

COMMODITY HEDGING THROUGH ZERO-COST COLLAR AND ITS FINANCIAL IMPACT

Amandeep Kaur¹, Amandeep Singh Rattol²

¹Institute of Management, Nirma University

²Gujarat State Petronet Limited

KEYWORDS

Options,
put option;
call option,
zero-cost collar,
NYMEX

Abstract: Option Derivatives appeared in 1990's and became popular tool of hedging and risk management. In this paper, the authors seek to study the zero cost collar option contracts for commodity hedging and its fair valuation and accounting. The paper underlines the main advances in hedge accounting proposed by IASB & IFRS 9 and tests the effectiveness of zero cost collar option strategy on NYMEX WTI crude oil in the backdrop of falling commodity prices. We underline that, while the results have a great significance from an economic viewpoint, they may also be utilized for hedge accounting purposes & accounting for time value of zero cost collar strategy.

1. INTRODUCTION

At the time of the U.S. shale boom, the fortune had favoured the bold drillers who discovered and pumped crude oil the fastest. In 2015, under the backdrop of falling crude oil prices, the winners were Oil & gas producers like Pioneer Natural Resources who had shielded themselves from the tumbling crude oil prices through use of derivative transactions. Using such transactions (refer Table 1), the Texas-based firm had locked in a minimum price for its year's production whereas its rivals were selling crude oil at the market price of around \$30/bbl, which

was not enough to cover the cost of drilling new wells.

¹ When NYMEX price is above call price, Pioneer receives call price. When NYMEX price is between put and call price, Pioneer receive NYMEX price. When NYMEX price is between the put and short put price, Pioneer receives put price. When NYMEX price is below the short put price, Pioneer receives NYMEX price plus the difference between put price and short put price.

¹ Parties have the option to extend 5000 BPD of 2015 collar contracts with short puts for an additional year with a call price of \$100.08/bbl, a put price of \$90/bbl and a short put price of \$80/bbl.

In 2014, about 15% of the Pioneer's production was hedged by swaps, which locked in a \$96.31 sale price. However, most of the company's hedges were conducted through three-way collars, which involve selling a call, buying a put, and selling a put. These collars did not cost anything and provided upside to rising crude oil prices, as well as downside protection, upto a point. The fact that the downside protection was limited started to become a point of contention as Crude oil prices continued to fall well below the short put prices in the year 2015 which exposed Pioneer, and others using this hedging technique, to unexpected downside risk. As a result Pioneer restructured its hedging technique for the following years as shown in Table 2:

Oil & Gas companies like Pioneer had no downside risk on its hedged volumes where it used swaps as a hedging technique. However, with the collars it was 100% protected only if NYMEX WTI Price falls below \$70 and stayed above the \$50/barrel of the short put. The protection provided by these hedges weakens

once NYMEX WTI Price fall below that point, meaning Oil & Gas companies receives less money per barrel as NYMEX oil prices keep falling.

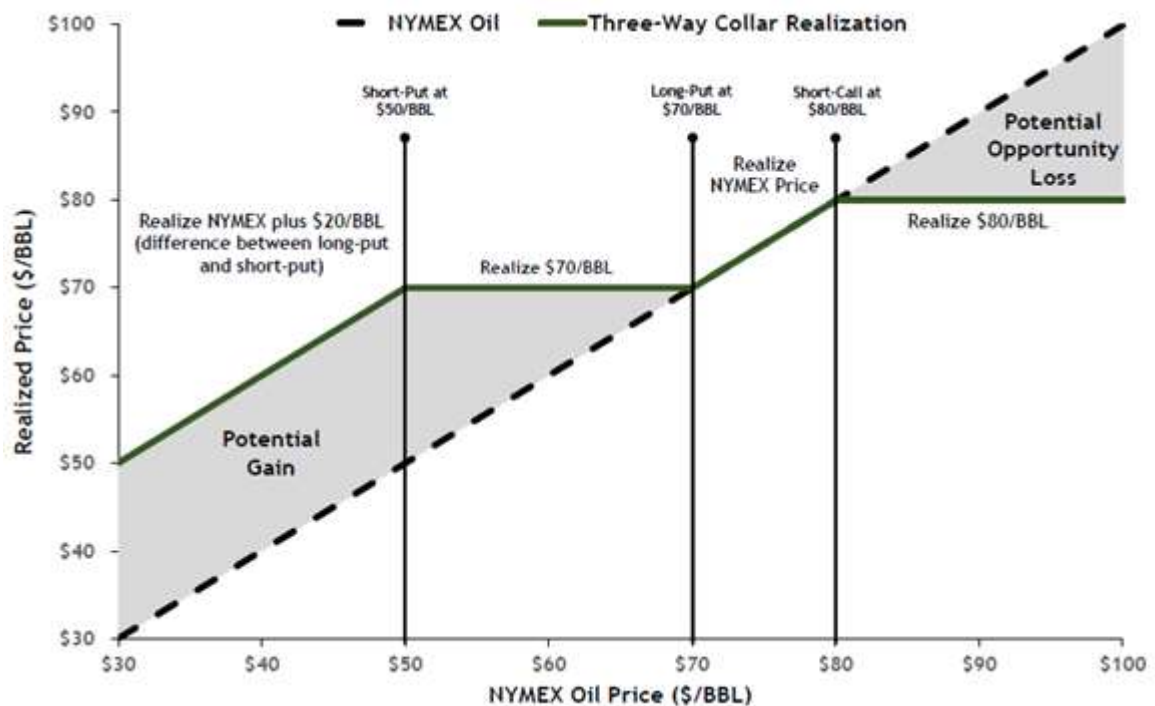
Oil & Gas firms around the world hedge production in order to protect themselves from the volatility of crude oil prices. According to risk management theories, to avoid volatility firms hedge optimally. Firms are also able to reduce the cost of financial distress and corporate tax through hedging (Smith & Stulz, 1985). Myers and Majluf (1984) studied that hedging facilitates in maintaining cash flows to finance investments internally. But not all hedges work the same. In fact, some hedges are now becoming a liability instead of insurance. Extensive uses of collars hedges are leaving such companies open to more downside risk than expected, which is now strangling their stock prices.

