RISK MANAGEMENT ACTIVITIES FOR OIL AND GAS PRODUCERS AND THE IMPACT ON FIRM VALUE

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Approval of the Institute of Social Sciences

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PLAGIARISM

I hereby declare that all information in this thesis has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work; otherwise I accept all legal responsibility.

Eren YILDIZ SAVAŞ

DEDICATION

To My Beloved

Father, Mother and Husband

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ABSTRACT

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This thesis questions the hedging activities of oil and natural gas firms if it is successful for reducing financial risks. The performance of companies is proxied by Tobin's Q and panel regression models are built to estimate the coefficients for firm value and derivative use. The speculative use of derivatives is eliminated in models by the regulations under IFRS and GAAP. 76 companies from IHS Markit Database are deployed in the model. Based on the availability of disclosures, data period is covering 2007 to 2016. Data includes Global, European, Russian, Asian, Canadian and Other Integrated Companies as well as South & Central International Oil Companies, Large North American Exploration and Production (E&P) Companies, Canadian E&Ps and Trusts, Outside North America E&Ps. The results give critical information regarding asymmetric information and signalling effect. Since the coefficient of derivatives use is negative, it shows the critical meaning of disclosures on the financial healthiness. If companies are publishing high level of hedging activities, it might be a warning for investors to avoid investing at that company.

Keywords: Risk management, energy, firm value

ÖZET

PETROL VE DOĞAL GAZ ÜRETİCİLERİNİN RİSK YÖNETİMİ AKTİVİTELERİ VE FİRMA DEĞERİ ÜZERİNDEKİ ETKİSİ

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Bu tezde petrol ve gaz firmalarının riskten kaçınma faaliyetlerinin riski azaltmaktaki başarısı değerlendirilmektedir. Firmaların performansları Tobin'in Q'su ile temsil edilerek panel regresyon modelleri ile firma değeri ve türev araç kullanımı arasındaki ilişki ölçülmektedir. Spekülatif amaçlı kullanılan türev araçlar UFRS ve Genel Kabül Görmüş Muhasebe İlkeleri'nde yer alan düzenlemeler ile elimine edilmiştir. Modeller IHS Markit veri tabanından alınan 76 firma ile kurulmuştur. Ulaşılabilen firma verilerine istinaden veriler 2007 - 2016 yılları arasını kapsamaktadır. Veriler, Uluslararası, Avrupa, Rusya, Asya, Kanada, ve diğer entegre petrol, doğal gaz firmalarının yanı sıra, Güney ve Merkez Amerika Uluslararası Petrol ve Doğal Gaz firmalarını, Büyük Kuzey Amerika Petrol Arama ve Üretim Firmalarını, Kanada Petrol Arama ve Üretim Firmaları ile Tröstlerini ve Kuzey Amerika dışındaki Petrol Arama ve Üretim Firmalarını kapsamaktadır. Tez sonuçları simetrik olmayan bilgi ve sinyal etkisi ile ilgili önemli bilgiler sağlamaktadır. Türev araç kullanımının firma değeri üzerindeki etkisinin negatif olması, bu tür açıklamaların firmanın finansal sağlığı açısından önemli bilgi içerdiğini göstermektedir. Firmaların türev araçları yoğun olarak kullanmasının yatırımcıların firmaya yatırım yapmaması için bir uyarı olarak görüldüğü değerlendirilmektedir.

Anahtar Kelimeler: Risk yönetimi, enerji, firma değeri

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1. INTRODUCTION

In an efficient market, the hedging activities of a company doesn't have any impact on firm value. Nonetheless, frictions such as the information asymmetry, government restrictions, taxes etc. keep the firms away from Modigliani-Miller world.

The power of most of the industrial firms is that they could change the price of the goods at certain times to adjust the economic situation. However, it is not possible for oil and gas companies, yet oil and natural gas prices are set in stock market. Clearly, lack of flexibility in oil and gas sector makes the undiversified Oil and Gas Exploration and Production firms, vulnerable and the commodity price, primary risk. Not only the price of oil, but also exchange and interest rate risks are reflected in stock price movements, considering oil and gas companies' cross-border revenues and costs.

Oil is still the primary source of energy. After the fairly stable energy market conditions in the 70's, Middle East realized their importance in the market and OPEC takes control of oil supply. Hence, political decisions became the key factor over transparent and open energy markets. The first energy contract, investors secured themselves with, was Heating Oil (Gasoil) Futures contract that was traded in 1979. The first oil swap was traded in 1986. In 1991, the Gulf War accelerated the trade volume of energy derivatives.(James, 2003)

This research tries to identify if there is a hedging premium for oil and natural gas companies. The motivation behind this topic is related to the changes in the economic factors. Since 2011, Brent oil prices have fluctuated from $30 to $125. It may accelerate the commodity price risk for companies, which take the commodity price primary or secondary risk. In Turkey, not only the Brent oil price fluctuated, but also the currency exchange rate. Since 2011, USD rate went from 1.5 to 4.9 against Turkish Liras. It may increase the currency risk and the need for companies to act against the volatility. Under these conditions, companies which had golden years under $125 conditions might not invest properly and companies who have higher debts under lower price situations might also face with interest rate risk. For BP (2017), if the floating interest rate increases by one percentage point in 2017, finance costs will increase by $488 million. The uncertainty and the impact of the event rises clearly through the years which also indicates the increase in risk. Companies under these circumstances should have an active management for the less profitable and more volatile environments. The question of this research rises at this point, if the hedging activities are good instruments for the investors to value the firm positively in such situation.

In the literature, there are some contrary ideas. Some researchers found supporting evidence for hedging premium. Nance et al. (1993) concluded hedging activities increase firm value by decreasing tax liabilities, transaction costs and agency problems. Rene M.Stulz (1996) emphasized the importance of risk management and the positive impact on financial distress and outside debt.

Some researchers found different companies act differently. Carter et al. (2004) conducted a research on airline companies. Since those companies have oil as their primary operational expenditure item, big companies which actively manage hedging activities during downturns benefit from hedging. However, small firms prefer not to hedge and not to profit from hedging. According to Lookman (2004), Exploration and Production (E&P) firms and Integrated firms differ. Exploration and Production Firms take the price risk as primary risk and they suffer from hedging. However, integrated firms benefit from hedging.

Studies also resulted that hedging has negative impact on firm value. Mayers & Smith (1990) found that outstanding debt are agency problems are the main incentives to use hedging which may have negative impacts on firm value. Booth et al. (1984) noted that financial distress is the main incentive to use hedging which shows the weakness of the company.

There are inconclusive studies as well. Ayturk et al. (2016) found no evidence for hedging premium. Jin & Jorion (2006)discussed the risk factors and divided it to easy to detect and hard to detect. They concluded that there is no added value of hedging. Bartram et al. (2011) found positive impacts of hedging activity in terms of lower cash flow volatility, however couldn’t find high significance on firm value impact.

The literature has a broaden perspective regarding the topic, however, since many companies avoided the numeric disclosures until 2005, most of the studies are either theoretical or covering a small area. After 2005, IFRS and GAAP regulations force the companies to disclose hedging related activities in their financial statements. This study aims to be a pioneer as a quantitative and worldwide research.

In recent years, finance sector is more global than ever. Hence, investors need to understand and compare financial statements of a company from a country to another company from a different country. It is the main reason for many companies to follow standardized rules and the regulatory authorities to force companies for such standards. It is also good for researchers to include more companies in studies and have robust results.

This study includes companies who are either following IFRS or GAAP rules and publish their hedging activities in their financial reports. In accordance with IFRS 7 Financial Instruments: Disclosures (IASB, 2008), a reporting entity is required to provide disclosures in its financial statements that enable users to evaluate the significance of financial instruments for the entity's financial position and performance as well as the nature (and extent) of risks arising from financial instruments and how the entity manage those risks. IHS Markit database is used for the data. There were 198 companies in the database, however, companies which doesn’t have complete data to analyse are eliminated for better results. This study identifies 76 exploration, production and integrated oil and gas firms which use hedging instruments and recorded in their balance sheet or income statement. Based on the availability of disclosures, data period is covering 2007 to 2016. STATA is used for modelling and tests.

For modelling purposes, the data is firstly tested for unit root, heteroskedasticity and autocorellation. 11 panel data models are built to investigate the main indicators of firm value and hedging activities.

The results of this thesis are quite important because a recent regulation which has a critical impact on reducing information asymmetry might lead different investor behaviour. This study is different from other articles because it is recent, quantitative and covering regions including Global Integrated Oil Companies, European Integrated Oil Companies, Russian Integrated Oil Companies, South & Central American International Oil Companies, Asian Integrated Oil Companies, Other Integrated Oil Companies, Canadian Integrated Oil Companies, Large North American Exploration and Production(E&P) Companies, Canadian E&Ps & Trusts, Outside North America E&Ps.

This thesis has 5 sections. After introduction, the theoretical background is overviewed. Main features of energy markets, derivatives and energy derivatives, global oil and gas energy markets, financial risks of using derivatives and international accounting standards for companies to disclose their hedging activities are discussed in that part. Related literature is also tabulated and reviewed in this section.

In third section, the econometric background, features of the data and methodology are described. The assumptions, details about the model, pre-tests and post-tests results are discussed. The variables and proxy selection are also explained in this session.

In fourth section, the hypothesis and model results are discussed. The model definitions, robustness tests and the main implications are reviewed in this section. In fifth section, conclusion includes all results, all discussions in literature, further research suggestions and the latest remarks regarding the scope of this thesis.

2. THEORETICAL BACKGROUND

2.1. DERIVATIVES MARKET

Hull (2012) described derivatives as an instrument whose value depends on the underlying variables' value.

The history of futures are as old as Mesopotamia, Hellenistic Egypt and Roman World. Byzantine Empire, Sephardic Jews spread derivative trading to Spain in 16^{th} Century. Derivatives were also used as a means of trading from Amsterdam to England in 17^{th} and 18^{th} century and France to Germany in 19^{th} century.(Weber, 2009)

"Derivative contracts emerged as soon as humans were able to make credible promises." Hence, history of derivatives was not revealed in early ages because it was private agreements between parties. (Weber, 2009)

Bruges was leading financial activities from the 12^{th} to the 15^{th} century, Antwerp in the 16^{th} century, and Amsterdam in the 17^{th} century. Bruges was a centre for the trade of wool, cloth and other commodities. Around 1540, Antwerp legalized the negotiability of bills of exchange and a royal decree made contracts for future delivery transferable to third parties. At about this time, an important innovation occurred in derivative markets. Merchants discovered that there is no need to settle forward contracts by delivering the underlying asset, as it is sufficient if the losing party compensates the winning party for the difference between the delivery price and the spot price at the time of settlement. Contracts for differences were written on bills of exchange, government bonds and commodities. (Weber, 2009)

Hull (2012) emphasized the importance of derivatives in finance in the last 30 years. Forward, futures contracts, swaps, options, and other derivatives are used by banks and investors. Derivatives are also issued with bonds, added to compensation plans, embedded in capital investment opportunities, used to transfer risks in mortgages from the original lenders to investors, etc.

Derivatives seem to appear in energy markets relatively new, however, the structure of options is similar to traditional supply and purchasing agreements in terms of providing flexibility in price, volume, timing and location of delivery. (Clewlow & Strickland, 2000)

The first future oil exchange was built in 1977 on heating oil as New York Mercantile Exchange.

International Swaps and Derivatives Association (ISDA, 2017a) stated that the notional outstanding of derivatives was $544 trillion by June 2016. It was $492.7 trillion in December 2015 and $551 trillion in June 2015. In June 2016, derivatives market was leaded by interest rate derivatives with $418.1 trillion, followed by FX derivatives with $74 trillion, credit derivatives with $11.9 trillion, equity derivatives with $6.6 trillion and commodity derivatives with $1.4 trillion.

The trading activity is dominated by US and UK. France, Hong Kong, Singapore, Japan and Australia are other key players in the market. (ISDA, 2017b) Companies, which have obligations in the future would like to limit the volatility of either commodity prices, interest rates, credit or equity balances. Figures show that derivatives are the main instruments for the purpose of hedging.

Derivatives as a hedging instrument can be used for industrial stability of the firms;

- Manufacturing: Manufacturing firms use derivatives to limit the cost of debt for the new investment and plants.

- Exporting: Companies with overseas revenues can lock the exchange rate with derivatives to create stability and ability to compete.

- Food Production: Seasonality is a big problem in food sector. To avoid weather risk, livestock, and energy risk, derivatives is a good option.

- Energy: Explorers, producers and distributors have many stakeholders and they would like to stabilize the input prices to decrease exposure for both supply and demand side.

- Financial Services: Financial Institutions borrow and lend at different interest rates, currencies, which increase their need to manage their balance sheet with futures or swaps etc.

- Transport: For airlines, fuel cost takes the biggest portion, to eliminate the oil price risk and keep ticket prices at affordable level is possible with derivative contracts.

- Pensions: Pension pots are really valuable for the retirees as they are the guarantee for the golden ages. Hence, it is possible to create funds without inflation or interest risk.

- Insurance: Insurance sector is vulnerable if the paid premiums don't meet insurance claims. (ISDA, 2017b)

2.2. OIL AND NATURAL GAS MARKETS

Crude oil market is the largest commodity market in the world with greatest trading hubs in London, New York and Singapore. Crude oil's gravity and sulphur content mainly define the quality of the oil. Oil, pumped from North Sea oil wells create Brent benchmark, which is estimated to reference the pricing of two thirds of the world's oil supply.

New York Mercantile Exchange (NYMEX) is where crude oil and natural gas are priced in the US. Crude oil, with less than 0.5% sulphur, namely "sweet" oil, is the main quoted crude price in this market.

Natural gas market is structured differently, since there are different market participants and customers. On the demand side, main customers are industrial, residential and commercial, with a fast-growing share of generating electricity. Other market participants are gas producers, pipeline companies, local delivery companies and marketers. (Eydeland & Wolyniec, 2003)

2.3. MAIN FEATURES OF ENERGY MARKETS

- Seasonality: The demand and supply of energy in general, and power in particular, tends to be highly affected by seasonality. The demand of natural gas increases with the low temperature, and prices go up in winter while lowers in summer when there is less demand.

- Sensitivity to Location: Trading centres are created in specific places to centralise commercial activities. It is not the case for energy suppliers and energy users, hence energy markets are decentralised. This becomes a problem because when an energy company signs a future contract in, for example, New York, the energy price is still dependent on the location of the energy company. The price can actually be very different from the local market price that we wish to hedge. It is the geographical risk, a company should deal with. In the common capital markets, one unit of some currency holds equal value everywhere, otherwise obvious arbitrage opportunities would arise. This is simply not possible in energy markets, for numerous reasons, like the limits of capacity of the power grids or the supply rate in that area.

- Mean Reversion: In energy markets, price spikes, or price events are common, in contrast to equity markets. The market moves around the equilibrium price, but there is higher persistence of positive actions compared to negative ones (Cartea, Figueroa, & Geman, 2009). For the other financial occasions, the incidents are fewer but they are more persistent (Pilipovic, 2007) The different situation for energy market can be explained by its sensitivity to changes in supply and demand. War, high rainfall or natural catastrophes may affect the energy market severely.

- Impact of Storage: The energy supplier could manage the price risk by producing or purchasing the energy, e.g. oil/gas/uranium, in the current period and storing it for later. One disadvantage with this approach is the cost of storage, which drives up the forward/future contract prices. Another more pressing concern is the inability to store electricity. The storage limitations are contributing to the high volatility of energy prices. This issue applies distinctively to power, further increasing the level of volatility of prices. In comparison, in the money markets you can easily store your contract, which usually is a piece of paper or an electronic document.

- Big Difference Between Long and Short Term: The short-term forward contracts are concerned with produced energy supply for today or up to the next couple of months. Long-term contracts, for more than six months or similar have to incorporate the issue of future possible supply of energy, which might differ heavily from today or last year.

- Relatively New Market: Since the research in energy market is relatively newer, there is still many in energy markets to be uncovered, there are still a lot of flaws and a comparatively higher level of uncertainty for modelling purposes than in other markets.

- Complex Derivative Contracts: Consistently the hedging, trading and risk quantification abilities are being developed to become more refined and complex. Whereas the plain vanilla options still play a significant part in money markets, their use for energy is still a concern. These markets demand a more refined sort of derivative, for speculative or hedging purposes. The derivatives used might range from more commonly known “Asian” or “Barrier” options, to far more complicated weather derivatives. With more complex derivatives come bigger problems of effectively pricing these derivatives. (Bjerstaf & Södergren, 2012)

2.4. ENERGY DERIVATIVES

"Companies must take risks if they would like to survive and prosper." (Hull, 2012) It is very important to understand the risk portfolio for the companies to act accordingly. They will first understand if the risk is acceptable or not and if the risk is unacceptable, then there should be actions to be taken.

Hedging aims to help the investor to offset the price risk of commodities and neutralize the volatility on the balance sheet. The critical thing in hedging is that, it doesn't create an always-winning environment, it creates a stable environment.

Table 1. Long Commodity Position Exposure Results

Economic Event	Actual Commodity Exposure	Desired Hedge Exposure
Commodity Prices Fall	Loss	Gain
Commodity Prices Rise	Gain	Loss

2.4.1. Risk Management

Risk can be defined as the uncertainty of an event to occur and the positive or negative impact on a company. The uncertainty relies on two elements of the event; the first one is the probability of the event to happen, the second one is the consequences of that event if it occurs. The magnitude of the risk are defined by those elements.

The risk management follows 5 main steps;

1. Identifying Risk: That is more likely the most important step to correctly describe and recognize the risk of a company's interest.

2. Analysing Risk: The second step is understanding the potential outcomes of the risk. The probability and consequences perception of the management would result with the action or no action.

3. Evaluating and Ranking the Risk: The acceptability of the risk level in terms of probability and consequences should be decided by the management. If the risk is not acceptable, then there should be hedging actions to be taken.

4. Risk Response Planning: After identifying, analysing and evaluating the risk from the companies acceptable risk level framework, the treatment plan should be created. As accepted in the literature, the downturns in economy might have new investment opportunities. Evaluating all options, preventing or aggressive strategies should be planned starting from the highest risk levels to lower risk levels.

5. Monitoring and Reviewing the Risk: At that level it is important to learn from own actions for better management in the future. It is critical to report all the pros and cons for hedging activities as well as speculative activities for management to increase the firm value.

2.4.2. Financial Risk Factors

Market Risk: This risk arises from market price movements which has an effect on company performance. An energy company is sensitive to oil, natural gas and power prices which might affect the assets, liabilities or expected cash flows of that company. Companies aim to build a control framework and a well-structured risk unit for an effective risk management strategy to avoid market risk. Diversification helps reducing market risk. (Sharpe et al., 1998)

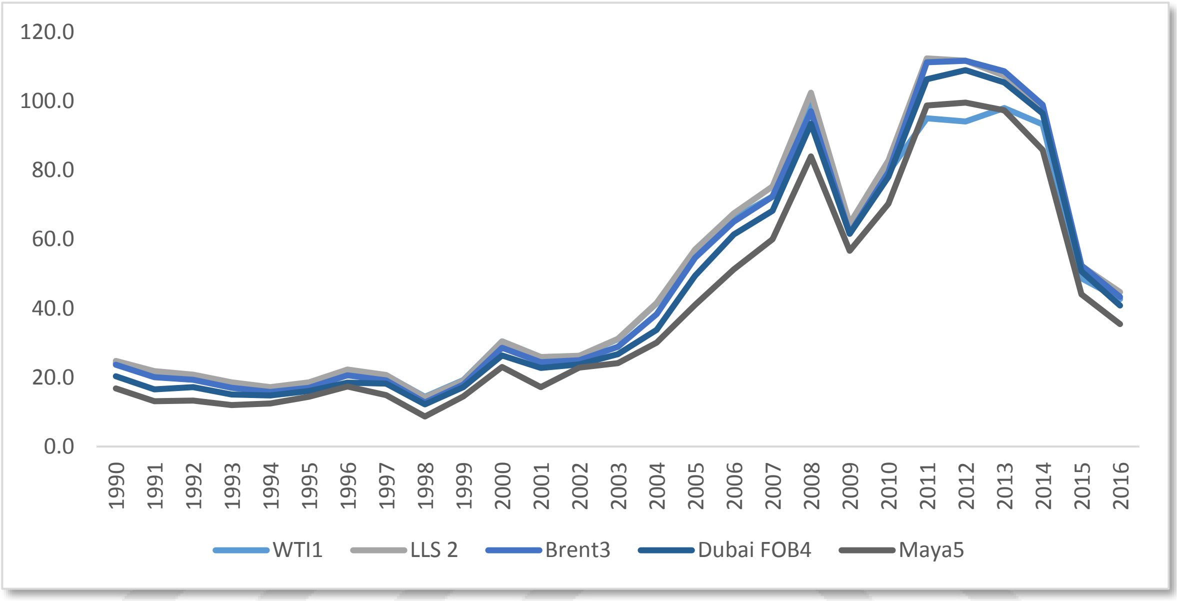
There are three main market risks, commodity price risk, credit risk, interest rate risk and foreign exchange rate risk.

Commodity Price Risk: Integrated supply and trading functions of big energy companies need to use financial tools and physical shipments and pipeline positions available in the related commodity markets. Price of oil, natural gas and power are usually mitigated with swaps, options, futures or over the counter forward contracts. Some companies may use combination of two contracts to mitigate the power risk by the main source of electricity, natural gas and the electricity price.

Risk assessments can be made by several techniques such as Value at Risk, stress testing etc. These calculations help companies to set their risk limits for the trading activities.

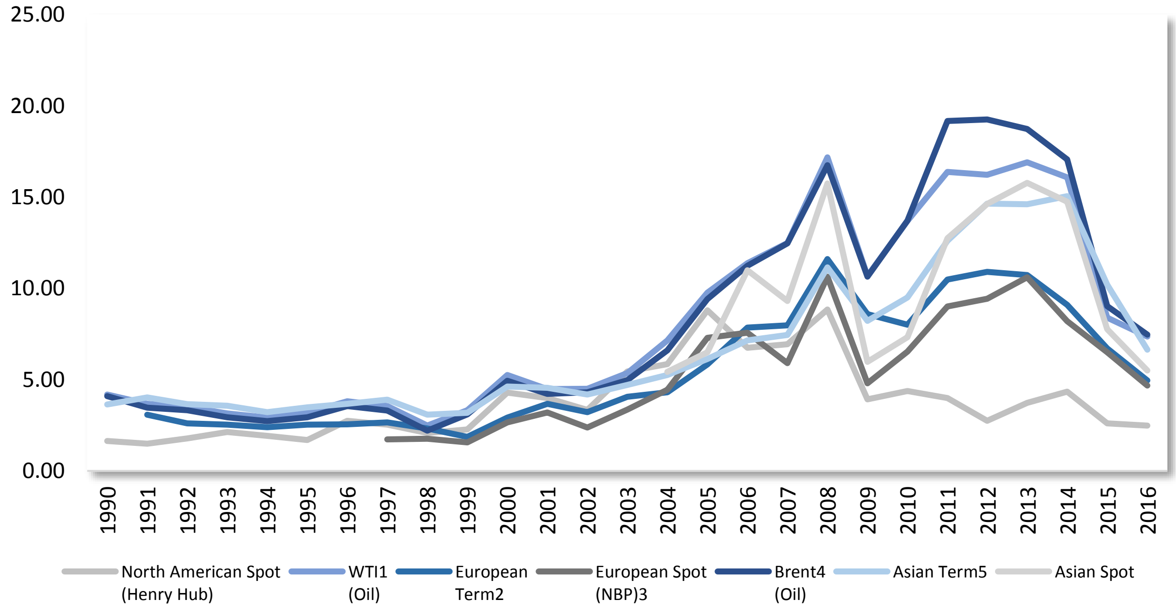
The volatility of nominal crude oil (USD/bbl) and natural gas (USD/MMBtu) prices are visualised in the graphs below to show the need of hedging for the stability of firms.

Graph 1: Crude Oil Prices for 1990 – 2016 (US Dollars)



Source: IHS Markit. Access Date: 25.10.2017

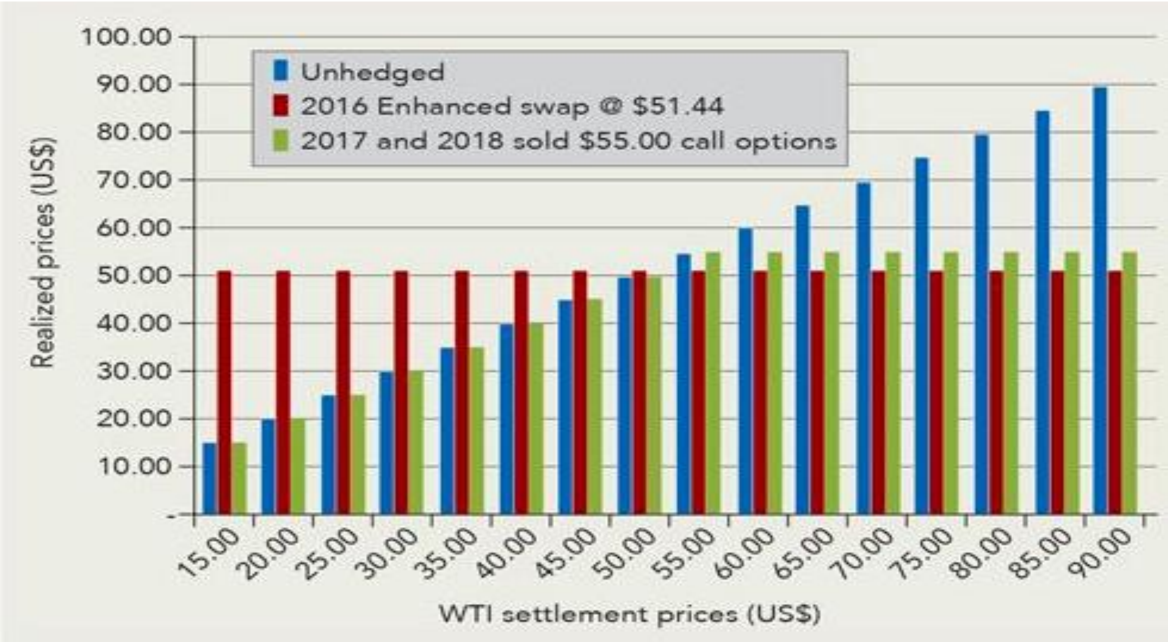
Graph 2: Natural Gas Prices for 1990 – 2016 (US Dollars)



Source: IHS Markit. Access Date: 25.10.2017

The graph below shows the hedging activity when the prices go downwards and upwards. It is not surprising that when the prices are low, hedging activities become essential for the companies. Enhanced Swap is sold out as a calendar strip of call options against a percentage of forecasted future production in order to receive favourable pricing on a near term swap. The transaction of the calls is employed to gain a better near-term price in a fixed for floating swap.

Graph 3: The Hedging Activity When The Prices Go Downwards And Upwards



Source: E&P Hedging During The Price Down (Purdy, Randolph, & Smith, 2017)

Foreign Currency Exchange Risk: Oil and gas extraction companies have international cash flows because of their operations worldwide. Since the oil is priced in US Dollars, firms aim to limit economic and material transaction exposures that is caused by currency movements against Dollar. At this point, companies measure the currency risk with Value at Risk model and decide the risk appetite of the company. Hence, the capital expenditure commitments, as well as the operational requirements can be exceeded without any struggles by using hedging instruments.

The volatility of exchange rates are a problem for the companies since the end of Bretton Woods system in 1970. There are several events that create crisis environment such as issues with peso in 1994, the East-Asian currency issues in 1997-1998, the rouble and Brazil breakdowns in 1998, 1999. (Dowd, 2002)

Interest Rate Risk: Interest rate have impacts on funding costs, corporate cash flows and asset values. Since energy companies have activities in many countries, they finance their trading with debt. If market opportunities lead them for a fixed interest rate, they might like to swap the exposure with US Dollar floating interest rate swap. For example, if the floating interest rate increases by one percentage point in 2017, finance costs will increase by $488 million. (BP, 2017)

Credit Risk: Credit risk arises when a customer or financial instrument have difficulty paying its duties, hence every contract with a third party contains the risk of default. Companies create their own policy to manage the credit risk by the establishing of credit systems and processes to ensure that all third-party exposure is assessed and that all third-party exposure and limits can be monitored and reported; and the timely documentation of any non-approved credit exposures and credit losses. Company-wide credit risk authority and segmental risk sections follow and take actions immediately against any credit risk exposure.

2.4.3. Techniques of Calculating Market Risks

Risk management helps measuring and managing any risk in a firm's portfolio of financial, product and other assets. Sadeghi and Shavvalpour (2006) discuss that in the energy market, producers and suppliers trade contracts which helps supply and demand match.

A company's portfolio risk is measured by assessing the risk exposure from fluctuations in any of the variables that affect existing contracts or the company's demand, supply or price forecasts. Analysis of expected return on assets based on Value-at-Risk measures allows the firm to optimize the use of both physical and financial assets. Analysts can then determine the best use of physical and financial capital in order to maximize earnings. A well-structured risk management strategy that addresses both portfolio and operational risk, helps companies to elude big costs due to price fluctuations or changing energy consumption patterns. It also decreases unpredictability in earnings while increasing return on investment, and meet authority requirements that limit exposure to risk.

Value at Risk measures the limit of loss a company can face at a position; under certain period of time and confidence level. (Hendricks, 1996)

There are three main methods for Value at Risk modelling:

1- Historical Simulation Approach: This approach offers simulations over price changes for a period of time.

2- Monte Carlo Simulation Method: This method also builds a simulation over price changes in a specific period of time.

3- Variance – Covariance Method: In this method, it is assumed that potential loss is highly related with return standard deviation.

The Historical Simulation Approach for VaR quantification contains two methods. One is the Historical Simulation Standard approach and the other the Historical Simulation ARMA Forecasting approach. Historical Simulation Approach methodology differentiates from the historical simulation standard approach as the first does not use the distribution of past returns but the distribution of forecasting errors, derived from an estimated ARMA model. (Cabedo & Moya, 2003)

Historical Simulation Approach methodology requires a four-stage procedure (Sadeghi & Shavvalpour, 2006). In the first stage the historical returns should be calculated and their stationary behaviour should be analysed with i.e. Dicky Fuller or Augmented Dicky Fuller tests. (Dickey & Fuller, 1979) If the outputs confirm the stationary behaviour of the series, then the procedure should be continued by testing the autocorrelation behaviour of the original series. If the stationary hypothesis is rejected, then the consecutive differences over the original series are required. Whether the original series is stationary or not, the next stage is to test the autocorrelation behaviour of the series with the Ljung–Box. If autocorrelation is not statistically significant, then the Historical Simulation Approach methodology is equivalent to the historical simulation standard approach. On the other hand, only when the analysis of the series determines a statistically significant autocorrelation level can the second stage of the procedure be implemented. In the second stage, by applying Box–Jenkin's methodology and using past returns, a model for past returns behaviour can be estimated. Ljung–Box autocorrelation tests are deployed later in order to determine the necessary number of lags to consider in order to remove the autocorrelation. During the third stage, using the coefficients estimated in the second stage, forecasts are made for price returns. Using these forecasts, the forecasting errors can be obtained. The statistical distribution of these errors is analysed and the percentile associated with the desired likelihood level is calculated. The final stage involves forecasting future returns using the model estimated in the second stage of the procedure. These forecasts are corrected by the percentile obtained in the previous stage. These corrected forecasts provide the Value-at-Risk associated with a statistical likelihood level equivalent to the percentile used in the third stage.

Energy companies compute market risk exposure arising from its trading positions in liquid periods using Value-at-Risk techniques. These techniques make a statistical assessment of the market risk arising from possible future changes in market prices over a one-day holding period. The value- at-risk measure is supplemented by stress testing. Trading activity occurring in liquid periods is subject to value-at-risk limits for each trading activity and for this trading activity in total. Alternative measures are also used to monitor exposures which are outside liquid periods and which cannot be actively risk-managed.

2.4.4. Other Traditional Methods to Calculate Risk

- GAP Analysis: It is a traditional simple method to calculate the interest risk. Equation is based on assets and liabilities which are re-priced in a specific time period. The gap between rate-sensitive liabilities and assets are sought by the exposure of interest-rate which is the change in net interest income by any interest change .

$$Change\ in\ interest\ rate\ income = (GAP)\ Change\ in\ Interest\ Rate$$

The calculation has limitations with its specified time period, its only balance sheet risks and income instead of values of assets and liabilities.

- Duration Analysis: Duration analysis calculates the bond price changes in response to yield changes.

$$D = \sum_{i=1}^{n}[i * PVCF_i] / \sum_{i=1}^{n} PVCF_i \qquad (1)$$

PVCF is the present value of the cash flow at time i, and duration shows the sensitivity of bond price on yield changes.

$$\%Change\ in\ Bond\ Price \approx -D * \Delta y/(1+y) \qquad (2)$$

The equation indicates that when the duration is higher the reaction of bond price to yield changes is higher.

Duration Analysis is simple and it looks at the values instead of income unlike Gap analysis, however, duration analysis only investigates interest-rate risk, and it is not most accurate way of risk evaluation.

- Scenario Analysis: A set of scenarios are being chosen to evaluate the stock prices, interest rates, commodity prices, exchange rates. The cash flows and accounting values of assets and liabilities are calculated to view the exposure afterwards.

That analysis is really subjective and depends highly on management skills which is hardly accurate in most cases.

