year. Column 3 and 6 include firms with negative profit in previous year. Please see Appendix A for detailed definition of variables. We report t-statistics in parentheses. ***, ** and * represents 1%, 5% and 10% significant levels.

	(1)	(2)	(3)	(4)	(5)	(6)
	Relative Delta Production	Relative Delta Production	Relative Delta Production	Relative Notional Production	Relative Notional Production	Relative Notional Production
Lag Reported Total Profit	0.180	0.816	-7.351**	0.780	1.461	-8.232*
	(0.30)	(0.82)	(-2.71)	(0.95)	(1.26)	(-1.75)
Oil Futures Risk Premia	0.011***	0.010**	-0.005	0.009**	0.004	-0.001
	(3.40)	(2.20)	(-0.47)	(2.04)	(0.85)	(-0.07)
Lifting Cost per Boe	-0.010	-0.003	-0.011	-0.014	0.011	-0.028
	(-1.32)	(-0.20)	(-0.69)	(-1.28)	(0.54)	(-1.08)
Market to Book Ratio	-0.001	0.000	-0.000	-0.000	-0.002	0.011
	(-0.16)	(0.07)	(-0.02)	(-0.03)	(-0.39)	(0.65)
Leverage Ratio	-0.274	-0.751*	0.481	0.206	-0.541	1.143
	(-0.85)	(-1.76)	(0.47)	(0.47)	(-1.10)	(0.65)
Log Asset	0.189	0.379*	-0.125	0.379*	0.555**	-0.100
	(1.34)	(1.87)	(-0.37)	(1.96)	(2.36)	(-0.17)
Cash	-0.886	-1.528	-0.906	-1.171	-1.585	-2.071
	(-1.31)	(-1.53)	(-0.67)	(-1.26)	(-1.37)	(-0.88)
Inventory	-2.566	-9.375	13.138	0.355	-6.995	-8.104
	(-0.45)	(-1.14)	(0.72)	(0.05)	(-0.73)	(-0.26)
Cost of Goods Sold	-0.134	0.001	1.618	0.059	0.075	2.501
	(-0.44)	(0.00)	(1.21)	(0.14)	(0.18)	(1.08)
ROA	-0.025	-0.281	2.516*	0.239	-0.250	3.704
	(-0.08)	(-0.75)	(1.72)	(0.54)	(-0.57)	(1.46)
Revenue	0.891*	1.850**	-2.158	0.814	2.435**	-3.126
	(1.90)	(2.32)	(-1.26)	(1.26)	(2.63)	(-1.05)
Dividend	-0.248**	-0.082	-0.214	-0.488***	-0.164	-1.269
	(-2.17)	(-0.47)	(-0.49)	(-3.11)	(-0.80)	(-1.68)
Capital Expenditure	-0.584**	-1.469***	0.003	-0.717*	-1.919***	-0.417
	(-2.07)	(-3.26)	(0.00)	(-1.86)	(-3.68)	(-0.34)
S&P Rating	0.042	0.161	0.025	0.083	0.264	-0.245
	(0.34)	(0.94)	(0.09)	(0.48)	(1.33)	(-0.51)
Observations	267	157	110	267	157	110
R-squared	0.835	0.895	0.934	0.784	0.896	0.877

Table 17: Feedback Effect on Hedging Activities – Sub period 2008-2011

The models include data samples from 2008 to 2011 (data samples in year 2007 are not included). The dependent variable is Relative Delta Production. The key independent variables are Lag Reported Total Profit, Lag Reported Realized Hedge Profit and Lag Reported non-Hedge Profit. Risk premia and firm characteristics are also included as control variables. We control for year fixed effect in column 3, 6 and 9. We control for both of year and firm fixed effect in column 4, 7 and 10. Please see Appendix A for detailed definition of the variables. We report t-statistics in parentheses. ***, ** and * represents 1%, 5% and 10% significant levels.