TABLE 1: Pioneer Natural Resources: Open Commodity Derivative Positions as of 10/30/2014

Oil	Q4 2014	2015	2016
Swaps- WTI (BPD)	15,000	-	-
NYMEX WTI Price (\$/bbl)	\$96.31	-	-
Three Way Collar (BPD) ^{1, 2}	69,000	95,767	70,000
NYMEX Call Price (\$/bbl)	\$114.05	\$99.36	\$96.86
NYMEX Put Price (\$/bbl)	\$93.70	\$87.98	\$85.62
NYMEX Short Put Price (\$/bbl)	\$77.61	\$73.54	\$74.45
% of Total Production	~85%	~85%	~45%

TABLE 2: Pioneer Natural Resources: Open Commodity Derivative Positions as of 10/30/2015

Oil	Q4 2015	2016	2017
Swaps- WTI (BPD)	82,000	4,475	-
NYMEX WTI Price (\$/bbl)	\$71.18	\$59.00	-
Three Way Collar (BPD) ^{1,2}	15,000	101.806	34,000
NYMEX Call Price (\$/bbl)	\$97.69	\$75.93	\$70.42
NYMEX Put Price (\$/bbl)	\$82.97	\$65.30	\$57.65
NYMEX Short Put Price (\$/bbl)	\$69.67	\$46.08	\$47.65
% of Total Production	~90%	~85%	~20%

FIGURE 1: Three Way Collars (\$50 by \$70 by \$80) to protect downside while providing upside exposure

In view of above background, this paper seeks to study the zero cost collar option contracts for commodity hedging and its financial impact analysis. This paper has been structured as follows: Section 2 explains briefly the literature. Section 3 describes briefly the Zero Cost Collar Hedging technique and underlines the main advances in hedge accounting proposed by IASB & IFRS 9 & describes briefly the hedge accounting under IFRS 9 and offers an overview of the traditional methods currently adopted by corporations for testing the effectiveness of their hedging strategies; Section 4 illustrates hedging of NYMEX WTI crude oil price with the collar option and applies hedge accounting treatment of derivatives from an IFRS 9 perspective. Further hedge effectiveness assessment is performed using Scenario analysis method of economic hedge effectiveness testing, and carry out Fair valuation and accounting for time value of zero cost collar hedging; and Section 5 collects some concluding remarks.

2. LITERATURE REVIEW

The implementation of hedging strategies leads to risk mitigation or not is still puzzling. Modigliani and Miller (1958) postulated that the financial risk management activities of a company are irrelevant to shareholder wealth since they have access to same risk management tools as corporate managers, hedging activities may potentially be value-increasing by mitigating a series of market imperfections. Stulz (1984) and Geczy *et al.* (1997) among others have conducted research on these hypothetical rationales for corporate risk management. They found numerous valid reasons why companies should consider hedging to maximize shareholder wealth by reducing costs related to financial distress, underinvestment problems and taxes. If we consider that hedging activities may be value enhancing due to existing market imperfections, investors should consider the information related to hedging strategies while valuing the firm.

Allayannis and Weston (2001) directly test the relation between firm value and the use of foreign currency derivatives. Empirically studying a sample of 720 large firms between 1990 and 1995, they found that the value of

firms that hedge, on average, is higher by about 5%. This hedging premium is statistically and economically significant. Carter et al (2005) studied the case of fuel hedging for a sample of U.S. airlines and report an even higher hedging premium of about 14%. They show that this financial risk is economically very significant for airlines. Moreover, they argue that hedging allows airlines to expand operations when times are bad for the industry, hence mitigating the underinvestment problem. Apparently, these issues are sufficiently important in this industry to allow a large hedging premium.

However, the interpretation of these results is debated. Guay and Kothari (2003) studied the economic effects of derivatives positions for a sample of nonfinancial derivatives users. They conclude that potential gains on derivatives are small compared to cash flows or movements in equity values, and possibly do not have an effect of the claimed magnitude.

Several features of Oil and Gas Companies make it particularly suited for an analysis of risk management policies. The volatility of crude prices is the prominent feature. This paper is focusing on implication of zero-cost collar hedging on the value of the firm. Options are the most versatile instrument and to make option strategies profitable, it is important to know not only the potential profit that can be earned by well-planned strategy, but also to understand how these investment instruments work and the risk included (Fontanills, 2005).

Hedging by options is not broadly used as forwards, it has gained popularity through the zero-cost option structures. A package with zero-cost consists of zero-cost option structures, where underlying assets are foreign currencies, currency futures, commodities, securities or securities in other than domestic currency (Hull, 2002).