2.4.5. Over The Counter (OTC) And On-Exchange Markets

Financial derivatives are sold in two ways, Over-the-counter (OTC) or On-Exchange-Market. Both has their advantages and disadvantages. The New York Mercantile Exchange (NYMEX) or London's International Petroleum Exchange (IPE) are two main exchange markets. The contracts trading in those markets and standardized so that there is no chance to customize. On the other hand, OTC contracts are more tailor made for the customers' needs, yet, it lacks price and liquidity transparency.

2.4.6. Forward And Future Contracts

Futures are contracts to sell or buy an underlying asset at a certain time in the future at a certain price. Future contracts are standardized in terms of date, amount and can be exchanged at futures market. Future contracts, which usually call for a physical delivery, require the following to be set;

- Volume
- Price
- Delivery Location
- Delivery Period
- Last Trading Day or Settlement Date

Forward contracts are similar to future contracts; however, forwards are set directly between two parties. One party involved in contracts take the long forward position to buy the underlying asset at the maturity date where the other party takes the short position by delivering the asset at maturity date and set price. Forward contracts don't need to be standardized, hence it can be structured in the most convenient way for the counterparties. It makes the contracts more liquid and it can be;

- Physically and financially settled,
- Yearly, seasonally, quarterly, monthly, daily, hourly etc.
- Defined in any geographical location.(Eydeland & Wolyniec, 2003)

In the contract, profit of the buyer is the difference between the price at the maturity date and the agreed delivery price of the future or forward contract. Therefore, buyer's profit is seller's loss (Clewlow & Strickland, 2000).

A forward contract should include;

- Delivery Details (total quantity, per day/hour quantity, firm/non-firm etc.)
- Delivery price or formula calculating delivery price
- Delivery period and time of delivery during the period
- Delivery location (Eydeland & Wolyniec, 2003)

Table 2. Comparison of Forward and Futures

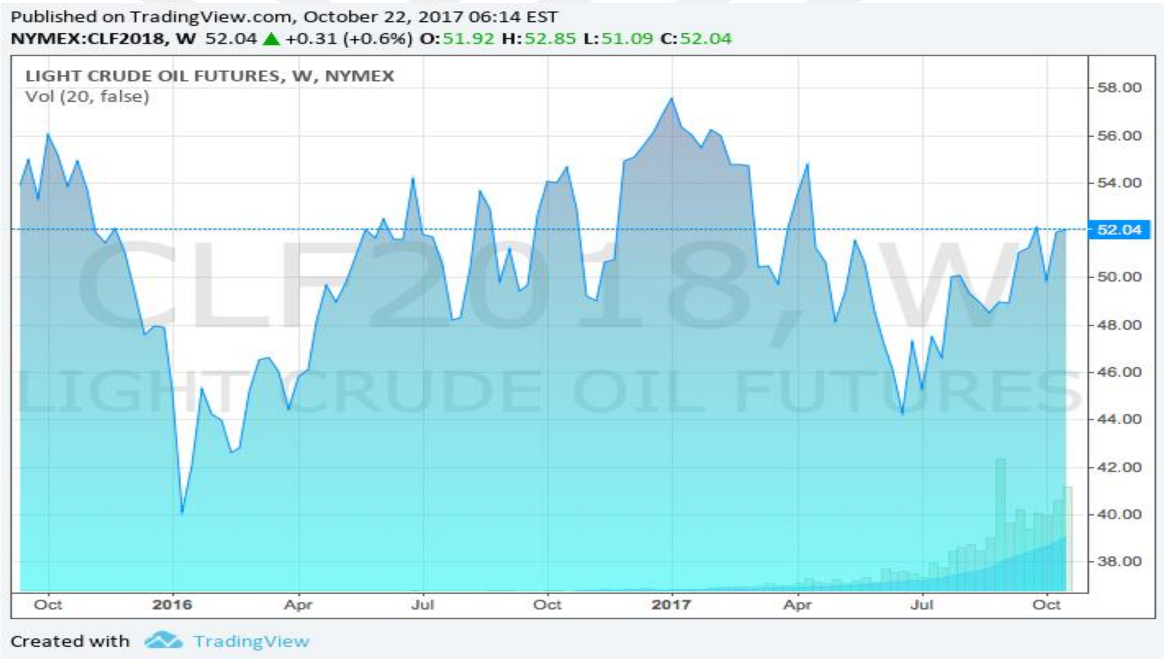
Forward	**Futures**
Specialized for parties	Traded on Exchange
Not standardized	Standardized
Normally only one specific date for delivery	Various dates for delivery
Settled at end of contract	Settled daily at Exchange
Physical delivery or cash exchange occurs at maturity	Contract is exercised before maturity
Some credit risk	No credit risk

Source: Hull, J. C. (2012). Risk Management and Financial Institutions. John Wiley & Sons, Inc.

It can be said that forward and future contracts are signed between parties with different expectations regarding the future price of an underlying asset.

The graph below shows the light crude oil futures for January 2018. From October 2016, market's expectations change dramatically. A firm can set the price at $56 or $40 according to their forecast or needs for January 2018 between October 2016 and October 2017. Going under future obligation will protect the firm from downward movements of oil price and the firm will give away the profit of upward movement. A company which uses futures for hedging doesn't worry about the loss to set the price at desired level, because that company will have the power to forecast the future more accurately and plan for the new investment opportunities.

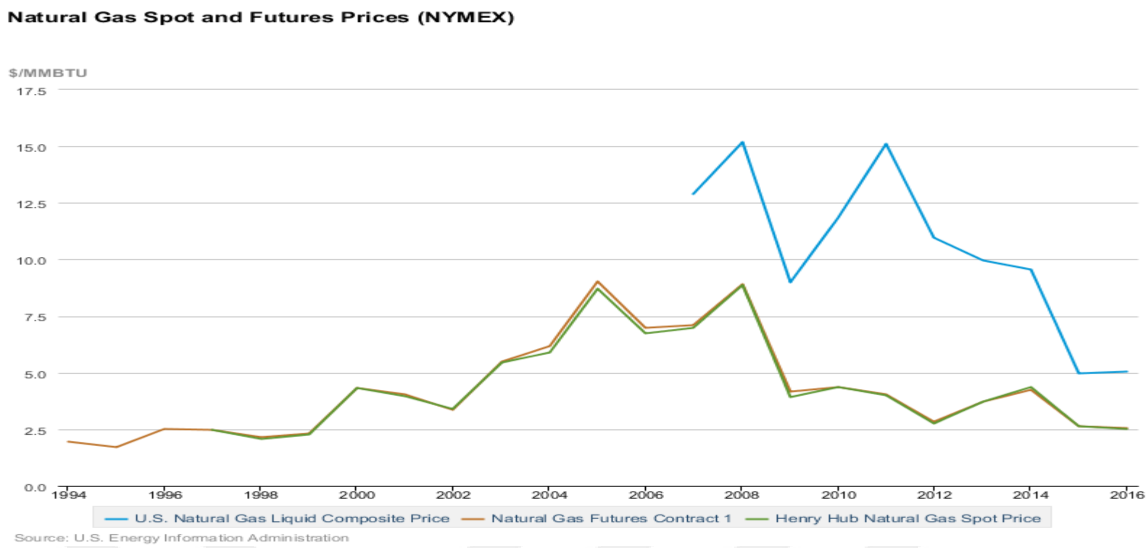
Graph 4: The Light Crude Oil Futures Prices for January 2018



Source: www.cmegroup.com Access Date: 22.10.2017

Prices for futures below are based on delivery at the Henry Hub in Louisiana. It states official daily closing prices at 2:30 p.m. from the trading floor of the New York Mercantile Exchange (NYMEX) for a specific delivery month. The natural gas liquids (NGPL) composite price is derived from daily Bloomberg spot price data for natural gas liquids at Mont Belvieu, Texas, weighted by production volumes of each product as reported on Form EIA-816, "Monthly Natural Gas Liquids Report."

Graph 5: Natural Gas Spot and Future Prices (NYMEX)



Source: https://www.eia.gov/ Access Date: 31.10.2017

2.4.7. Options Contracts

Option contracts differ from forward and future contracts in terms of obligation. Option contracts give the buyer the right to buy or sell an underlying asset at or until a specified time. In a call or cap in OTC option, a premium is being paid to buy an asset without any obligation. Hence, if the price increases in the market, option buyer can use the option and buy the asset at predefined rate. In a put or floors in OTC option, a premium is being paid to sell an asset without any obligation. Hence, if the price goes down, the option buyer can use the option and sell the asset at a predefined rate. As it is described, option buyer has the right not to use the option at a loss of the premium. However, option seller is obliged to sell for call options and buy for put options if buyer decides to use the contract. This leaves the seller of the option with an unlimited risk.

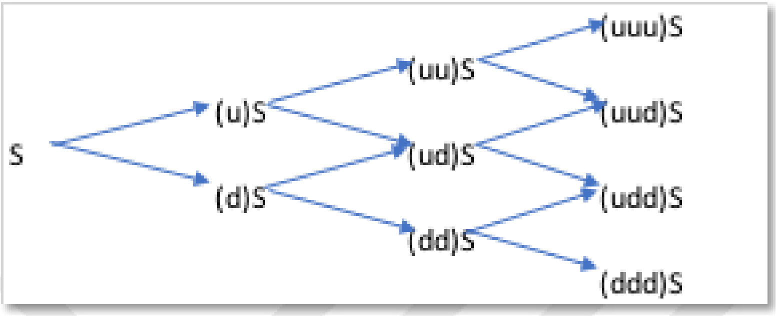
Energy options typically include;

- Location
- Exercise Time
- Delivery Conditions
- Strike
- Volume

2.4.7.1.Option Valuation

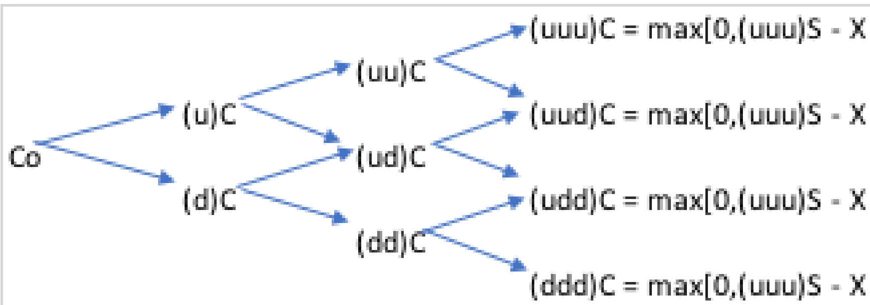
The premium calculation of an option mainly covers the reference rate, the strike price, expiry date, volatility estimate and the risk-free interest rate.

2.4.7.1.1. The Binomial Option Pricing Model



The picture above shows the stock price changes at Time S1, S2 and one year later. For example, after an increase at stock price, at S1 it is shown as (u)S.

Hence, the option premium of Co can be computed by going backward and calculating all the values on the tree.



Hence the equation for binomial option pricing is as below;

$$C_j = \frac{(p)C_{ju}+(1-p)C_{jd}}{r} \qquad (3)$$

Where,

$$p = \frac{r-d}{u-d} \qquad (4)$$

And r is the one plus risk free rate for the subperiod. When we generalize the equation, it becomes;

$$C_0 = \{\sum_{j=0}^{N} \frac{N!}{(N-j)!j!} p^j (1-p)^{N-j} \max[0, (u^j d^{N-j})S - X]\}/r^N \quad (5)$$

2.4.7.1.2. The Black And Scholes Valuation Method

The assumption for Binomial Option Pricing is that security prices follow distinct upward or downward movements. Black & Scholes (1973), evaluated a discrete model which assumes prices change continuously.

That model also assumes that compounded risk free rate and the stock's variance remain constant until the maturity.

$$C_0 = SN(d_1) - X\left(e^{-(RFR)T}\right)N(d_2) \quad (6)$$

$$d_1 = \frac{\left[\left(\ln\left(\frac{S}{X}\right) + \left(RFR + 0.5\sigma^2\right)[T]\right)\right]}{\left(\sigma[T]^{\frac{1}{2}}\right)} \quad (7)$$

$$d_2 = d_1 - \sigma[T]^{1/2} \quad (8)$$

In the equation,

N(d) = the probability of one observation from standard normal distribution,

T = Time to expiration,

σ = the security price volatility,

RFR = the risk free rate,

X = Exercise Price

S = Current Security Price

Table 3. Reaction of Option Premium

Increase in	Call Value	Put Value
Security Price (S)	Increase	Decrease
Exercise Price (X)	Decrease	Increase
Time to Expiration (T)	Increase	Increase or Decrease
Risk-Free Rate (RFR)	Increase	Decrease
Security Volatility(σ)	Increase	Increase

2.4.7.2. Types of Options

- American Options: American Options can be used any time before the maturity date. All options in International Petroleum Exchange (IPE) or NYMEX (New York Mercantile Exchange) are American Options.

- European Options: European Options can only be traded at maturity. It is not very common in energy markets.

- Over The Counter Asian Options: In energy market it is the most common option type. The profit or loss is dependent on the average price rate of the underlying price at a specific time.

2.4.7.2.1. Option Strategies For Hedging Energy Exposure

Option strategies are summarized in the table below, for the level of energy exposure;

Table 4. Option Strategies

Short Energy Exposure	Long Energy Exposure
Buy call or cap	Sell call or cap
Sell put or floors	Buy put or floors
Buy call spread	Buy put spread
Sell put spread	Sell call spread

2.4.7.3. The Greeks

The Greeks are the measures of the option price according to changes in underlying asset price or market volatility.

- Delta: Delta shows the change in option price when there is a change in underlying asset price.

- Gamma: Gamma shows the change in delta as a reaction of underlying asset price movement.

- Theta: Theta is the indicator of the time decay on option price. Option loses value when time gets closer to maturity.

- Vega: Vega indicates the sensitivity of an option to the volatility of underlying asset's price.

2.4.7.4. Option Structures

- Zero Cost Collar: It is mainly for the end-user customer, to hedge the price for movements upwards. It is buying a cap and selling a floor at same maturity for different price levels simultaneously without any cost.

- Spread Options: Spread Options cover buying of one option and selling another option of the same asset with different exercising price or expiration date.

- Straddle Options: Straddle options are used to hedge the volatility risk. An investor can hold the position by buying both call and put option at same strike price and maturity. When the volatility is high, it doesn't matter price goes up or down, investor gets a profit.

- Strangle Options: Strangle options also helps to hedge the volatility. A call and a put option are bought at different strike prices for same maturity of an asset. Strangle options are cheaper than straddle options because it contains call options with a strike price higher than market price or put options with a strike price lower than market price.

There are crude versus crude, complete refinery margin, crude and petroleum crack, natural gas versus power prices, gasoil versus power prices options in the energy market which combines the option structures explained above.

2.4.8. Derivative Investing Example

If an investor plans to buy a stock in the future and wants to secure the price, she can either go long on a forward or on a call option transaction. The table below shows the initial payment and the cost at maturity.

Table 5. Buying Stock Transactions

<table>
<tr><th colspan="6">1. Exchange today</th></tr>
<tr><td colspan="3">Forward</td><td colspan="3">Call Option</td></tr>
<tr><td>Investor Who Goes Long on A Forward Contract</td><td></td><td>Investor Who Goes Short on a Forward Contract</td><td>Investor Who Buys a Call Option</td><td>Premium→</td><td>Investor Who Sells a Call Option</td></tr>
<tr><td colspan="3">Initial Cost : 0</td><td colspan="3">Initial Cost: Option Premium >0</td></tr>
<tr><th colspan="6">2. Exchange at maturity</th></tr>
<tr><td colspan="6">If $S_t > X$ (=F_o,t)</td></tr>
<tr><td colspan="3">Forward</td><td colspan="3">Call Option</td></tr>
<tr><td>Investor Who Goes Long on A Forward Contract</td><td>←Stock
F_o,t→</td><td>Investor Who Goes Short on a Forward Contract</td><td>Investor Who Buys a Call Option</td><td>←Stock
X→</td><td>Investor Who Sells a Call Option</td></tr>
<tr><td colspan="3">Net Contract Value = [S_t-F_o,t] > 0</td><td colspan="3">Net Contract Value = [S_t-X] > 0</td></tr>
<tr><td colspan="6">If $S_t \leq X$ (=F_o,t)</td></tr>
<tr><td colspan="3">Forward</td><td colspan="3">Call Option</td></tr>
<tr><td>Investor Who Goes Long on A Forward Contract</td><td>←Stock
F_o,t→</td><td>Investor Who Goes Short on a Forward Contract</td><td>Investor Who Buys a Call Option</td><td></td><td>Investor Who Sells a Call Option</td></tr>
<tr><td colspan="3">Net Contract Value = [S_t-F_o,t] < 0</td><td colspan="3">Net Contract Value = 0</td></tr>
</table>

Source: Reilly, F. K., & Brown, K. C. (2012). Investment Analysis & Portfolio Management

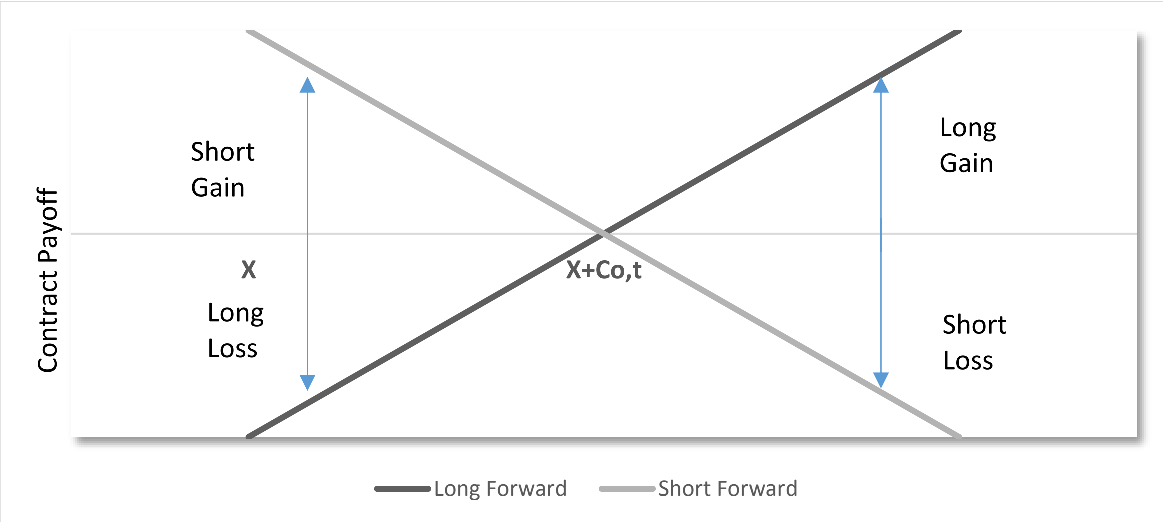
If an investor plans to sell a stock in the future and wants to secure the price, she can either go short on a forward or buy a put option transaction. The table below shows the initial payment and the cost at maturity.

Table 6. Selling Stock Transactions

1. Exchange today					
Forward			Put Option		
Investor Who Goes Short on A Forward Contract		Investor Who Goes Long on a Forward Contract	Investor Who Buys a Put Option	Premium→	Investor Who Sells a Put Option
Initial Cost : 0			Initial Cost: Option Premium >0		
2. Exchange at maturity					
If $S_t > X$ (=F_o,t)					
Forward			Put Option		
Investor Who Goes Short on A Forward Contract	Stock→ ←F_o,t	Investor Who Goes Long on a Forward Contract	Investor Who Buys a Put Option		Investor Who Sells a Put Option
Net Contract Value = [F_o,t-St] < 0			Net Contract Value = 0		
If $S_t \leq X$ (=F_o,t)					
Forward			Put Option		
Investor Who Goes Short on A Forward Contract	Stock→ ←F_o,t	Investor Who Goes Long on a Forward Contract	Investor Who Buys a Put Option	Stock→ ←F_o,t	Investor Who Sells a Put Option
Net Contract Value = [S_t-F_o,t] > 0			Net Contract Value = [X-S_t] > 0		

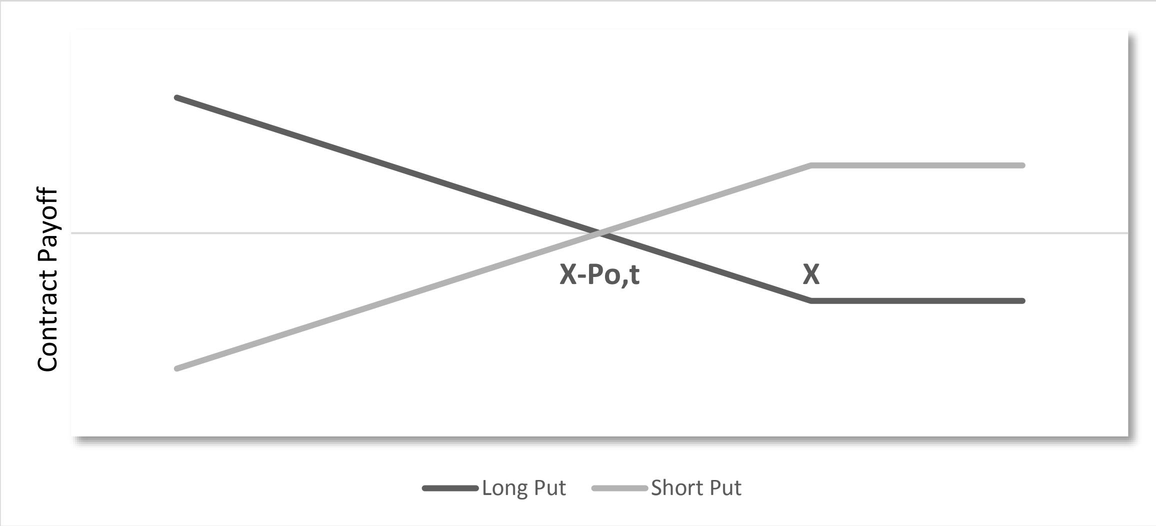
Source: Reilly, F. K., & Brown, K. C. (2012). Investment Analysis & Portfolio Management

Graph 6. Forward Payoffs on Long and Short Positions



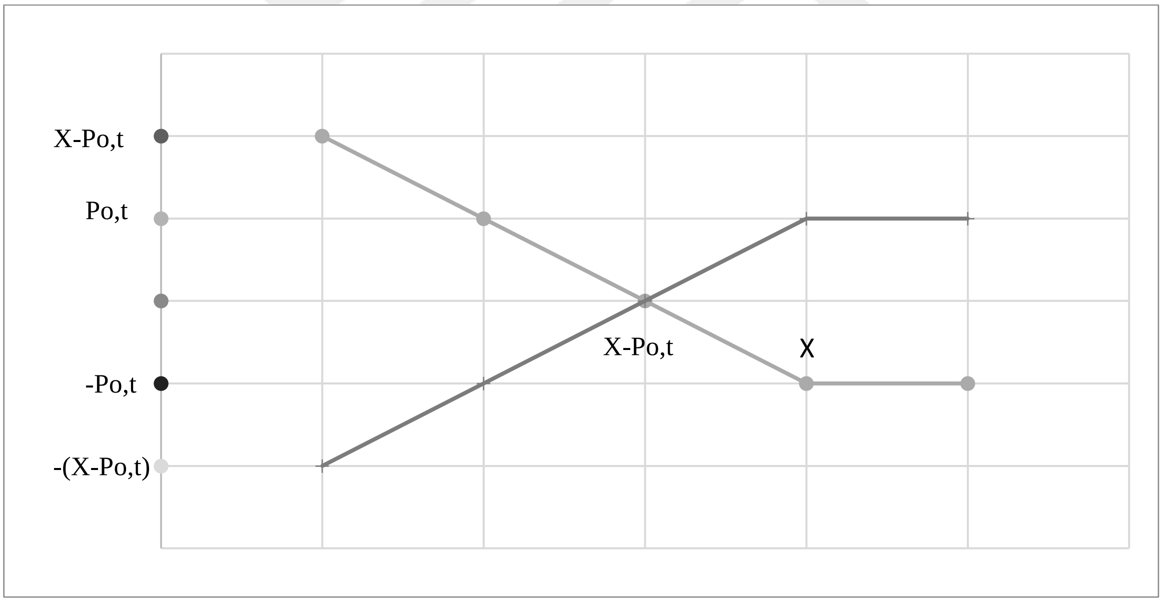
Source: Reilly, F. K., & Brown, K. C. (2012). Investment Analysis & Portfolio Management

Graph 7. Call Option Payoffs on Long and Short Positions



Source: Reilly & Brown (2012). Investment Analysis & Portfolio Management

Graph 8. Put Option Payoffs on Long and Short Positions



Source: Reilly & Brown (2012). Investment Analysis & Portfolio Management

2.4.9. Swap Contracts

Swap Contracts are traded between two parties to swap cash flows at time of execution and on the average of a floating price until maturity.

Swaps are commonly used in the energy markets because;

- Swaps are adaptable, Over the Counter, tailor-made transactions.
- Swaps are usually financial, don't need physical delivery.
- Their flexible nature creates ideal hedging instruments.

The most frequently used swaps in energy sector are parties paying fixed price for several months/years period exchanged with a payment linked to a floating index.

Futures and options are the main instruments of the derivative market and the features are similar in every market. Yet, in energy sector the situation gets more complicated because of the complex derivative instruments and energy prices. The models used to forecast the prices and types of derivatives change because of that complexity. Such as Asian or average price options, energy contracts use weekly or monthly averages for oil markets and hourly or less in the electricity markets. Production processes are also very critical as it might involve the conversion of one energy means to another, such as natural gas to electricity. The importance of high level volatility on natural gas and electricity becomes a matter under highly volatile cost of generation and high levels of seasonality. (Clewlow & Strickland, 2000)

2.4.9.1. Types Of Swaps In Energy Markets

- Plain Vanilla Swaps: These are mainly basic swaps, fixed price versus floated price, and common for Oil. LNG, LPG hedging and trading.
- Differential Swaps: It is based on fixed price of two different products. Jet Kero and Gasoline are the most common ones and also called regrade swap.
- Participation Swaps: For this kind of swaps, the fixed price buyer/seller only participate when the price only moves higher/lower than the fixed price.
- Double-up Swaps: It is used mostly for speculative purposes as it mainly helps swap users to achieve a better price than the market price, and swap provider has the chance to double the swap volume before the pricing period.
- Margin Swaps: This swap type covers most of the price risks, the company considers the profit margin while participating in that contract.

2.5. GLOBAL OIL, GAS, COAL AND POWER EXCHANGE MARKETS

- International Petroleum Exchange (IPE) London
- European Energy Exchange (EEX)
- UK Power Exchange (UKPX)
- New York Mercantile Exchange (NYMEX) New York
- Tokyo Commodity Exchange (TOCOM) Tokyo / SGX
- Singapore Exchange (SGX) Singapore
- Nord Pool

2.6. FINANCIAL RISKS OF TRADING DERIVATIVES

2.6.1. Price Risk (Market Risk)

This is the risk related to the price movements. In the energy market, when oil or gas prices go up, producers may benefit from it, however, the customers will suffer. If oil and gas prices decrease, producers may find it hard to cover its operational expenditures.

2.6.2. Credit Risk

Credit Risk arises in the case of credit default possibility. After critical incidents in the world, companies in energy sector overviewed their credit policies to avoid credit risk.

2.6.3. Liquidity Risk

If the derivatives market becomes illiquid and banks would not like to trade with the energy derivatives such like during Gulf War, the volatility could not be stabilized as oil traders wouldn’t give a bid or offer price.

2.6.4. Cash Flow Risk

This risk occurs if the company can’t meet its obligations. One company can face big losses even if it hedges the oil price risk, if it can’t foresee the exchange rate change.

2.6.5. Basis Risk

It is expected in the market that spot value of one underlying asset changes in the same way with its derivatives. However, political issues, regulation changes or even weather conditions might cause basis risk in terms of increasing the gap between those two prices. In energy sector, if the shortage of energy need can't be alleviated by transporting the material to the needed area, or accessing another substitute material or producing in a short period, basis risk might increase.

There might also be legal risks, tax risk or operational risks which can make trading derivatives costly or impossible.

2.7. INTERNATIONAL ACCOUNTING STANDARDS FOR DERIVATIVES

The general increasing use of derivatives lead the regulators to control and account them for the stakeholders. In 2001, FAS 133 (USA based FASB) and IAS 32 and IAS 39 (London Based IASB) emerged to clarify the matters. (James, 2003)

Before the regulations, derivatives related loss or profit were off-balance sheet and it wasn't obligatory to present it in the balance sheet. European companies, however, have to prepare their accounts according to International Accounting Standards after 2004. These regulations require companies to report their portfolios' at their marked to market, in other words, fair value. It means more than reporting the latest cash flow, showing any unrealized loss or profit from the derivatives on their balance sheet.

Hedge accounting methods aim to clarify the reporting of derivatives if a company uses derivatives to hedge a physical transaction in the future. However, if derivatives are used for speculation purposes, it goes directly to the balance sheet. Accounting standards also require the companies to give information about what instruments they use to hedge and the calculations behind those decisions. It is also beneficial for firms who want to show their hedging activities to reduce risk exposures. However, if you go speculative with derivatives, reports should indicate the risks clearly, so stakeholders can be aware of it.

FAS 133 is effective from 1 January 2001 in the US to regulate the derivative instrument appearance in balance sheets. With the new rules, firms are required to show the effectiveness of the instruments on hedging. Derivatives are used for three main categories;

- Speculative purposes: When a company uses derivatives for speculative purposes, it should be valued marked to market and earnings and losses should be reflected to P&L directly.

- To hedge the price fluctuations: If derivatives are used for the price changes of the asset, liability or commitment, the effect of derivatives on market value and the profit or loss on the derivatives are required to be reflected as earnings.

- To hedge the cash flow expectations: Derivatives used for cash flow expectations are evaluated if derivative use is effective or not. If the derivative use is ineffective, then the ineffective part should be posted to P&L, the effective part should be shown under Other Comprehensive Income (OCI) created specifically for hedge accounting purposes. (James, 2003) FASB, hence, requires effectiveness test before the execution and for a periodic basis. If the result is satisfactory, then company can use hedge accounting.

Derivatives use has great impacts on P&L which is a discussion topic lately as it increases the volatility of one financial table. However, it is also discussed that actually it has always been a hidden risk factor which is now reflected in the income statement.

IAS 39, on the other hand, became effective after 1 January 2001, and all European countries were required to follow IAS 39 rules by 2005 with the proposal of European Commission. IAS 39 is a supplement of IAS 32 disclosure rules of financial instruments. There are three main types of hedging, recognized for hedge accounting:

a. If the instrument is used for specific and identified risk, not for general business risk and the activity will eventually have an impact on firm's value.
b. If the instrument can be effectively used to offset losses.
c. If a firm can clearly identify the exposure to be hedged, the derivative to be used, the nature of the risk, the evaluation of the hedge performance at a minimum under the hedged fair value and cash flow.

IAS 39 requires the firm to directly show the profit or loss both from the hedged item and the marked to market value of the hedge instrument. If it offsets each other, the hedge is efficient and the net impact of profit or loss is zero on P&L. Otherwise, the movement will cause volatility on P&L.

2.8. LITERATURE REVIEW

The literature investigating firms' hedging activities is relatively rich. In literature, most of the researches supports the value adding rationale of hedging. (Bessembinder, 1991; Froot et al., 1993; Rene M.Stulz, 1996; W.Smith & M.Stulz, 1985)

Several articles studied on the main incentives for hedging activities and they found agency problems, risk averse managers, information asymmetries, firm size and outstanding debt are the initial reasonings. (Booth et al. 1984, Block & Gallagher, 1986, Houston & Mueller, 1988, Mayers & Smith 1990)

Wall & Pringle (1989) studied 250 swap users from their annual report footnotes in 1986. Their conclusion was beyond the popular reason of using swaps, arbitraging quality spread differentials. Swap users usually benefit from this activity by reducing agency costs and information asymmetries, adjusting the interval of outstanding debt, tax and regulatory arbitrage.

Nance et al. (1993) investigated 169 firms to discuss the main motives behind hedging and conclude that companies with convex tax schedules have incentives to hedge. Moreover, their study suggests there is a relationship between firm size and hedging. Another interesting finding in that study was that firms with more R&D expenditures and growth options have lower leverage and higher leverage respectively.

Firms usually benefit from hedging because it decreases the probability of bankruptcy, underinvestment, the cost of asymmetric information and agency. They also benefit from tax incentives. (Dadalt et al., 2002; Froot et al., 1993; Leland, 1998; DeMarzo & Duffie, 1995; Rene M.Stulz, 1996; Smith & Stulz, 1985)

Allayannis & Weston (2001) deployed a regression analysis to understand the impact of foreign currency derivatives on firms' market value by controlling size, profitability, leverage, growth opportunities, ability to access financial markets, geographic and industrial diversification, credit quality, industry effects, firm fixed effects, and time effects for 720 companies. They found significant evidence that using foreign currency derivatives has a positive effect on Tobin's Q, which they used as a proxy for firm market value.

Carter et al. (2004) investigated the US airlines way of dealing with jet fuel price volatility. Since jet fuel prices take the biggest portion in the operating costs of airlines, hedging becomes essential for cash flows. Results also indicated that since hedging creates value when there is a downturn in airline market, it also creates acquisition opportunities. However, benefits of hedging were only clear for bigger firms according to the research and small firms prefer not to hedge.