Dependent Variable: Relative Delta Production

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Lag Reported Total Profit		1.692**	1.692**	0.492						
		(2.38)	(2.38)	(0.84)						
Lag Reported Realized Hedge Profit					2.694	2.694	1.489			
					(1.63)	(1.63)	(1.18)			
Lag Reported non-Hedge Profit								1.650*	1.650*	-0.229
								(1.72)	(1.72)	(-0.28)
Lag Oil Price Volatility	0.707*	0.926**			0.237			0.795*		
	(1.69)	(2.27)			(0.38)			(1.66)		
Oil Futures Risk Premia	-0.004	0.004	-0.001	0.003**	0.004	-0.002	0.003	-0.014	0.001	0.003
	(-0.21)	(0.24)	(-0.44)	(2.03)	(0.14)	(-0.91)	(1.47)	(-0.67)	(0.40)	(1.46)
Gas Futures Risk Premia	0.036	-0.061			-0.073			0.164		
	(0.17)	(-0.30)			(-0.22)			(0.67)		
Lifting Cost per Boe	0.001	0.001	0.001	-0.005	-0.009	-0.009	-0.009	0.007	0.007	-0.000
	(0.16)	(0.32)	(0.32)	(-0.78)	(-1.55)	(-1.55)	(-1.29)	(1.27)	(1.27)	(-0.05)
Market to Book Ratio	-0.001	-0.001	-0.001	-0.003	-0.003	-0.003	0.022	-0.002	-0.002	-0.004
	(-0.28)	(-0.23)	(-0.23)	(-0.93)	(-0.12)	(-0.12)	(1.48)	(-0.34)	(-0.34)	(-1.08)
Leverage Ratio	1.035***	0.981***	0.981***	-0.261	0.468	0.468	-0.022	1.018***	1.018***	-0.505
	(4.97)	(4.86)	(4.86)	(-0.77)	(1.47)	(1.47)	(-0.05)	(4.14)	(4.14)	(-1.08)
Log Asset	-0.073*	-0.081**	-0.081**	0.093	-0.103*	-0.103*	-0.124	-0.092**	-0.092**	0.085
	(-1.92)	(-2.18)	(-2.18)	(0.64)	(-1.84)	(-1.84)	(-0.47)	(-2.04)	(-2.04)	(0.52)
Cash	-2.448***	-2.186***	-2.186***	-0.776	-2.694**	-2.694**	-0.168	-2.092***	-2.092***	-1.207
	(-3.42)	(-3.19)	(-3.19)	(-1.05)	(-2.25)	(-2.25)	(-0.19)	(-2.79)	(-2.79)	(-1.42)
Inventory	-3.793	-3.696	-3.696	1.295	-6.427	-6.427	1.351	-5.770	-5.770	1.616
	(-0.89)	(-0.91)	(-0.91)	(0.21)	(-0.91)	(-0.91)	(0.14)	(-1.20)	(-1.20)	(0.21)
Cost of Goods Sold	-0.026	-0.165	-0.165	-0.034	-0.290	-0.290	0.225	-0.190	-0.190	-0.298
	(-0.08)	(-0.50)	(-0.50)	(-0.11)	(-0.43)	(-0.43)	(0.49)	(-0.54)	(-0.54)	(-0.84)
ROA	0.204	-0.024	-0.024	0.102	-0.611	-0.611	0.148	0.004	0.004	-0.108
	(0.54)	(-0.07)	(-0.07)	(0.30)	(-1.01)	(-1.01)	(0.35)	(0.01)	(0.01)	(-0.25)
Revenue	-0.558	-0.561	-0.561	0.726	-0.034	-0.034	0.360	-0.204	-0.204	0.558
	(-1.52)	(-1.60)	(-1.60)	(1.56)	(-0.05)	(-0.05)	(0.58)	(-0.50)	(-0.50)	(1.00)
Dividend	0.396***	0.599***	0.599***	-0.298*	0.311**	0.311**	-0.247	0.605***	0.605***	-0.280
	(6.48)	(8.40)	(8.40)	(-1.87)	(2.45)	(2.45)	(-1.32)	(7.40)	(7.40)	(-1.64)
Capital Expenditure	-0.110	0.188	0.188	0.563	-1.251*	-1.251*	0.521	0.304	0.304	0.413
	(-0.34)	(0.57)	(0.57)	(1.64)	(-1.91)	(-1.91)	(0.83)	(0.82)	(0.82)	(1.02)
S&P Rating	-0.057	-0.058	-0.058	-0.027	-0.099	-0.099	-0.249	-0.018	-0.018	0.171
	(-0.50)	(-0.53)	(-0.53)	(-0.20)	(-0.63)	(-0.63)	(-1.44)	(-0.13)	(-0.13)	(1.07)
Observations	263	256	256	256	123	123	123	187	187	187
R-squared	0.341	0.415	0.415	0.853	0.342	0.342	0.886	0.438	0.438	0.857