3. ACCOUNTING STANDARDS – IAS 39 & IFRS 9

The International Accounting Standards Board (IASB) had issued Statement 39, or IAS 39, to make an entity's exposure to its derivative positions more transparent. Prior to IAS 39, most derivatives were carried off-balance sheet and reported only in footnotes to the financial statements. The introduction of IAS 39 for International Accounting Standards reporting has radically changed the recognition of derivatives. Both these standards require derivatives to be recorded in the balance sheet (as assets or liabilities) at fair value.

Derivatives that are not designated as hedges must be adjusted to fair value through income. Depending on the reason for holding the derivative position and the derivative's effectiveness in hedging, changes in the derivatives' fair value are recorded either in the income statement (in the case of a fair value hedge) or in a component of equity known as other comprehensive income - OCI (in the case of a cash flow hedge).

Changes in fair value of derivatives that are considered to be 'effective'³ for hedging aim will either offset the change in fair value of the hedged assets, liabilities or entity commitments through earnings or will be recorded in OCI until the hedged item is recorded in earnings. Any portion of a change in a derivative's fair value that is considered to be ineffective,⁴ may have to be immediately recorded in earnings. Any portion of a change in a derivative's fair value that the entity has elected to exclude from its measurement of effectiveness, such as the change in time value of options contracts, will be recorded in earnings. Consequently, unless they are designed as a part of a hedging relationship which qualifies for hedge accounting treatment, derivative instruments can create additional earnings volatility. Many corporations find this volatility undesirable due to the adverse impact it may have on the views of rating agencies, analysts and investors. By applying hedge accounting treatment, managers may avoid this additional volatility.

³ **Effective part** represents the portion that is offset by a change in fair value of the hedged item.

⁴ **Ineffective part** represents the portion of the change in fair value of the hedging instrument that

has not been offset by a change in fair value of the hedged item.

Hedge accounting is elective, but the problem is that companies must qualify for this treatment. To qualify, the manager must measure the effectiveness of the hedge at least each reporting period for the entire life of the hedge relationship.

In November 2013, the International Accounting Standards Board (IASB) published IFRS 9 Financial Instruments (Hedge Accounting and amendments to IFRS 9, IFRS 7 and IAS 39). Most changes relate to new hedge accounting requirements developed from the proposals in Exposure Draft ED 2010/13 Hedge Accounting⁵, issued in December 2010 as part of the third phase of the IASB's project to replace IAS 39 Financial Instruments: Recognition and Measurement.⁶

Derivatives & Hedge accounting under IFRS 9 IFRS 9 Financial Instruments is a complex standard which establishes accounting principles for recognising, measuring and disclosing information about financial assets and financial liabilities. IFRS 9 is remarkably wide in scope and interacts with several other standards (see Figure 2)⁷.

Under IFRS 9, Hedge accounting modifies the normal basis for recognising gains and losses (or revenues and expenses) associated with a hedged item or a hedging instrument to enable gains and losses on the hedging instrument to be recognised in profit or loss (or in OCI in the case of hedges of equity instruments) in the same period as offsetting losses and gains on the hedged item. Hedge accounting takes two forms under IFRS 9⁸:

2.1.1 Fair value hedge – The objective of the fair value hedge is to reduce the exposure to changes in the fair value of an asset or liability already recognised in the balance sheet. Therefore, the aim of the fair value hedge is to offset in profit or loss the

change in fair value of the hedged item with the change in fair value of the hedging instrument (e.g., a derivative). (See Figure 3).

2.1.2 Cash flow hedge or net investment hedge which is a hedge of the exposure to variability in cash flows that is attributable to a particular risk associated with all, or a component, of a recognised asset or liability; and could affect reported profit or loss.

Further under IFRS 9, the change in the hedging instrument fair value is split into two components (see Figure 4): an effective and an ineffective part.

The effective part represents the portion that is offset by a change in fair value of the hedged item and is calculated as the lower of the following (in absolute amounts):

- The cumulative gain or loss on the hedging instrument from inception of the hedge; and
- The cumulative change in fair value (present value) of the hedged item (i.e., the present value of the cumulative change in the hedged expected future cash flows) from inception of the hedge.

The ineffective part represents the hedge ineffectiveness, or in other words, the portion of the change in fair value of the hedging instrument that has not been offset by a change in fair value of the hedged item. It is calculated as the difference between the cumulative change in fair value of the hedging instrument and its effective part. Common sources of ineffectiveness for a cash flow hedge are (i) the time value of the

⁵ IASB ED/2010/13 Hedge Accounting, December 9, 2010, available at www.ifrs.org

⁶ The **existing 2015 effective date of IFRS 9** has been deleted, and the IASB has left the effective date open until all the outstanding phases of IFRS 9 are finalised.

⁷ When addressing hedging there are, in addition to IFRS 9, primarily three standards that have an impact on the way a hedge is structured: **IAS 21 The Effects of Changes in Foreign Exchange Rates**, **IAS 32 Financial Instruments: Disclosure and Presentation** and **IFRS 13 Fair Value Measurement**.

⁸ Accounting for derivatives – advance hedging under IFRS 9 by Juan Ramirez

option included in the hedging relationship, (ii) structured derivative features embedded in the hedging instrument, (iii) changes in timing of the highly probable forecast

transaction, (iv) credit/debit valuation adjustments and (v) differences between the risk being hedged and the underlying of the hedging instrument.