Lookman (2004) discussed the Oil and Gas Producing Firms' value increasing hedging activities for 1999 and 2000 in US, Canada and Cayman Islands. He divided the commodity price volatility as a primary or secondary risk. He defined that undiversified E&P firms take the commodity price as a primary risk, where integrated firms take the commodity price as secondary risk. The results are not parallel with hypothesis that hedging increases firm value. In fact, firms hedging their primary risk trade at a discount compared to their unhedged rivals. In contrary, firms hedging their secondary risk trade at a significant premium compared to their unhedged counterparts. Surprisingly, he concluded that hedging for primary risk might be proxy for bad management and high agency cost, while hedging for secondary risk might be proxy for good management and low agency cost.

Jin & Jorion (2006) discussed the firm value and hedging activities of 119 US oil and gas producer firms from 1998 to 2001. They stated that the homogenous sector helped them avoid the spurious results and they could test the relation clearly. However, they couldn't find an obvious hedging premium and they concluded that there might be different explanations for the lack of that correlation. Firstly, they thought that the commodity price risk is easy to detect and avoid, so individual investors can also hedge. On the other hand, exchange risk is hard to detect for US companies, hence, hard to hedge by individuals using exotics. There is also the spurious hedge premium which intrinsically reflect the information asymmetry and operational hedges.

Fauver & Naranjo (2010) found that firms with high agency cost and monitoring problems suffer from hedging activities. Less transparency, poorer corporate governance, higher information asymmetry problems, higher agency costs and worse monitoring create a bad impression on firms and impact the firm value negatively.

Ayturk et al. (2016) conducted a pioneer research for Turkey, regarding the impact of hedge use on firm value. For Turkish case, there is a very limited or no hedging premium. They collected the data by referencing IFRS disclosure regulations, however lack of data limited their research. Hence, they saw the great need for further research in emerging countries.

Lau (2016) found that taking all control variables into account, hedging has a negative impact on firm value. At operational level, net profit margins and operating income decreases with hedging activities. Hedging has positive impact on return on assets because firms need to widen their regional markets for better returns, and it creates sensitivity to exchange rates and interest rates. Firms, which use derivatives perform better in such environment than non-hedgers.

Mnasri et al. (2017) concluded that the revenue sensitivity of oil prices leads the nonlinear hedging activities to create great marginal firm value.

Table 7. Literature Review

Author	Year	Region	Results
Booth, Smith and Stolz	1984	US	Derivates are used when the financial distress is higher and the firm is large.
Rene M. Stulz	1985	Theoretical	The optimal capital and ownership structure can be accomplished by risk management. Financial distress, outside debt can be controlled for better performance by hedging activities.
Block, Gallagher	1986	Fortune 500	Derivatives usage is related to financial distress and firm size.
Houston and Mueller	1988	US	Financial distress and firm size increases the need for hedging.
Mayers & Smith	1990	US	Outstanding Debt, agency problems, firm size are the main incentives to use hedging.
Bessembinder	1991	Theoretical	The firms benefits from hedging by reducing agency cost and improving contracting terms with creditors, customers, employees and suppliers.
Wall & Pringle	1993	US	Swap users aim to reduce agency cost as well as the information asymmetries. Users also profit from the arbitrage opportunities for tax and regulations and they change the risk level interval of outstanding debt.
Nance et al.	1993	US	Hedging activities increase firm value by decreasing tax liabilities, transaction costs and agency problems.
Froot et al.	1993	Theoretical	Main findings of this paper is; 1. External finance is more costly for firms than internal funds. Hence, it is beneficial to hedge. 2. Marketable risk cannot be perfectly eliminated by optimal hedging strategies. 3. If company has future cash flow expectations from investment opportunities, they prefer not to hedge, their motivation for hedging is mostly external sources which brings external risks. 4. If a company would like to invest abroad with a pre-decided level of cost and revenue expectation, they would like to settle the currency exposure with hedging instruments.

			5. Nonlinear means of hedging, ie. options, are more accurate than linear means, forwards and future for investment and financing plans. 6. For futures, it is hard to see the impact of present value of cash flows and the value of cash at a specific point of time. 7. For options case, the value of hedging for a company is related to the market conditions and other companies' hedging strategies.
Demarzo and Duffie	1995	Theoretical	The information to the public related to hedging activities is really important. Companies, which have young managers would like to show great profits, and it leads to the reputational and informational consequences of hedging. The accounting standards and disclosures matter because if there is full disclosure regarding hedging, it is seen as a signal and it gives private information that managers only know.
Smith and Stulz	1996	Theoretical	Firms aim to maximize their value. For that purpose, they use hedging instruments to avoid taxes, to decrease financial stress and to control managerial risk aversion.
Leland	1998	Theoretical	The benefits of hedging can be recognized. However, the value of active hedging strategies is not significantly high under high agency cost.
Allayannis & Weston	2001	US	Foreign currency derivatives usage has a positive impact on firm value.
Dadalt et al.	2002	US including Fortune 500 and Business Week 1000 companies	Companies can benefit from hedging by minimizing the asymmetric information that affects their earnings. Macro-economic factors such as exchange rates and interest rates are critical for a company but hardly predictable. If a company can control the variations of those kind of elements, it will add value to their company.

Carter et al.	2004	US	The research on airline companies, which have the oil price volatility as their highest operational expenditure item, indicates that big firms which have hedging activities at downturn benefit from hedging. However small firms prefer not to hedge at all.
Lookman	2004	US	Exploration and Production firms, which take the price risk as primary risk, suffer from hedging. On the other hand, integrated oil companies, which take the price risk as secondary risk, benefit from hedging. Hence, the negative signalling affect for bad management and high agency cost might cause that loss.
Jin &Jorion	2006	US	The risk factors are either easy to detect and easy to avoid, or hard to detect and hard to avoid, so hedging doesn't create any additional value.
Fauver & Naranjo	2010	US	Firms with high agency cost and monitoring problems suffer from hedging activities. Less transparency, poorer corporate governance, higher information asymmetry problems, higher agency costs and worse monitoring create a bad impression on firms and impact the firm value negatively.
Bartram et al.	2011	47 countries	Hedging firms have lower cash flow volatility, unsystematic and systematic risk. However the hedging premium is less significant.
Ayturk et al.	2016	Turkey	For Turkey there is no evidence for hedging premium.
Lau	2016	Malaysia	The hedging activities have negative impact on net profit margins and operating income, which also cause a decline on firm value.
Mnasri et al.	2017	US	The revenue sensitivity of oil prices leads the nonlinear hedging activities to create great marginal firm value.

3. RESEARCH METHODS

This study identifies 76 exploration, production and integrated oil and gas firms which use hedging instruments and recorded in their balance sheet or income statement. Data is collected from IHS Markit database. There were 198 companies in the database, however, companies which doesn't have complete data to analyse are eliminated for better results. IHS Markit delivers analysis, reports and data about main sectors such as energy and natural sources, automotive, technology and financial service to the researchers. Companies in the study are following either IFRS or GAAP rules and publish their hedging activities in their financial reports. In accordance with IFRS 7 Financial Instruments: Disclosures (IASB, 2008), a reporting entity is required to provide disclosures in its financial statements that enable users to evaluate the significance of financial instruments for the entity's financial position and performance as well as the nature (and extent) of risks arising from financial instruments and how the entity manage those risks. Based on the availability of disclosures, data period is covering 2007 to 2016. STATA is used for modelling and tests.

3.1. ECONOMETRIC BACKGROUND

The method to observe two or more periods of time for one unit or entity is called panel data. The fixed effects regression is a multiple regression of constant independent variables but differing from entity to entity.

$$(X_{it}, Y_{it}), i = 1, \dots\dots\dots., n \; and \; t = 1, \dots\dots\dots., T \qquad (9)$$

A balanced panel has all its observations for every time and entity, where an unbalanced panel has missing data for at least one institution and term period.

The fixed effect regression model has n different intercepts, one for each entity. The intercepts can be represented by binary variables for each time, where the binary variables absorb the impacts of omitted variables which differ from one entity to another but constant over time.

Fixed effects regression is the main tool for analysis of panel data, which is an extension of multiple regression to control for variables across entities. Panel data consist of observations on n entities at two or more time periods. The simplified model of data set, which has observations from X and Y variables can be formulized;

$(X_{it}, Y_{it}), i = 1, \dots\dots\dots, n \; and \; t = 1, \dots\dots\dots, T$ where i refers to the entity and t refers to date.

3.2. GAUSS MARKOV ASSUMPTIONS

The simple linear regression has basic properties, they are called Gauss Markov assumptions. The assumptions are summarized below and the models require those assumptions to be met in order to create reliable coefficients and results.

1. Linearity. The dependent variable y is associated with dependent variable x and the error term u.

$$y = \beta_0 + \beta_1 x + u \tag{10}$$

The β_0 is the intercept and $\beta_1$is the slope of the model.

2. Random Sampling. The sample used in the model is randomly selected, $\{(x_i, y_i): i = 1,2, \dots\dots, n\}$
3. Sample Variation. The data is not all the same for $\{x_i, i = 1,2, \dots. n\}$.
4. Zero Conditional Mean. The expected value of the error term u is always zero for any independent variable value.
5. Homoskedasticity. The variance of the error term u is constant and the same for any independent variable.

$$Var(u|x) = \sigma^2 \tag{11}$$

3.3. PANEL DATA

Panel data includes a number of observations for n different entities and t different time periods. Panel data is also known as pooled data, combination of time series and cross sectional data, micropanel data, longitudinal data, event history analysis and cohort analysis. Panel data seeks the relation for the movement over time of cross-sectional units. A balanced panel is where all the variables' data is observed for each entity and each time. If the data set has missing data for at least one period for at least one entity is called unbalanced panel. Panel data is advantageous because it gives more informative, more variable, less collinear data with more degrees of freedom and more efficiency. (Gujarati, 2004), (Baltagi, 2005)

3.4. FIXED EFFECTS REGRESSION

The formulation for Fixed Effects Regression is ;

$$Y_{it} = \beta_0 + \beta_1 X_{it} + \beta_2 Z_i + u_{it} \tag{12}$$

The formulation allows the researcher to estimate β, the effect of Y on X, while holding the unobserved characteristics of Z. Z varies from one entity to another, but doesn't change over time. The formulation for the regression can be simplified by summing constants; $\alpha_i = \beta_0 + \beta_2 Z_i$.

$$Y_{it} = \beta_1 X_{it} + \alpha_i + u_{it} \tag{13}$$

The intercept in the equation are known as entity fixed effects. The slope efficient β_1 is the same for all entities, but the intercept differs from one to another. In the regression, all entities can have binary variables, however, all n binary variables and an intercept can't be added to the model. The first binary variable is omitted from the regression to avoid perfect multicollinearity, or dummy variable trap. The balance of omitted variable bias and dummy variable trap should be considered in the fixed effect regression models.

The time fixed effects can also be controlled with its own intercept, for the variables which vary over time but not across firms. That intercept in the equation below is known as time fixed effect.

$$Y_{it} = \beta_1 X_{it} + \lambda_t + u_{it} \tag{14}$$

If there are omitted variables which are constant over time but vary over entities and variables which are constant over entities and differ for the time, it is possible to add entity and time fixed effects in the regression. The model as n-1 entity binary indicators and T-1 time binary indicators to avoid perfect multicollinearity.

$$Y_{it} = \beta_1 X_{it} + \alpha_i + \lambda_t + u_{it} \tag{15}$$

The model estimation can be made by Ordinary Least Squares. In a balanced panel, the coefficients on the X are deviated Y and X from entity and time means, and then coefficients of Y by deviated X's.

3.4.1. The Fixed Effect Regression Assumptions

There are mainly five assumptions for the model with firm fixed effects.

1. $E(u_{it} \| X_{i1}, X_{i2}, \dots \dots \dots \dots, X_{it}, \alpha_{it}) = 0$. That assumption means that error terms have conditional mean zero for all t values of x for one entity. It also implies that there is no omitted variable bias.

2. $X_{i1,} X_{i2}, \dots \dots .., X_{it}, u_{i1}, u_{i2}, \dots \dots \dots, u_{it}), i = 1, \dots \dots .. n$ are independent and identically distributed random variables. Second assumptions indicates the random sampling of the population and the variables of one entity are independent and identically distributed from another variable for another entity.

3. Large outliers are unlikely: (X_{it}, u_{it}) have nonzero finite fourth moments.

4. There is no perfect multicollinearity.

5. The errors for a given firm are not correlated over time, conditional on the variables; specifically, cov($u_{it}, u_{is} \| X_{i1}, X_{i2}, \dots \dots \dots \dots, X_{it}, \alpha_{it}$) = 0 for t ≠ s. If u_{it} is correlated with u_{is}, then it is said to be autocorrelated or serially correlated.

If the series do not hold assumption 5, the homoskedasticity should be tested and the usual standard errors will not be valid because they will be derived from the assumption that standard errors are not auto-correlated and also homoscedastic. The heteroscedastic and auto-correlation consistent (HAC) standard errors allow the errors to be correlated within a group but uncorrelated in different groups. (Stock & Watson, 2012)

3.5. RANDOM EFFECTS REGRESSION

In fixed effects model, including the relevant dummy variables for time fixed effects and entity fixed effects is to cover up the ignorance for the variables which is not added in the model. However, as it causes the loss of number of degrees of freedom. (Kmenta, 1971) If the dummies do show a lack of knowledge, it is also possible to express the unknown through disturbance term.

$$Y_{it} = \beta_0 + \beta_1 X_{it} + \beta_2 Z_i + u_{it} \quad (16)$$

Differently from fixed effects regression model, β_0 is a random variable with a mean of zero and variance of σ_ε^2.

$$\beta_0 = \beta_{0i} + \varepsilon_i \qquad i = 1,2, \dots \dots \dots \dots, N \tag{17}$$

Then the model becomes;

$$Y_{it} = \beta_0 + \beta_1 X_{it} + \beta_2 Z_i + \omega_{it} \tag{18}$$

In the model $\omega_{it} = \varepsilon_i + u_{it}$, ε_{it} is the cross section, individual specific error component, u_{it} is the combined time series and cross-section error component.

3.5.1. The Random Effect Regression Assumptions

In Random Effects Regression, error terms are not correlated with each other and are not autocorrelated with cross section and time series units.

1. $\varepsilon_i \sim N(0, \sigma_\varepsilon^2)$. That assumption means that ε_i terms are normally distributed.

2. $u_{it} \sim N(0, \sigma_u^2)$. That assumption indicates that u_{it} terms are normally distributed

3. $E(\varepsilon_i, u_{it}) = 0$ $E(\varepsilon_i, \varepsilon_j) = 0$ $i \neq$ j This assumption shows that the average value of error terms is zero.

4. $E(u_{it}, u_{is}) = E(u_{it}, u_{jt}) = E(u_{it}, u_{js}) = 0$ $(i \neq j \neq s)$. This assumption expresses that the average value of error terms is zero. (Brooks, 2014)

3.6. THE CHOICE OF FIXED AND RANDOM REGRESSIONS

1. If number of time series data, namely T, is large and number of entities, namely N, is small, there will not be much difference between coefficients of Fixed Effects Regression and Random Effect Regression. Besides the computational convenience, Fixed Effects Regression will fit better.

2. When N is big and T is small, Fixed Effects Regression and Random Effects Regression will give significantly different results. In Random Effects Regression, $\beta_{1i} = \beta_1 + \varepsilon_i$, where ε_i is the cross sectional random, however in Fixed Effects Regression β_{1i} is fixed and not random. The statistical inference depends on the observed cross-sectional units

in sample. If the individual, cross sectional units in the sample are not random, then Fixed Effects Regression Model is more appropriate, but if the individual, cross sectional units in the sample are random, then Random Effects Model is more appropriate.

3. If the error component ε_i or one or more regressors are correlated, then the Random Effects Model will be biased, hence the Fixed Effects Model will be suitable.

4. If N is large and T is small, and Random Effects Model is applicable, the assumptions of Random Effects Model holds, then Random Effects Model will give more reliable coefficient numbers.(Judge et al., 1982)

3.7. MODEL PRE-TESTS

Considering the assumptions of panel data, the model only gives reliable results if the assumptions are not violated. Hence, the model should be built just after testing for the assumptions of model.

3.7.1. Unit Root Tests

If a regressor has a unit root process in a model, the equation can give misleading results if the CLM assumptions are violated. (Wooldridge, 2013)

Integrated of order zero, I(0) is the weakly dependent process which is desired in the model. If the variable follows I(0), nothing is needed to be done to the data to use in the equation, it satisfies the limit theorems. Unit root theorems such as random walk is called integrated of order one, I(1), which means the first difference of the data is dependent and stationary.

To eliminate the dependency there are different methods;

1. The first difference is often useful. For the random walk;

$$\Delta y_t = y_t - y_{t-1} = e_t, t = 2,3, \ldots\ldots; \qquad (19)$$

Hence, the first differenced series $\{\Delta y_t; t = 2,3, \ldots\ldots\}$ is i.i.d..(independent and identically distributed) sequence. So, when the process is integrated with order one, taking the first difference will help with the stationarity and dependency.

2. In the regression analysis, the first difference in the logs can also be used to eliminate the unit root.

$$\Delta \log(y_t) = \log(y_t) - \log(y_{t-1}) \quad (20)$$

Alternatively, proportionate or percentage can also be effective for the unit root elimination.

$$\Delta\log \approx \frac{(y_t - y_{t-1})}{y_{t-1}} \quad (21)$$

Differencing time series also removes any linear time trend. A linearly trending variable is;

$$y_t = \gamma_0 + \gamma_1 t + v_t \quad (22)$$

Where v_t has zero mean. Then $\Delta y_t = \gamma_1 + v_t$ and $E(\Delta y_t) = \gamma_1 + E(v_t) = \gamma_1$. That concludes $E(\Delta y_t)$ is constant. Taking the first difference of the regressor or the logarithm of the regressor can substitute including a time trend in the regression.

There are different tests to identify the problem. The simplest method to recognize the unit root starts with AR(1) model.

$$y_t = \alpha + \rho y_{t-1} + e_t, \; t = 1,2, \ldots\ldots x, \quad (23)$$

y_0 is the initial value. Through that, $\{e_t\}$ has zero mean,

$$E(e_t, y_{t-1}, y_{t-2}, \ldots\ldots, y_0) = 0 \quad (24)$$

$\{e_t\}$ is a martingale difference sequence, with respect to $\{y_{t-1}, y_{t-2}, \ldots\ldots, y_0\}$.

If $y_t = \alpha + \rho y_{t-1} + e_t$, it has a unit root if ρ = 1. If $\alpha = 0$ and ρ = 1 , y_t follows random walk without drift. If $\alpha \neq 0$ and ρ = 1 , y_t follows random walk with drift, hence E(y_t) is a linear function of t.

Moreover the null hypothesis is that y_t has a unit root.

$$H_o;\ \rho = 1 \quad (25)$$

If the alternative H_o; $\rho < 1$ is the case, y_t is a stable AR(1) process, which is weakly dependent or asymptotically uncorrelated.

Modifying the equation with $\theta = \rho - 1$ and subtracting y_{t-1} from $y_t = \alpha + \rho y_{t-1} + e_t$, $\Delta y_t = \alpha + \theta y_{t-1} + e_t$, then H_o; $\theta = 0$ and H_1; $\theta < 0$. Under H_o, y_{t-1} is I(1), so central limit theorem which assumes asymptotic standard normal distribution for t statistic is not applicable even in large sample sizes. That distribution under H_o is called Dickey Fuller Distribution. (Dickey & Fuller, 1979)

The resulting test is also known as the Dickey-Fuller(DF) test for a unit root. The extended version is known as augmented Dickey Fuller (ADF) test since it is augmented with the lagged changes Δy_{t-h} . Pesaran (2007) proposed a new simple test which use cross section averages of lagged levels as well as first differences of the individual series for the cross section dependence as an extension of ADF, Moon & Perron (2004), Bai & Ng (2002), Phillips & Sul (2003).

$$CIPS = N^{-1}\Sigma_{i=1}^{N} CADF_I \quad (26)$$

Where $N \to \infty$, $T \to \infty, \frac{N}{T} \to k$ where k is a fixed finite non-zero constant. The standard central limit theorems don't apply for CIPS, however it has its own critical values.

Table 12. CIPS critical values

N	20			30			50		
Level Of Significance / T	**1%**	**5%**	**10%**	**1%**	**5%**	**10%**	**1%**	**5%**	**10%**
20	-2.4	-2.21	-2.1	-2.32	-2.15	-2.07	-2.25	-2.11	-2.03
30	-2.38	-2.2	-2.11	-2.3	-2.15	-2.07	-2.23	-2.11	-2.04
50	-2.36	-2.2	-2.11	-2.3	-2.16	-2.08	-2.23	-2.11	-2.05
100	-2.36	-2.2	-2.11	-2.3	-2.16	-2.08	-2.23	-2.12	-2.05
200	-2.36	-2.2	-2.11	-2.3	-2.16	-2.08	-2.23	-2.12	-2.05

3.7.2. Serial Correlation

For Ordinary Least Squares Regressions, there should be no serial correlation between the error terms. If that assumption is violated, then OLS is no longer BLUE (best linear unbiased estimator) and the results are no longer reliable.

$$Corr(u_t, u_s) = 0\,, t \neq s \tag{27}$$

When this equation doesn't hold for the model, the errors are serially correlated or auto-correlated. For example, when $u_{t-1} > 0$ then $u_t > 0$ as it is the next period. Then, $Corr(u_t, u_{t-1}) > 0$ and the error terms are serially correlated.

3.7.3. Testing For Serial Correlation

The AR(1) model is the most efficient model to test for autocorrelation. The null hypothesis is that there is no serial correlation. The strong evidence is being sought to show that null hypothesis is not violated.

The standard assumptions for AR(1) model is that;

$$E(e_t|\, u_{t-1}, u_{t-2}, \dots \dots.) = 0 \tag{28}$$

and

$$Var(e_t|u_{t-1}) = Var(e_t) = \sigma_e^2 \tag{29}$$

And the null hypothesis is H_0: $\rho = 0$. The hypothesis can be tested by applying the normality test results to the dynamic model;

$$u_t = \rho u_{t-1} + e_t, t = 2, \dots \dots, n \tag{30}$$

Under the null hypothesis, $\rho = 0$, u_t is weakly dependent. The estimation is applicable for all t= 2,……,n without an intercept and usual t statistics. Since it is possible to replace u_t with OLS residuals $\hat{u}_t$, there is no effect to use u_t instead of OLS residual u_t.

3.7.3.1. The Durbin Watson Tests

The Durbin Watson test relies on OLS residuals;

$$DW = \frac{\sum_{t=2}^{n}(\hat{u}_t - \hat{u}_{t-1})^2}{\sum_{t=1}^{N}\hat{u}_t{}^2} \tag{31}$$

Hence, $W \approx 2(1 - \hat{\rho})$. This equation is not exact, because $\hat{\rho}$ has $\sum_{t=1}^{N} \hat{u}_{t-1}^{\ 2}$ in its denominator, DW has the sum of squares of all OLS residuals in its denominator. The distribution of Durbin and Watson has all classical linear model assumptions and the normality of error terms. The distribution also relies on the sample size, number of variables, the intercept, the values of independent variables.

Durbin Watson test is computed for $H_1: \rho > 0$. From the equation, $\hat{\rho} \approx 0$ and DW ≈ 2 and $\hat{\rho} > 0$ DW < 2. In favour of null distribution of Durbin Watson, two critical values are examined, $d_U(upper)\ and\ d_L(lower)$.

If DW < d_L, then H_0 is rejected, if DW > d_U , H_0 is failed to reject. If $d_L \leq DW \leq d_U$, test is inconclusive.

3.7.3.2. Lagrange Multiplier Test

Lagrange Multiplier (LM Test) is another test for F test. The statistics for LM test is;

$$LM = (n - q)R_{\hat{u}}^2 \tag{32}$$

In the equation, $R_{\hat{u}}^2$is the general R-squared. Null hypothesis suggests $M \sim X_q^2$, which is known as Breusch – Godfrey test.

3.7.4. Correcting For Serial Correlation

In serially correlated models, the errors are assumed to follow AR(1) model;

$$u_t = \rho u_{t-1} + e_t\ for\ t = 1,2, \dots \dots . t \tag{33}$$

The Gauss Markov assumptions are still hold and the autocorrelated equation for t ≥ 2;

$$y_{t-1} = \beta_0 + \beta_1 x_{t-1} + u_{t-1} \tag{34}$$

$$y_t = \beta_0 + \beta_1 x_t + u_t \tag{35}$$

$$y_t - \rho y_{t-1} = (1 - \rho)\beta_0 + \beta_1(x_t - \rho x_{t-1}) + e_t,\ \ t \geq 2 \tag{36}$$

Since $e_t = u_t - \rho u_{t-1}$,

$$\tilde{y}_t = (1-\rho)\beta_0 + \beta_1\tilde{x}_t + e_t,\ t \geq 2, \tag{37}$$

Showing,

$$\tilde{y}_t = y_t - \rho y_{t-1}\,, \tilde{x}_t = x_t - \rho x_{t-1} \tag{38}$$

That equation is called quasi-differenced data. The error terms are not correlated in that equation and it satisfies all Gauss and Markov assumptions.

OLS in that equation is not BLUE any more as the first time data is dropped. Generalized Least Squares regressors can be used in that situation, which is BLUE and serially uncorrelated, t and F statistics are valid.

$$\tilde{y}_t = (1-\rho)\beta_0 + \beta_1\tilde{x}_{t1} + \cdots + \beta_k\tilde{x}_{tk} + e_t, t \geq 2, \tag{39}$$

$$\text{For t=1}\ , \tilde{y}_1 = (1-\rho^2)^{1/2}y_1, \tilde{x}_{1j} = (1-\rho^2)^{1/2}x_{1j}. \tag{40}$$

Hardly known ρ estimator is often replaced by $\hat{\rho}$ from the OLS to generate quasi-differenced data and it is called feasible GLS (FGLS).

There are different approaches while using Generalized Least Squares (GLS), such as Cochrane Orcutt (CO) estimation and Prais-Winsten (PW) estimation. Cochrane Orcutt (CO) drops the first observation, however, Prais-Winsten adds it back and it is mostly critical for small data set results.

3.7.5. Heteroskedasticity

Homoskedasticity requires constant $Var(u|x_1, x_2, \ldots \ldots, x_k) = \sigma^2$. In the presence of heteroskedasticity, R-square is not affected, however, if the estimators variances do not follow t distribution, the confidence intervals and t statistics are not meaningful. Similarly, F statistics and LM statistics are not F-distributed or chi-square distributed. The statistics under Gauss-Markov assumption is not applicable when there is heteroskedasticity.

In small data sets, heteroskedasticity might be a concern. Firstly, the autocorrelation test must be applied for the homoskedasticity validation. After autocorrelation tests, the robustness for heteroskedasticity can be discussed.

3.7.5.1. Testing For Heteroskedasticity

3.7.5.1.1. Breusch-Pagan Test

Breusch-Pagan is one of the alternatives to test heteroskedasticity.

$$u_t^2 = \delta_0 + \delta_1 x_{t1} + \cdots + \delta_k x_{tk} + v_t, \quad (41)$$

The null hypothesis suggests $H_0 = \delta_1 = \delta_2 = \cdots = \delta_k = 0$ under the assumption that v_t is homoskedastic and serially uncorrelated.

3.7.5.1.2. White Test

White (1980) suggested a test for heteroskedasticity that adds the squares and cross products of all the independent variables. The test aims to test for heteroskedasticity that invalidate the usual OLS standard errors and test statistics. If k equals 3,

$$\hat{u}^2 = \delta_0 + \delta_1 x_1 + \delta_2 x_2 + \delta_3 x_3 + \delta_4 {x_1}^2 + \delta_5 {x_2}^2 +$$

$$\delta_6 {x_3}^2 + \delta_7 x_1 x_2 + \delta_8 x_1 x_3 + \delta_9 x_2 x_3 + error \quad (42)$$

The White test seeks if all δ_j except the intercept is zero, with six more regressors than Breusch-Pagan test with LM statistics.

3.7.5.2. Correcting For Heteroskedasticity

If there is heteroskedasticity problem in one dataset, the robust statistics of OLS is one alternative to overcome the situation by adjusting standard errors, t, F and LM statistics. If there is a possibility to specify the variance as a function of explanatory variables, then Weighted Least Squares(WLS) is a better alternative than OLS.

$$Var(u|x) = \sigma^2 h(x) \quad (43)$$

In the equation, h(x) is a function of explanatory variables to define heteroskedasticity and since $Var(u|x) > 0$, $h(x) > 0$.

As discussed in correcting Serial Correlation, GLS estimators can be used for correcting heteroskedasticity as well.

3.8. POST-MODEL TESTS

3.8.1. Variance Inflation Factor (VIF)

Variance Inflation Factor(VIF) is an indicator for variance and covariance rising speed.

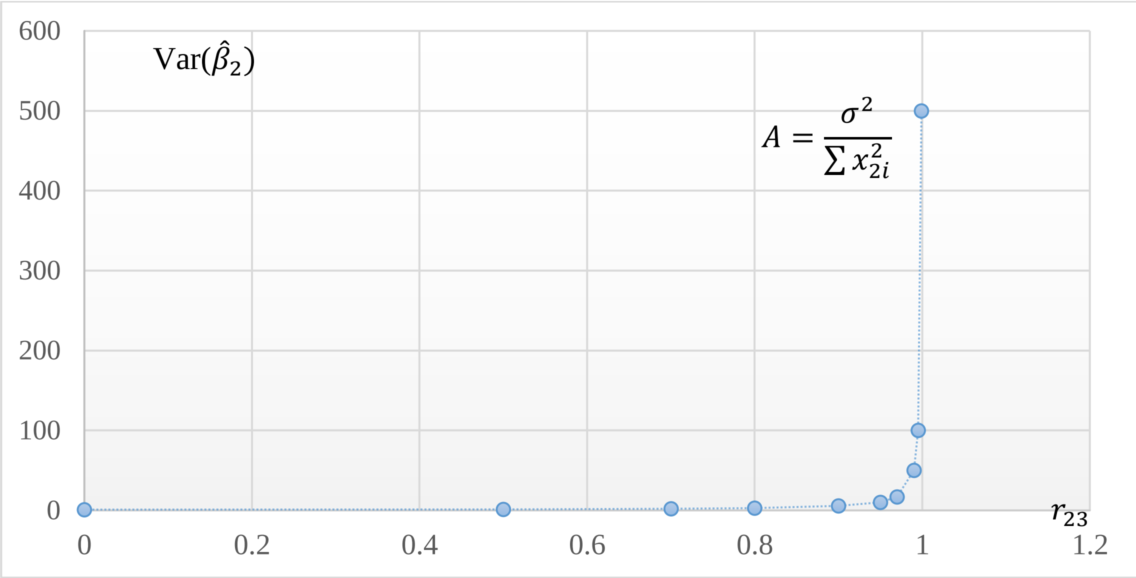
$$VIF = \frac{1}{(1-r_{23}^2)} \quad (44)$$

Under the presence of multicollinearity, the Variance Inflation Factor rises. When r_{23}^2 gets closer to 1, VIF limits to infinity. If there is no multicollinearity, VIF is calculated as 1.

Table 8. The effect of r_{23}^2 on variances and covariances.

Value of r_{23}^2	VIF	$\text{var}(\hat{\beta}_1)$	$\frac{\text{var}(\hat{\beta}_1)(r_{23} \neq 0)}{\text{var}(\hat{\beta}_1)(r_{23} = 0)}$	Covar $(\hat{\beta}_1, \hat{\beta}_2)$
0	1	$A = \frac{\sigma^2}{\sum x_{2i}^2}$	-	*0*
0.5	1.33	1.33 x A	1.33	*0.67 x B*
0.7	1.96	1.96 x A	1.96	*1.37 x B*
0.8	2.78	2.78 x A	2.78	*2.22 x B*
0.9	5.76	5.26 x A	5.26	*4.73 x B*
0.95	10.26	10.26 x A	10.26	*9.74 x B*
0.97	16.92	16.92 x A	16.92	*16.41 x B*
0.99	50.25	50.25 x A	50.25	*49.75 x B*
0.995	100	100 x A	100	*99.50 x B*
0.999	500	500 x A	500	*499.50 x B*

Graph 9: Variance Inflation Factor (VIF)



3.9. MODEL DESCRIPTION

3.9.1. Tobin's Q Calculation

In this thesis, as a proxy of the dependent variable market's firm value, Tobin's Q is used as in the studies of Allayannis & Weston (2001), Lau (2016), Bartram et al. (2011), Jin & Jorion (2006). Tobin's Q ratio is calculated as the firm's market value, divided by total assets.

Tobin's Q is originally created by Tobin in 1969 and developed by Lindenberg and Ross, National Bureua of Economic Research, Lewellen and Badrinath (Lewellen & Badrinath, 1997; Lindenberg & Ross, 1981; Tobin, 1969). In these papers there is not an argument on market value, however, the replacement cost of the assets is critically discussed. Chung & Pruitt (1994) stated and investigated that the replacement cost of total assets can be proxied by the book value of the total assets and the calculations give very similar results to complicated calculations.

