The Risk Perceptions of Strategic Decisions and the Project Life Cycle: An Application of the Event Study Method to the Oil and Gas Industry

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Abstract

The announcement of a major investment project by a publicly-traded company generally has a clear impact on the value of its stock. As demonstrated since 1973, based on hundreds of Event Studies in the field of Finance, market fluctuations associated with key events are an accurate gauge for perceived risks in a project, especially for systemic and financial feasibility or cost-benefit risk purposes. However, the literature is scarce on the key dimensions of decision-making process to manage the aforementioned risk, especially throughout the life cycle projects.

Hereby, an Event Study is proposed on how publicly-traded companies in the Oil & Gas industry manage the market-perceived risks linked with major exploration and drilling projects during their life cycle. We identify, for a set of companies, news related to announcements of their major investment projects in 2007. An event-study method is used to measure the perceived risks by the market, and the efficiency level of strategies applied by the companies to manage risk, and this at various life cycle stages of each project announced. In this study, Exploration & Drilling as well as Independent Oil & Gas firms in S&P500 index are investigated. A total of 64 exploration/drilling announcements and prior days (from 2006 to 2007) regarding important contingencies concerned in PM have been observed and analyzed in this research.

Based on the results of this study, three contingency factors have been identified - project objectives, project risk factors, and project operation - affecting exploration projects in oil and gas industry. The projects experiencing changes in their implementation have found to be affected more than those projects being operated regularly. Furthermore, we found that a project announcement with probability of occurring high severity of risk factors causes significant negative abnormal returns compared to projects with lower degree of complexity in terms of implementation. Finally, exploration projects with planning intents awarded more than projects with development and acquisition purposes.

Employing epistemology approach was one of the most important implications for recognizing appropriate events. Stock market behaviour was studied based on positivism and postmodernism ideas to fully understand environment of financial markets for strategic decisions.

Portfolio management is provided as a solution to define project characteristics during planning phase. Furthermore, due to its vital role in describing project characteristics, project appraisal is also introduced in planning stage. At execution phase, time and budget, project requirements, and communication were addressed as significant parameters toward mitigation and control of irregularity in project implementation. Using PMBOK (Project Management Body of Knowledge) techniques and approaches have been also introduced to design, manage, and analyze project phases and characteristics. Additionally, several PM discipline criteria were proposed to be considered for strategic decisions including Project Change Management and Scope Change Management.

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1. Introduction

1.1. Purpose of the Thesis

Announcement of an exploration or drilling project can potentially demonstrate many perspectives and make it complicated to identify key elements. Company's announcements may reveal several aspects of a project and/or that of company and consequently our interpretation changes the implications for risk management.

An exploration announcement reveals investors' reaction; thereby company's stock price will change. If investors find that that exploration project adds some value to the company and produce income, they would start buying. In contrast, if they realize that particular announcement of an exploration project may fail; they might start selling their share. In fact any perceived risk by investors and stockholders present itself as dropping or rising of companies' stock price. This can be interpreted as stock market's reaction to a company's announcement of a drilling project. Therefore, this research mainly focuses on market response to any exploration project announcement. It is noteworthy that perceived risk rooting from announcements depends on how investors interpret the event as well as its importance for the industry.

There are also some situations where other company's announcement may change investors' interest in a company's stock. When a company loses its value in capital market, there might be some attempts required to return confidence to investors by making decisions to control consequences of the announcement. The company might change their strategy of drilling projects only because of another company's announcement.

There are many potential parameters which can affect stock market when an exploration project is announced, and the interaction between these factors makes it even more complicated. Major environments identifying project characteristics should be described in order to define the key elements within research as well as finding the reasonable angle for analyzing the events.

Toward that end, one needs to consider that businesses in a capital market mainly attempt to estimate the results of drilling projects of a certain company onto stock market. They take care of their clients as investors and the firms known as: investor brokers, insurance companies, banks, analysis agencies, and also stock market associations. They should be capable of estimating the consequences of an exploration project even if their concepts of an exploration project are different from those who work on the project. However, companies involve in oil and gas production need to identify market response to announcement of an exploration project, as well as understanding the effects of market fluctuation on their projects.

Therefore, there are two separate environments with two different characteristics: oil and gas companies, and capital market enterprises. Project managers can incorporate the results of the event-study to evaluate exploration/drilling projects and to define perceived risks originated from stock market. These perceived risks demonstrate investors' concerns which have a key role in company's future. If managers are capable of predicting the outcomes of market reaction to exploration announcement, they can identify reliable strategy during project life cycle. Project managers who involve in portfolio management will be able to determine the characteristics of the project wisely.