FIGURE 2: Relevant accounting standards for hedging

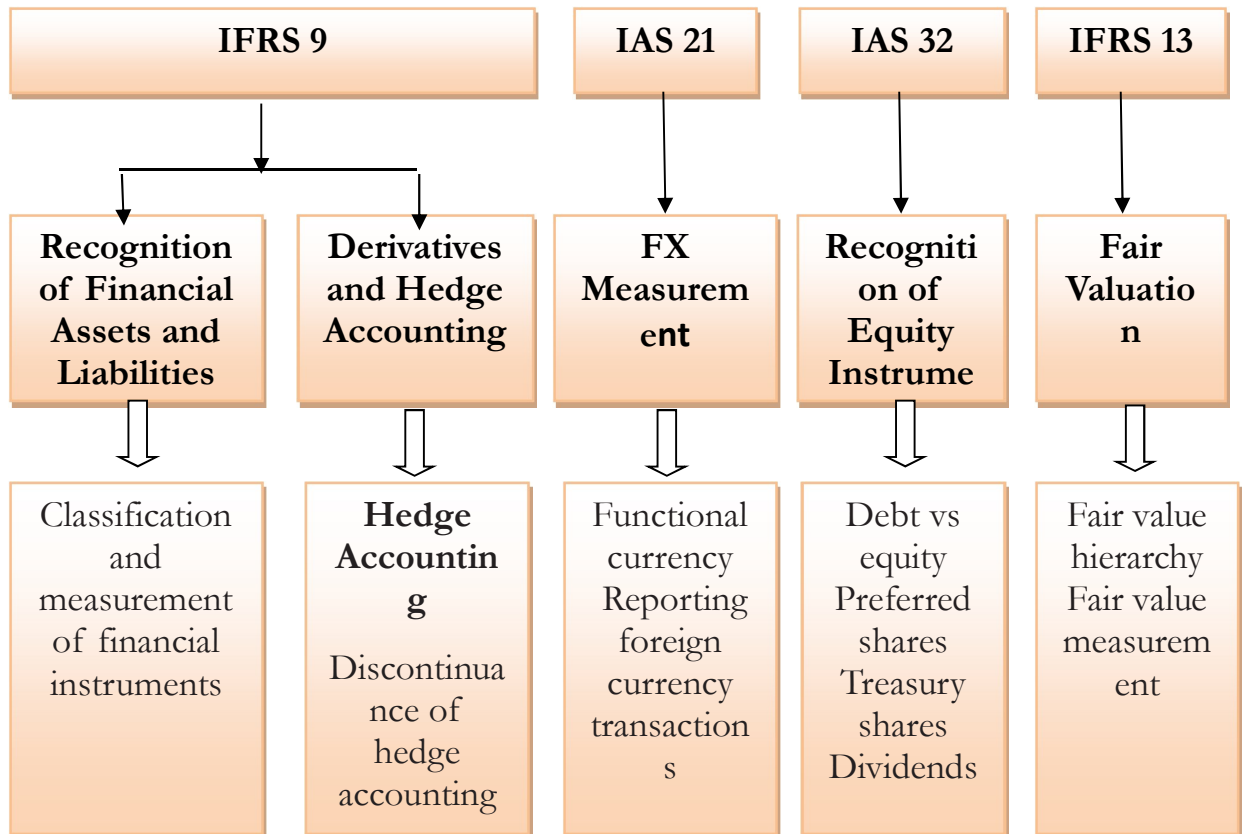
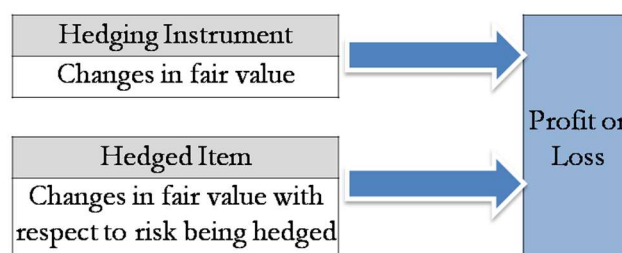


FIGURE 3: Accounting for Fair Value hedges



Accounting Recognition of the Effective and Ineffective Parts: The recognition of the change in fair value of the hedging instrument is as follows:

- The effective portion of the gain or loss on the hedging instrument is recognised

directly in a separate reserve in OCI –the “cash flow hedge reserve”.

- The ineffective portion of the fair value movement on the hedging instrument is recorded immediately in profit or loss.

2.3. Hedge effectiveness assessment:

2.3.1. *Qualifying criteria:* To qualify for hedge accounting, the hedging relationship must meet three requirements as set under IFRS standards such as eligible hedging instruments and eligible hedged items; formal designation and documentation of the hedging relationship and the entity's risk management objectives and meets all hedge effectiveness requirements.

2.3.2. *Assessment frequency:* Hedge effectiveness assessment is probably the most operationally challenging aspect of applying hedge accounting. At a minimum, whichever comes first, IFRS 9 requires that hedge effectiveness be evaluated:

- at the inception of the hedge;
- at each reporting date, including interim financial statements; and
- upon a significant change in the circumstances affecting the hedge effectiveness requirements.

Each effectiveness assessment relates to future expectations about hedge effectiveness and is therefore only forward-looking.