3.9.1.1.Lindenberg And Ross Calculation

That approach has an initial date when the replacement cost of assets is the same as the book values of assets. Every year ahead, the cost is affected by inflation, depreciation and technological change. Hence the formula for replacement cost of fixed assets is;

$$RCF_t = (RCF_{t-1})\left[\frac{1+i}{(1+d)(1+\theta)}\right] + (GF_t - GF_{t-1}) \quad (45)$$

RCF_t = the replacement cost of fixed assets at time t

RCF_{t-1} = the replacement cost of fixed assets at time t-1

GF_t= the book value of fixed assets at time t

GF_{t-1}= the book value of fixed assets at time t-1

d = rate of depreciation for fixed assets at time t

θ = rate of technological change for fixed assets at time t

i = inflation rate

The formula for the replacement cost of inventories is;

$$RCI_t = (RCI_{t-1})(1+i) + (BI_t - BI_{t-1})[1 + \frac{i}{2})] \quad (46)$$

RCI_t = the replacement cost of inventories at time t
RCI_{t-1} = the replacement cost of inventories at time t-1
BI_t = book values of inventories at time t
BI_{t-1}= book values of inventories at time t-1

The correction for inventories can only be done when LIFO is used. If FIFO is the inventory methods, then the book value equals replacement costs.

3.9.1.2.National Bureau Of Economic Research Calculations

Main difference for National Bureau calculations is related to the comparisons with the initial dates in Lindenberg & Ross calculations. Instead of choosing an initial date, National Bureau uses past five years. Replacement cost of fixed assets (RCF_t) is;

$$AA_t = AD_t / D_t \quad (47)$$

$$LL_t = \frac{GF_t}{D_t} \quad (48)$$

$$SLL_t = (LL_t + LL_{t-1} + \cdots + LL_{t-4})/5 \quad (49)$$

$$SAA_t = (AA_t)\left(\frac{LL_t}{SLL_t}\right) \quad (50)$$

$$RCF_t = (NF_t)(1 + i_t)(1 + i_{t-1}) \dots \dots (1 + i_t - SAA) \quad (51)$$

AA_t = average approximate age of fixed assets

AD_t = cumulative depreciation

D_t = current depreciation

LL_t= average life span of fixed assets

SLL_t= smoothed average life span of fixed assests

SAA_t= smoothed average age of fixed assets

GF_t = book value of gross fixed assets

NF_t = net book value of fixed assets

For inventories, replacement cost of inventories is;

$$RCI_t = (RCI_{t-1})(1 + i) + (BI_t - BI_{t-1}) \quad (52)$$

If there is a decrease in inventories, the equation should be changed as;

$$RCI_t = (RCI_{t-1})(1 + i) + \left(\frac{BI_t}{BI_{t-1}}\right) \quad (53)$$

3.9.1.3.Lewellen And Badrinath Calculations

Lewellen & Badrinath (1997) suggested a model where only the information from financial reports are deployed in the equation for easier calculations.

$$GF_t = GF_{t-1} + I_t - R_t \quad (54)$$

$$AD_t = AD_{t-1} + D_t - R_t \quad (55)$$

D_t= depreciation at year t

I_t= new investments at year t

R_t= book value of out of service assets at year t

The new investments at year t is calculated as;

$$I_t = NF_t - NF_{t-1} + D_t \quad (56)$$

NF_t= net fixed assets at year t

NF_{t-1}= net fixed assets at year t-1

The derivative usage of the company is measured by the total derivatives reported under IFRS and GAAP rules, stated under current assets related to hedging, non-current assets related to hedging, current liabilities related to hedging and non-current liabilities related to hedging. 695 observations of full data set have a percentage of less than %20 over operational revenue.

Table 9. Variable Definition

Variable	Initials
Total Long-Term Debt, MM	TLD
Total Firm Market Value, MM	MV
Oil & Gas Capital Expenditures, MM	CAPEX
Total Sales & Operating Revenues, MM	OPREV
Cash and Equivalents, if reported, MM	CASH
Total Current Liabilities, MM	TCL
Total Non-Debt Long-Term Liabilities, MM	TNDL
Net Income (as reported), MM	NINC
Return on Total Assets, %	ROA
Capital Expenditures/Additions to PP&E: IA, MM	CAPEXA
Current Assets Related to Hedging, MM Non-Current Assets Related to Hedging, MM Current Liabilities Related to Hedging, MM Non-Current Liabilities Related to Hedging, MM	HA
Tobin's Q	TQ
S&P 500	SP500

The data is investigated and some companies are omitted to see a clear picture of derivative usage effectiveness. In some countries like Turkey, National Oil Companies are not allowed to use derivatives to eliminate risks due to legal regulations. Companies, which don’t use derivatives during the selected years of this research for such reason or any other reason are ignored.

Table 10 shows the descriptive statistics of the variables.

Table 10. Descriptive Statistics

Variable	Obs	Mean	Standard Deviation	Minimum	Maximum
TLD	760	7,070,000,000	11,600,000,000	-	87,200,000,000
OPREV	760	34,800,000,000	77,500,000,000	-	470,000,000,000
CASH	760	2,070,000,000	4,380,000,000	-	31,200,000,000
TCL	760	8,330,000,000	17,600,000,000	3,029,000	106,000,000,000
TNDL	760	4,540,000,000	11,300,000,000	-	109,000,000,000
NINC	760	2,030,000,000	6,310,000,000	(44,900,000,000)	45,800,000,000
ROA	760	0.5549503	21	(330)	89
CAPEXA	760	4,680,000,000	7,340,000,000	(4,800,000,000)	53,000,000,000
HAL	760	1,120,000,000	4,890,000,000	(182,000,000)	79,500,000,000
TQ	760	1.10162100	0.5928632	-	5.141413

Table 11 shows that Total Long Term Debt, Total Non-Debt Long-Term Liabilities and Total Current Liabilities can be used for each other. Correlation Matrix also shows that Total Sales and Operating Revenues, Return on Assets and Net Income have strong correlation.

Table 11. Correlation Matrix

	TLD	OPREV	CASH	TCL	TNDL	NINC	ROA	CAPEXA	HAL	TQ
TLD	1									
OPREV	0.6733*	1								
CASH	0.7305*	0.7365*	1							
TCL	0.7254*	0.9689*	0.7601*	1						
TNDL	0.8188*	0.6157*	0.6069*	0.6216*	1					
NINC	0.3156*	0.6339*	0.5443*	0.6251*	0.1631*	1				
ROA	0.0352	0.1065*	0.0965*	0.0955*	0.0186	0.2998*	1			
CAPEXA	0.7929*	0.8223*	0.7938*	0.8346*	0.6243*	0.6929*	0.1175*	1		
HAL	0.3738*	0.6406*	0.4485*	0.6858*	0.4297*	0.3857*	0.0473	0.4874*	1	
TQ	-0.3102*	-0.2352*	-0.2332*	-0.2469*	-0.2409*	-0.1550*	-0.1565*	-0.2701*	-0.1263*	1

In the next step, variables are tested for autocorrelation. Since the null hypothesis of the Pesaran test is the cross sectional independence, Table 13 results show that models should be corrected for autocorrelation.

Table 13. Pesaran Test Results

Variable	CD test	PValue	Corr	ABS
TLD	48.26	0.0000	0.286	0.497
XTCD	73.03	0.0000	0.433	0.553
CASH	14.27	0.0000	0.085	0.320
TCL	42.95	0.0000	0.254	0.404
TNDL	38.84	0.0000	0.230	0.505
NINC	78.94	0.0000	0.468	0.497
ROA	89.31	0.0000	0.529	0.557
CAPEXA	58.31	0.0000	0.345	0.472
HAL	18.43	0.0000	0.109	0.350
TQ	25.40	0.0000	0.150	0.403

Before the model, variables are also tested for Unit Root. The results and existence of unit root are shown in Table 14.

Unit root is eliminated from the variables with unit root by taking the first difference. Table 15 shows the unit root figures of first differenced variables.

After the tests, 9 models are being built. The models are shown in Table 16.

Table 16. Models

Model 1	**Model 2**	**Model 3**	**Model 2***	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**	**Model 9**
TQ	TQ	TQ	TQ	TQ	TQ	TQ	TQ	TQ	TQ
HAL	HAL	HAL	HAL	HAL	HAL	HAL	HAL	HAL	HAL
TLD	TLD	TLD	TLD	TNDL	TNDL	TNDL	TCL	TCL	TCL
OPREV	ROA	NINC	ROA	OPREV	ROA	NINC	OPREV	ROA	NINC
CASH	CASH	CASH	CASH	CASH	CASH	CASH	CASH	CASH	CASH
CAPEXA	CAPEXA	CAPEXA	CAPEXA	CAPEXA	CAPEXA	CAPEXA	CAPEXA	CAPEXA	CAPEXA
			SP500	SP500	SP500	SP500	SP500	SP500	SP500

To decide if random effects or fixed effects will be used, the Hausman test was run.

Table 17 shows the results of Model 1. The results showed that the random effects will be more suitable for our model. Then, heteroskedasticity and autocorrelation tests were applied. The data is described as heteroskedastic and auto correlated random effects. Prais-Winsten regression, heteroskedastic panels corrected standard errors was run.

Table 17 shows the results of Model 2. The results showed that the fixed effects will be more suitable for model 2. Then, heteroskedasticity and autocorrelation tests were applied. The data is described as heteroskedastic and autocorrelated fixed effects. Region based dummies were also inserted in model

Table 17. Model 1 and Model 2 Results

Variables	Model 1	Model 2
DHAL	0.000000000000229	(0.00000000000643)***
DTLD	(0.0000000000121)***	(0.00000000000561)***
DOPREV	(0.00000000000027)	
TCL		
TNDL		
NINC		
ROA		0.0043338*
CASH	0.00000000000055	(0.00000000000288)
CAPEXA	(0.0000000000019)	(0.00000000000295)
IREGION2		(0.2776337)***
IREGION3		(0.2672777)**
IREGION4		(0.0087602)
IREGION5		(0.2118061)**
IREGION6		(0.6209612)***
IREGION7		(0.1688663)
IREGION8		0.1342359
IREGION9		0.0901621
IREGION10		0.0489859
IT2008		0.3635849***
IT2009		0.3904811***
IT2010		0.0932863
IT2011		0.2222452***
IT2012		0.2683222***
IT2013		0.0247953
IT2014		0.170244*
IT2015		0.3213604***
IT2016		0.2132909**
CONS	1.19275***	0.9658774***

The regions of the companies are added in the group as in IHS Market Database. These regions include Global Integrated Oil Companies(1), European Integrated Oil Companies(2), Russian Integrated Oil Companies(3), South & Central American

International Oil Companies(4), Asian Integrated Oil Companies(5), Other Integrated Oil Companies(6), Canadian Integrated Oil Companies(7), Large North American Exploration and Production(E&P) Companies(8), Canadian E&Ps & Trusts(9), Outside North America E&Ps(10).

Table 18. Model 3 and Model 2* Results

Variables	Model 3	Model 2*
DHAL	0.00000000000027	(0.00000000000643)***
DTLD	(0.0000000000125)***	(0.00000000000561)***
DOPREV		
TCL		
TNDL		
NINC	0.00000000000401	
ROA		0.0043338*
CASH	(0.00000000000328)	(0.00000000000288)
CAPEXA	(0.00000000000775)*	(0.00000000000295)
SP500		0.0005034***
IREGION2		(0.2776337)***
IREGION3		(0.2672777)***
IREGION4		(0.0087602)
IREGION5		(0.2118061)**
IREGION6		(0.6209612)***
IREGION7		(0.1688663)
IREGION8		0.1342359***
IREGION9		0.0901621***
IREGION10		0.0489859***
IT2008		0.3084192***
IT2009		0.438931***
IT2010		0.3138885***
IT2011		0.5333739***
IT2012		0.5884925***
IT2013		0.4250308***
IT2014		0.7003639***
IT2015		0.5931311***
IT2016		0.462206***
CONS	1.258431***	(dropped)

Since the model constant was significantly positive, besides the firm specific variables, macroeconomic variable such as S&P 500 index is included in model 2*. As seen in model results, the impact of macroeconomic events follow perfect multicollinearity with our model constant, so that constant is dropped from the model. Following models are updated accordingly to capture the importance of macroeconomic events.

Table 19. Model 4 and Model 5 Results

Variables	Model 4	Model 5
DHAL	(0.00000000000448)**	(0.00000000000705)***
TNDL	(0.00000000000408)*	(0.0000000000039)*
ROA		0.004402*
DOPREV	(0.000000000000584)	
CASH	0.000000000000134	(2.24E-12)
CAPEXA	(0.000000000001560)	(3.18E-12)
SP500	0.000518***	0.0004611***
IREGION2	(0.2907092)***	(0.245997)**
IREGION3	(0.3422185)***	(0.3119332)***
IREGION4	(0.0577832)	(0.0060199)
IREGION5	(0.1853907)*	(0.2489293)**
IREGION6	(0.6266462)***	(0.6095049)***
IREGION7	(0.1702301)	(0.1167606)
IREGION8	0.0841178	0.1688507
IREGION9	0.0811354	0.1476769
IREGION10	0.0108535	0.1037438
IT2008	0.3330258***	0.3449651***
IT2009	0.4467278***	0.4678163***
IT2010	0.3272652***	0.3207427***
IT2011	0.5602442***	0.5309937***
IT2012	0.6024993***	0.588554***
IT2013	0.4411363***	0.4146527***
IT2014	0.7094473***	0.6732297***
IT2015	0.4835397***	0.5862716***
IT2016	0.4233353***	0.453025***
CONS	(dropped)	(dropped)

Table 20. Model 6 and Model 7 Results

Variables	Model 6	Model 7
DHAL	(0.00000000000588)***	(0.00000000000408)*
TNDL	(2.14E-12)	
NINC	(0.0000000000117)***	
TCL		(2.06E-12)
DOPREV		(6.13E-13)
CASH	(1.17E-12)	(3.22E-13)
CAPEXA	(9.08E-12)	(1.66E-12)
SP500	0.0004221***	0.000527***
IREGION2	(0.1616918)	(0.3042574)***
IREGION3	(0.2624918)**	(0.3316489)***
IREGION4	0.1000086	(0.1451652)
IREGION5	(0.1554087)	(0.0748344)
IREGION6	(0.5166445)***	(0.6410693)***
IREGION7	(0.011645)	(0.1894671)
IREGION8	(0.2724385)**	0.0702305
IREGION9	(0.2493143)*	0.066166
IREGION10	0.1812655	(0.0035163)
IT2008	0.3501891***	0.3326666***
IT2009	0.4564307***	0.4462066***
IT2010	0.3009789***	0.3299522***
IT2011	0.5043764***	0.565933***
IT2012	0.5495975***	0.6057648***
IT2013	0.3795658***	0.4464049***
IT2014	0.6329473***	0.7138412***
IT2015	0.4880093***	0.4803688***
IT2016	0.4104416***	0.4202097***
CONS	(dropped)	(dropped)

Table 21. Model 8 and Model 9 Results

Variables	Model 8	Model 9
DHAL	(0.00000000000726)***	3.76E-13
TCL	(5.49E-13)	(0.00000000000771)***
ROA	0.0044108*	
NINC		(0.00000000000716)**
CASH	(3.27E-12)	(2.19E-13)
CAPEXA	(4.47E-12)	(4.76E-12)
SP500	0.0004433***	(0.0001258)*
IREGION2	(0.2248488)**	
IREGION3	(0.2637607)**	
IREGION4	(0.0473129)	
IREGION5	(0.1678524)*	
IREGION6	(0.5783498)***	
IREGION7	(0.0866671)	
IREGION8	0.2060791	
IREGION9	0.183074	
IREGION10	0.1398117	
IT2008	0.3492445***	
IT2009	0.4671158***	
IT2010	0.3130987***	
IT2011	0.5210859***	
IT2012	0.5759431***	
IT2013	0.3994002***	
IT2014	0.6509072***	
IT2015	0.5718651***	
IT2016	0.4381094***	
CONS	(dropped)	0.9681147

The proportion of hedging activities under asset and liability items is not more not %20 for most cases. To robust the model results, another model is built. The hedging activities are divided to market value of the firms to normalize the size effect of hedging activities in Model 10. Moreover, two other dummy variables are inserted to investigate the impact of size and crisis environment on firm value instead of region dummies. The results are tabulated in Table X.

Table 22. Model 10 Results

Variables	**Model 10**
DHALMV	(0.00000305)***
DTLD	(0.00000000000686)***
ROA	0.00396*
CAPEXA	(0.00000000000854)**
SP500	0.000551***
SIZEDUMMY	(0.0154)
CRISISDUMMY	0.7302826***
IT2008	(0.4066706)***
IT2009	(0.2252374)***
IT2010	0.3693449***
IT2011	0.5709709***
IT2012	0.6268634***
IT2013	0.4693329***
IT2014	(dropped)
IT2015	(0.1083274)
IT2016	0.4913188***
CONS	(dropped)

4. RESULTS

In this research, the value adding impact of derivative usage is being investigated. Since it is a comparatively new regulation for companies which follow IFRS, there are not many firm-based data research. As it can be seen from the literature review tabulation, the data set selection is either theoretical or US based. For energy companies, it is really critical to operate outside the main country. For example, Shell is a Dutch company, however it has operations in Middle East, Northern Sea, US, South America, and Far East etc. These regions have different economic dynamics, different currencies, and different interest rates. It makes the company really vulnerable.

The risk perception is not only important for the company, but also for the investors. A market which has information asymmetry, would price any kind of information and reflect it to the firm value.

Energy companies have another vulnerability in such an environment. Since oil and gas prices are decided by main producer countries, many small and mid-size companies suffer from down-turns. However, in most manufacturing sectors, pricing would be a good means of surviving in a recession period.

The models' results are quite interesting and different than the literature. In the literature there are only a few research regarding energy sector. Bessembinder (1991), Froot et al. (1993), Rene M.Stulz (1996), W.Smith & M.Stulz (1985) discuss the hedging premium. Jin & Jorion (2006), on the other hand, stated that the risk factors are either easy to detect or not easy to detect and hence, hedging doesn't create any additional value.

Lau (2016) found that hedging activities have negative impact on net profit margins and operating income. Bartram et al. (2011), likewise, found the significant positive impact of hedging activities on risk and volatility, but couldn't find a strong relationship between market value and hedging.

The models created are as below;

MODEL 1: DTQ = f(DHAL, DTLD, DOPREV, CASH, CAPEXA)
MODEL 2: DTQ = f(DHAL, DTLD, ROA, CASH, CAPEXA)
MODEL 3: DTQ = f(DHAL, DTLD, NINC, CASH, CAPEXA)

MODEL 4: DTQ = f(DHAL, TNLD, DOPREV, CASH, CAPEXA)
MODEL 5: DTQ = f(DHAL, TNLD, ROA, CASH, CAPEXA, SP500)
MODEL 6: DTQ = f(DHAL, TNLD, NINC, CASH, CAPEXA, SP500)
MODEL 7: DTQ = f(DHAL, TCL, DOPREV, CASH, CAPEXA, SP500)
MODEL 8: DTQ = f(DHAL, TCL, ROA, CASH, CAPEXA, SP500)
MODEL 9: DTQ = f(DHAL, TCL, NINC, CASH, CAPEXA, SP500)

The variable selection is based on the literature of firm value. As in Allayannis & Weston, (2001), Lau (2016), Bartram et al. (2011), Jin & Jorion (2006). Tobin's Q is used for firm value proxy. As explained in Model Description, it is hard to calculate exact Tobin's Q, so the approximate Tobin's Q is included. Different variables which are highly correlated and substitute for each other are included in different models for robust results. TLD, TNDL and TCL, OPREV, NINC and ROA are taken as substitutes. In first models, the intercept was significant, to avoid omitted variable bias, a macroeconomic variable S&P 500 index is included in the model. Moreover, the null hypothesis and alternative hypothesis are;

$$H_0 = The\ hedging\ activities\ has\ an\ impact\ on\ firm\ value.$$

Surprisingly, all models indicate that hedging activities have a negative impact on firm value. This can be explained with the asymmetric information and signalling affect. DeMarzo & Duffie (1995) state that as there are disclosure regulations, hedging is seen as a signal and it gives private information that only managers are aware. Houston & Mueller (1988), Mayers & Smith (1990) found the relation between agency problems, financial distress and hedging activities.

Other findings indicate the negative impact of debt level on firm value. Investors price the debt as an increase on financial distress, hence the symbol is negative at 1% significance level. The profitability variables, ROA, NINC and OPREV create a positive perception and the firm value increases with higher profitability measures.

Another firm specific variable, CAPEXA shows relatively low significance level but big investment figures create bigger risks for oil and gas companies, and it is priced as a bad signal in the market.

The market conditions indicator S&P500 is one of the most significant variables. If the market goes well, the investors are willing to invest, macroeconomic figures such as inflation, employment rates, interest rates create a stable climate. Hence the market value of the firm increases.

Since the big integrated companies are compared to other regional areas, the region dummy display that those companies use their know-how to realize greater market values and they are significantly succeeding. When the companies are compared to their first year in data set, they are improving their market performance eventually.

For robust results, the size and crisis dummy are also included to the model. The crisis dummy takes value 1 for year 2008, 2009, 2014 and 2015 where the oil price declines dramatically. For size dummy, the average market value of all firms is found. Then, if the market value of the company for 10 years average is higher than the firms' average, dummy takes value 1, if the market value of the company for 10 years average is lower than the firms' average, dummy takes value 0. In the alternative model, hedging proxy variable is also divided to market value to normalize company size. The variance inflation factor also gives robust results that show the healthy model structuring.

MODEL 10: DTQ = f(DHALMV, DTLD, ROA, CAPEXA, SP500, SIZE,CRISIS)

The results are robust with the previous models. The effect of hedging activities is negative on market value. Crisis dummy, on the other hand, gives interesting results. Tobin's Q is significantly and positively dependent with the crisis dummy. It might not indicate that market value increases under crisis conditions, but market value doesn't decline as fast as the asset value. Another interpretation might be the other macroeconomic factors. The commodity price was taken as crisis proxy, but other factors might have year specific stimulations on firms' performance which overcomes the price effect.

As in Lau (2016), the relation between hedging activities and other control variables are investigated in Model 11;

MODEL 11: DTQ = f(DHALMV, DTLD, ROA, CASH, CAPEXA, SP500, SIZE,CRISIS)

Table 23. Model 11 Results

Variables	Model 11
DTLD	0.000000565***
ROA	(29.38773)
CASH	0.00000025
CAPEXA	0.000000745
SP500	9.161263***
SIZEDUMMY	(20624.31)***
CRISISDUMMY	30008.39***
IT2008	(18786.31)***
IT2009	(dropped)
IT2010	14652.02
IT2011	9560.898
IT2012	9775.217
IT2013	8162.092
IT2014	(28965.64)***
IT2015	(19401.54)
IT2016	11962.38*
CONS	(dropped)

Houston & Mueller (1988), Stulz (1996) found similar results as Model 11 in terms of DTLD. It indicates that when the outstanding debt of a firm is hig, than hedging activities to eliminate the debt related financial risks is more severe.

Model 11 also shows that smaller companies tend to use derivatives more than bigger companies. It may be a critical finding for the fragility of small undiversified companies to market risks.

Another important finding is the positive and significant crisis dummy. Since the crisis dummy is directly related to commodity price, companies try to bear with price risk using hedging strategies.

All results of the models are summarized in the Table below.

Table 24. Model Results

DTQ	DHAL/ DHALMV	DTLD/ TNDL/TCL	ROA/NINC/ OPREV	CASH	CAPEXA	SP500	REGION	TIME	SIZE	CRISIS
Model 1		Negative***								
Model 2	Negative***	Negative***	Positive*				Negative**	Positive***		
Model 2*	Negative***	Negative***	Positive*			Positive***	Negative - Positive***	Positive***		
Model 3		Negative***			Negative*					
Model 4	Negative**	Negative*				Positive***	Negative**	Positive***		
Model 5	Negative***	Negative*	Positive*			Positive***	Negative**	Positive***		
Model 6	Negative***		Negative***			Positive***	Negative**	Positive***		
Model 7	Negative*					Positive***	Negative**	Positive***		
Model 8	Negative***		Positive*			Positive***	Negative**	Positive***		
Model 9		Negative***	Negative***			Negative*				
Model 10	Negative***	Negative***			Negative**	Positive***		Positive***		Positive***

5. CONCLUSION

Risk is always a great interest for researchers. It would be great if one can evaluate the risk perfectly and use the right instruments to avoid or even benefit from risk. However, it was a political decision for producing leaders to keep the supply at a high level in 2014, and not many could expect it. Unconventional gas in US was seen as a new era recently, but the current events didn't help new investors and many small firms stopped their low profit, long term investments.

Oil and gas is long seen as a really profitable sector and it has many stakeholders. Governments would like to take royalties, the highest wages are mentioned in drilling fields. However, it is risky in nature. The probability of finding a reservoir in wild cat is really low, and it costs million dollars to drill a well in the middle of the sea. When everything is going well, market value of oil and gas companies are very high as well. Moreover, managers would not want to limit their profits by hedging activities. When there is a downturn, companies reduce their capital expenditures, lower the salaries, reduce the headcount and follow a conservative approach. Hence, it might not be forecasted to last long, so they don't work hard for active portfolio management.

This study identifies 76 exploration, production and integrated oil and gas firms which use hedging instruments and recorded in their balance sheet or income statement. Data is collected from IHS Markit database. These companies are following either IFRS or GAAP rules and publish their hedging activities in their financial reports. In accordance with IFRS 7 Financial Instruments: Disclosures (IASB, 2008), a reporting entity is required to provide disclosures in its financial statements that enable users to evaluate the significance of financial instruments for the entity's financial position and performance as well as the nature (and extent) of risks arising from financial instruments and how the entity manage those risks. Based on the availability of disclosures, data period is covering 2007 to 2016.

In the literature, there are different conclusions. Allayannis & Weston (2001) discussed the hedging premium of currency derivatives. Nance et al. (1993) also indicated that swap users profit from arbitrage opportunities and risk level reduction. Mnasri et al. (2017) also stated that hedging premium is present for oil and gas firms.

Jin & Jorion (2006) couldn’t find any relation. The risk factors are either easy to detect and easy to avoid, or hard to detect and hard to avoid, so hedging doesn't create any additional value. Ayturk et al. (2016) couldn’t find any evidence for hedging premium either.

Lookman (2004) found the negative impact of hedging on firm value. Lookman (2004) stated that signalling effect of bad management and high agency cost is causing the loss. DeMarzo & Duffie (1995) also discussed the significance of disclosures regarding hedging. It is seen as a signal and it gives private information that managers only know.

The results of this research give critical information regarding asymmetric information, signalling effect and financial distress.

All models indicate that hedging activities have a negative impact on firm value. Financial disclosures might signal the financial healthiness of a company. If companies are informing the public high hedging activities, it might be a warning for investors to avoid investing at that company. It might give a bad impression to the public having high level of asset and liability items related to hedging on balance sheet.

The model results are robust when it is econometrically and rationally tested. The variance inflation factor is deployed to test for perfect multicollinearity. Hedging is also normalized with market value to avoid any size affect. Results are similar.

Booth et al. (1984)discussed the importance of derivatives under financial distress. Block & Gallagher (1986) also found the relationship between hedging and financial distress and size. Mayers & Smith (1990)stated that outstanding debt, agency problems and firm size are the main incentives for hedging. Smith & Stulz (1985) reviewed in their study that the purpose of hedging instruments is to avoid taxes, to decrease financial stress and to control managerial risk aversion.

When the outstanding debt of a firm is big, than hedging activities to eliminate the debt related financial risks is more severe. Results demonstrate that companies which are small and have more outstanding debt tend to use derivatives.

Another important finding is the positive and significant crisis dummy. Since the crisis dummy is directly related to commodity price, companies try to bear with price risk using hedging strategies.

In this research, the general risk perception of oil and gas companies and their risk management activities are investigated. As the sector has its own unique features, companies' way of bearing with price risk is also discussed generally. However, the classification of the risk factors was not in the scope of this thesis. It would be an interesting research field for the researchers who are interested in energy sector and risk management. Evaluation of risk factors, and the importance of risk management from every risk factor perspective would give great attribute to the literature.

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APPENDIX-1 STATISTICAL TABLES

Table 10. Descriptive Statistics

Variable	Obs	Mean	Standard Deviation	Minimum	Maximum
TLD	760	7,070,000,000	11,600,000,000	-	87,200,000,000
OPREV	760	34,800,000,000	77,500,000,000	-	470,000,000,000
CASH	760	2,070,000,000	4,380,000,000	-	31,200,000,000
TCL	760	8,330,000,000	17,600,000,000	3,029,000	106,000,000,000
TNDL	760	4,540,000,000	11,300,000,000	-	109,000,000,000
NINC	760	2,030,000,000	6,310,000,000	(44,900,000,000)	45,800,000,000
ROA	760	0.5549503	21	(330)	89
CAPEXA	760	4,680,000,000	7,340,000,000	(4,800,000,000)	53,000,000,000
HAL	760	1,120,000,000	4,890,000,000	(182,000,000)	79,500,000,000
TQ	760	1.10162100	0.5928632	-	5.141413

Table 11. Correlation Matrix

	TLD	OPREV	CASH	TCL	TNDL	NINC	ROA	CAPEXA	HAL	TQ
TLD	1									
OPREV	0.6733*	1								
CASH	0.7305*	0.7365*	1							
TCL	0.7254*	0.9689*	0.7601*	1						
TNDL	0.8188*	0.6157*	0.6069*	0.6216*	1					
NINC	0.3156*	0.6339*	0.5443*	0.6251*	0.1631*	1				
ROA	0.0352	0.1065*	0.0965*	0.0955*	0.0186	0.2998*	1			
CAPEXA	0.7929*	0.8223*	0.7938*	0.8346*	0.6243*	0.6929*	0.1175*	1		
HAL	0.3738*	0.6406*	0.4485*	0.6858*	0.4297*	0.3857*	0.0473	0.4874*	1	
TQ	-0.3102*	-0.2352*	-0.2332*	-0.2469*	-0.2409*	-0.1550*	-0.1565*	-0.2701*	-0.1263*	1

Table 12. CIPS critical values

N	20			30			50		
Level Of Significance / T	**1%**	**5%**	**10%**	**1%**	**5%**	**10%**	**1%**	**5%**	**10%**
20	-2.4	-2.21	-2.1	-2.32	-2.15	-9	-2.25	-2.11	-2.03
30	-2.38	-2.2	-2.11	-2.3	-2.15	-2.07	-2.23	-2.11	-2.04
50	-2.36	-2.2	-2.11	-2.3	-2.16	-2.08	-2.23	-2.11	-2.05
100	-2.36	-2.2	-2.11	-2.3	-2.16	-2.08	-2.23	-2.12	-2.05
200	-2.36	-2.2	-2.11	-2.3	-2.16	-2.08	-2.23	-2.12	-2.05

Table 13. Average correlation coefficients & Pesaran (2004) CD test

Group variable	Firm
Number of groups	76
Average number of observations	10
Panel	Unbalanced

Variable	CD test	PValue	Corr	ABS
TLD	48.26	0.0000	0.286	0.497
XTCD	73.03	0.0000	0.433	0.553
CASH	14.27	0.0000	0.085	0.320
TCL	42.95	0.0000	0.254	0.404
TNDL	38.84	0.0000	0.230	0.505
NINC	78.94	0.0000	0.468	0.497
ROA	89.31	0.0000	0.529	0.557
CAPEXA	58.31	0.0000	0.345	0.472
HAL	18.43	0.0000	0.109	0.350
TQ	25.40	0.0000	0.150	0.403

Table 14. Pesaran (2007) Unit Root Test (CIPS)

Variable	With/Without Trend	Lags	ZtBar	Pvalue	Unit Root
TLD	Without Trend	0	-1.22	0.11	YES
TLD	Without Trend	1	-1.53	0.06	
TLD	Without Trend	2	27.77	1.00	
TLD	With Trend	0	3.17	1.00	
TLD	With Trend	1	1.64	0.95	
TLD	With Trend	2	22.16	1.00	
OPREV	Without Trend	0	1.27	0.90	YES
OPREV	Without Trend	1	-2.77	0.00	
OPREV	Without Trend	2	27.77	1.00	
OPREV	With Trend	0	1.63	0.95	
OPREV	With Trend	1	0.92	0.82	
OPREV	With Trend	2	22.16	1.00	
CASH	Without Trend	0	-3.22	0.00	NO
CASH	Without Trend	1	-6.62	0.00	
CASH	Without Trend	2	27.77	1.00	
CASH	With Trend	0	-1.82	0.04	
CASH	With Trend	1	-1.58	0.06	
CASH	With Trend	2	22.16	1.00	
TCL	Without Trend	0	-4.11	0.00	NO
TCL	Without Trend	1	-1.54	0.06	
TCL	Without Trend	2	27.77	1.00	
TCL	With Trend	0	-5.76	0.00	
TCL	With Trend	1	-1.55	0.06	
TCL	With Trend	2	22.16	1.00	
TNDL	Without Trend	0	-2.08	0.02	NO
TNDL	Without Trend	1	-4.51	0.00	
TNDL	Without Trend	2	27.77	1.00	
TNDL	With Trend	0	0.60	0.73	
TNDL	With Trend	1	-4.90	0.00	