1.1.1. Research Description

The announcement of a major investment project by a publicly-traded company generally has a clear impact on the value of its stock. As demonstrated since 1973, based on hundreds of Event Studies in the field of Finance, market fluctuations associated with key events are an accurate gauge for evaluation of the perceived risks in a project, especially systemic and financial feasibility or cost-benefit risk. However, the literature is on the key parameters of decision-making process for risk management is quite scarce, especially throughout the project life cycle.

In this study, an Event Study will be proposed on how publicly-traded companies in the Oil & Gas industry manage the market-perceived risks associated with major exploration and drilling projects during their life cycle. An Event Study method is applied in this

study to measure the perceived risks by the market and to evaluate the efficiency level of the applied strategies by the companies to manage the corresponding risk at various life cycle stages of each project announced. The event-study is used as a statistical method to predict the market response for companies publicly traded and their information provided in financial markets in oil and gas sector. The firms in two sections of Exploration & Drilling and Independent Oil & Gas in S&P500 index are investigated in this study. A total of 64 exploration/drilling announcements and prior days (from 2006 to 2007) regarding important contingencies are observed and analyzed in this research. Events during project life cycle are assessed to draw appropriate and reliable directions for decision-making process.

This research is performed in three main stages including: I) understanding environments of market and the industry, II) identifying the events, analyzing project characteristics, using the event-study methodology and estimating Returns and CARs, and III) identifying relevant and possible directions for decision-making process. In each stage, there have been several benefits to improve the results. The fact that three important contingencies are the project objectives, project risk factors, and project, is originated in phase 1. In this phase, project with regard to several aspects are investigated in order to clarify the variables that are perceived as risks in stock market. Furthermore, environment of stock market and drilling projects provide the most remarkable risk/uncertainties that managers confront with, so that strategic decisions will be structured more reliably. All Companies and information which has been collected in this stage are presented in Table 5 in appendix 1. In the second phase, the quantity of companies in Exploration & Drilling category (major related industry) was reduced to half in order to concentrate on the more appropriate companies. Events and project announcements were investigated to identify contingency factors based on (Wells 2004) following which their method will be followed in this study. Table 5 demonstrates the companies as well as the conditions used to establish certain companies and accurate data. The third stage is associated with research model and methodology that produce results and estimate market returns. Afterward, research objectives and its approaches are established, and two prior phases were only used to indicate significant events and environment of companies and projects.

Exploration companies, their announcement, and contingency factors identified in this phase, moreover, hypotheses are evaluated. Cumulative Abnormal Returns and results of contingencies in the model are interpreted in order to identify perspectives for decision-making purposes. Table 5 also illustrates total companies investigated, and describes several parameters in each stage.

1.1.2. Objectives

The event-study as a method enables one to estimate market reaction related to specific events. Indeed, announcing oil and gas acquisitions reveals market response, and it can evaluate the investors' response to the event. Identifying influential variables in an exploration project could facilitate managers in business side to predict investors' concerns. Researchers have studied market reaction using the event-study from multiple perspectives to recognize the impacts of announcing certain project on market. In previous studies financial features of the method have been broadly investigated. The event-study has usually evaluated the consequences of implementing a certain project on a company's stock price. The major concerns have been the estimation of abnormal returns for determining the impacts of those projects on market. Although managers make up their decisions using the results of an event-study, the methodology have not been employed to define management style and managing the project phases from beginning to the end.

This thesis mainly attempts to recognize perceived risks from exploration projects and provide perspectives and directions in order to manage those projects. The results will identify significant factors demonstrating the major perceived risks associated with projects announced in financial news. The main objectives of this study are: (1) determining the severity level in each term of those contingencies, (2) calculating abnormal returns, and (3) providing reliable directions for project managers. Managers can decide on the factors to be monitored and controlled further in each phase for reducing the unexpected results and negative market returns. Indeed, the outcomes of event-study are exploited to assist managers for framework structure. The event-study

assessment of an exploration project introduces value of strategy undertaken by managers or project managers.

In order to investigate entire project process in its life cycle, one needs to tag project phases which investors are sensitive about them. Several characteristics related to each phase of a project demand different strategy which will be discussed later.

1.2. Outline of Chapters

This report consists of 7 Chapters and an Appendix. The Chapters are labelled as Introduction, Context, Theory, Methodology, Results, Implications, and Conclusion.

Chapter 1 defines the description of the thesis and its objectives as seen. In this chapter, the key elements of the research, i.e. projects, management, oil and gas industry, capital market, and event-study will be introduced. In chapter 2, several perspectives of the research that may unlikely be paid attention are presented. Internal and external risks originated from events are explained in order to understand the concerns being revealed after project announcement. Distinction between concepts of managing a project and every-day management helps one to make decisions regarding different concepts.