2.4. Assessment methods:

IFRS 9 does not specify a method for assessing whether an economic relationship exists between a hedging instrument and a hedged item. However, an entity shall use a method that captures the relevant characteristics of the hedging relationship, including its sources of hedge ineffectiveness.

The effectiveness requirement of an existence of an economic relationship between the hedged item and the hedging instrument (the "economic relationship

requirement") is commonly assessed by applying either of Critical terms method⁹; Simple scenario analysis¹⁰ method; linear regression method¹¹; or Monte Carlo simulation method¹².

IFRS 9 requires an entity to specify at hedge inception, in the hedge documentation, the method it will apply to assess the hedge effectiveness requirements and to apply that method consistently during the life of the hedging relationship. The method chosen by the entity has to be applied consistently to all similar hedges unless different methods are explicitly justified.

4. HEDGING OF NYMEX WTI CRUDE OIL PRICE WITH A COLLAR OPTION

This section covers hedging of NYMEX WTI crude oil price with a collar option to protect the Oil & Gas producer from the variability in cash flow payments pertaining to a floating NYMEX WTI crude oil price. The hedge accounting treatment of derivatives is relatively clear from an IFRS 9 perspective as mentioned in previous section.

3.1 Zero-cost collar hedge execution:

In the present Crude oil market scenario, most of the oil and gas producers are looking to hedge their December 2015 crude oil production with a NYMEX WTI costless collar or "producer costless collar" such that the producers need to be hedged against December WTI prices trading below \$45/BBL. As such, the producers are buying a \$45/BBL December WTI APO (average price) put option for a premium of \$2.10/BBL. In addition, in order to offset the cost of the \$2.10 premium associated with the \$45 put option, the producers are selling a \$71 December WTI APO (average price) call option for a premium of \$2.10/BBL.

As a result, the Oil and gas producers are entering into a collar with the following

⁹ **Critical terms method** is a qualitative method (i.e., no numerical analysis is performed)

¹⁰ **Simple scenario analysis method** is a quantitative method assessing how the hedging relationship would behave under various future scenarios.

¹¹ **Linear regression method** is quantitative method assessing, using historical information, how the

hedging relationship would have behaved if it had been entered into in the past.

¹² **Monte Carlo simulation method** is a quantitative method assessing how the hedging relationship would behave under a large number of future scenarios.

terms to hedge their December 2015 crude oil production with a NYMEX WTI costless collar. The December WTI prices were expected to trade below \$45/BBL.

Buying a \$45 December WTI APO put option for a premium of \$2.10/BBL.

Selling a \$71 December WTI APO call option for a premium of \$2.10/BBL in order to offset the cost of the \$2.10 premium associated with the \$45 put option.

When an option strategy as mentioned above is used in hedging crude oil price risk and hedge accounting is applied, IFRS 9 gives entities two choices:

1. To designate the option strategy in its entirety as the hedging instrument; which is rarely chosen; or
2. To separate the option strategy's intrinsic and time values, and to designate only the intrinsic value as the hedging instrument in the hedging relationship. The option strategy's time value is, therefore, excluded from the hedging relationship. This is the alternative commonly used because it enhances hedge effectiveness as the option's time value is not replicated in the hedged item. In other words, from a hedge accounting perspective the hedged item is assumed to lack any time value.

As a result, an oil and gas producer will designate the collar's intrinsic value (i.e., the intrinsic values of both the purchased and sold options) as the hedging instrument, and the highly expected variable NYMEX WTI crude oil price as the hedged item in a cash flow hedge of crude price risk.

3.2 Zero-cost collar hedge relationship documentation:

The producer shall document the hedging relationship as indicated in the Table 3.

Zero cost collar hedge effectiveness assessment

Hedge effectiveness of Zero Cost Collar strategy is assessed by comparing changes in the fair value of the hedging instrument to changes in the fair value of a hypothetical derivative¹³ only during those periods in which there is a change in intrinsic value. The terms of the hypothetical derivative are such that changes in its fair value exactly offset the changes in fair value of the hedged item for the risk being hedged. The main terms of the hypothetical derivative were as follows:

The change in the fair value of the effective part of the gain or loss on the hedging instrument (i.e., the collar's intrinsic value) is recognised in the cash flow hedge reserve of OCI in equity and the ineffective part of the gain or loss on the hedging instrument is recognised immediately in profit or loss.

The change in time value of the collar (the "actual time value") is excluded from the hedging relationship. Due to the absence of actual time value at the beginning and end of the hedging relationship, the changes in actual time value will be recognised temporarily in the time value reserve of OCI.

Hedge effectiveness is assessed prospectively at hedging relationship inception, on an ongoing basis at least upon each reporting date.

Firstly, for the hedging relationship to qualify for hedge accounting it is tested on various criteria under IFRS 9 for Hedge Effectiveness Assessment and Figure 5 below shows that the hedging relationship meets all the criteria to qualify for hedge accounting.

Secondly, the economic relationship between the hedged item and the hedging instrument is assessed on a quantitative basis using the Scenario Analysis method using two scenarios in which *NYMEX WTI crude oil prices* are shifted upwards and downwards by 20% and the changes in fair value of the hypothetical derivative and the hedging instrument are

¹³ The hypothetical derivative is a ***theoretical NYMEX WTI crude oil price collar*** with no counterparty credit risk, with zero fair value at the start of the hedging relationship, a floor rate of 45

\$/bbl and a cap rate of 71\$/bbl such that the collar results in a zero-cost option combination.

calculated and compared to their initial fair values.