TNDL	With Trend	2	22.16	1.00	
NINC	Without Trend	0	-3.53	0.00	NO
NINC	Without Trend	1	-2.03	0.02	
NINC	Without Trend	2	27768.00	1.00	
NINC	With Trend	0	-1.63	0.05	
NINC	With Trend	1	-5.04	0.00	
NINC	With Trend	2	22160.00	1.00	
ROA	Without Trend	0	-5.80	0.00	NO
ROA	Without Trend	1	-3.08	0.00	
ROA	Without Trend	2	27768.00	1.00	
ROA	With Trend	0	-2.43	0.01	
ROA	With Trend	1	-2.21	0.01	
ROA	With Trend	2	22160.00	1.00	
CAPEXA	Without Trend	0	-5.21	0.00	NO
CAPEXA	Without Trend	1	-2.32	0.01	
CAPEXA	Without Trend	2	27768.00	1.00	
CAPEXA	With Trend	0	-2.80	0.00	
CAPEXA	With Trend	1	-1479.00	0.07	
CAPEXA	With Trend	2	22160.00	1.00	
HAL	Without Trend	0	-0.14	0.45	YES
HAL	Without Trend	1	-0.25	0.40	
HAL	Without Trend	2	27.36	1.00	
HAL	With Trend	0	-2.10	0.02	
HAL	With Trend	1	-2.17	0.02	
HAL	With Trend	2	22.16	1.00	
TQ	Without Trend	0	-1.54	0.06	YES
TQ	Without Trend	1	-0.81	0.21	
TQ	Without Trend	2	27768.00	1.00	
TQ	With Trend	0	1.10	0.87	
TQ	With Trend	1	-0.93	0.18	
TQ	With Trend	2	22160.00	1.00	

Table 15. Pesaran (2007) Unit Root Test (CIPS)

Variable	With/Without Trend	Lags	ZtBar	Pvalue	Unit Root
DTLD	Without Trend	0	-8.11	0.000	NO
DTLD	Without Trend	1	0.46	0.677	
DTLD	With Trend	0	-2.27	0.012	
DTLD	With Trend	1	3.44	1.000	
DOPREV	Without Trend	0	-12.26	0.000	NO
DOPREV	Without Trend	1	-1.09	0.138	
DOPREV	With Trend	0	-9.08	0.000	
DOPREV	With Trend	1	2.83	0.998	
DHAL	Without Trend	0	-5.20	0.000	NO
DHAL	Without Trend	1	0.26	0.602	
DHAL	With Trend	0	-4.06	0.000	
DHAL	With Trend	1	0.31	0.377	
DTQ	Without Trend	0	-3.53	0.000	NO
DTQ	Without Trend	1	-1.88	0.030	
DTQ	With Trend	0	-1.97	0.024	
DTQ	With Trend	1	-1.45	0.007	

Table 16. Models

Model 1	Model 2	Model 3	Model 2*	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
TQ	TQ	TQ	TQ	TQ	TQ	TQ	TQ	TQ	TQ
HAL	HAL	HAL	HAL	HAL	HAL	HAL	HAL	HAL	HAL
TLD	TLD	TLD	TLD	TNDL	TNDL	TNDL	TCL	TCL	TCL
OPREV	ROA	NINC	ROA	OPREV	ROA	NINC	OPREV	ROA	NINC
CASH	CASH	CASH	CASH	CASH	CASH	CASH	CASH	CASH	CASH
CAPEXA	CAPEXA	CAPEXA	CAPEXA	CAPEXA	CAPEXA	CAPEXA	CAPEXA	CAPEXA	CAPEXA
			SP500	SP500	SP500	SP500	SP500	SP500	SP500

APPENDIX-2 MODEL RESULTS

Table 25. Model 1 Results

Fixed-effects (within) regression				
Group variable:	firm		**Number of obs**	759
R-sq within	0.0236		**Number of groups**	76
between	0.1818		**Obs per group**	Min 9
overall	0.0959		**avg**	10
			max	10
F(5,678)	3.28			
corr(ui, Xb)	0.0703		**Prob > F**	0.0062

DTQ	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
DHAL	-2.50E-12	7.03E-12	-0.36	0.723	-1.63E-11	1.13E-11
DTLD	-1.12E-11	2.91E-12	-3.85	0	-1.69E-11	-5.49E-12
DOPREV	-3.11E-13	7.23E-13	-0.43	0.668	-1.73E-12	1.11E-12
CASH	-2.87E-12	9.51E-12	-0.3	0.763	-2.15E-11	1.58E-11
CAPEXA	6.93E-13	7.43E-12	0.09	0.926	-1.39E-11	1.53E-11
CONS	1.197871	0.0465283	25.74	0	1.106514	1.289228
sigmau	0.36763414					
sigmae	0.45456948					
rho	0.39543446	(fraction of variance due to ui)				
F test that all ui	0	**F(75, 678)**	6.46	**Prob > F**		0.0000

Random-effects GLS regression				
Group variable:	firm		**Number of obs**	759
R-sq within	0.0235		**Number of groups**	76
between	0.1845		**Obs per group**	Min 9
overall	0.0971		**avg**	10
			max	10
Random effects ui	Gaussian		**Wald chi2(5)**	.
corr(ui, X)	0 (assumed)			

DTQ	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
DHAL	-1.33E-12	6.16E-12	-0.22	0.829	-1.34E-11	1.07E-11
DTLD	-1.21E-11	2.64E-12	-4.57	0	-1.73E-11	-6.89E-12
DOPREV	-3.50E-13	6.40E-13	-0.55	0.584	-1.60E-12	9.03E-13
CASH	-1.34E-12	8.50E-12	-0.16	0.875	-1.80E-11	1.53E-11
CAPEXA	-1.08E-12	6.12E-12	-0.18	0.859	-1.31E-11	1.09E-11
CONS	1.209284	0.0493318	24.51	0	1.112596	1.305973
sigmau	0.34785739					
sigmae	0.45456948					
rho	0.36932437	(fraction of variance due to ui)				

Coefficients				
	(b)	**(B)**	**(b-B)**	**sqrt(diag(Vb-VB))**
	fe	**re**	**Difference**	**S.E.**
DHAL	-2.50E-12	-1.33E-12	-1.17E-12	3.37E-12
DTLD	-1.12E-11	-1.21E-11	8.67E-13	1.22E-12
DOPREV	-3.11E-13	-3.50E-13	3.97E-14	3.37E-13
CASH	-2.87E-12	-1.34E-12	-1.54E-12	4.25E-12
CAPEXA	6.93E-13	-1.08E-12	1.78E-12	4.22E-12
b = consistent under Ho and Ha; obtained from xtreg				
B = inconsistent under Ha, efficient under Ho; obtained from xtreg				
Test: Ho: difference in coefficients not systematic				
chi2(5) = (b-B)'[(Vb-VB)^(-1)](b-B)			1.17	
Prob>chi2			0.9479	

RE GLS regression with AR(1) disturbances				
Group variable:	firm		Number of obs	759
R-sq within	0.0235		Number of groups	76
between	0.1845		Obs per group	Min 9
overall	0.0971		avg	10
			max	10
corr(ui, X)	0 (assumed)		Wald chi2(5)	.
			Prob > chi2	.

theta				
min	**0.05**	**median**	**0.95**	**max**
0.457	0.4757	0.4757	0.4757	0.4757

DTQ	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
DHAL	-1.02E-12	6.46E-12	-0.16	0.874	-1.37E-11	1.16E-11
DTLD	-1.20E-11	2.68E-12	-4.47	0	-1.72E-11	-6.73E-12
DOPREV	-2.49E-13	6.78E-13	-0.37	0.713	-1.58E-12	1.08E-12
CASH	-1.05E-12	8.89E-12	-0.12	0.906	-1.85E-11	1.64E-11
CAPEXA	-1.14E-12	6.56E-12	-0.17	0.861	-1.40E-11	1.17E-11
CONS	1.199336	0.0475072	25.25	0	1.106224	1.292448
rhoar	0.26220489	(estimated autocorrelation coefficient)				
sigmau	0.3031019					
sigmae	0.45067825					
rhofov	0.31144569	(fraction of variance due to ui)				

Durbin Watson and LBI	
modified Bhargava et al. Durbin-Watson	1.4779333
Baltagi-Wu LBI	1.7793126

Wooldridge test for autocorrelation in panel data	
H0: no first order autocorrelation	
F(1,75)	25.433
Prob > F	0

Prais-Winsten regression, heteroskedastic panels corrected standard errors			
Group variable:	firm	**Number of obs**	759
Time variable	t	**Number of groups**	76
Panels	heteroskedastic (unbalanced)	**Obs per group**	Min 9
Autocorrelation	common AR(1)	**avg**	9.986842
		max	10
Estimated covariances	76	**R-squared**	0.0532
Estimated autocorrelations	1	**Wald chi2(5)**	.
Estimated coefficients	6	**Prob > chi2**	.

DTQ	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
DHAL	2.29E-13	2.08E-12	0.11	0.912	-3.84E-12	4.30E-12
DTLD	-1.21E-11	1.54E-12	-7.86	0	-1.52E-11	-9.10E-12
DOPREV	-2.70E-13	3.48E-13	-0.78	0.437	-9.52E-13	4.12E-13
CASH	5.49E-13	4.50E-12	0.12	0.903	-8.26E-12	9.36E-12
CAPEXA	-1.85E-12	4.17E-12	-0.44	0.657	-1.00E-11	6.32E-12
CONS	1.19275	0.0396821	30.06	0	1.114975	1.270526
rho	0.4770157					

Table 26. Model 2 Results

Fixed-effects (within) regression				
Group variable:	firm		**Number of obs**	759
R-sq within	0.0404		**Number of groups**	76
between	0.1497		**Obs per group**	Min 9
overall	0.09		**avg**	10
			max	10
F(5,678)	5.7			
corr(ui, Xb)	0.0497		**Prob > F**	0.0000

DTQ	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
DHAL	-3.32E-12	6.63E-12	-0.5	0.617	-1.63E-11	9.69E-12
DTLD	-1.09E-11	2.86E-12	-3.8	0	-1.65E-11	-5.26E-12
ROA	3.01E-03	8.67E-04	3.47	0.001	1.30E-03	4.71E-03
CASH	-3.37E-12	9.18E-12	-0.37	0.713	-2.14E-11	1.47E-11
CAPEXA	-1.32E-12	7.00E-12	-0.19	0.85	-1.51E-11	1.24E-11
CONS	1.194401	0.045917	26.01	0	1.104245	1.284558
sigmau	0.37433862					
sigmae	0.45065492					
rho	0.40827954	(fraction of variance due to ui)				
F test that all ui	0	**F(75, 678)**	6.72	**Prob > F**	0.0000	

Random-effects GLS regression				
Group variable:	firm		**Number of obs**	759
R-sq within	0.0398		**Number of groups**	76
between	0.1594		**Obs per group**	Min 9
overall	0.0946		**avg**	10
			max	10
Random effects ui	Gaussian		**Wald chi2(5)**	9.72
corr(ui, X)	0 (assumed)		**Prob > chi2**	0.0835

DTQ	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
DHAL	-2.66E-12	5.57E-12	-0.48	0.633	-1.36E-11	8.26E-12
DTLD	-1.20E-11	2.58E-12	-4.64	0	-1.70E-11	-6.92E-12
ROA	2.67E-03	8.57E-04	3.12	0.002	9.93E-04	4.35E-03
CASH	-2.64E-12	8.07E-12	-0.33	0.743	-1.84E-11	1.32E-11
CAPEXA	-3.71E-12	5.51E-12	-0.67	0.501	-1.45E-11	7.09E-12
CONS	1.211352	0.0483716	25.04	0	1.116546	1.306159
sigmau	0.33848187					
sigmae	0.45065492					
rho	0.36066875	(fraction of variance due to ui)				

Coefficients				
	(b)	**(B)**	**(b-B)**	**sqrt(diag(Vb-VB))**
	fe	**re**	**Difference**	**S.E.**
DHAL	-3.32E-12	-2.66E-12	-6.58E-13	3.59E-12
DTLD	-1.09E-11	-1.20E-11	1.11E-12	1.22E-12
ROA	3.01E-03	2.67E-03	3.33E-04	1.30E-04
CASH	-3.37E-12	-2.64E-12	-7.33E-13	4.39E-12
CAPEXA	-1.32E-12	-3.71E-12	2.39E-12	4.32E-12
b = consistent under Ho and Ha; obtained from xtreg				
B = inconsistent under Ha, efficient under Ho; obtained from xtreg				
Test: Ho: difference in coefficients not systematic				
chi2(5) = (b-B)'[(Vb-VB)^(-1)](b-B)			6.59	
Prob>chi2			0.0103	

FE (within) regression with AR(1) disturbances				
Group variable:	firm		**Number of obs**	683
R-sq within	0.0534		**Number of groups**	76
between	0.1405		**Obs per group**	Min 8
overall	0.1002		**avg**	9
			max	9
corr(ui, X)	-0.0281		**Wald chi2(5)**	6.8
			Prob > chi2	0.0000

DTQ	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
DHAL	-2.99E-12	7.98E-12	-0.37	0.708	-1.87E-11	1.27E-11
DTLD	-1.19E-11	4.65E-12	-2.57	0.011	-2.11E-11	-2.80E-12
ROA	4.00E-03	8.10E-04	4.94	0	2.41E-03	5.59E-03
CASH	-2.06E-12	1.05E-11	-0.2	0.845	-2.27E-11	1.86E-11
CAPEXA	-7.33E-12	8.08E-12	-0.91	0.365	-2.32E-11	8.54E-12
CONS	1.25553	0.0449182	27.95	0	1.167314	1.343745
rhoar	0.27400953					
sigmau	0.41307897					
sigmae	0.42017461					
rhofov	0.49148503	(fraction of variance due to ui)				
F test that all ui=0			**F(75,602)**	4.97	**Prob > F**	0.0000

Durbin Watson and LBI	
modified Bhargava et al. Durbin-Watson	1.4543485

Baltagi-Wu LBI	1.7617158

Wooldridge test for autocorrelation in panel data	
H0: no first order autocorrelation	
F(1,75)	20.901
Prob > F	0.0000

Pesaran's test of cross sectional independence	17.493	**Pr**	0.0000
Average absolute value of the off-diagonal elements	0.346		

Modified Wald test for groupwise heteroskedasticity in fixed effect regression model	
H0: sigma(i)^2 = sigma^2 for all i	
chi2 (76)	28965.56
Prob>chi2	0.0000

i.region Iregion 1-10 **(naturally coded; Iregion 1 omitted)**

i.t It 2007-2016 **(naturally coded; It2007 omitted)**

Prais-Winsten regression, heteroskedastic panels corrected standard errors			
Group variable:	firm	**Number of obs**	759
Time variable	t	**Number of groups**	76
Panels	heteroskedastic (unbalanced)	**Obs per group**	Min 9
Autocorrelation	common AR(1)	**avg**	9.986842
		max	10
Estimated covariances	76	**R-squared**	0.1827
Estimated autocorrelations	1	**Wald chi2(5)**	126.56
Estimated coefficients	24	**Prob > chi2**	0

DTQ	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
DHAL	-6.43E-12	1.54E-12	-4.18	0	-9.44E-12	-3.42E-12
DTLD	-5.61E-12	1.72E-12	-3.27	0.001	-8.98E-12	-2.24E-12
ROA	4.33E-03	2.31E-03	1.87	0.061	-2.00E-04	8.87E-03
CASH	-2.88E-12	4.73E-12	-0.61	0.543	-1.22E-11	6.40E-12
CAPEXA	-2.95E-12	4.41E-12	-0.67	0.503	-1.16E-11	5.69E-12
IREGION2	-0.2776337	0.1034214	-2.68	0.007	-0.4803359	-0.0749315
IREGION3	-0.2672777	0.1126937	-2.37	0.018	-0.4881532	-0.0464022
IREGION4	-0.0087602	0.1292488	-0.07	0.946	-0.2620833	0.2445628
IREGION5	-0.2118061	0.0904219	-2.34	0.019	-0.3890298	-0.0345824
IREGION6	-0.6209612	0.1727909	-3.59	0	-0.9596251	-0.2822972
IREGION7	-0.1688663	0.1800272	-0.94	0.348	-0.5217131	0.1839806
IREGION8	0.1342359	0.1225805	1.1	0.273	-0.1060175	0.3744892

IREGION9	0.0901621	0.1445701	0.62	0.533	-0.1931901	0.3735143
IREGION10	0.0489859	0.133583	0.37	0.714	-0.212832	0.3108039
IT2008	0.3635849	0.0629701	5.77	0	0.2401658	0.487004
IT2009	0.3904811	0.0774958	5.04	0	0.238592	0.5423701
IT2010	0.0932863	0.0814784	1.14	0.252	-0.0664085	0.2529811
IT2011	0.2222452	0.084586	2.63	0.009	0.0564596	0.3880308
IT2012	0.2683222	0.0876422	3.06	0.002	0.0965467	0.4400977
IT2013	0.0247953	0.0896175	0.28	0.782	-0.1508518	0.2004423
IT2014	0.170244	0.0892514	1.91	0.056	-0.0046855	0.3451734
IT2015	0.3213604	0.1022795	3.14	0.002	0.1208963	0.5218245
IT2016	0.2132909	0.09183	2.32	0.02	0.0333075	0.3932744
CONS	0.9658774	0.1321419	7.31	0	0.7068841	1.224871
rho	0.51292					

Table 27. Model 3 Results

Fixed-effects (within) regression					
Group variable:	firm			**Number of obs**	759
R-sq within	0.0241			**Number of groups**	76
between	0.1801			**Obs per group**	Min 9
overall	0.0946			**avg**	10
				max	10
F(5,678)	3.35				
corr(ui, Xb)	0.1039			**Prob > F**	0.0054

DTQ	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
DHAL	-3.16E-12	6.69E-12	-0.47	0.637	-1.63E-11	9.98E-12
DTLD	-1.09E-11	2.97E-12	-3.66	0	-1.67E-11	-5.04E-12
NINC	3.58E-12	5.00E-12	0.72	0.475	-6.24E-12	1.34E-11
CASH	-2.67E-12	9.39E-12	-0.28	0.777	-2.11E-11	1.58E-11
CAPEXA	-2.03E-12	7.45E-12	-0.27	0.785	-1.67E-11	1.26E-11
CONS	1.190509	0.0469239	25.37	0	1.098375	1.282643
sigmau	0.36948178					
sigmae	0.45445988					
rho	0.39794945	(fraction of variance due to ui)				
F test that all ui	0	**F(75, 678)**	6.48	**Prob > F**	0.0000	

Random-effects GLS regression				
Group variable:	firm		Number of obs	759
R-sq within	0.0238		Number of groups	76
between	0.1825		Obs per group	Min 9
overall	0.0963		avg	10
			max	10
Random effects ui	Gaussian		Wald chi2(5)	.
corr(ui, X)	0 (assumed)		Prob > chi2	.

DTQ	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
DHAL	-2.78E-12	5.62E-12	-0.5	0.621	-1.38E-11	8.23E-12
DTLD	-1.20E-11	2.66E-12	-4.52	0	-1.72E-11	-6.81E-12
NINC	2.58E-12	4.66E-12	0.55	0.579	-6.54E-12	1.17E-11
CASH	-2.43E-12	8.14E-12	-0.3	0.765	-1.84E-11	1.35E-11
CAPEXA	-4.22E-12	6.34E-12	-0.67	0.506	-1.66E-11	8.21E-12
CONS	1.210046	0.0492157	24.59	0	1.113585	1.306508
sigmau	0.34679475					
sigmae	0.45445988					
rho	0.36801242	(fraction of variance due to ui)				

Coefficients				
	(b)	**(B)**	**(b-B)**	**sqrt(diag(Vb-VB))**
	fe	**re**	**Difference**	**S.E.**
DHAL	-3.16E-12	-2.78E-12	-3.77E-13	3.64E-12
DTLD	-1.09E-11	-1.20E-11	1.16E-12	1.32E-12
NINC	3.58E-12	2.58E-12	9.93E-13	1.82E-12
CASH	-2.67E-12	-2.43E-12	-2.35E-13	4.69E-12
CAPEXA	-2.03E-12	-4.22E-12	2.19E-12	3.92E-12
b = consistent under Ho and Ha; obtained from xtreg				
B = inconsistent under Ha, efficient under Ho; obtained from xtreg				
Test: Ho: difference in coefficients not systematic				
chi2(5) = (b-B)'[(Vb-VB)^(-1)](b-B)			1.79	
Prob>chi2			0.8779	

RE GLS regression with AR(1) disturbances				
Group variable:	firm		**Number of obs**	759
R-sq within	0.0239		**Number of groups**	76
between	0.1832		**Obs per group**	Min 9
overall	0.0963		**avg**	10
			max	10
corr(ui, X)	0 (assumed)		**Wald chi2(5)**	.
			Prob > chi2	.

theta				
min	**0.05**	**median**	**0.95**	**max**
0.4573	0.476	0.476	0.476	0.476

DTQ	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
DHAL	-2.04E-12	5.75E-12	-0.35	0.723	-1.33E-11	9.23E-12
DTLD	-1.19E-11	2.66E-12	-4.47	0	-1.71E-11	-6.68E-12
NINC	3.18E-12	4.74E-12	0.67	0.503	-6.12E-12	1.25E-11
CASH	-1.78E-12	8.59E-12	-0.21	0.836	-1.86E-11	1.51E-11
CAPEXA	-4.21E-12	6.59E-12	-0.64	0.523	-1.71E-11	8.70E-12
CONS	1.200422	0.0475558	25.24	0	1.107214	1.293629
rhoar	0.263266	(estimated autocorrelation coefficient)				
sigmau	0.30364107					
sigmae	0.4504428					
rhofov	0.31233616	(fraction of variance due to ui)				

Durbin Watson and LBI	
modified Bhargava et al. Durbin-Watson	1.4753604
Baltagi-Wu LBI	1.7762711

Wooldridge test for autocorrelation in panel data	
H0: no first order autocorrelation	
F(1,75)	25.628
Prob > F	0

Prais-Winsten regression, heteroskedastic panels corrected standard errors			
Group variable:	firm	**Number of obs**	759
Time variable	t	**Number of groups**	76
Panels	heteroskedastic (unbalanced)	**Obs per group**	Min 9
Autocorrelation	common AR(1)	**avg**	9.986842
		max	10
Estimated covariances	76	**R-squared**	0.0534
Estimated autocorrelations	1	**Wald chi2(5)**	.
Estimated coefficients	6	**Prob > chi2**	.

DTQ	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
DHAL	-9.20E-13	1.53E-12	-0.6	0.547	-3.92E-12	2.08E-12
DTLD	-1.21E-11	1.57E-12	-7.75	0	-1.52E-11	-9.07E-12
NINC	2.78E-12	2.53E-12	1.1	0.273	-2.18E-12	7.74E-12
CASH	-5.08E-13	4.35E-12	-0.12	0.907	-9.04E-12	8.02E-12
CAPEXA	-4.80E-12	3.88E-12	-1.24	0.216	-1.24E-11	2.81E-12
CONS	1.194896	0.0396121	30.16	0	1.117258	1.272535
rho	0.4754665					

Table 28. Model 2* Results

Fixed-effects (within) regression				
Group variable:	firm		**Number of obs**	759
R-sq within	0.0477		**Number of groups**	76
between	0.1291		**Obs per group**	Min 9
overall	0.0792		**avg**	10
			max	10
F(5,678)	5.65			
corr(ui, Xb)	0.1041		**Prob > F**	0.0000

DTQ	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
DHAL	-3.55E-12	6.61E-12	-0.54	0.591	-1.65E-11	9.42E-12
DTLD	-1.01E-11	2.87E-12	-3.54	0	-1.58E-11	-4.51E-12
ROA	2.78E-03	8.70E-04	3.2	0.001	1.07E-03	4.49E-03
CASH	8.60E-13	9.34E-12	0.09	0.927	-1.75E-11	1.92E-11
CAPEXA	3.57E-12	7.30E-12	0.49	0.625	-1.08E-11	1.79E-11
SP500	1.17E-04	5.13E-05	2.28	0.023	1.65E-05	2.18E-04
CONS	0.9865799	0.1018457	9.69	0	0.7866084	1.186551
sigmau	0.38293436					
sigmae	0.44925964					
rho	0.42080375	(fraction of variance due to ui)				
F test that all ui	0	**F(75, 678)**	6.77	**Prob > F**	0.0000	

Random-effects GLS regression				
Group variable:	firm		**Number of obs**	759
R-sq within	0.0462		**Number of groups**	76
between	0.1591		**Obs per group**	Min 9
overall	0.0974		**avg**	10
			max	10
Random effects ui	Gaussian		**Wald chi2(5)**	14.14
corr(ui, X)	0 (assumed)		**Prob > chi2**	0.0281

DTQ	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
DHAL	-3.95E-12	5.60E-12	-0.71	0.48	-1.49E-11	7.02E-12
DTLD	-1.19E-11	2.58E-12	-4.63	0	-1.70E-11	-6.87E-12
ROA	2.48E-03	8.60E-04	2.88	0.004	7.91E-04	4.16E-03
CASH	-1.09E-12	8.09E-12	-0.13	0.893	-1.69E-11	1.48E-11
CAPEXA	-1.97E-12	5.56E-12	-0.35	0.724	-1.29E-11	8.94E-12
SP500	1.02E-04	4.91E-05	2.08	0.038	5.71E-06	1.98E-04
CONS	1.052176	0.0907591	11.59	0	0.8742914	1.23006
sigmau	0.34151961					
sigmae	0.44925964					
rho	0.36623761 (fraction of variance due to ui)					

Coefficients				
	(b)	**(B)**	**(b-B)**	**sqrt(diag(Vb-VB))**
	fe	**re**	**Difference**	**S.E.**
DHAL	-3.55E-12	-3.95E-12	3.99E-13	3.50E-12
DTLD	-1.01E-11	-1.19E-11	1.79E-12	1.26E-12
ROA	2.78E-03	2.48E-03	3.06E-04	1.29E-04
CASH	8.60E-13	-1.09E-12	1.95E-12	4.67E-12
CAPEXA	3.57E-12	-1.97E-12	5.53E-12	4.72E-12
SP500	1.17E-04	1.02E-04	1.54E-05	1.50E-05
b = consistent under Ho and Ha; obtained from xtreg				
B = inconsistent under Ha, efficient under Ho; obtained from xtreg				
Test: Ho: difference in coefficients not systematic				
chi2(5) = (b-B)'[(Vb-VB)^(-1)](b-B)			7.36	
Prob>chi2			0.0252	

FE (within) regression with AR(1) disturbances				
Group variable:	firm		**Number of obs**	683
R-sq within	0.0911		**Number of groups**	76
between	0.0041		**Obs per group**	Min 8
overall	0.0392		**avg**	9
			max	9
corr(ui, X)	-0.0143		**F(6,601**	10.04
			Prob > chi2	0.0000

DTQ	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
DHAL	-3.29E-12	7.83E-12	-0.42	0.675	-1.87E-11	1.21E-11
DTLD	-4.53E-12	4.79E-12	-0.95	0.345	-1.39E-11	4.88E-12
ROA	4.30E-03	7.96E-04	5.4	0	2.73E-03	5.86E-03
CASH	2.70E-12	1.04E-11	0.26	0.794	-1.76E-11	2.30E-11
CAPEXA	2.10E-12	8.16E-12	0.26	0.797	-1.39E-11	1.81E-11
SP500	3.31E-04	6.64E-05	4.99	0	2.01E-04	4.62E-04
CONS	0.6899114	0.0928068	7.43	0	0.5076463	0.8721765
rhoar	0.2784909					
sigmau	0.4450346					
sigmae	0.4123718					
rhofov	0.5380397	(fraction of variance due to ui)				
F test that all ui=0			**F(75,601)**	5.19	**Prob > F**	0.0000

Durbin Watson and LBI	
modified Bhargava et al. Durbin-Watson	1.4485295
Baltagi-Wu LBI	1.7684396

Wooldridge test for autocorrelation in panel data	
H0: no first order autocorrelation	
F(1,75)	19.211
Prob > F	0.0000

Pesaran's test of cross sectional independence	14.355	**Pr**	0.0000
Average absolute value of the off-diagonal elements	0.346		

Modified Wald test for groupwise heteroskedasticity in fixed effect regression model	
H0: sigma(i)^2 = sigma^2 for all i	
chi2 (76)	58572.96
Prob>chi2	0.0000

i.region Iregion 1-10 **(naturally coded; Iregion 1 omitted)**
i.t It 2007-2016 **(naturally coded; It2007 omitted)**

Prais-Winsten regression, heteroskedastic panels corrected standard errors			
Group variable:	firm	**Number of obs**	759
Time variable	t	**Number of groups**	76
Panels	heteroskedastic (unbalanced)	**Obs per group**	Min 9
Autocorrelation	common AR(1)	**avg**	9.986842
		max	10
Estimated covariances	76	**R-squared**	0.1827
Estimated autocorrelations	1	**Wald chi2(5)**	1225.51
Estimated coefficients	24	**Prob > chi2**	0

DTQ	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
DHAL	-6.43E-12	1.54E-12	-4.18	0	-9.44E-12	-3.42E-12
DTLD	-5.61E-12	1.72E-12	-3.27	0.001	-8.98E-12	-2.24E-12
ROA	4.33E-03	2.31E-03	1.87	0.061	-2.00E-04	8.87E-03
CASH	-2.88E-12	4.73E-12	-0.61	0.543	-1.22E-11	6.40E-12
CAPEXA	-2.95E-12	4.41E-12	-0.67	0.503	-1.16E-11	5.69E-12
SP500	5.03E-04	6.89E-05	7.31	0	3.68E-04	6.38E-04
IREGION2	-0.2776337	0.1034214	-2.68	0.007	-0.4803359	-0.0749315
IREGION3	-0.2672777	0.1126937	-2.37	0.018	-0.4881532	-0.0464022
IREGION4	-0.0087602	0.1292488	-0.07	0.946	-0.2620833	0.2445628
IREGION5	-0.2118061	0.0904219	-2.34	0.019	-0.3890298	-0.0345824
IREGION6	-0.6209612	0.1727909	-3.59	0	-0.9596251	-0.2822972
IREGION7	-0.1688663	0.1800272	-0.94	0.348	-0.5217131	0.1839806

IREGION8	0.1342359	0.1225805	1.1	0.273	-0.1060175	0.3744892
IREGION9	0.0901621	0.1445701	0.62	0.533	-0.1931901	0.3735143
IREGION10	0.0489859	0.133583	0.37	0.714	-0.212832	0.3108039
IT2008	0.3084192	0.0649782	4.75	0	0.1810642	0.4357741
IT2009	0.438931	0.0758463	5.79	0	0.290275	0.587587
IT2010	0.3138885	0.080186	3.91	0	0.1567268	0.4710503
IT2011	0.5333739	0.0880903	6.05	0	0.3607201	0.7060277
IT2012	0.5884925	0.0932569	6.31	0	0.4057123	0.7712726
IT2013	0.4250308	0.1002575	4.24	0	0.2285297	0.6215319
IT2014	0.7003639	0.1075751	6.51	0	0.4895207	0.9112072
IT2015	0.5931311	0.1001564	5.92	0	0.3968281	0.7894341
IT2016	0.462206	0.0884919	5.22	0	0.2887651	0.6356468
CONS	(dropped)					
rho	0.51292					

Variable	**Obs**	**Mean**	**Std. Dev**	**Min**	**Max**
SP500	760	1462.482	346.0714	865.58	2028.18

	TLD	OPREV	CASH	TCL	TNDL	NINC	ROA	CAPEXA	HAL	TQ	SP500
TLD	1										
OPREV	0.6733*	1									
CASH	0.7305*	0.7365*	1								
TCL	0.7254*	0.9689*	0.7601*	1							
TNDL	0.8188*	0.6157*	0.6069*	0.6216*	1						
NINC	0.3156*	0.6339*	0.5443*	0.6251*	0.1631*	1					
ROA	0.0352	0.1065*	0.0965*	0.0955*	0.0186	0.2998*	1				
CAPEXA	0.7929*	0.8223*	0.7938*	0.8346*	0.6243*	0.6929*	0.1175*	1			
HAL	0.3738*	0.6406*	0.4485*	0.6858*	0.4297*	0.3857*	0.0473	0.4874*	1		
TQ	-0.3102*	-0.2352*	-0.2332*	-0.2469*	-0.2409*	-0.1550*	-0.1565*	-0.2701*	-0.1263*	1	
SP500	-0.1253*	-0.0421	-0.1060*	-0.0377	-0.0720*	0.0421	0.0915*	-0.0989*	0.0388	0.1063*	1

Table 29. Model 4 Results

Fixed-effects (within) regression				
Group variable:	firm		**Number of obs**	759
R-sq within	0.0165		**Number of groups**	76
between	0.0007		**Obs per group**	Min 9
overall	0.0065		**avg**	10
			max	10
F(6,677)	1.89			
corr(ui, Xb)	-0.0644		**Prob > F**	0.0793

DTQ	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
DHAL	-2.84E-12	7.13E-12	-0.4	0.691	-1.68E-11	1.12E-11
TNDL	-4.40E-12	5.22E-12	-0.84	0.4	-1.46E-11	5.85E-12
DOPREV	-5.15E-13	7.27E-13	-0.71	0.479	-1.94E-12	9.12E-13
CASH	3.67E-12	9.94E-12	0.37	0.712	-1.58E-11	2.32E-11
CAPEXA	9.63E-12	7.70E-12	1.25	0.211	-5.48E-12	2.47E-11
SP500	1.50E-04	5.20E-05	2.89	0.004	4.81E-05	2.52E-04
CONS	0.8712933	0.1016042	8.58	0	0.6717961	1.07079
sigmau	0.4069897					
sigmae	0.45655879					
rho	0.44276175	(fraction of variance due to ui)				
F test that all ui	0	**F(75, 677)**	6.74	**Prob > F**	0.0000	

Random-effects GLS regression				
Group variable:	firm		**Number of obs**	759
R-sq within	0.013		**Number of groups**	76
between	0.1349		**Obs per group**	Min 9
overall	0.068		**avg**	10
			max	10
Random effects ui	Gaussian		**Wald chi2(5)**	5.72
corr(ui, X)	0 (assumed)		**Prob > chi2**	0.4552