Table 18: Feedback Effect on Hedging Activities – Gain or Loss Status, Sub period 2008-2011

The models include data samples from 2008 to 2011 (data samples in year 2007 are not included). The dependent variable is Relative Delta Production. The key independent variables are Lag Reported Total Profit, Lag Reported Realized Hedge Profit and Lag Reported non-Hedge Profit. Risk premia and firm characteristics are also included as control variables. Column 1, 2 and 3 include firm-years with positive profits only. Column 4, 5 and 6 include firm-years with negative profits only. We control for both of year and firm fixed effect in all regressions. Please see Appendix A for detailed definition of the variables. We report t-statistics in parentheses. ***, ** and * represents 1%, 5% and 10% significant levels.

Dependent Variable: Relative Delta Production

	(1)	(2)	(3)	(4)	(5)	(6)
Lag Reported Total Profit	2.199**			-7.321**		
	(2.14)			(-2.51)		
Lag Reported Realized Hedge Profit		3.646			-4.382	
		(1.56)			(-0.23)	
Lag Reported non-Hedge Profit			0.756			-6.361**
			(0.42)			(-2.21)
Oil Futures Risk Premia	0.005*	0.010*	0.005	-0.000	0.009	-0.002
	(1.95)	(1.91)	(1.25)	(-0.08)	(0.47)	(-0.24)
Lifting Cost per Boe	0.018	0.023	0.019	-0.009	0.005	-0.008
	(1.09)	(0.39)	(0.97)	(-0.70)	(0.12)	(-0.54)
Market to Book Ratio	-0.001	-0.003	-0.001	0.000	-0.212	-0.015
	(-0.29)	(-0.09)	(-0.38)	(0.01)	(-0.14)	(-1.12)
Leverage Ratio	-0.234	-0.218	0.150	0.317	2.297	-0.693
	(-0.57)	(-0.32)	(0.22)	(0.24)	(0.46)	(-0.63)
Log Asset	0.332	0.123	0.193	-0.038	-1.402	0.140
	(1.44)	(0.25)	(0.71)	(-0.10)	(-0.49)	(0.35)
Cash	-1.679	0.554	-3.289	-1.295	-0.707	-0.911
	(-1.47)	(0.25)	(-1.63)	(-0.83)	(-0.12)	(-0.66)
Inventory	-10.531	-3.065	-15.081	0.522	-38.673	25.752
	(-1.21)	(-0.16)	(-1.16)	(0.03)	(-0.41)	(1.09)
Cost of Goods Sold	-0.227	0.042	-0.502	2.323	1.339	0.858
	(-0.69)	(0.07)	(-1.31)	(1.44)	(0.16)	(0.54)
ROA	-0.317	-0.075	-0.442	2.692	4.310	1.120
	(-0.90)	(-0.14)	(-0.91)	(1.63)	(0.54)	(0.68)
Revenue	1.237	0.583	0.817	-2.411	0.576	-0.651
	(1.49)	(0.54)	(0.70)	(-1.23)	(0.10)	(-0.29)
Dividend	-0.185	-0.216	-0.208	-0.435	-0.078	-0.027
	(-1.08)	(-0.83)	(-0.48)	(-0.84)	(-0.03)	(-0.05)
Capital Expenditure	0.171	1.049	-0.067	0.089	-0.439	0.502
	(0.32)	(0.93)	(-0.09)	(0.11)	(-0.14)	(0.54)
S&P Rating	0.153	-0.236	0.099	-0.056	0.225	0.196
	(0.91)	(-0.66)	(0.41)	(-0.17)	(0.16)	(0.50)
Observations	148	66	101	108	57	85
R-squared	0.930	0.943	0.942	0.918	0.909	0.946