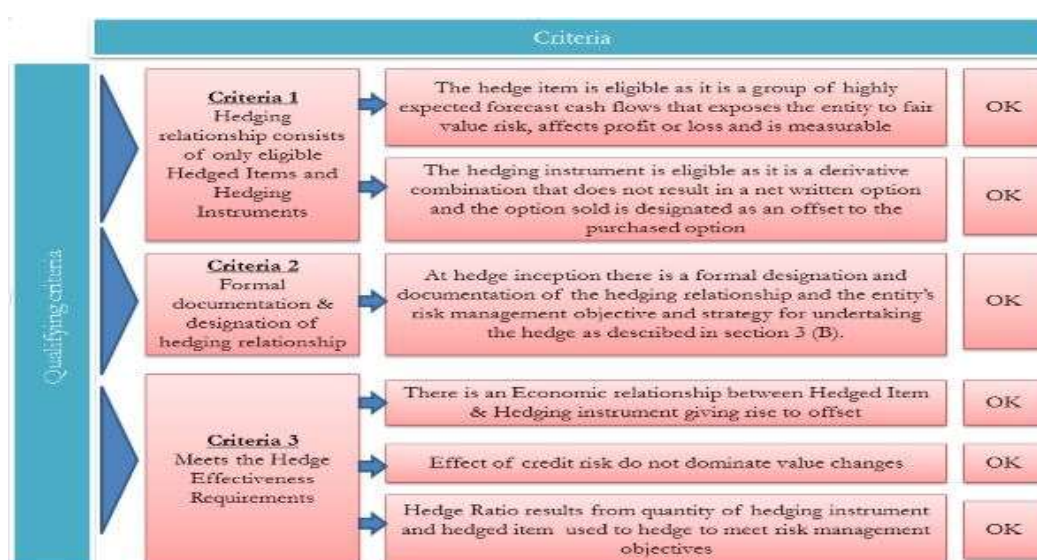
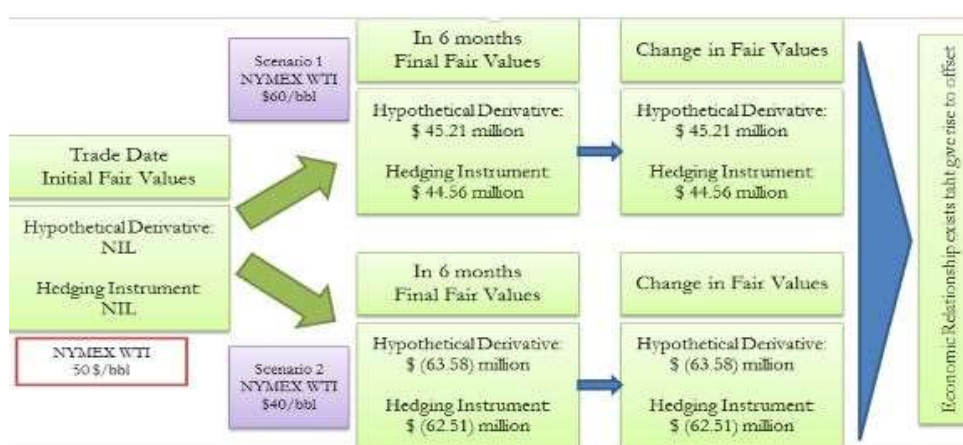
TABLE 3: Hedging relationship documentation

Risk management objective and strategy for undertaking the hedge	The objective of the hedge is to protect the variability of the cash flows due to unfavourable movements in the NYMEX WTI crude oil price below 45\$/bbl. To achieve this objective while not paying any up-front premium for the hedge, the entity does not benefit from favourable movements in the NYMEX WTI crude oil price above 71 \$/bbl. This hedging objective is consistent with oil and gas producer's overall risk management strategy of managing its exposure to NYMEX WTI crude oil price risk with focus on floor protection. Price risk. The designated risk being hedged is the risk of changes in the dollar value of the hedged cash flows due to movements in the NYMEX WTI crude oil price.
Type of hedge	Cash flow hedge
Hedged item	The cash flows stemming from the crude oil payments with reference to NYMEX WTI linked crude oil contract issued on 31 December 2015 with a 5-year term, for a 1.00 million bbl of crude oil notional, and a NYMEX WTI crude oil price.
Hedging instrument ¹⁴	The intrinsic value of a zero-cost collar (the combination of a purchased floor and a sold cap). The main terms of the collar are a combination of: 1) Contract number 145668: a long \$45 December WTI APO (average price) put option for a premium of \$2.10/BBL for 1.00 million barrels for expiry on 31 December 2020. Because it is an exchange traded instrument, the credit risk associated with the instrument is considered to be very low. 2) Contract number 145669: a short \$71 December WTI APO (average price) call option for a premium of \$2.10/BBL in order to offset the cost of the \$2.10 premium associated with the \$45 put option. The counterparty to the collar is BP Singapore and the credit risk associated with this counterparty is considered to be very low i.e. "AA" rated or better. For the avoidance of doubt, the collar's time value is excluded from the hedging relationship.