DTQ	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
DHAL	-3.19E-12	6.25E-12	-0.51	0.61	-1.55E-11	9.07E-12
TNDL	-6.09E-12	3.78E-12	-1.61	0.107	-1.35E-11	1.31E-12
DOPREV	-7.16E-13	6.46E-13	-1.11	0.268	-1.98E-12	5.50E-13
CASH	-6.67E-13	8.84E-12	-0.08	0.94	-1.80E-11	1.67E-11
CAPEXA	1.08E-13	6.30E-12	0.02	0.986	-1.22E-11	1.25E-11
SP500	1.19E-04	4.96E-05	2.39	0.017	2.14E-05	2.16E-04
CONS	0.986011	0.0920514	10.71	0	0.8055935	1.166428
sigmau	0.35728195					
sigmae	0.45655879					
rho	0.37980301	(fraction of variance due to ui)				

Coefficients				
	(b)	(B)	(b-B)	sqrt(diag(Vb-VB))
	fe	re	Difference	S.E.
DHAL	-2.84E-12	-3.19E-12	3.56E-13	3.42E-12
TNDL	-4.40E-12	-6.09E-12	1.69E-12	3.61E-12
DOPREV	-5.15E-13	-7.16E-13	2E-13	3.34E-13
CASH	3.67E-12	-6.67E-13	4.34E-12	4.55E-12
CAPEXA	9.63E-12	1.08E-13	9.53E-12	4.42E-12
SP500	1.50E-04	1.19E-04	0.0000316	0.0000156
b = consistent under Ho and Ha; obtained from xtreg				
B = inconsistent under Ha, efficient under Ho; obtained from xtreg				
Test: Ho: difference in coefficients not systematic				
chi2(5) = (b-B)'[(Vb-VB)^(-1)](b-B)			4.12	
Prob>chi2			0.04	

FE (within) regression with AR(1) disturbances					
Group variable:	firm		**Number of obs**	683	
R-sq within	0.0436		**Number of groups**	76	
between	0.1212		**Obs per group**	Min 8	
overall	0.0005		**avg**	9	
			max	9	
corr(ui, X)	-0.1883		**F(6,601)**	4.57	
			Prob > chi2	0.0002	

DTQ	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
DHAL	-2.54E-12	8.29E-12	-0.31	0.759	-1.88E-11	1.37E-11
TNDL	-7.63E-13	5.75E-12	-0.13	0.894	-1.21E-11	1.05E-11
DOPREV	1.64E-13	9.94E-13	0.17	0.869	-1.79E-12	2.12E-12
CASH	3.54E-12	1.07E-11	0.33	0.741	-1.75E-11	2.46E-11
CAPEXA	5.15E-12	8.82E-12	0.58	0.56	-1.22E-11	2.25E-11
SP500	3.33E-04	6.47E-05	5.15	0	2.06E-04	4.60E-04
CONS	0.6333106	0.0873418	7.25	0	0.4617783	0.8048429
rhoar	0.26728192					
sigmau	0.46549861					
sigmae	0.42227199					
rhofov	0.54857605 (fraction of variance due to ui)					
F test that all ui=0			**F(75,601)**	5.11	**Prob > F**	0.0000

Durbin Watson and LBI	
modified Bhargava et al. Durbin-Watson	1.47
Baltagi-Wu LBI	1.79E+00

Wooldridge test for autocorrelation in panel data	
H0: no first order autocorrelation	
F(1,75)	24.485
Prob > F	0.0000

Pesaran's test of cross sectional independence	20.831	**Pr**	0.0000
Average absolute value of the off-diagonal elements	0.361		

Modified Wald test for groupwise heteroskedasticity in fixed effect regression model	
H0: sigma(i)^2 = sigma^2 for all i	
chi2 (76)	12300.34
Prob>chi2	0.0000

i.region Iregion 1-10 **(naturally coded; Iregion 1 omitted)**
i.t It 2007-2016 **(naturally coded; It2007 omitted)**

Prais-Winsten regression, heteroskedastic panels corrected standard errors			
Group variable:	firm	**Number of obs**	759
Time variable	t	**Number of groups**	76
Panels	heteroskedastic (unbalanced)	**Obs per group**	Min 9
Autocorrelation	common AR(1)	**avg**	9.986842
		max	10
Estimated covariances	76	**R-squared**	0.1495
Estimated autocorrelations	1	**Wald chi2(5)**	1164.97
Estimated coefficients	24	**Prob > chi2**	0

DTQ	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
DHAL	-4.48E-12	2.26E-12	-1.98	0.048	-8.92E-12	-3.91E-14
TNDL	-4.08E-12	2.22E-12	-1.84	0.066	-8.44E-12	2.78E-13
DOPREV	-5.84E-13	4.09E-13	-1.43	0.153	-1.39E-12	2.18E-13
CASH	1.34E-13	4.82E-12	0.03	0.978	-9.31E-12	9.58E-12
CAPEXA	-1.56E-12	4.73E-12	-0.33	0.742	-1.08E-11	7.72E-12
SP500	5.18E-04	6.75E-05	7.67	0	3.86E-04	6.50E-04
IREGION2	-0.2907092	0.1087998	-2.67	0.008	-0.5039528	-0.0774656
IREGION3	-0.3422185	0.1206869	-2.84	0.005	-0.5787605	-0.1056765
IREGION4	-0.0577832	0.1361287	-0.42	0.671	-0.3245905	0.2090241
IREGION5	-0.1853907	0.1020141	-1.82	0.069	-0.3853348	0.0145533
IREGION6	-0.6266462	0.1800037	-3.48	0	-0.9794469	-0.2738455
IREGION7	-0.1702301	0.1860475	-0.91	0.36	-0.5348766	0.1944163
IREGION8	0.0841178	0.1364569	0.62	0.538	-0.1833329	0.3515685

IREGION9	0.0811354	0.1514282	0.54	0.592	-0.2156585	0.3779293
IREGION10	0.0108535	0.141592	0.08	0.939	-0.2666617	0.2883687
IT2008	0.3330258	0.0622857	5.35	0	0.2109481	0.4551036
IT2009	0.4467278	0.075229	5.94	0	0.2992817	0.5941739
IT2010	0.3272652	0.0823183	3.98	0	0.1659243	0.4886062
IT2011	0.5602442	0.0920888	6.08	0	0.3797534	0.740735
IT2012	0.6024993	0.1004316	6	0	0.405657	0.7993416
IT2013	0.4411363	0.1081717	4.08	0	0.2291237	0.6531489
IT2014	0.7094473	0.1176429	6.03	0	0.4788716	0.9400231
IT2015	0.4835397	0.0956604	5.05	0	0.2960488	0.6710307
IT2016	0.4233353	0.0872498	4.85	0	0.2523289	0.5943418
CONS	(dropped)					
rho	0.5177859					

Table 30. Model 5 Results

Fixed-effects (within) regression						
Group variable:		firm		**Number of obs**		759
R-sq within		0.0312		**Number of groups**		76
between		0.0117		**Obs per group**		Min 9
overall		0.0042		**avg**		10
				max		10
F(6,677)		3.64				
corr(ui, Xb)		-0.1325		**Prob > F**		0.0015

DTQ	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
DHAL	-4.26E-12	6.70E-12	-0.64	0.525	-1.74E-11	8.89E-12
TNDL	-4.52E-12	5.13E-12	-0.88	0.379	-1.46E-11	5.55E-12
ROA	2.88E-03	8.77E-04	3.29	0.001	1.16E-03	4.60E-03
CASH	1.96E-12	9.71E-12	0.2	0.84	-1.71E-11	2.10E-11
CAPEXA	6.27E-12	7.38E-12	0.85	0.396	-8.22E-12	2.08E-11
SP500	1.32E-04	5.19E-05	2.54	0.011	3.01E-05	2.34E-04
CONS	0.8996409	0.1010335	8.9	0	0.7012642	1.098018
sigmau	0.41428214					
sigmae	0.4531282					
rho	0.45530568	(fraction of variance due to ui)				
F test that all ui	0	**F(75, 677)**	6.99	**Prob > F**		0.0000

Random-effects GLS regression				
Group variable:	firm		**Number of obs**	759
R-sq within	0.0268		**Number of groups**	76
between	0.1073		**Obs per group**	Min 9
overall	0.0633		**avg**	10
			max	10
Random effects ui	Gaussian		**Wald chi2(5)**	14.66
corr(ui, X)	0 (assumed)		**Prob > chi2**	0.0231

DTQ	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
DHAL	-5.74E-12	5.66E-12	-1.01	0.311	-1.68E-11	5.36E-12
TNDL	-6.42E-12	3.67E-12	-1.75	0.081	-1.36E-11	7.84E-13
ROA	2.61E-03	8.70E-04	3	0.003	9.04E-04	4.31E-03
CASH	-3.63E-12	8.47E-12	-0.43	0.669	-2.02E-11	1.30E-11
CAPEXA	-4.29E-12	5.75E-12	-0.75	0.455	-1.56E-11	6.98E-12
SP500	1.01E-04	4.97E-05	2.03	0.043	3.37E-06	1.98E-04
CONS	1.016594	0.0917166	11.08	0	0.836833	1.196356
sigmau	0.34839037					
sigmae	0.4531282					
rho	0.37151966 (fraction of variance due to ui)					

Coefficients				
	(b)	**(B)**	**(b-B)**	**sqrt(diag(Vb-VB))**
	fe	**re**	**Difference**	**S.E.**
DHAL	-4.26E-12	-5.74E-12	1.48E-12	3.58E-12
TNDL	-4.52E-12	-6.42E-12	1.90E-12	3.58E-12
ROA	2.88E-03	2.61E-03	2.74E-04	1.12E-04
CASH	1.96E-12	-3.63E-12	5.59E-12	4.74E-12
CAPEXA	6.27E-12	-4.29E-12	1.06E-11	4.63E-12
SP500	1.32E-04	1.01E-04	3.12E-05	1.49E-05
b = consistent under Ho and Ha; obtained from xtreg				
B = inconsistent under Ha, efficient under Ho; obtained from xtreg				
Test: Ho: difference in coefficients not systematic				
chi2(5) = (b-B)'[(Vb-VB)^(-1)](b-B)			12.62	
Prob>chi2			0.0018	

FE (within) regression with AR(1) disturbances				
Group variable:	firm		**Number of obs**	683
R-sq within	0.0898		**Number of groups**	76
between	0.1499		**Obs per group**	Min 8
overall	0.0071		**avg**	9
			max	9
corr(ui, X)	-0.1585		**F(6,601)**	9.89
			Prob > chi2	0.0000

DTQ	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
DHAL	-1.98E-12	7.79E-12	-0.25	0.799	-1.73E-11	1.33E-11
TNDL	-2.20E-13	5.66E-12	-0.04	0.969	-1.13E-11	1.09E-11
ROA	4.39E-03	7.91E-04	5.55	0	2.84E-03	5.94E-03
CASH	2.55E-12	1.05E-11	0.24	0.808	-1.81E-11	2.32E-11
CAPEXA	3.03E-12	8.15E-12	0.37	0.71	-1.30E-11	1.90E-11
SP500	3.53E-04	6.40E-05	5.51	0	2.27E-04	4.79E-04
CONS	0.6254114	0.0827797	7.56	0	0.4628388	0.7879839
rhoar	0.28453665					
sigmau	0.46774088					
sigmae	0.41305421					
rhofov	0.56184942	(fraction of variance due to ui)				
F test that all ui=0			**F(75,601)**	5.33	**Prob > F**	0.0000

Durbin Watson and LBI	
modified Bhargava et al. Durbin-Watson	1.4381951
Baltagi-Wu LBI	1.7646735]

Wooldridge test for autocorrelation in panel data	
H0: no first order autocorrelation	
F(1,75)	20.711
Prob > F	0.0000

Pesaran's test of cross sectional independence	17.69	**Pr**	0.0000
Average absolute value of the off-diagonal elements	0.359		

Modified Wald test for groupwise heteroskedasticity in fixed effect regression model	
H0: sigma(i)^2 = sigma^2 for all i	
chi2 (76)	22566.52
Prob>chi2	0.0000

i.region Iregion 1-10 **(naturally coded; Iregion 1 omitted)**
i.t It 2007-2016 **(naturally coded; It2007 omitted)**

Prais-Winsten regression, heteroskedastic panels corrected standard errors			
Group variable:	firm	**Number of obs**	759
Time variable	t	**Number of groups**	76
Panels	heteroskedastic (unbalanced)	**Obs per group**	Min 9
Autocorrelation	common AR(1)	**avg**	9.986842
		max	10
Estimated covariances	76	**R-squared**	0.1809
Estimated autocorrelations	1	**Wald chi2(5)**	1178.24
Estimated coefficients	24	**Prob > chi2**	0

DTQ	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
DHAL	-7.05E-12	1.65E-12	-4.27	0	-1.03E-11	-3.81E-12
TNDL	-3.90E-12	2.23E-12	-1.75	0.08	-8.27E-12	4.69E-13
ROA	4.40E-03	2.30E-03	1.91	0.056	-1.04E-04	8.91E-03
CASH	-2.24E-12	4.86E-12	-0.46	0.644	-1.18E-11	7.28E-12
CAPEXA	-3.18E-12	4.59E-12	-0.69	0.488	-1.22E-11	5.82E-12
SP500	4.61E-04	6.66E-05	6.93	0	3.31E-04	5.92E-04
IREGION2	-0.245997	0.1035791	-2.37	0.018	-0.4490083	-0.0429857
IREGION3	-0.3119332	0.118138	-2.64	0.008	-0.5434795	-0.0803869
IREGION4	-0.0060199	0.1345408	-0.04	0.964	-0.2697149	0.2576752
IREGION5	-0.2489293	0.1003344	-2.48	0.013	-0.4455811	-0.0522776
IREGION6	-0.6095049	0.1746671	-3.49	0	-0.951846	-0.2671637
IREGION7	-0.1167606	0.1829991	-0.64	0.523	-0.4754323	0.2419112

IREGION8	0.1688507	0.1264094	1.34	0.182	-0.0789072	0.4166085
IREGION9	0.1476769	0.1444332	1.02	0.307	-0.135407	0.4307607
IREGION10	0.1037438	0.1340376	0.77	0.439	-0.158965	0.3664526
IT2008	0.3449651	0.0613825	5.62	0	0.2246576	0.4652726
IT2009	0.4678163	0.0740915	6.31	0	0.3225997	0.613033
IT2010	0.3207427	0.0809533	3.96	0	0.1620772	0.4794082
IT2011	0.5309937	0.0893125	5.95	0	0.3559443	0.706043
IT2012	0.588554	0.0948758	6.2	0	0.4026009	0.774507
IT2013	0.4146527	0.101979	4.07	0	0.2147776	0.6145279
IT2014	0.6732297	0.1089096	6.18	0	0.4597707	0.8866886
IT2015	0.5862716	0.1008162	5.82	0	0.3886755	0.7838677
IT2016	0.453025	0.088829	5.1	0	0.2789234	0.6271267
CONS	(dropped)					
rho	0.5273448					

Table 31. Model 6 Results

Fixed-effects (within) regression				
Group variable:	firm		**Number of obs**	759
R-sq within	0.0172		**Number of groups**	76
between	0.0268		**Obs per group**	Min 9
overall	0.0001		**avg**	10
			max	10
F(6,677)	1.97			
corr(ui, Xb)	-0.2012		**Prob > F**	0.0676

DTQ	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
DHAL	-3.87E-12	6.77E-12	-0.57	0.568	-1.72E-11	9.43E-12
TNDL	-3.48E-12	5.38E-12	-0.65	0.518	-1.40E-11	7.08E-12
NINC	5.00E-12	5.13E-12	0.97	0.33	-5.07E-12	1.51E-11
CASH	3.14E-12	9.80E-12	0.32	0.749	-1.61E-11	2.24E-11
CAPEXA	5.13E-12	8.04E-12	0.64	0.524	-1.07E-11	2.09E-11
SP500	1.45E-04	5.23E-05	2.78	0.006	4.25E-05	2.48E-04
CONS	0.8695953	0.1013149	8.58	0	0.6706661	1.068524
sigmau	0.41775472					
sigmae	0.45640819					
rho	0.45586859	(fraction of variance due to ui)				
F test that all ui	0	**F(75, 677)**	6.78	**Prob > F**	0.0000	

Random-effects GLS regression				
Group variable:	firm		**Number of obs**	759
R-sq within	0.0125		**Number of groups**	76
between	0.1306		**Obs per group**	Min 9
overall	0.0653		**avg**	10
			max	10
Random effects ui	Gaussian		**Wald chi2(5)**	5.02
corr(ui, X)	0 (assumed)		**Prob > chi2**	0.5419

DTQ	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
DHAL	-6.06E-12	5.71E-12	-1.06	0.288	-1.72E-11	5.12E-12
TNDL	-6.12E-12	3.91E-12	-1.57	0.118	-1.38E-11	1.54E-12
NINC	2.98E-12	4.90E-12	0.61	0.543	-6.63E-12	1.26E-11
CASH	-3.33E-12	8.53E-12	-0.39	0.696	-2.00E-11	1.34E-11
CAPEXA	-4.90E-12	6.84E-12	-0.72	0.474	-1.83E-11	8.50E-12
SP500	1.13E-04	5.03E-05	2.24	0.025	1.41E-05	2.11E-04
CONS	0.9957917	0.0932662	10.68	0	0.8129933	1.17859
sigmau	0.3579727					
sigmae	0.45640819					
rho	0.38086894 (fraction of variance due to ui)					

Coefficients				
	(b)	**(B)**	**(b-B)**	**sqrt(diag(Vb-VB))**
	fe	**re**	**Difference**	**S.E.**
DHAL	-3.87E-12	-6.06E-12	2.19E-12	3.65E-12
TNDL	-3.48E-12	-6.12E-12	2.64E-12	3.69E-12
NINC	5.00E-12	2.98E-12	2.02E-12	1.5E-12
CASH	3.14E-12	-3.33E-12	6.47E-12	4.83E-12
CAPEXA	5.13E-12	-4.90E-12	1E-11	4.23E-12
SP500	1.45E-04	1.13E-04	0.0000325	0.0000142
b = consistent under Ho and Ha; obtained from xtreg				
B = inconsistent under Ha, efficient under Ho; obtained from xtreg				
Test: Ho: difference in coefficients not systematic				
chi2(5) = (b-B)'[(Vb-VB)^(-1)](b-B)			5.25	
Prob>chi2			0.02	

FE (within) regression with AR(1) disturbances				
Group variable:	firm		**Number of obs**	683
R-sq within	0.0473		**Number of groups**	76
between	0.0951		**Obs per group**	Min 8
overall	0.0014		**avg**	9
			max	9
corr(ui, X)	-0.1774		**F(6,601)**	4.98
			Prob > chi2	0.0001

DTQ	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
DHAL	-1.26E-12	8.00E-12	-0.16	0.875	-1.70E-11	1.44E-11
TNDL	7.48E-13	5.82E-12	0.13	0.898	-1.07E-11	1.22E-11
NINC	7.87E-12	5.07E-12	1.55	0.121	-2.08E-12	1.78E-11
CASH	2.96E-12	1.07E-11	0.28	0.783	-1.81E-11	2.40E-11
CAPEXA	5.40E-13	8.90E-12	0.06	0.952	-1.69E-11	1.80E-11
SP500	3.32E-04	6.46E-05	5.14	0	2.05E-04	4.58E-04
CONS	0.6425209	0.0857209	7.5	0	0.4741721	0.8108698
rhoar	0.26912777					
sigmau	0.46503247					
sigmae	0.42156202					
rhofov	0.54891323 (fraction of variance due to ui)					
F test that all ui=0			**F(75,601)**	5.11	**Prob > F**	0.0000

Durbin Watson and LBI	
modified Bhargava et al. Durbin-Watson	1.46
Baltagi-Wu LBI	1.78E+00

Wooldridge test for autocorrelation in panel data	
H0: no first order autocorrelation	
F(1,75)	25.043
Prob > F	0.0000

Pesaran's test of cross sectional independence	16.282	**Pr**	0.0000
Average absolute value of the off-diagonal elements	0.353		

Modified Wald test for groupwise heteroskedasticity in fixed effect regression model	
H0: sigma(i)^2 = sigma^2 for all i	
chi2 (76)	23449.53
Prob>chi2	0.0000

i.region Iregion 1-10 **(naturally coded; Iregion 1 omitted)**
i.t It 2007-2016 **(naturally coded; It2007 omitted)**

Prais-Winsten regression, heteroskedastic panels corrected standard errors			
Group variable:	firm	**Number of obs**	759
Time variable	t	**Number of groups**	76
Panels	heteroskedastic (unbalanced)	**Obs per group**	Min 9
Autocorrelation	common AR(1)	**avg**	9.986842
		max	10
Estimated covariances	76	**R-squared**	0.1546
Estimated autocorrelations	1	**Wald chi2(5)**	1169.37
Estimated coefficients	24	**Prob > chi2**	0

DTQ	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
DHAL	-5.88E-12	2.17E-12	-2.71	0.0070	-1.01E-11	-1.63E-12
TNDL	-2.14E-12	2.27E-12	-0.95	0.3440	-6.58E-12	2.30E-12
NINC	1.17E-11	3.27E-12	3.56	0.0000	5.24E-12	1.81E-11
CASH	-1.17E-12	5.02E-12	-0.23	0.8160	-1.10E-11	8.67E-12
CAPEXA	-9.08E-12	4.88E-12	-1.86	0.0630	-1.86E-11	4.80E-13
SP500	4.22E-04	6.96E-05	6.06	0.0000	2.86E-04	5.59E-04
IREGION2	-0.1616918	0.1086241	-1.49	0.1370	-0.3745911	0.0512075
IREGION3	-0.2624918	0.1172092	-2.24	0.0250	-0.4922176	-0.032766
IREGION4	0.1000086	0.1393174	0.72	0.4730	-0.1730486	0.3730657
IREGION5	-0.1554087	0.1062608	-1.46	0.1440	-0.363676	0.0528586
IREGION6	-0.5166445	0.1801403	-2.87	0.0040	-0.869713	-0.1635761
IREGION7	-0.011645	0.185302	-0.06	0.9500	-0.3748303	0.3515403
IREGION8	0.2724385	0.1335608	2.04	0.0410	0.010664	0.5342129

IREGION9	0.2493143	0.1487596	1.68	0.0940	-0.0422493	0.5408778
IREGION10	0.1812655	0.1381699	1.31	0.1900	-0.0895426	0.4520736
IT2008	0.3501891	0.0626038	5.59	0.0000	0.227488	0.4728902
IT2009	0.4564307	0.074622	6.12	0.0000	0.3101743	0.6026871
IT2010	0.3009789	0.0818622	3.68	0.0000	0.1405319	0.4614258
IT2011	0.5043764	0.0910231	5.54	0.0000	0.3259744	0.6827783
IT2012	0.5495975	0.0967846	5.68	0.0000	0.3599032	0.7392919
IT2013	0.3795658	0.1030523	3.68	0.0000	0.1775869	0.5815447
IT2014	0.6329473	0.1097963	5.76	0.0000	0.4177506	0.8481441
IT2015	0.4880093	0.0933857	5.23	0.0000	0.3049768	0.6710419
IT2016	0.4104416	0.0866115	4.74	0.0000	0.2406862	0.5801971
CONS	(dropped)					
rho	0.5177859					

Table 32. Model 7 Results

Fixed-effects (within) regression					
Group variable:	firm		**Number of obs**	759	
R-sq within	0.0171		**Number of groups**	76	
between	0.0299		**Obs per group**	Min 9	
overall	0.0225		**avg**	10	
			max	10	
F(6,677)	1.96				
corr(ui, Xb)	0.0032		**Prob > F**	0.0690	

DTQ	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
DHAL	-2.37E-12	7.06E-12	-0.34	0.737	-1.62E-11	1.15E-11
TCL	-5.27E-12	5.03E-12	-1.05	0.295	-1.51E-11	4.60E-12
DOPREV	-3.67E-13	7.54E-13	-0.49	0.626	-1.85E-12	1.11E-12
CASH	6.76E-13	9.79E-12	0.07	0.945	-1.85E-11	1.99E-11
CAPEXA	1.15E-11	7.97E-12	1.44	0.151	-4.18E-12	2.71E-11
SP500	1.51E-04	5.17E-05	2.93	0.004	4.98E-05	2.53E-04
CONS	0.8851452	0.1039042	8.52	0	0.681132	1.089158
sigmau	0.39916554					
sigmae	0.45642722					
rho	0.43337211	(fraction of variance due to ui)				
F test that all ui	0	**F(75, 677)**	6.85	**Prob > F**		0.0000

Random-effects GLS regression				
Group variable:	firm		**Number of obs**	759
R-sq within	0.0146		**Number of groups**	76
between	0.1127		**Obs per group**	Min 9
overall	0.0595		**avg**	10
			max	10
Random effects ui	Gaussian		**Wald chi2(5)**	6.57
corr(ui, X)	0 (assumed)		**Prob > chi2**	0.3626

DTQ	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
DHAL	-1.68E-12	6.32E-12	-0.27	0.791	-1.41E-11	1.07E-11
TCL	-5.97E-12	3.80E-12	-1.57	0.116	-1.34E-11	1.48E-12
DOPREV	-3.72E-13	7.21E-13	-0.52	0.606	-1.79E-12	1.04E-12
CASH	-3.03E-12	8.59E-12	-0.35	0.725	-1.99E-11	1.38E-11
CAPEXA	3.08E-12	6.89E-12	0.45	0.655	-1.04E-11	1.66E-11
SP500	1.27E-04	4.96E-05	2.56	0.01	2.99E-05	2.24E-04
CONS	0.9724809	0.0920195	10.57	0	0.792126	1.152836
sigmau	0.36040417					
sigmae	0.45642722					
rho	0.38404685	(fraction of variance due to ui)				

Coefficients				
	(b)	**(B)**	**(b-B)**	**sqrt(diag(Vb-VB))**
	fe	**re**	**Difference**	**S.E.**
DHAL	-2.37E-12	-1.68E-12	-6.95E-13	3.15E-12
TCL	-5.27E-12	-5.97E-12	6.96E-13	3.29E-12
DOPREV	-3.67E-13	-3.72E-13	5.1E-15	2.21E-13
CASH	6.76E-13	-3.03E-12	3.7E-12	4.69E-12
CAPEXA	1.15E-11	3.08E-12	8.39E-12	4.01E-12
SP500	1.51E-04	1.27E-04	0.0000242	0.0000146
b = consistent under Ho and Ha; obtained from xtreg				
B = inconsistent under Ha, efficient under Ho; obtained from xtreg				
Test: Ho: difference in coefficients not systematic				
chi2(5) = (b-B)'[(Vb-VB)^(-1)](b-B)			2.75	
Prob>chi2			0.0972	

FE (within) regression with AR(1) disturbances				
Group variable:	firm		**Number of obs**	683
R-sq within	0.0466		**Number of groups**	76
between	0.0285		**Obs per group**	Min 8
overall	0.0376		**avg**	9
			max	9
corr(ui, X)	0.0113		**F(6,601)**	4.89
			Prob > chi2	0.0001

DTQ	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
DHAL	-3.15E-12	8.19E-12	-0.38	0.701	-1.92E-11	1.29E-11
TCL	-7.73E-12	5.57E-12	-1.39	0.166	-1.87E-11	3.21E-12
DOPREV	3.80E-13	1.00E-12	0.38	0.705	-1.59E-12	2.35E-12
CASH	2.88E-12	1.06E-11	0.27	0.786	-1.79E-11	2.37E-11
CAPEXA	8.62E-12	9.16E-12	0.94	0.347	-9.37E-12	2.66E-11
SP500	3.24E-04	6.46E-05	5.02	0	1.97E-04	4.51E-04
CONS	0.6835747	0.0886531	7.71	0	0.5094672	0.8576821
rhoar	0.26920404					
sigmau	0.43909647					
sigmae	0.42173295					
rhofov	0.52016248	(fraction of variance due to ui)				
F test that all ui=0			**F(75,601)**	5.16	**Prob > F**	0.0000

Durbin Watson and LBI	
modified Bhargava et al. Durbin-Watson	1.46
Baltagi-Wu LBI	1.79E+00

Wooldridge test for autocorrelation in panel data	
H0: no first order autocorrelation	
F(1,75)	24.317
Prob > F	0.0000

Pesaran's test of cross sectional independence	15.561,	**Pr**	0.0000
Average absolute value of the off-diagonal elements	0.358		

Modified Wald test for groupwise heteroskedasticity in fixed effect regression model	
H0: sigma(i)^2 = sigma^2 for all i	
chi2 (76)	30513.99
Prob>chi2	0.0000

i.region Iregion 1-10	**(naturally coded; Iregion 1 omitted)**
i.t It 2007-2016	**(naturally coded; It2007 omitted)**

Prais-Winsten regression, heteroskedastic panels corrected standard errors

Group variable:	firm	**Number of obs**	759
Time variable	t	**Number of groups**	76
Panels	heteroskedastic (unbalanced)	**Obs per group**	Min 9
Autocorrelation	common AR(1)	**avg**	9.986842
		max	10
Estimated covariances	76	**R-squared**	0.1486
Estimated autocorrelations	1	**Wald chi2(5)**	1144.75
Estimated coefficients	24	**Prob > chi2**	0

DTQ	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
DHAL	-4.08E-12	2.39E-12	-1.71	0.0880	-8.78E-12	6.09E-13
TCL	-2.06E-12	2.06E-12	-1	0.3170	-6.11E-12	1.98E-12
DOPREV	-6.13E-13	4.28E-13	-1.43	0.1520	-1.45E-12	2.26E-13
CASH	-3.22E-13	4.85E-12	-0.07	0.9470	-9.82E-12	9.18E-12
CAPEXA	-1.66E-12	4.92E-12	-0.34	0.7360	-1.13E-11	7.98E-12
SP500	5.27E-04	7.23E-05	7.29	0.0000	3.85E-04	6.69E-04
IREGION2	-0.3042574	0.108727	-2.8	0.0050	-0.5173584	-0.0911564
IREGION3	-0.3316489	0.1222022	-2.71	0.0070	-0.5711607	-0.092137
IREGION4	-0.1451652	0.1458467	-1	0.3200	-0.4310195	0.1406891
IREGION5	-0.0748344	0.0984981	-0.76	0.4470	-0.2678871	0.1182182
IREGION6	-0.6410693	0.1845207	-3.47	0.0010	-1.002723	-0.2794154
IREGION7	-0.1894671	0.1913893	-0.99	0.3220	-0.5645832	0.1856489
IREGION8	0.0702305	0.1424556	0.49	0.6220	-0.2089774	0.3494385

IREGION9	0.066166	0.1563836	0.42	0.6720	-0.2403403	0.3726722
IREGION10	-0.0035163	0.1466677	-0.02	0.9810	-0.2909796	0.2839471
IT2008	0.3326666	0.0628704	5.29	0.0000	0.2094428	0.4558905
IT2009	0.4462066	0.0753829	5.92	0.0000	0.2984589	0.5939543
IT2010	0.3299522	0.0824379	4	0.0000	0.1683769	0.4915275
IT2011	0.565933	0.0928464	6.1	0.0000	0.3839573	0.7479086
IT2012	0.6057648	0.1003676	6.04	0.0000	0.409048	0.8024816
IT2013	0.4464049	0.1086865	4.11	0.0000	0.2333832	0.6594265
IT2014	0.7138412	0.1175445	6.07	0.0000	0.4834583	0.9442242
IT2015	0.4803688	0.0926614	5.18	0.0000	0.2987557	0.6619818
IT2016	0.4202097	0.0869424	4.83	0.0000	0.2498056	0.5906137
CONS	(dropped)					
rho	0.5218167					

Table 33. Model 8 Results

Fixed-effects (within) regression					
Group variable:	firm		**Number of obs**	759	
R-sq within	0.0322		**Number of groups**	76	
between	0.0142		**Obs per group**	Min 9	
overall	0.0228		**avg**	10	
			max	10	
F(6,677)	3.75				
corr(ui, Xb)	-0.0313		**Prob > F**	0.0011	

DTQ	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
DHAL	-3.31E-12	6.67E-12	-0.5	0.62	-1.64E-11	9.78E-12
TCL	-5.67E-12	4.76E-12	-1.19	0.234	-1.50E-11	3.67E-12
ROA	2.88E-03	8.77E-04	3.28	0.001	1.16E-03	4.60E-03
CASH	-6.97E-13	9.43E-12	-0.07	0.941	-1.92E-11	1.78E-11
CAPEXA	8.76E-12	7.81E-12	1.12	0.262	-6.57E-12	2.41E-11
SP500	1.32E-04	5.16E-05	2.56	0.011	3.10E-05	2.34E-04
CONS	0.918219	0.1036057	8.86	0	0.7147919	1.121646
sigmau	0.40281625					
sigmae	0.45291294					
rho	0.44165727	(fraction of variance due to ui)				
F test that all ui	0	**F(75, 677)**	7.08	**Prob > F**	0.0000	

Random-effects GLS regression				
Group variable:	firm		**Number of obs**	759
R-sq within	0.0296		**Number of groups**	76
between	0.0945		**Obs per group**	Min 9
overall	0.0591		**avg**	10
			max	10
Random effects ui	Gaussian		**Wald chi2(5)**	15.91
corr(ui, X)	0 (assumed)		**Prob > chi2**	0.0142