Chapter 3 describes the event-study methodology, application to the risk perceptions, and hypotheses. In this chapter, it will be demonstrated how the event-study can be used in oil and gas industry and to define perceived risks based on financial data. The hypotheses and the required calculations for obtaining abnormal returns are also provided in this chapter. Chapter 4 shows the event identification, research model, data gathering, CAR estimation and hypotheses testing. Chapter 5 analyzes the results of the event-study and possible directions related to different environments. Knowledge of philosophy behind stock markets and epistemology approaches are introduced to identify influential events in stock market. In Chapter 6, implications and research contributions are presented including new lessons of risk perceptions for strategic decisions and new lessons for project management in oil and gas industry.

Chapter 7 provides the conclusion of the investigation and research deliverables. Down side of the methodology and critiques are touched in this chapter. References provide citations and in Appendix Tables are illustrated. Company names, events, and significant factors in each environment are demonstrated in Tables in the Appendix. These Tables synthesize concept of subjects and research contributions in some sections. They summarize the objectives and assumptions in particular area.

2. Context

In order to clarify the research environment and to describe the key elements in the topic, the research environment is divided into two subsystems of different concepts: (1) projects and its environment at oil fields, and (2) projects at business. Identifying parameters of these two systems enables one to indicate the definitions used in each domain, and subsequently to search for perspectives and definitions used in each discipline, as academic disciplines generally have their own terminology. Since projects are defined and managed unlikely at sites and at offices in oil and gas industry due to the experts different backgrounds while working in each environment, the quantitative and qualitative information with regard to those two subsystems are investigated and analyzed.

At business environment, exploration and drilling projects are analyzed mostly based on financial aspects and their business characteristics. When they are being implemented, office project managers deal with them. On the other hand, projects at sites are mainly managed and controlled based on their technical features and delivered by taking into account the budget, schedule, and communication with top-managers at headquarters. Therefore, to identify events and data analysis for the event-study, which is the most important part of the methodology, one needs to know the business aspects of news even if related to a drilling project. Knowledge of two environments enables one to involve reliable and appropriate events in the method.

Table 1 presents some major features of events when qualitative information is observed from business point of view. It is crucial to recognize business terms of a company while identifying events and analyzing data. These terms indeed present functionality of a company and capability of a company to perform an exploration project. Analysts evaluate an exploration announcement and managers can predict shareholders' response to an event based on these factors.

All parameters presented in Table 2.1 can potentially affect a project during its life cycle; nevertheless, none of them depends on how a project is being implemented. Any

announcement including these terms is categorized as "Irrelevant events" to an exploration or drilling project during event identification.

Table 2.1- Business Aspects of events

Index	Business aspect
Profile	Board members, business background, investors, partners, company's location, royalty arrangements, shareholders, activities (consulting, technical, technology…)
Portfolio	Leases, contract agreements, stocks, permits, awards, association memberships, projects, assets…

Hereby, the key elements of the research are indicated with respect to the business features of projects and solid foundation of Exploration and Production oil and gas. Table 2.1 allows one to pay attention to business and market reactions. In fact, these parameters also contribute to defining reliable strategies after analyzing the results of the model and the event-study's outcomes in this research.

In order to establish an appropriate investigation, the key features of project management discipline, oil and gas industry, perceived risk, and stock market in this research are introduced.

2.1. Project Management Discipline

The concept of a project in this research is based on what is defined in PM contents and most managers and professionals understand expectedly. It is important whether managers and project managers working in dissimilar disciplines use it in a same approach. As believed in many fields in industries, project managers are senior engineers with a bachelor or master degree in different academic disciplines. They appoint PM after many years of engineering in projects and/or eventually manage a project without

becoming a project manager. A project based on its definition in PMBOK is "a temporary endeavour undertaken to create a unique product, service, or result". In this thesis, exploration projects refer to any activity including oil and gas production and related material, i.e. drilling, development, digging, acquisition, and production in an oil and gas exploration fields. Project managers divide projects into different phases to provide better management control, and these phases demonstrate the role of processes and time series components in a project.

Project management has various areas of knowledge with respect to PMBOK such as project integration management, project scope management, project time management, project cost management, project quality management, project human resources management, project communications management, project risk management, and project procurement management. Project management plan and its components are provided as an input into the first process of the diagram, and considered to be available in each subsequent process in their latest updated form. Therefore, each company is described with two major environments: managers in business side and project managers in site.