¹⁴ **Chicago Mercantile Exchange (CME)** - Crude Oil Options Contract Specs

TABLE 4: Hypothetical derivative terms

Floor terms		Cap terms	
Start date	31 December 2015	Trade date	31 December 2015
Buyer	Oil and Gas producer	Buyer	Credit risk-free counterparty
Seller	Credit risk-free counterparty	Seller	Oil and Gas producer
Notional	1.00 million bbl of crude oil	Notional	1.00 million bbl of crude oil
Maturity	5 years (31 December 2020)	Maturity	5 years (31 December 2020)
Floor rate	45 \$/bbl	Cap rate	72 \$/bbl ¹⁵
Underlying	NYMEX WTI Contract	Underlying	NYMEX WTI Contract

FIGURE 5: Effectiveness assessment results at inception**FIGURE 6:** Scenario analysis assessment

¹⁵ The Cap rate of the hypothetical derivative (72\$/bbl) is different from that of the hedging instrument (71\$/bbl) due to the absence of CVA (**Credit Value Adjustment**) in the hypothetical derivative (the counterparty to the hypothetical derivative is assumed to be credit risk-free).

The cumulative change in fair value of the hedging instrument over that of the hypothetical derivative resulted in a degree of offset of 98.5% under Scenario1 and 102% under Scenario 2. Based on these results, it is concluded that an economic relationship existed between the hedged item and the hedging instrument.

3.4 Collar strategy's fair valuations, effective/ineffective amounts and cash flow calculations

3.4.1 Fair valuations of hedging instrument

IFRS 9 does not specify how to calculate the intrinsic value of cap (or a collar). The most accurate way is to calculate for each caplet/floorlet the present value of an undiscounted intrinsic amount by comparing the implied NYMEX WTI rate with the cap/floor rate. The sum of the discounted values yields the intrinsic value of the cap/floor. The time value of the collar was calculated as follows:

TABLE 5: Collar fair valuation on 31 December 2015

Date	NYMEX WTI rate	Discount factor	Floor intrinsic value (undiscounted) (1) ¹⁶	Cap intrinsic value (undiscounted) (2) ¹⁷	Total intrinsic value (present value) (3) ¹⁸
31-Dec-2016	47 \$	0.9685	-0-	-0-	-0-
31-Dec-2017	50 \$	0.9667	-0-	-0-	-0-
31-Dec-2018	55 \$	0.9299	-0-	-0-	-0-
31-Dec-2019	60 \$	0.8904	-0-	-0-	-0-
31-Dec-2020	70 \$	0.8507	-0-	-0-	-0-
CVA/DVA					-0-
Total intrinsic value					-0-
Collar Time value (4) ¹⁹					-0-
Collar Fair value (5) ²⁰					-0-

TABLE 6: Collar fair valuation on 31 December 2016

Date	NYMEX WTI rate	Discount factor	Floor intrinsic value (undiscounted) (1)	Cap intrinsic value (undiscounted) (2)	Total intrinsic value (present value) (3)
31-Dec-2017	47\$	0.9591	-0-	-0-	-0-
31-Dec-2018	45\$	0.9146	-0-	-0-	-0-
31-Dec-2019	38\$	0.8705	70,00,000	-0-	60,93,500
31-Dec-2020	40\$	0.8275	50,00,000	-0-	41,37,500
CVA/DVA ²¹					<4,000>
Total intrinsic value					102,27,000
Collar Time value (4)					62,51,000
Collar Fair value (5) ²²					164,78,000

¹⁶ (1) 1 mn bbl × max (NYMEX WTI rate – 45\$/bbl

¹⁷ (2) <1 mn bbl> × max(71\$/bbl - NYMEX WTI rate; 0)

¹⁸ (3) (Undiscounted cap intrinsic value + Undiscounted floor intrinsic value) × Discount factor

¹⁹ (4) Collar time value = Collar total fair value – Collar intrinsic value

²⁰ (5) Initial fair value was nil, calculated using the Black–Scholes model

²¹ CVA = {Credit Risk – free settlement amount} * Probability of Default (PD) * Loss Given default (LGD)

²² Fair value calculated using the Black–Scholes model

The following table summarises the split between the collar's intrinsic and time value at each reporting date:

TABLE 7: Collar's intrinsic and time value at each reporting date

Date	Collar intrinsic value	Collar time value	Collar total fair value	Period change in intrinsic value	Period change in time value	Period change in total fair value
31-Dec-2015	-0-	-0-	-0-	—	—	—
31-Dec-2016	102,27,000	62,51,000	164,78,000	102,27,000	62,51,000	164,78,000
31-Dec-2017	91,30,000	53,00,000	144,30,000	<10,97,000>	<9,51,000>	<20,48,000>
31-Dec-2018	-0-	11,70,000	11,70,000	<91,30,000>	<41,30,000>	<132,60,000>
31-Dec-2019	-0-	1,20,000	1,20,000	-0-	<10,50,000>	<10,50,000>
31-Dec-2020	-0-	-0-	-0-	-0-	<120,000>	<120,000>

3.5 Effective and ineffective amounts:

The following table summarises the fair value cumulative changes of the hedging instrument (i.e., the collar's intrinsic value) and the hypothetical derivative (which had intrinsic value only):

TABLE 8: Intrinsic value of hedging instrument and the hypothetical derivative

Date	Hedging Instrument fair value	Cumulative change	Hypothetical derivative fair value	Cumulative change
31-Dec-2015	-0-	—	-0-	—
31-Dec-2016	102,27,000	102,27,000	92,27,000	92,27,000
31-Dec-2017	91,30,000	91,30,000	91,00,000	91,00,000
31-Dec-2018	-0-	-0-	-0-	-0-
31-Dec-2019	-0-	-0-	-0-	-0-
31-Dec-2020	-0-	-0-	-0-	-0-

The ineffective part of the change in fair value of the hedging instrument was the excess of its cumulative change in fair value over that of the hypothetical derivative.