DTQ	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
DHAL	-1.68E-12	6.32E-12	-0.27	0.791	-1.41E-11	1.07E-11
TCL	-5.97E-12	3.80E-12	-1.57	0.116	-1.34E-11	1.48E-12
ROA	-3.72E-13	7.21E-13	-0.52	0.606	-1.79E-12	1.04E-12
CASH	-3.03E-12	8.59E-12	-0.35	0.725	-1.99E-11	1.38E-11
CAPEXA	3.08E-12	6.89E-12	0.45	0.655	-1.04E-11	1.66E-11
SP500	1.27E-04	4.96E-05	2.56	0.01	2.99E-05	2.24E-04
CONS	0.9724809	0.0920195	10.57	0	0.792126	1.152836
sigmau	0.3534622					
sigmae	0.45291294					
rho	0.37851719 (fraction of variance due to ui)					

Coefficients				
	(b)	**(B)**	**(b-B)**	**sqrt(diag(Vb-VB))**
	fe	**re**	**Difference**	**S.E.**
DHAL	-3.31E-12	-2.43E-12	-8.73E-13	2.90E-12
TCL	-5.67E-12	-6.64E-12	9.74E-13	3.4E-12
ROA	2.88E-03	2.64E-03	0.0002428	0.0001225
CASH	-6.97E-13	-4.27E-12	3.57E-12	4.5E-12
CAPEXA	8.76E-12	8.85E-13	7.87E-12	3.87E-12
SP500	1.32E-04	1.10E-04	0.0000222	0.0000141
b = consistent under Ho and Ha; obtained from xtreg				
B = inconsistent under Ha, efficient under Ho; obtained from xtreg				
Test: Ho: difference in coefficients not systematic				
chi2(5) = (b-B)'[(Vb-VB)^(-1)](b-B)			7.45	
Prob>chi2			0.0241	

FE (within) regression with AR(1) disturbances				
Group variable:	firm		**Number of obs**	683
R-sq within	0.0916		**Number of groups**	76
between	0.0055		**Obs per group**	Min 8
overall	0.0389		**avg**	9
			max	9
corr(ui, X)	-0.0381		**F(6,601)**	10.1
			Prob > chi2	0.0000

DTQ	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
DHAL	-2.22E-12	7.69E-12	-0.29	0.773	-1.73E-11	1.29E-11
TCL	-5.80E-12	5.43E-12	-1.07	0.286	-1.65E-11	4.87E-12
ROA	4.34E-03	7.91E-04	5.49	0	2.79E-03	5.90E-03
CASH	2.27E-12	1.04E-11	0.22	0.827	-1.81E-11	2.26E-11
CAPEXA	6.14E-12	8.64E-12	0.71	0.478	-1.08E-11	2.31E-11
SP500	3.45E-04	6.40E-05	5.39	0	2.19E-04	4.71E-04
CONS	0.6691472	0.0848648	7.88	0	0.5024796	0.8358148
rhoar	0.28529504					
sigmau	0.44579456					
sigmae	0.4127122					
rhofov	0.53847763 (fraction of variance due to ui)					
F test that all ui=0			**F(75,601)**	5.38	**Prob > F**	0.0000

Durbin Watson and LBI	
modified Bhargava et al. Durbin-Watson	1.44
Baltagi-Wu LBI	1.76E+00

Wooldridge test for autocorrelation in panel data	
H0: no first order autocorrelation	
F(1,75)	20.486
Prob > F	0.0000

Pesaran's test of cross sectional independence	16.474	**Pr**	0.0000
Average absolute value of the off-diagonal elements	0.361		

Modified Wald test for groupwise heteroskedasticity in fixed effect regression model	
H0: sigma(i)^2 = sigma^2 for all i	
chi2 (76)	27115.37
Prob>chi2	0.0000

i.region Iregion 1-10	**(naturally coded; Iregion 1 omitted)**
i.t It 2007-2016	**(naturally coded; It2007 omitted)**

Prais-Winsten regression, heteroskedastic panels corrected standard errors

Group variable:	firm	**Number of obs**	759
Time variable	t	**Number of groups**	76
Panels	heteroskedastic (unbalanced)	**Obs per group**	Min 9
Autocorrelation	common AR(1)	**avg**	9.986842
		max	10
Estimated covariances	76	**R-squared**	0.18
Estimated autocorrelations	1	**Wald chi2(5)**	1164.52
Estimated coefficients	24	**Prob > chi2**	0

DTQ	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
DHAL	-7.26E-12	1.84E-12	-3.94	0.0000	-1.09E-11	-3.65E-12
TCL	-5.49E-13	1.87E-12	-0.29	0.7690	-4.21E-12	3.12E-12
ROA	4.41E-03	2.30E-03	1.92	0.0550	-9.17E-05	8.91E-03
CASH	-3.27E-12	4.87E-12	-0.67	0.5020	-1.28E-11	6.28E-12
CAPEXA	-4.47E-12	4.80E-12	-0.93	0.3520	-1.39E-11	4.95E-12
SP500	4.43E-04	7.38E-05	6	0.0000	2.99E-04	5.88E-04
IREGION2	-0.2248488	0.1061558	-2.12	0.0340	-0.4329103	-0.0167873
IREGION3	-0.2637607	0.1236956	-2.13	0.0330	-0.5061996	-0.0213218
IREGION4	-0.0473129	0.1451047	-0.33	0.7440	-0.3317129	0.237087
IREGION5	-0.1678524	0.0964932	-1.74	0.0820	-0.3569755	0.0212707
IREGION6	-0.5783498	0.1807962	-3.2	0.0010	-0.9327039	-0.2239958
IREGION7	-0.0866671	0.1909402	-0.45	0.6500	-0.460903	0.2875689
IREGION8	0.2060791	0.1380396	1.49	0.1350	-0.0644736	0.4766318

IREGION9	0.183074	0.153798	1.19	0.2340	-0.1183646	0.4845125
IREGION10	0.1398117	0.1433632	0.98	0.3290	-0.141175	0.4207984
IT2008	0.3492445	0.0620477	5.63	0.0000	0.2276332	0.4708558
IT2009	0.4671158	0.0741695	6.3	0.0000	0.3217464	0.6124853
IT2010	0.3130987	0.0811856	3.86	0.0000	0.1539779	0.4722196
IT2011	0.5210859	0.0908475	5.74	0.0000	0.343028	0.6991438
IT2012	0.5759431	0.0961961	5.99	0.0000	0.3874023	0.764484
IT2013	0.3994002	0.1037198	3.85	0.0000	0.1961131	0.6026873
IT2014	0.6509072	0.1106456	5.88	0.0000	0.4340457	0.8677687
IT2015	0.5718651	0.0992188	5.76	0.0000	0.3773998	0.7663304
IT2016	0.4381094	0.0885663	4.95	0.0000	0.2645226	0.6116962
CONS	(dropped)					
rho	0.5292935					

Table 34: Model 9 Results

Fixed-effects (within) regression				
Group variable:	firm		**Number of obs**	759
R-sq within	0.0202		**Number of groups**	76
between	0.0403		**Obs per group**	Min 9
overall	0.029		**avg**	10
			max	10
F(5,678)	2.33			
corr(ui, Xb)	-0.0009		**Prob > F**	0.0313

DTQ	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
DHAL	-2.70E-12	6.72E-12	-0.4	0.688	-1.59E-11	1.05E-11
TCL	-7.81E-12	4.92E-12	-1.59	0.113	-1.75E-11	1.86E-12
NINC	7.82E-12	5.06E-12	1.55	0.123	-2.11E-12	1.78E-11
CASH	1.52E-12	9.57E-12	0.16	0.874	-1.73E-11	2.03E-11
CAPEXA	7.37E-12	8.13E-12	0.91	0.365	-8.60E-12	2.33E-11
SP500	1.38E-04	5.24E-05	2.63	0.009	3.47E-05	2.41E-04
CONS	0.9152302	0.105638	8.66	0	0.7078126	1.122648
sigmau	0.39699888					
sigmae	0.4557034					
rho	0.43147949	(fraction of variance due to ui)				
F test that all ui	0	**F(75, 678)**	6.85	**Prob > F**	0.0000	

Random-effects GLS regression				
Group variable:	firm		**Number of obs**	759
R-sq within	0.0178		**Number of groups**	76
between	0.1148		**Obs per group**	Min 9
overall	0.0622		**avg**	10
			max	10
Random effects ui	Gaussian		**Wald chi2(5)**	5.18
corr(ui, X)	0 (assumed)		**Prob > chi2**	0.5214

DTQ	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
DHAL	-1.75E-12	6.05E-12	-0.29	0.773	-1.36E-11	1.01E-11
TCL	-8.08E-12	3.42E-12	-2.36	0.018	-1.48E-11	-1.37E-12
NINC	7.76E-12	4.76E-12	1.63	0.103	-1.56E-12	1.71E-11
CASH	-2.20E-12	8.40E-12	-0.26	0.794	-1.87E-11	1.43E-11
CAPEXA	-1.03E-12	7.14E-12	-0.14	0.885	-1.50E-11	1.30E-11
SP500	1.14E-04	5.02E-05	2.28	0.023	1.58E-05	2.13E-04
CONS	0.997728	0.0932074	10.7	0	0.8150448	1.180411
sigmau	0.35978813					
sigmae	0.4557034					
rho	0.38398834	(fraction of variance due to ui)				

Coefficients				
	(b)	**(B)**	**(b-B)**	**sqrt(diag(Vb-VB))**
	fe	**re**	**Difference**	**S.E.**
DHAL	-2.70E-12	-1.75E-12	-9.52E-13	2.93E-12
TCL	-7.81E-12	-8.08E-12	2.65E-13	3.54E-12
NINC	7.82E-12	7.76E-12	6.35E-14	1.73E-12
CASH	1.52E-12	-2.20E-12	3.72E-12	4.59E-12
CAPEXA	7.37E-12	-1.03E-12	8.41E-12	3.90E-12
SP500	1.38E-04	1.14E-04	0.0000234	0.0000151
b = consistent under Ho and Ha; obtained from xtreg				
B = inconsistent under Ha, efficient under Ho; obtained from xtreg				
Test: Ho: difference in coefficients not systematic				
chi2(5) = (b-B)'[(Vb-VB)^(-1)](b-B)			2.41	
Prob>chi2			0.12	

RE GLS regression with AR(1) disturbances					
Group variable:	firm		**Number of obs**	759	
R-sq within	0.0179		**Number of groups**	76	
between	0.1135		**Obs per group**	Min 9	
overall	0.0616		**avg**	10	
			max	10	
corr(ui, X)	0 (assumed)		**Wald chi2(5)**	3.76	
			Prob > chi2	0.8064	

theta

min	0.05	median	0.95	max
0.4616	0.4802	0.4802	0.4802	0.4802

DTQ	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
DHAL	-1.47E-12	6.11E-12	-0.24	0.809	-1.35E-11	1.05E-11
TCL	-8.51E-12	3.52E-12	-2.42	0.015	-1.54E-11	-1.62E-12
NINC	7.75E-12	4.87E-12	1.59	0.112	-1.79E-12	1.73E-11
CASH	-4.92E-13	8.98E-12	-0.05	0.956	-1.81E-11	1.71E-11
CAPEXA	-9.81E-13	7.45E-12	-0.13	0.895	-1.56E-11	1.36E-11
SP500	1.15E-04	5.91E-05	1.94	0.052	-1.16E-06	2.30E-04
CONS	0.9877333	0.1030793	9.58	0	0.7857016	1.189765
rhoar	0.26966566	(estimated autocorrelation coefficient)				
sigmau	0.31154054					
sigmae	0.45365953					
rhofov	0.32046514	(fraction of variance due to ui)				

Durbin Watson and LBI	
modified Bhargava et al. Durbin-Watson	1.462452
Baltagi-Wu LBI	1.7762711

Wooldridge test for autocorrelation in panel data	
H0: no first order autocorrelation	
F(1,75)	24.778
Prob > F	0.00E+00

Table 35. Model 10 Results

Fixed-effects (within) regression				
Group variable:	firm		**Number of obs**	757
R-sq within	0.0948		**Number of groups**	76
between	0.2222		**Obs per group**	Min 9
overall	0.1521		**avg**	10
			max	10
F(5,678)	14.16			
corr(ui, Xb)	0.0748		**Prob > F**	0.0000

DTQ	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
DHALMV	-2.69E-06	4.59E-07	-5.87	0	-3.60E-06	-1.79E-06
DTLD	-1.04E-11	2.78E-12	-3.75	0	-1.59E-11	-4.95E-12
ROA	2.63E-03	8.44E-04	3.12	0.002	9.76E-04	4.29E-03
CAPEXA	2.44E-12	7.05E-12	0.35	0.729	-1.14E-11	1.63E-11
SP500	1.55E-04	4.91E-05	3.15	0.002	5.83E-05	2.51E-04
CONS	1.011211	0.0935482	10.81	0	0.8275306	1.194891
sigmau	0.35945743					
sigmae	0.43553946					
rho	0.4051675	(fraction of variance due to ui)				
F test that all ui	0	**F(75, 678)**	6.48	**Prob > F**	0.0000	

Random-effects GLS regression				
Group variable:	firm		**Number of obs**	759
R-sq within	0.0937		**Number of groups**	76
between	0.2468		**Obs per group**	Min 9
overall	0.1643		**avg**	10
			max	10
Random effects ui	Gaussian		**Wald chi2(5)**	58.76
corr(ui, X)	0 (assumed)		**Prob > chi2**	0

DTQ	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
DHALMV	-2.72E-06	4.11E-07	-6.6	0	-3.52E-06	-1.91E-06
DTLD	-1.20E-11	2.43E-12	-4.95	0	-1.68E-11	-7.27E-12
ROA	2.33E-03	8.34E-04	2.79	0.005	6.92E-04	3.96E-03
CAPEXA	-2.16E-12	4.78E-12	-0.45	0.651	-1.15E-11	7.21E-12
SP500	1.44E-04	4.75E-05	3.03	0.002	5.09E-05	2.37E-04
CONS	1.060864	0.0865498	12.26	0	0.8912295	1.230498
sigmau	0.32122299					
sigmae	0.43553946					
rho	0.35231024	(fraction of variance due to ui)				

Coefficients				
	(b)	(B)	(b-B)	sqrt(diag(Vb-VB))
	fe	re	Difference	S.E.
DHALMV	-2.69E-06	-2.72E-06	2.10E-08	2.04E-07
DTLD	-1.04E-11	-1.20E-11	1.63E-12	1.35E-12
ROA	2.63E-03	2.33E-03	0.0003064	1.29E-04
CAPEXA	2.44E-12	-2.16E-12	4.61E-12	5.18E-12
SP500	1.55E-04	1.44E-04	0.0000107	0.0000125
b = consistent under Ho and Ha; obtained from xtreg				
B = inconsistent under Ha, efficient under Ho; obtained from xtreg				
Test: Ho: difference in coefficients not systematic				
chi2(5) = (b-B)'[(Vb-VB)^(-1)](b-B)			7.14	
Prob>chi2			0.07	

FE (within) regression with AR(1) disturbances				
Group variable:	firm		**Number of obs**	681
R-sq within	0.1491		**Number of groups**	76
between	0.1536		**Obs per group**	Min 8
overall	0.1481		**avg**	9
			max	9
corr(ui, X)	-0.0056		**F(6,601)**	21.04
			Prob > chi2	0.0000

DTQ	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
DHALMV	-3.26E-06	5.08E-07	-6.41	0	-4.26E-06	-2.26E-06
DTLD	-6.28E-12	4.52E-12	-1.39	0.165	-1.52E-11	2.60E-12
ROA	4.13E-03	7.64E-04	5.4	0	2.63E-03	5.63E-03
CAPEXA	4.73E-13	7.83E-12	0.06	0.952	-1.49E-11	1.58E-11
SP500	3.96E-04	6.47E-05	6.11	0	2.69E-04	5.23E-04
CONS	0.7142444	0.0857303	8.33	0	0.5458765	0.8826124
rhoar	0.28054257					
sigmau	0.40979428					
sigmae	0.39588574					
rhofov	0.51725797	(fraction of variance due to ui)				
F test that all ui=0			**F(75,601)**	5.08	**Prob > F**	0.0000

Durbin Watson and LBI	
modified Bhargava et al. Durbin-Watson	1.44
Baltagi-Wu LBI	1.78E+00

Wooldridge test for autocorrelation in panel data	
H0: no first order autocorrelation	
F(1,75)	17.985
Prob > F	0.0001

Pesaran's test of cross sectional independence	17.191	**Pr**	0.0000
Average absolute value of the off-diagonal elements	0.347		

Modified Wald test for groupwise heteroskedasticity in fixed effect regression model	
H0: sigma(i)^2 = sigma^2 for all i	
chi2 (76)	36468.69
Prob>chi2	0.0000

i.region Iregion 1-10 (naturally coded; Iregion 1 omitted)
i.t It 2007-2016 (naturally coded; It2007 omitted)

Prais-Winsten regression, heteroskedastic panels corrected standard errors			
Group variable:	firm	**Number of obs**	757
Time variable	t	**Number of groups**	76
Panels	heteroskedastic (unbalanced)	**Obs per group**	Min 9
Autocorrelation	common AR(1)	**avg**	9.960526
		max	10
Estimated covariances	76	**R-squared**	0.2136
Estimated autocorrelations	1	**Wald chi2(5)**	1213.99
Estimated coefficients	15	**Prob > chi2**	0

DTQ	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
DHALMV	-3.05E-06	3.85E-07	-7.91	0.0000	-3.80E-06	-2.29E-06
DTLD	-6.86E-12	1.73E-12	-3.97	0.0000	-1.03E-11	-3.47E-12
ROA	3.96E-03	2.28E-03	1.74	0.0820	-5.03E-04	8.42E-03
CAPEXA	-8.54E-12	3.75E-12	-2.28	0.0230	-1.59E-11	-1.18E-12
SP500	5.51E-04	3.52E-05	15.63	0.0000	4.82E-04	6.20E-04
SIZEDUMMY	-1.54E-02	6.92E-02	-0.22	0.8240	-1.51E-01	1.20E-01
CRISISDUMMY	0.7302826	0.067624	10.8	0.0000	0.597742	0.8628232
IT2008	-0.4066706	0.0806762	-5.04	0.0000	-0.564793	-0.2485482
IT2009	-0.2252374	0.0852789	-2.64	0.0080	-0.3923809	-0.0580938
IT2010	0.3693449	0.0710037	5.2	0.0000	0.2301802	0.5085095
IT2011	0.5709709	0.0708315	8.06	0.0000	0.4321438	0.709798
IT2012	0.6268634	0.0719597	8.71	0.0000	0.485825	0.7679019
IT2013	0.4693329	0.0713297	6.58	0.0000	0.3295292	0.6091365

IT2014	(dropped)					
IT2015	-0.1083274	0.0723772	-1.5	0.1340	-0.2501841	0.0335292
IT2016	0.4913188	0.0781236	6.29	0.0000	0.3381994	0.6444383
CONS	(dropped)					
RHO	0.5112335					

Variable	VIF	1/VIF
SP500	6.95	0.14
CRISISDUMMY	5.01	0.20
CAPEXA	3.79	0.26
DTLD	3.51	0.28
SIZEDUMMY	2.89	0.35
IT2008	2.48	0.40
IT2009	2.36	0.42
IT2015	2.29	0.44
IT2010	1.65	0.61
IT2016	1.61	0.62
IT2011	1.53	0.66
IT2012	1.53	0.66
IT2013	1.42	0.71
DHALMV	1.30	0.77
ROA	1.24	0.81
MEAN	**VIF**	**2.64**

Table 36. Model 11 Results

Fixed-effects (within) regression				
Group variable:	firm		**Number of obs**	757
R-sq within	0.0232		**Number of groups**	76
between	0.0247		**Obs per group**	Min 9
overall	0.0015		**avg**	10
			max	10
F(5,676)	3.22			
corr(ui, Xb)	0.2439		**Prob > F**	0.0071

DHALMV	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
DTLD	-9.99E-08	2.33E-07	-0.43	0.668	-5.57E-07	3.57E-07
ROA	-5.66E+01	7.06E+01	-0.8	0.423	-1.95E+02	8.20E+01
CASH	-5.55E-07	7.44E-07	-0.74	0.457	-2.02E-06	9.07E-07
CAPEXA	-5.75E-07	5.91E-07	-0.97	0.331	-1.74E-06	5.85E-07
SP500	1.23E+01	4.17E+00	2.96	0.003	4.14E+00	2.05E+01
CONS	13220.95	8221.594	1.61	0.108	-2921.983	29363.88
sigmau	45568.404					
sigmae	36446.912					
rho	0.60985808	(fraction of variance due to ui)				
F test that all ui	0	**F(75, 676)**	14.21		**Prob > F**	0.0000

Random-effects GLS regression				
Group variable:	firm		**Number of obs**	757
R-sq within	0.0206		**Number of groups**	76
between	0.0001		**Obs per group**	Min 9
overall	0.0078		**avg**	10
			max	10
Random effects ui	Gaussian		**Wald chi2(5)**	14.24
corr(ui, X)	0 (assumed)		**Prob > chi2**	0.0141

DHALMV	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
DTLD	3.43E-08	2.16E-07	0.16	0.874	-3.90E-07	4.58E-07
ROA	-5.57E+01	7.01E+01	-0.79	0.427	-1.93E+02	8.17E+01
CASH	-1.08E-07	6.87E-07	-0.16	0.875	-1.46E-06	1.24E-06
CAPEXA	4.47E-08	4.91E-07	0.09	0.927	-9.17E-07	1.01E-06
SP500	1.44E+01	4.01E+00	3.59	0	6.55E+00	2.23E+01
CONS	5455.89	8632.946	0.63	0.527	-11464.37	22376.15
sigmau	43217.667					
sigmae	36446.912					
rho	0.58438126	(fraction of variance due to ui)				

Coefficients				
	(b)	**(B)**	**(b-B)**	**sqrt(diag(Vb-VB))**
	fe	**re**	**Difference**	**S.E.**
DTLD	-9.99E-08	-1.20E-11	-9.99E-08	2.33E-07
ROA	-5.66E+01	2.33E-03	-56.5861887	7.06E+01
CASH	-5.55E-07	-8.17E-13	-5.54999E-07	7.44E-07
CAPEXA	-5.75E-07	-1.92E-12	-5.74998E-07	5.91E-07
SP500	1.23E+01	1.44E-04	12.3316964	4.171082
b = consistent under Ho and Ha; obtained from xtreg				
B = inconsistent under Ha, efficient under Ho; obtained from xtreg				
Test: Ho: difference in coefficients not systematic				
chi2(5) = (b-B)'[(Vb-VB)^(-1)](b-B)			8.97	
Prob>chi2			0.01	

FE (within) regression with AR(1) disturbances					
Group variable:	firm			**Number of obs**	681
R-sq within	0.0485			**Number of groups**	76
between	0.0189			**Obs per group**	Min 8
overall	0			**avg**	9
				max	9
corr(ui, X)	-0.2507			**F(5,600)**	6.12
				Prob > chi2	0.0000

DHALMV	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
DTLD	-4.17E-07	3.56E-07	-1.17	0.242	-1.12E-06	2.82E-07
ROA	-4.70E+01	6.02E+01	-0.78	0.435	-1.65E+02	7.13E+01
CASH	-6.51E-07	8.06E-07	-0.81	0.42	-2.24E-06	9.32E-07
CAPEXA	-5.17E-07	6.49E-07	-0.8	0.426	-1.79E-06	7.57E-07
SP500	2.34E+01	5.54E+00	4.22	0	1.25E+01	3.43E+01
CONS	2305.269	6491.419	0.36	0.723	-10443.4	15053.93
rhoar	0.37149754					
sigmau	51594.376					
sigmae	32144.671					
rhofov	0.72037692	(fraction of variance due to ui)				
F test that all ui=0			**F(75,600)**	9.16	**Prob > F**	0.0000

Durbin Watson and LBI	
modified Bhargava et al. Durbin-Watson	1.26

Baltagi-Wu LBI	1.55E+00

Wooldridge test for autocorrelation in panel data	
H0: no first order autocorrelation	
F(1,75)	48199.000
Prob > F	0.0000

Pesaran's test of cross sectional independence	2943	**Pr**	0.0032
Average absolute value of the off-diagonal elements	0.357		

Modified Wald test for groupwise heteroskedasticity in fixed effect regression model	
H0: sigma(i)^2 = sigma^2 for all i	
chi2 (76)	450000.00
Prob>chi2	0.0000

i.region Iregion 1-10 **(naturally coded; Iregion 1 omitted)**

i.t It 2007-2016 **(naturally coded; It2007 omitted)**

Prais-Winsten regression, heteroskedastic panels corrected standard errors			
Group variable:	firm	**Number of obs**	757
Time variable	t	**Number of groups**	76
Panels	heteroskedastic (unbalanced)	**Obs per group**	Min 9
Autocorrelation	common AR(1)	**avg**	9.960526
		max	10
Estimated covariances	76	**R-squared**	0.0609
Estimated autocorrelations	1	**Wald chi2(5)**	153.13

Estimated coefficients	15			Prob > chi2		0

DHALMV	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
DTLD	5.65E-07	1.86E-07	3.04	0.0020	2.00E-07	9.29E-07
ROA	-2.94E+01	4.16E+01	-0.71	0.4800	-1.11E+02	5.22E+01
CASH	2.50E-07	8.61E-07	0.29	0.7720	-1.44E-06	1.94E-06
CAPEXA	7.45E-07	6.46E-07	1.15	0.2490	-5.20E-07	2.01E-06
SP500	9.16E+00	3.03E+00	3.03	0.0020	3.23E+00	1.51E+01
SIZEDUMMY	-2.06E+04	6.66E+03	-3.1	0.0020	-3.37E+04	-7.57E+03
CRISISDUMMY	30008.39	6163.565	4.87	0.0000	17928.02	42088.75
IT2008	-18786.31	4791.975	-3.92	0.0000	-28178.41	-9394.216
IT2009	(dropped)					
IT2010	14652.02	6243.465	2.35	0.0190	2415.051	26888.99
IT2011	9560.898	6352.997	1.5	0.1320	-2890.747	22012.54
IT2012	9775.217	6414.18	1.52	0.1280	-2796.346	22346.78
IT2013	8162.092	6318.074	1.29	0.1960	-4221.106	20545.29
IT2014	-28965.64	7291.077	-3.97	0.0000	-43255.89	-14675.39
IT2015	-19401.54	7461.675	-2.6	0.0090	-34026.16	-4776.928
IT2016	11962.38	6647.416	1.8	0.0720	-1066.318	24991.07
CONS	(dropped)					
RHO	0.5652132					

CURRICULUM VITAE

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Education

Yildirim Beyazit University, Social Sciences Institute, PhD Candidate(Dissertation Level) in Banking And Finance — July 2018

University of Manchester, MBS, MSc Accounting and Finance — June 2011
Award: The scholarship for Masters and Language School education in the UK by the Republic of Turkey Ministry of National Education and Turkish Petroleum Corporation, 2008.
The scholarship by the Scientific and Technological Research Council of Turkey, 2008.

Anglo Continental School Of English, Bournemouth, UK — March 2008
Level : Advanced

Universidade do Minho, **Portugal, BA in International Relations**, — February 2007
Fall Semester Erasmus / Socrates Student

Ankara University, Turkey, Dept. of Political Science, BA in Management — September 2007
Award: Honor Degree
The scholarship by the Government during Undergraduate Degree , 2003-2007.
The scholarship by Izmir Metropolitan Municipality, 2005-2006.
Awarded to be an Erasmus Student in Portugal with the scholarship by the University and Turkish National Agency, 2005.

Experience

Turkish Petroleum Corporation (TP), Ankara, TURKEY — June 2014 - Present
Chief Accountant of Cost and Revenue Division

- Managing daily accounting & finance activities related with the revenues and costs of the company under IFRS and Turkish Tax Regulations.
- Managing fixed assets of the company.
- Managing R&D accounting activities for the special needs of subsidies.
- Reviewing, drafting and participating in the negotiation of a wide variety of operation & service agreements, joint operation agreements (JOA) with multinational companies for their exploration, drilling and production activities in Turkey.
- Working on Projects to monitor and forecast oil fields' economical figures for more efficient operations.
- Auditing and reporting the operations of Partners (Operators) on the Joint Venture fields.
- Preparing revenues and costs figures for the monthly and annual reports of the company.

TP Europe, Jersey Islands, UK — March 2014 – June 2016
Financial Subcommittee Member

- Making financial decisions as authorised on behalf of the Operating Committee between meetings, and reporting such decisions.
- Preparing presentations for the Executive Board, regarding the financial aspects of companies' activities in The Netherlands and Russia.
- Preparing the economic model and cash flow forecasts of Company's subsidiaries.

Turkish Petroleum Corporation (TP), Ankara, TURKEY — September 2009 – June 2014
Junior Accountant

- Reviewing, drafting and participating in the negotiation of a wide variety of operation & service agreements, joint operation agreements (JOA) with multinational companies for their exploration, drilling and production activities in Turkey.
- Working on a Project to monitor and forecast the unit exploration cost of a barrel of petroleum by building a mathematical model and regressing the cost function using the historical data for more efficient operations.
- Auditing and reporting the operations of Partners (Operators) on the Joint Venture fields**.**
- Preparing revenues and costs figures for the monthly and annual reports of the company.

2005 Summer Universiade, Izmir, TURKEY — June 2003 - Aug2005
Volunteer Manager

- Conducting interviews with potential volunteers, organizing sports activities and work schedules.

Papers – Proceedings - Dissertation

Yildiz, E. and Ulusoy, M.K., 2015. The Fragility of Turkish Economy from the Perspective of Oil Dependency. Managing Global Transitions, 13(3), p.253.

Yıldız E, Ulusoy M.K., Uysal B., Çetinkaya N., 2015. Is Oil Price Decline Cure for Turkey's Current Account Deficit? 5th Multinational Energy and Value Conference, İstanbul.

Dissertation(MSc) – Importance of Country-Level Investor Protection on Specific Convertible Bond Design.

Dissertation(PhD) - Risk Management Activities for Oil and Gas Producers and The Impact on Firm Value.

Computer Skills

Microsoft Office (All Applications), SQL, Visual Basic, Eviews, Stata, DataStream, MSCI Barra, and CRSP.

Languages

Turkish (Native), English (Proficient)(TOEFL IBT Score:99, TOEIC Score:990), Spanish (Intermediate)

Certificates

SPL(CFA for Turkey), International Financial Reporting Standards(PwC), Energy Diplomacy(Ankara University Cotinuing Education Center), Advanced Tax & Accounting(PwC), International Payments, Taxing Issues, Remarks and Suggestions(PwC), Exploration and Production Accounting Level 1-2-3(MDT International), Energy Subsidy Reform(IMF).

Activities

Basketball, Manchester Campus Sports Runner-Ups, Ankara University Campus Sports Runner-Ups, High School Street Ball Tournament Runner-Ups, Alternative Music, Travelling, Social Responsibility Activities.

TEZ FOTOKOPISI IZIN FORMU

ENSTİTÜ

Fen Bilimleri Enstitüsü	
Sosyal Bilimler Enstitüsü	X

YAZARIN

Soyadı: YILDIZ SAVAŞ

Adı: Eren

Bölümü: Bankacılık ve Finans

TEZİN ADI: Risk Management Activities For Oil And Gas Producers And The Impact On Firm Value

TEZİN TÜRÜ: Yüksek Lisans [ ] Doktora [X]

1. Tezimin tamamından kaynak gösterilmek şartıyla fotokopi alınabilir.	
2. Tezimin içindekiler sayfası, özet, indeks sayfalarından ve/veya bir bölümünden kaynak gösterilmek şartıyla fotokopi alınabilir.	
3. Tezimden bir (1) yıl süreyle fotokopi alınamaz.	X

TEZİN KÜTÜPHANEYE TESLİM TARİHİ:

TURKISH SUMMARY

Etkin piyasalarda, riskten korunma yöntemlerinin işe yaramaması beklenmektedir. Bilgi asimetrisi, hükümet kısıtlamaları, vergilerin bulunduğu gerçek dünya ise etkin piyasaların öngörüldüğü Modigliani-Miller dünyasından uzaktır. Birçok sektörde ekonomik durum kötüye gittiğinde firmalar ürün fiyatlarında değişiklik yaparak piyasa koşullarına uyum sağlayabilir. Ancak, bu durum petrol ve doğal gaz fiyatı borsada belirlendiği için bu sektör firmaları için geçerli değildir. Ürün farklılaşması yapmamış veya entegre olmayan petrol ve doğal gaz arama, üretim şirketleri için petrol fiyatı birincil risk faktörü olurken, firmalar da son derece kırılgan bir finansal yapıya sahiptir. Petrol fiyatlarının yanı sıra, petrol ve doğal gaz firmalarının deniz aşırı faaliyetleri ve gelir-gider beklentisi nedeniyle kur ve faiz riski de onları kırılganlaştırmaktadır.

Bu tezde petrol ve gaz firmalarının riskten kaçınma faaliyetlerinin riski azaltmaktaki başarısı değerlendirilmektedir. Firmaların performansları Tobin'in Q'su ile temsil edilerek panel regresyon modelleri ile firma değeri ve türev araç kullanımı arasındaki ilişki ölçülmektedir. Spekülatif amaçlı kullanılan türev araçlar UFRS ve Genel Kabül Görmüş Muhasebe İlkeleri'nde yer alan düzenlemeler ile elimine edilmiştir. Modeller IHS Market veri tabanından alınan 76 firma ile kurulmuştur. Ulaşılabilen firma verilerine istinaden veriler 2007 - 2016 yılları arasını kapsamaktadır. Veriler, Uluslararası, Avrupa, Rusya, Asya, Kanada, ve diğer entegre petrol, doğal gaz firmalarının yanı sıra, Güney ve Merkez Amerika Uluslararası Petrol ve Doğal Gaz firmalarını, Büyük Kuzey Amerika Petrol Arama ve Üretim Firmalarını, Kanada Petrol Arama ve Üretim Firmaları ile Tröstlerini ve Kuzey Amerika dışındaki Petrol Arama ve Üretim Firmalarını kapsamaktadır. Tez sonuçları simetrik olmayan bilgi ve sinyal etkisi ile ilgili önemli bilgiler sağlamaktadır. Türev araç kullanımının firma değeri üzerindeki etkisinin negatif olması, bu tür açıklamaların firmanın finansal sağlığı açısından önemli bilgi içerdiğini göstermektedir. Firmaların türev araçları yoğun olarak kullanmasının yatırımcıların firmaya yatırım yapmaması için bir uyarı olarak görüldüğü değerlendirilmektedir.