2.1.1. Managers in Business Side

Managers in office expectedly confront with business impacts and organization issues originated from a project, thus their responsibility is to mitigate perceived risks associated with projects respecting stock markets environment. They need to understand project processes, definitions and characteristics in order to determine appropriate strategy related to conditions, and consequently consider announcements which do not change stockholders' confidence significantly. Companies should be able to assess the risk factors of an announcement released in market which can potentially affect their own projects, as well as identifying level of severity of those risks.

2.1.2. Project Managers in Site

In oil and gas fields, project managers traditionally manage projects and indeed activities. In petroleum science context, Exploration and production (E&P) has its technical and business considerations which make up project life cycle, and demonstrates the link

between many disciplines involved. The definitions provided in petroleum science illustrate descriptions that involve techniques of different concept than project management's concept. Engineering parameters and technical tasks with respect to budget and cost of the E&P projects are those presented in petroleum science. For instance, Frank John, Mark Cook and Mark Graham define phases regarding many people and disciplines involved and provided techniques similar to those of PMBOK with narrower vision. Environment of E&P projects and oil fields require the proceeding phases: Feasibility, definition and preliminary design, detailed design, procurement, construction, commissioning, and review (John, Cook et al. 1998). According to Frank and John, the first three abovementioned phases are sometimes defined collectively as the pro-project stage. This is the stage in which ideas are developed and tested, but before large funding commitments are made. In the feasibility phase, the project is tested as a concept. At this stage, the estimate of cost and income (production) profile will carry a considerable uncertain range, but are used to filter out unrealistic options. In the definition, phase options are narrowed down and a preferred solution is proposed. Normally a clear statement should be prepared; describing why the option is preferred and what specific project specifications must be met, and to be used as a basis for further work. The object of the preliminary design phase is to prepare a document supporting an application for funds. Once a project has been given approval, then detailed design can be started. It is quite common for oil and gas companies to contract out the work from this stage. The detailed engineering drawings are used to initiate procurement activities and construction planning. Procurement is a matter of getting the right materials together at the right time and within a specified budget.

The character of a project construction phase can vary considerably depending on the nature of the contract. The construction of a gas plant in a rural setting will raise very different issues from that of a refurbishment project on an old production platform. The construction manager is responsible for delivering completed works to specification and within time and budget limits. When design problems come to light, the construction manager must determine the impact of changes and co-ordinate an appropriate response with the construction contractor and design team. As construction is near completion, the

commissioning phase will begin. The objective of the commissioning phase is to demonstrate that the facility constructed platforms to the design specifications. It is good practice to review a project on completion and record the reasons for differences between planned and actual performances. Where lessons can be learned, or opportunities exploited, they should be incorporated into project management guidelines.

Obviously, above definitions show differentiation between project managers perception working on E&P sites, and project managers employing PMBOK techniques or ones with management background. In this manner, project managers do not even realize many techniques which could assist them in managing projects. Therefore, stock market and its events are not discussed with managers in business side and the fact that events in market might affect project's future is not recognized. Furthermore, company's announcements are defined and traditionally presented by managers in business side monitoring projects.

2.1.3. Components of a time series

Different phases of any project are known as the project life cycle which defines the phases linking beginning the start of a project to its end. This definition may be interpreted in many trends in various industries and businesses. Feasibility studies need analysis and efforts preliminary are delivered so that might not identified as projects, however, in some cases these activities could be defined as separate projects according to project management context. Project life cycle generally define three phases: initial, intermediate, and final. According to PMBOK most project life cycles share a number of common characteristics:

- Phases are generally sequential and usually defined by some form of technical information transfer or technical component handoff.

- Cost and staffing levels are low at the start, peak during the intermediate phases, and drop rapidly as the project draws to a conclusion

- The level of uncertainty is highest and, hence, risk of failing to achieve the objectives is greatest at the start of the project. The certainty of completion generally gets progressively better as the project continues.

- The ability of the stakeholders to influence the final characteristics of the project's product and the final cost of the project is highest at the start, and gets progressively lower as the project continues.

2.1.4. Processes

The project management processes intend to initiate, plan, execute, monitor and control, and close a project. PMI describes the nature of project management processes in terms of the integration between the processes, the integrations within them, and the purposes they serve. These processes are aggregated into five groups: initial process, planning process, executing process, monitoring and controlling process, and closing process.

Initial process defines and authorizes the project or a project phase. Planning process defines and refines objectives, and plans the course of action required to attain the objectives and scope that the project was undertaken to address. Executing process integrates people and other resources to carry out the project management plan for the project. Monitoring and controlling process regularly measure and monitors progress to identify variances from the project management plan so that corrective action can be taken when necessary to meet project objectives. Closing process formalizes acceptance of the product, services or result and brings the project to an orderly end.