TABLE 9: Effective part & Ineffective part of the hedging instrument

Date	31-Dec-16	31-Dec-17	31-Dec-18	31-Dec-19	31-Dec-20
Cumulative change in fair value of hedging instrument	102,27,000	91,30,000	0	0	0
Cumulative change in fair value of hypothetical derivative	92,27,000	91,00,000	0	0	0
Lower amount	92,27,000	91,00,000	0	0	0
Previous cumulative effective amount	-	92,27,000	91,00,000	0	0
Available amount	92,27,000	<127,000>	<91,00,000>	0	0
Period change in fair value of hedging instrument	102,27,000	<10,97,000>	<91,30,000>	0	0
Effective part	92,27,000	<127,000>	<91,00,000>	0	0
Ineffective part	10,00,000	<9,70,000>	<30,000>	0	0

3.6 Time Value Reserve Amounts:

Under IFRS 9, when the time value component of an option is excluded from the hedging relationship, its cumulative change in fair value from the date of designation of the hedging instrument is temporarily accumulated in OCI to the extent that it relates to the hedged item.

In our case, due to the absence of actual time value at the beginning (31 December

2015) and end (31 December 2020) of the hedging relationship, changes in actual time value were recognised temporarily in the time value reserve of OCI, as shown in the table below. No reclassification to profit or loss was carried out during the term of the hedging relationship as the carrying value of the time value reserve in OCI was expected to be nil at the end of the hedging relationship.

TABLE 10: Amounts to be recognised in the time value reserve of OCI (in \$)

	31-Dec-16	31-Dec-17	31-Dec-18	31-Dec-19	31-Dec-20
New entry in reserve	62,51,000	<9,51,000	<41,30,000>	<10,50,000>	<120,000>
Reserve carrying value	62,51,000	53,00,000	11,70,000	120,000	0

5. FINAL REMARKS

As may be observed from hedge effectiveness assessment of zero cost collar strategy, the collar had no intrinsic value at the start of the hedging relationship because both the cap rate (71 \$/bbl) and the floor rate (45 \$/bbl) were well “away” from the projected NYMEX WTI rates. The accounting for the time value of a collar that has a zero time value both at the start and end of the hedging relationship is relatively simple, as all the changes in time value are recognised in the

time value reserve of OCI and no reclassification is needed.

A non-zero intrinsic value at the start of a hedging relationship has important operational implications since the entities would need to keep track of the intrinsic and time values of each caplet/floorlet and compare them with the intrinsic and time values to the corresponding caplet/floorlet of the hypothetical derivative. As a result, effective/ineffective amounts have to

be separately calculated for each caplet/floorlet combination, which is a complex exercise.

Oil & Gas producers, Traders and portfolio managers judge the effectiveness of their hedge strategies in terms of volatility reduction. In order to minimize the operational burden of hedge accounting, management therefore should consider the methods or tools used for risk management purposes and evaluate which methods are appropriate for hedge

effectiveness assessment. Such an approach would be in line with the objective of the new hedge accounting requirements, as described in IFRS 9. The aim is to better reflect the effect of the entity's risk management activities in the financial statements. This might include Value at Risk calculations, volatility reduction methods or other approaches such as Monte Carlo simulation for testing the hedge effectiveness, which shall be the future scope of this research paper.

REFERENCES

- Allayannis, George, and James Weston, (2001), The use of foreign currency derivatives and firm market value, *Review of Financial Studies* 14, 243–276.
- Carter, David, Daniel Rogers, and Betty Simkins, 2005, Does fuel hedging make economic sense? The case of the U.S. airline industry, *Financial Management*, forthcoming.
- Fontanills, G.A. (2005). The Options Course. High Profit & Low Stress Trading Methods. Second Edition. New Jersey: John Wiley & Sons.
- Hull, J.C. (2002). Fundamentals of Futures and Options Markets. New Jersey: Financial Times Prentice Hall.
- Guay, Wayne, and S. P. Kothari, 2003, How much do firms hedge with derivatives? *Journal of Financial Economics* 80, 423–461.
- IASB (2003), IAS 39 Financial Instruments: Recognition and Measurement, December (1998), revised version December (2003).
- IASB (2013), IFRS 9, Financial Instruments: Recognition and Measurement.
- IASB (2013), IFRS 13, Fair Value Measurement.
- Miller, M., and Franco Modigliani, (1958), The cost of capital, corporation finance and the theory of investment, *American Economic Review* 53, 261–267.
- Myers, S.C., and N.S. Majluf, (1984), Corporate financing and investment decisions when firms have information that investors do not have, *Journal of Financial Economics* 13(2), 187–221.
- Stulz, René, (1984), Optimal hedging policies, *Journal of Financial and Quantitative Analysis* 19, 127–140.
- Smith, C.W., and R.M. Stulz, (1985), The determinant of firms' hedging policies, *Journal of Financial and Quantitative Analysis* 20(4), 391–402.