Tablo 1. Literatür Taraması

Yazar(lar)	Yıl	Bölge	Sonuçlar
Allayannis & Weston	2001	ABD	Yabancı para türev araçlarının firma değeri üzerindeki etkisi pozitiftir.
Ayturk	2016	Türkiye	Türkiye için riskten kaçınma primine dair bir kanıt bulunamamıştır.
Bartram vd.	2011	47 ülke	Riskten kaçınan firmaların nakit akışında daha az oynaklık, sistematik olan ve olmayan riskte de aşağı yönlü farklılık gözlenmiştir. Ancakö riskten kaçınma primi istatistiksel olarak daha az anlamlıdır.
Bessembinder	1991	Teorik	Firmalar, vekalet maliyetini düşürürken alacaklılar, müşteriler, çalışanlar ve sağlayıcılar ile aralarındaki sözleşmelerde iyileşme sağlayarak riskten kaçınma yöntemlerinden fayda sağlarlar.
Block, Gallagher	1986	Fortune 500 firmaları	Türev araçlarının kullanımı finansal stres ve firma büyüklüğü ile ilişkilidir.
Booth, Smith ve Stolz	1984	ABD	Türev araçlar finansal stres yüksekken ve firma büyükken daha çok kullanılmaktadır.
Carter vd.	2003	ABD	Petrol fiyatına ilişkin oynaklığın en büyük operasyonel maliyeti oluşturduğu havayolu firmaları üzerine yapılan araştırmada büyük firmaların riskten korunma yöntemlerini aşağı yönlü hareketlerde kullanarak bundan fayda sağladığı görülmüştür. Ancak küçük firmalar nerdeyse hiç riskten korunmayı tercih etmemektedir.
Dadalt vd.	2002	ABDö Fortune 500 ve Business Week 1000 firmaları	Firmalar, gelirlerini etkileyen asimetrik bilgiyi minimize ederek riskten korunma yöntemlerinden avantaj sağlayabilirler. Ancak, kur ve faiz oranları gibi makro ekonomik faktörler firmalar için çok önemliyse de öngörmesi oldukça güçtür. Eğer ki firmalar bu tür faktörleri kontrol edebilirse firmaya değer kazandırabilir.

Demarzo ve Duffie	1995	Teorik	Riskten korunma yöntemlerine ilişkin kamu bilgilendirmeleri çok önemlidir. Genç yöneticileri olan firmalar için yüksek kar rakamları çok önemlidir ve bu durum riskten korunma faaliyetlerinin reklamsal ve bilgisel gücünün sonuçlarını kullanır. Muhasebe standartları ve kamu aydınlatma açıklamaları piyasa tarafından sinyal olarak görülür ve yalnızca yöneticilerin bildiği özel bilgilerin açıklanması olarak değerlendirilir.
Froot ve diğerleri	1993	Teorik	Bu çalışmanın temel bulguları aşağıdadır; 1. Firmalar için dış borçlanma, iç borçlanmadan daha maliyetlidir. Riskten korunma yöntemleri bu nedenle faydalıdır. 2. Optimal riskten korunma yöntemleri kullanılarak piyasada al-sat yapılan riskten tamamen kaçınmak mümkün değildir. 3. Firmalar yatırımlarından nakit akışı bekliyorlarsa riskten korunma yöntemlerini tercih etmezler. Firmaların riskten korunma yöntemlerini kullanmadaki temel motivasyonu dış kaynakların getirdiği dışsal risklerdir. 4. Bir firma belli bir yatırım ve gelir beklentisi ile yurt dışına yatırım yapmak istiyorsa kur riskini riskten korunma yöntemleri ile belli bir seviyede tutmak isteyecektir. 5. Opsiyonlar gibi doğrusal olmayan riskten korunma yöntemleri yatırım ve finansal kararlarda forward ve future gibi doğrusal yöntemlerden daha anlamlıdır. 6. Futurelar için nakit akışlarının bugünkü değerinin ve nakidin ileriki bir zamandaki değerinin etkisini görmek çok zordur. 7. Opsiyonlar özelinde bir firma için riskten korunma yöntemlerinin değeri piyasa koşullarına ve diğer firmaların riskten korunma yöntemlerine bağlıdır.
Houston ve Mueller	1988	US	Finansal stres ve firma büyüklüğü riskten korunma yöntemleri ihtiyacını artırmaktadır.
Jin &Jorion	2006	US	Risk faktörleri ya tespit edilmesi ve önlenmesi kolay ya da tespit edilmesi ve önlenmesi zor faktörlerdir. Bu

			nedenle riskten korunma yöntemleri herhangi bir artı değer yaratmamaktadır.
Lau	2016	Malaysia	Riskten korunma yöntemleri kar marjları ve faaliyet karında negatif bir etki yaratmaktadırö bu durum da firma değerini olumsuz etkilemektedir.
Leland	1998	Teorik	Riskten korunma yöntemlerinin faydaları görülmektedir. Ancak, yüksel vekil maliyeti olması durumunda aktif riskten korunma yöntemlerinin değeri anlamlı şekilde yüksek değildir.
Lookman	2004	ABD	Arama ve Üretim firmalarında, petrol fiyatı birincil risk olduğundan riskten korunma aktiviteleri firma değerini olumsuz etkiler. Entegre petrol firmalarında ise fiyat riski ikincil risk olduğundan riskten korunma faaliyetlerinde olumlu etkiler yaratır. Negatif sinyal etkisi ve yüksek vekil maliyetleri bu durumu ortaya çıkarabilir.
Mayers Smith	1990	ABD	Mevcut dış borç, vekil sorunları, firma büyüklüğü riskten korunma yöntemleri kullanılmasındaki en önemli nedenlerdir.
Mnasri ve diğerleri	2017	ABD	Petrol fiyatlarındaki gelir duyarlılığı nedeniyle doğrusal olmayan riskten korunma yöntemleri firma değerine büyük marjinal katkılar sağlar.
Nance ve diğerleri	1993	ABD	Riskten korunma aktiviteleri vergi yükümlülükleri, işlem maliyetleri ve vekil maliyetlerini azaltarak firma değerini arttırır.
Rene M. Stulz	1985	Teorik	Optimal kaynak ve sahiplik yapısı risk yönetimi ile başarılabilir. Finansal stres ve dış borç riskten korunma yöntemleri ile daha iyi performans için kontrol edilebilir.
W. Smith ve Stulz	1996	Teorik	Firmalar firma değerlerini maksimize etmeyi amaçlarlar. Riskten korunma araçlarını bu amaçla vergiden kaçınma, finansal stresi azaltma ve yönetimsel riskten kaçınmak için kullanırlar.
Wall & Pringle	1993	ABD	Swap kullanıcıları vekil maliyetini ve bilgi asimetrisini azaltmayı amaçlarlar. Ayrıca kullanıcılar, vergiden kaçınmak, mevzuatsal sıkıntıları aşmak ve dış borçlanmadaki risk seviyesini azaltmak yoluyla kazanç sağlarlar.

Modelde kullanılan değişkenler aşağıda tanımlanmıştır;

Tablo 2. Değişken Tanımları

Değişken	Kısaltmalar
Uzun Dönemli Borç	TLD
Firma Değeri	MV
Petrol ve Doğal Gaz Yatırımları	CAPEX
Toplam Satış ve Faaliyet Gelirleri	OPREV
Nakit ve Benzerleri	CASH
Toplam Yabancı Kaynaklar	TCL
Toplam Borç Harici Yabancı Kaynaklar	TNDL
Net Kar	NINC
Aktif Karlılığı, %	ROA
Aktif Yatırım Yüzdesi, %	CAPEXA
Dönen Varlıklardaki Riskten Korunma Araçları Duran Varlıklardaki Riskten Korunma Araçları Kısa Vadeli Yabancı Kaynaklardaki Riskten Korunma Araçları Kısa Vadeli Yabancı Kaynaklardaki Riskten Korunma Araçları	HA
Tobin'in Q oranı	TQ
S&P 500 endeks değeri	SP500

Tablo 3. Temel İstatistikler

Değişken	Obs	Ortalama	Standart Sapma	Minimum	Maksimum
TLD	760	7,070,000,000	11,600,000,000	-	87,200,000,000
OPREV	760	34,800,000,000	77,500,000,000	-	470,000,000,000
CASH	760	2,070,000,000	4,380,000,000	-	31,200,000,000
TCL	760	8,330,000,000	17,600,000,000	3,029,000	106,000,000,000
TNDL	760	4,540,000,000	11,300,000,000	-	109,000,000,000
NINC	760	2,030,000,000	6,310,000,000	(44,900,000,000)	45,800,000,000
ROA	760	0.5549503	21	(330)	89
CAPEXA	760	4,680,000,000	7,340,000,000	(4,800,000,000)	53,000,000,000
HAL	760	1,120,000,000	4,890,000,000	(182,000,000)	79,500,000,000
TQ	760	1.10162100	0.5928632	-	5.141413

Model seçiminde korelasyon matrisi kullanılmıştır;

Tablo 4. Korelasyon Matriksi

	TLD	OPREV	CASH	TCL	TNDL	NINC	ROA	CAPEXA	HAL	TQ
TLD	1									
OPREV	0.6733*	1								
CASH	0.7305*	0.7365*	1							
TCL	0.7254*	0.9689*	0.7601*	1						
TNDL	0.8188*	0.6157*	0.6069*	0.6216*	1					
NINC	0.3156*	0.6339*	0.5443*	0.6251*	0.1631*	1				
ROA	0.0352	0.1065*	0.0965*	0.0955*	0.0186	0.2998*	1			
CAPEXA	0.7929*	0.8223*	0.7938*	0.8346*	0.6243*	0.6929*	0.1175*	1		
HAL	0.3738*	0.6406*	0.4485*	0.6858*	0.4297*	0.3857*	0.0473	0.4874*	1	
TQ	-0.3102*	-0.2352*	-0.2332*	-0.2469*	-0.2409*	-0.1550*	-0.1565*	-0.2701*	-0.1263*	1

Panel data sonuçlarının güvenilir olması için otokorelasyon testi yapılmıştır.

Tablo 5. Otokorelasyon Testi

Grup Değişkeni	Firma
Grup Sayısı	76
Ortalama gözlem Sayısı	10
Panel	Dengelenmemiş

Değişken	CD test	PValue	Corr	ABS
TLD	48.26	0.0000	0.286	0.497
XTCD	73.03	0.0000	0.433	0.553
CASH	14.27	0.0000	0.085	0.320
TCL	42.95	0.0000	0.254	0.404
TNDL	38.84	0.0000	0.230	0.505
NINC	78.94	0.0000	0.468	0.497
ROA	89.31	0.0000	0.529	0.557
CAPEXA	58.31	0.0000	0.345	0.472
HAL	18.43	0.0000	0.109	0.350
TQ	25.40	0.0000	0.150	0.403

Panel data sonuçlarının güvenilir olması için birim kök testi yapılmış, birim kök görülen değişkenlerdeki trend birinci fark alınarak düzeltilmiştir.

Tablo 6. Pesaran (2007) Birim Kök Testleri (CIPS)

Variable	With/Trendsiz	Lags	ZtBar	Pvalue	Unit Root
TLD	Trendsiz	0	-1.22	0.11	VAR
TLD	Trendsiz	1	-1.53	0.06	
TLD	Trendsiz	2	27.77	1.00	
TLD	Trendli	0	3.17	1.00	
TLD	Trendli	1	1.64	0.95	
TLD	Trendli	2	22.16	1.00	
OPREV	Trendsiz	0	1.27	0.90	VAR
OPREV	Trendsiz	1	-2.77	0.00	
OPREV	Trendsiz	2	27.77	1.00	
OPREV	Trendli	0	1.63	0.95	
OPREV	Trendli	1	0.92	0.82	
OPREV	Trendli	2	22.16	1.00	
CASH	Trendsiz	0	-3.22	0.00	YOK
CASH	Trendsiz	1	-6.62	0.00	
CASH	Trendsiz	2	27.77	1.00	
CASH	Trendli	0	-1.82	0.04	
CASH	Trendli	1	-1.58	0.06	
CASH	Trendli	2	22.16	1.00	
TCL	Trendsiz	0	-4.11	0.00	YOK
TCL	Trendsiz	1	-1.54	0.06	
TCL	Trendsiz	2	27.77	1.00	
TCL	Trendli	0	-5.76	0.00	
TCL	Trendli	1	-1.55	0.06	
TCL	Trendli	2	22.16	1.00	
TNDL	Trendsiz	0	-2.08	0.02	YOK

TNDL	Trendsiz	1	-4.51	0.00	
TNDL	Trendsiz	2	27.77	1.00	
TNDL	Trendli	0	0.60	0.73	
TNDL	Trendli	1	-4.90	0.00	
TNDL	Trendli	2	22.16	1.00	
NINC	Trendsiz	0	-3.53	0.00	YOK
NINC	Trendsiz	1	-2.03	0.02	
NINC	Trendsiz	2	27768.00	1.00	
NINC	Trendli	0	-1.63	0.05	
NINC	Trendli	1	-5.04	0.00	
NINC	Trendli	2	22160.00	1.00	
ROA	Trendsiz	0	-5.80	0.00	YOK
ROA	Trendsiz	1	-3.08	0.00	
ROA	Trendsiz	2	27768.00	1.00	
ROA	Trendli	0	-2.43	0.01	
ROA	Trendli	1	-2.21	0.01	
ROA	Trendli	2	22160.00	1.00	
CAPEXA	Trendsiz	0	-5.21	0.00	YOK
CAPEXA	Trendsiz	1	-2.32	0.01	
CAPEXA	Trendsiz	2	27768.00	1.00	
CAPEXA	Trendli	0	-2.80	0.00	
CAPEXA	Trendli	1	-1479.00	0.07	
CAPEXA	Trendli	2	22160.00	1.00	
HAL	Trendsiz	0	-0.14	0.45	VAR
HAL	Trendsiz	1	-0.25	0.40	
HAL	Trendsiz	2	27.36	1.00	
HAL	Trendli	0	-2.10	0.02	
HAL	Trendli	1	-2.17	0.02	
HAL	Trendli	2	22.16	1.00	
TQ	Trendsiz	0	-1.54	0.06	VAR

TQ	Trendsiz	1	-0.81	0.21	
TQ	Trendsiz	2	27768.00	1.00	
TQ	Trendli	0	1.10	0.87	
TQ	Trendli	1	-0.93	0.18	
TQ	Trendli	2	22160.00	1.00	

Table 7. Pesaran (2007) Birim Kök Testleri (CIPS)

Variable	With/Trendsiz	Lags	ZtBar	Pvalue	Unit Root
DTLD	Trendsiz	0	-8.11	0.000	YOK
DTLD	Trendsiz	1	0.46	0.677	
DTLD	Trendli	0	-2.27	0.012	
DTLD	Trendli	1	3.44	1.000	
DOPREV	Trendsiz	0	-12.26	0.000	YOK
DOPREV	Trendsiz	1	-1.09	0.138	
DOPREV	Trendli	0	-9.08	0.000	
DOPREV	Trendli	1	2.83	0.998	
DHAL	Trendsiz	0	-5.20	0.000	YOK
DHAL	Trendsiz	1	0.26	0.602	
DHAL	Trendli	0	-4.06	0.000	
DHAL	Trendli	1	0.31	0.377	
DTQ	Trendsiz	0	-3.53	0.000	YOK
DTQ	Trendsiz	1	-1.88	0.030	
DTQ	Trendli	0	-1.97	0.024	
DTQ	Trendli	1	-1.45	0.007	

Teze ilişkin kurulan modeller aşağıda sunulmaktadır;

MODEL 1: DTQ = f(DHAL, DTLD, DOPREV, CASH, CAPEXA)
MODEL 2: DTQ = f(DHAL, DTLD, ROA, CASH, CAPEXA)
MODEL 3: DTQ = f(DHAL, DTLD, NINC, CASH, CAPEXA)
MODEL 4: DTQ = f(DHAL, TNLD, DOPREV, CASH, CAPEXA)
MODEL 5: DTQ = f(DHAL, TNLD, ROA, CASH, CAPEXA, SP500)
MODEL 6: DTQ = f(DHAL, TNLD, NINC, CASH, CAPEXA, SP500)
MODEL 7: DTQ = f(DHAL, TCL, DOPREV, CASH, CAPEXA, SP500)
MODEL 8: DTQ = f(DHAL, TCL, ROA, CASH, CAPEXA, SP500)
MODEL 9: DTQ = f(DHAL, TCL, NINC, CASH, CAPEXA, SP500)
MODEL 10: DTQ = f(DHALMV, DTLD, ROA, CAPEXA, SP500, SIZE,CRISIS)
MODEL 11: DTQ = f(DHALMV, DTLD, ROA, CASH, CAPEXA, SP500, SIZE,CRISIS)

Bu tezde, kurulan modeller ile türev araçların kullanımının değer artırma üzerindeki etkisi araştırılmıştır. UFRS'de yer alan yeni düzenlemeler ile firmaların riskten korunma aktivitelerini yayınlama zorunluluğu ortaya çıkmıştır, ancak bundan önceki çalışmalar genelde Amerika bazlı veya teorik olmak zorunda kalmıştır. Bu çalışma ile bu yöndeki araştırma eksikliğinin giderilmesi amaçlanmıştır.

Risk algısının firmalar için önemi yadsınamaz. Ancak risk, yatırımcılar için de yatırım kararı verilirken çok önemli bir faktördür. Piyasada özellikle bilgi asimetrisi bulunuyorsa, bu durumda piyasa, her türlü bilgiyi kullanmak ve fiyatlamak isteyecektir.

Bu kapsamda yapılan bu çalışmada literatürden farklı sonuçlar elde edilmiştir. Literatürde sınırlı sayıda enerji üzerine yapılan çalışma bulunmaktadır. Lau(2016), Bartram ve diğerleri(2006) firma değeri ve riskten korunma arasında anlamlı bir ilişki bulamamıştır.

Aşağıda yer alan tüm sonuçlar riskten korunma araçlarının firma değeri üzerinde olumsuz bir etki bulunduğunu göstermektedir. Duffie(1995) riskten korunma araçlarının kullanımına ilişkin kamu bildirimleri yatırımcılar tarafından sadece yöneticilerin sahip olduğu gizli bilgi gibi görülmektedir. Houston ve Mueller(1988), Mayers and Smith(1990) de vekil problemleri ve finansal sıkıntılar ile riskten korunma aktiviteleri arasında ilişki bulmuştur.

Bunun dışında, firma borçlanma seviyesinin firma değeri üzerindeki olumsuz etkisi görülmektedir. Diğer yandan varlık karlılığı, net kar, faaliyet gelirlerinin ise pozitif bir algı yarattığı görülmektedir. Firma tarafından yapılan büyük çaplı yatırımlar ise yatırımcılar tarafından petrol ve gaz firmaları için büyük risk olarak değerlendirilmekte ve eksi yönlü fiyatlandırılmaktadır.

Firma bazlı etkenlerin ötesinde, piyasanın durumunun firma değeri üzerindeki etkisi büyüktür. Eğer ki uluslararası endeksler yukarı yönlüyse, ham petrol ve doğal gaz firma değerleri de artış yönlü hareket eder. Bunun yanı sıra modele konan zaman ve bölge değişkenleri göstermektedir ki büyük firmaların riskten korunma aktiviteleri daha başarılıdır ve yıllar geçtikçe bu faaliyetlere ilişkin algı da olumlu yönde değişmektedir.

Tablo 8. Model 1 ve 2 Sonuçları

Değişkenler	Model 1	Model 2
DHAL	0.000000000000229	(0.00000000000643)***
DTLD	(0.0000000000121)***	(0.00000000000561)***
DOPREV	(0.00000000000027)	
TCL		
TNDL		
NINC		
ROA		0.0043338*
CASH	0.00000000000055	(0.00000000000288)
CAPEXA	(0.0000000000019)	(0.00000000000295)
IREGION2		(0.2776337)***
IREGION3		(0.2672777)**
IREGION4		(0.0087602)
IREGION5		(0.2118061)**
IREGION6		(0.6209612)***
IREGION7		(0.1688663)
IREGION8		0.1342359
IREGION9		0.0901621
IREGION10		0.0489859
IT2008		0.3635849***
IT2009		0.3904811***
IT2010		0.0932863
IT2011		0.2222452***
IT2012		0.2683222***

IT2013		0.0247953
IT2014		0.170244*
IT2015		0.3213604***
IT2016		0.2132909**
CONS	1.19275***	0.9658774***

Tablo 9. Model 3 ve 2* Sonuçları

Değişkenler	**Model 3**	**Model 2***
DHAL	0.00000000000027	(0.00000000000643)***
DTLD	(0.0000000000125)***	(0.00000000000561)***
DOPREV		
TCL		
TNDL		
NINC	0.00000000000401	
ROA		0.0043338*
CASH	(0.00000000000328)	(0.00000000000288)
CAPEXA	(0.00000000000775)*	(0.00000000000295)
SP500		0.0005034***
IREGION2		(0.2776337)***
IREGION3		(0.2672777)***
IREGION4		(0.0087602)
IREGION5		(0.2118061)**
IREGION6		(0.6209612)***
IREGION7		(0.1688663)
IREGION8		0.1342359***
IREGION9		0.0901621***
IREGION10		0.0489859***
IT2008		0.3084192***
IT2009		0.438931***
IT2010		0.3138885***

IT2011		0.5333739***
IT2012		0.5884925***
IT2013		0.4250308***
IT2014		0.7003639***
IT2015		0.5931311***
IT2016		0.462206***
CONS	1.258431***	(çıkarıldı)

Tablo 10. Model 4 ve 5 Sonuçları

Değişkenler	Model 4	Model 5
DHAL	(0.00000000000448)**	(0.00000000000705)***
TNDL	(0.00000000000408)*	(0.0000000000039)*
ROA		0.004402*
DOPREV	(0.000000000000584)	
CASH	0.000000000000134	(2.24E-12)
CAPEXA	(0.000000000001560)	(3.18E-12)
SP500	0.000518***	0.0004611***
IREGION2	(0.2907092)***	(0.245997)**
IREGION3	(0.3422185)***	(0.3119332)***
IREGION4	(0.0577832)	(0.0060199)
IREGION5	(0.1853907)*	(0.2489293)**
IREGION6	(0.6266462)***	(0.6095049)***
IREGION7	(0.1702301)	(0.1167606)
IREGION8	0.0841178	0.1688507
IREGION9	0.0811354	0.1476769
IREGION10	0.0108535	0.1037438
IT2008	0.3330258***	0.3449651***
IT2009	0.4467278***	0.4678163***
IT2010	0.3272652***	0.3207427***
IT2011	0.5602442***	0.5309937***
IT2012	0.6024993***	0.588554***
IT2013	0.4411363***	0.4146527***

IT2014	0.7094473***	0.6732297***
IT2015	0.4835397***	0.5862716***
IT2016	0.4233353***	0.453025***
CONS	(çıkarıldı)	(çıkarıldı)

Tablo 11. Model 6 ve 7 Sonuçları

Değişkenler	Model 6	Model 7
DHAL	(0.00000000000588)***	(0.00000000000408)*
TNDL	(2.14E-12)	
NINC	(0.0000000000117)***	
TCL		(2.06E-12)
DOPREV		(6.13E-13)
CASH	(1.17E-12)	(3.22E-13)
CAPEXA	(9.08E-12)	(1.66E-12)
SP500	0.0004221***	0.000527***
IREGION2	(0.1616918)	(0.3042574)***
IREGION3	(0.2624918)**	(0.3316489)***
IREGION4	0.1000086	(0.1451652)
IREGION5	(0.1554087)	(0.0748344)
IREGION6	(0.5166445)***	(0.6410693)***
IREGION7	(0.011645)	(0.1894671)
IREGION8	(0.2724385)**	0.0702305
IREGION9	(0.2493143)*	0.066166
IREGION10	0.1812655	(0.0035163)
IT2008	0.3501891***	0.3326666***
IT2009	0.4564307***	0.4462066***
IT2010	0.3009789***	0.3299522***
IT2011	0.5043764***	0.565933***
IT2012	0.5495975***	0.6057648***
IT2013	0.3795658***	0.4464049***
IT2014	0.6329473***	0.7138412***
IT2015	0.4880093***	0.4803688***

IT2016	0.4104416***	0.4202097***
CONS	(çıkarıldı)	(çıkarıldı)

Tablo 12. Model 8 ve 9 Sonuçları

Değişkenler	Model 8	Model 9
DHAL	(0.00000000000726)***	3.76E-13
TCL	(5.49E-13(	(0.00000000000771)***
ROA	0.0044108*	
NINC		(0.00000000000716)**
CASH	(3.27E-12)	(2.19E-13)
CAPEXA	(4.47E-12)	(4.76E-12)
SP500	0.0004433***	(0.0001258)*
IREGION2	(0.2248488)**	
IREGION3	(0.2637607)**	
IREGION4	(0.0473129)	
IREGION5	(0.1678524)*	
IREGION6	(0.5783498)***	
IREGION7	(0.0866671)	
IREGION8	0.2060791	
IREGION9	0.183074	
IREGION10	0.1398117	
IT2008	0.3492445***	
IT2009	0.4671158***	
IT2010	0.3130987***	
IT2011	0.5210859***	
IT2012	0.5759431***	
IT2013	0.3994002***	
IT2014	0.6509072***	
IT2015	0.5718651***	
IT2016	0.4381094***	
CONS	(çıkarıldı)	0.9681147

Tablo 13. Model 10 Sonuçları

Değişkenler	**Model 10**
DHALMV	(0.00000305)***
DTLD	(0.00000000000686)***
ROA	0.00396*
CAPEXA	(0.00000000000854)**
SP500	0.000551***
SIZEDUMMY	(0.0154)
CRISISDUMMY	0.7302826***
IT2008	(0.4066706)***
IT2009	(0.2252374)***
IT2010	0.3693449***
IT2011	0.5709709***
IT2012	0.6268634***
IT2013	0.4693329***
IT2014	(çıkarıldı)
IT2015	(0.1083274)
IT2016	0.4913188***
CONS	(çıkarıldı)

Tablo 14. Model 11 Sonuçları

Değişkenler	Model 11
DTLD	0.000000565***
ROA	(29.38773)
CASH	0.00000025
CAPEXA	0.000000745
SP500	9.161263***
SIZEDUMMY	(20624.31)***
CRISISDUMMY	30008.39***
IT2008	(18786.31)***
IT2009	(çıkarıldı)
IT2010	14652.02
IT2011	9560.898
IT2012	9775.217
IT2013	8162.092
IT2014	(28965.64)***
IT2015	(19401.54)
IT2016	11962.38*
CONS	(çıkarıldı)

Tablo 15. Model Sonuçları

DTQ	DHAL/ DHALMV	DTLD/ TNDL/TCL	ROA/NINC/ OPREV	CASH	CAPEXA	SP500	REGION	TIME	SIZE	CRISIS
Model 1		Negatif***								
Model 2	Negatif***	Negatif***	Pozitif*				Negatif**	Pozitif***		
Model 2*	Negatif***	Negatif***	Pozitif*			Pozitif***	Negatif - Pozitif***	Pozitif***		
Model 3		Negatif***			Negatif*					
Model 4	Negatif**	Negatif*				Pozitif***	Negatif**	Pozitif***		
Model 5	Negatif***	Negatif*	Pozitif*			Pozitif***	Negatif**	Pozitif***		
Model 6	Negatif***		Negatif***			Pozitif***	Negatif**	Pozitif***		
Model 7	Negatif*					Pozitif***	Negatif**	Pozitif***		
Model 8	Negatif***		Pozitif*			Pozitif***	Negatif**	Pozitif***		
Model 9		Negatif***	Negatif***			Negatif*				
Model 10	Negatif***	Negatif***			Negatif**	Pozitif***		Pozitif***		Pozitif***

Risk araştırmacılar için her zaman araştırma odağı olmuştur. Eğer ki risk mükemmel şekilde ölçülebilen bir kavram olsa ve riskten korunmak hatta fayda sağlamak mümkün olsa harika bir durum olurdu. Ancak, petrol sektöründe ortaya çıkan durumda, 2014 yılında verilen politik kararla üretici liderler petrol arzında yükseltmişlerdir. Bunu birçok kişinin tahmin etmesi mümkün değildir. Kaya gazı Amerika'da yükselen trend olarak görülmekle birlikte son dönemdeki gelişmeler nedeniyle küçük firmaların karlılığı düşmüş, dolayısıyla uzun dönem yatırımları sekteye uğramıştır.

Petrol ve gaz birçok paydaşı tarafından karlılığı oldukça yüksek bir sektör olarak görülmektedir. Hükümetler yüksek vergiler almaktadır, sahalardaki sondaj mühendisleri yüksek maaşlar kazanmaktadır. Ancak, sektör doğasında risklidir. Arama kuyularında rezervuar bulma ihtimali oldukça zayıftır, denizin ortasında bir kuyu kazmanın maliyeti milyon dolarlardır. Riskten korunmanın aynı zamanda gelirden vazgeçmek anlamına da gelmesi nedeniyle yöneticiler bu tür enstrümanları kullanmak istemezler. Sektörün zor dönemlerinde firmalar yatırımlarını dondurarak personel sayılarını azaltırlar ve tutucu bir yaklaşım izlerler. Zor dönemlerin çok uzun sürmeyeceği varsayımıyla aktif portföy yönetimi için büyük çabalar harcamazlar.

Literatürde bu uzun zamandır araştırılan piyasaların firma değeri ile ilgili çalışmalarda farklı sonuçlar yer almaktadır. Allayannis ve Weston(2001) kur oynaklığı için kullanılan türevlerin olumlu etkisini tartışmışlardır. Nance ve diğerleri(1993)ne göre ise swap kullanıcıları arbitraj fırsatları ve risk seviyesindeki azalıştan faydalanmaktadır. Mnasri ve diğerleri(2017) ise petrol ve gaz firmaları için de etkin riskten korunma yöntemlerinin bulunduğunu belirtmektedir.

Jin ve Jorion(2006) riskten korunmanın yalnızca riski bilip bundan kolaylıkla kaçınmak yoluyla olabileceğini belirtmiştir. Tespiti zor riskler için ise riskten korunma yöntemlerinin bir faydası yoktur. Aytürk(2016) da benzer şekilde riskten korunmaya ilişkin bir prim görememiştir.

Lookman(2004) ise kötü yönetim ve vekil maliyetine ilişkin sinyal etkisi nedeniyle riskten korunma yöntemlerinin firma değerini kötü etkilediğini belirtmiştir. Demarzo ve Duffie(1995) kamuyu bilgilendirmeye ilişkin mevzuatın yatırımcının gizli bilgiye ulaşmasına ilişkin sinyal etkisini tartışmaktadır.

Bu araştırmalar ışığında yazılan bu tezde de asimetrik bilgi, sinyal etkisi ve finansal zorluklar konusunda önemli çıkarımlar bulunmaktadır.

Tüm modellerde riskten korunma yöntemleri ile firma değeri arasındaki negatif ilişki gözlemlenmektedir. Finansal bilgilendirmelerin firmanın finansal sağlığı açısından sinyal etkisi yaratmış olabileceği değerlendirilmektedir. Eğer ki firmalar riskten korunma aktivitelerini kamuya bildirirlerse, yatırımcılar o firmaya yatırım yapmaktan çekinebilmektedir. Bu durum, firmanın yüksek varlık ve kaynaklarıyla ilişkili sorunlara ilişkin kötü bir izlenim yaratmaktadır.

Model sonuçları, ekonometrik ve rasyonel olarak test edilmiştir. Mutlak çoklu doğrusal bağlantı varyans büyüme faktörü ile test edilmiş, riskten korunma aktiviteleri firma büyüklüğünden arındırılmak için piyasa değeri ile normalleştirilmiştir. Sonuçlar benzerdir.

Riskten korunma amaçlı türev araç kullanan firmaların büyük ve yüksek borçlanma altındaki firmalar olduğu gözlenmektedir. Ayrıca, kriz kukla değişkeninin de petrol fiyatı ile belirlendiği göz önüne alındığında, kriz dönemlerinde riskten korunma aktivitelerinde artış gözlemlenmektedir.

Bu çalışmada temel olarak ham petrol ve doğal gaz firmalarının genel risk algısı ve risk yönetimi yaklaşımları değerlendirilmiştir. Sektörün sahibi olduğu spesifik yapı düşünülerek firmaların temelde petrol ve doğal gaz fiyatına ilişkin riskten korunma çabaları tartışılmıştır. Bu tezin kapsamında yer almayan, riskin sınıflandırılması, risk faktörlerinin değerlendirilmesi ve risk yönetiminin risk faktörleri perspektifinden değerlendirilmesinin literatüre ayrı bir katkı sağlayacağı da değerlendirilmiştir.