2.2. Oil and Gas Industry

Although the factors produced may or may not affect an Exploration and production (E&P) company directly, they have to be well understood in order to estimate their results on the company. If these factors have direct impacts on exploration and drilling projects, they must be identified and their impacts must be mitigated. This perspective includes project's elements involved in its system and sub-systems and project's decision makers.

On the other side, announcing a drilling project also might produce some concerns among stockholders.

Obviously, there are two sub-systems in each company whose characteristics are different because of the business environment and project environment. Therefore, various parameters and subsystems of these two environments indicate risks associated with projects with respect to the capital market. In fact, the influences are studied in regard to both business and project sides of exploration inside a company. This perception emerges different approaches that have to be taken into account due to their unlike environment, capabilities, and knowledge.

2.2.1. Definitions

Evidently, oil and gas industry as core of the research and information about an exploration project demands understanding of its technical terminology. To be able to interpret announcements and events, one needs to know some basic definitions broadly used in oil and gas exploration industry. Reviewing exploration news through companies' web sites requires emphasizing effective events from news. Anybody who involves in the market and interested in this sector must understand the news in appropriate manner to assess their effects. As explained, identifying their effective events and perceived risks is the difficult part of the event-study method. Interpretation of events needs one who can analyze announcements from different perspectives. The following parts define the most common definitions in oil and gas industry.

- Oil reserves: Oil reserves are primarily a measure of geological risk - of the probability of oil existing and being producible under current economic conditions using current technology. The three categories of reserves generally used are proven, probable, and possible reserves. Proven reserves- defined as oil and gas "Reasonably Certain" to be producible using current technology at current prices, with current commercial terms and government consent. Probable reserves- defined as oil and gas "Reasonably Probable" of being produced using current or likely technology at current prices, with current commercial terms and

government consent. Possible reserves- mean having a chance of being developed under favourable circumstances.

- Oil resources: resources are productions which may or may not be produced in the future. A resource number may be assigned to an undrilled prospect or an unapprised discovery. Appraisal by drilling additional delineation wells or acquiring extra seismic data will confirm the size of the field and lead to project sanction. At this point the relevant government body gives the oil company a production license which enables the field to be developed. This is also the point at which oil reserves can be formally booked.

- Licensing: Petroleum resources are typically owned by the government of the host country. In most nations the government issues licenses to explore, develop and produce its oil and gas resources, which are typically administered by the oil ministry. There are several different types of licence. Typically oil companies operate in joint ventures to spread the risk, one of the companies in the partnership is designated the operator who actually supervises the work.

- Tax and Royalty- companies would pay a royalty on any oil produced, together with a profits tax (which can have expenditure offset against it). In some cases there are also various bonuses and ground rents (license fees) payable to the government.

- Service contract- This is when an oil company acts as a contractor for the host government, being paid to produce oil/gas.

- Reserve booking: Oil and gas reserves are the main asset of an oil company - booking is the process by which they are added to the Balance sheet. This is done according to a set of rules developed by the Society of Petroleum Engineers (SPE). The Reserves of any company listed on the stock markets have to be stated to the U.S. Securities and Exchange Commission. In many cases these reported reserves are audited by external geologists, although this is not a legal

requirement. The U.S. Securities and Exchange Commission rejects the probability concept and prohibits companies from mentioning probable and possible reserves in their filings. Thus, official estimates of proven reserves will always be understated compared to what oil companies think actually exists. For practical purposes companies will use proven plus probable estimate (2P), and for long term planning they will be looking primarily at possible reserves. Other countries also have their national hydrocarbon reserves authorities for example the GKZ - State reserves commission of Russia to which companies operating in these countries have to report.

2.3. Project Life cycle in Oil & Gas Industry

This section provides an overview of the activities carried out at the various stages of field development in petroleum industry. Each activity is driven by a business need related to that particular phase. These phases show projects based on what most project managers in petroleum industry recognize [for instance (Carter and Price 2001)and(Binder 1998)]. The following phases are defined in "Hydrocarbon Exploration and Production: Developments in Petroleum Science 46" written by(John, Cook et al. 1998).

- Exploration phase: during this period major discoveries have been made in many parts of the world. The development of new exploration techniques has improved geologists' understanding and increased the efficiency of exploration. Traditionally, investments in exploration are made many years before any opportunity of producing the oil. In such situations companies must have at least one scenario in which the potential rewards from eventual production justify investment in exploration. It is common for a company to work for several years on a prospective area before an exploration well is dug.

- Appraisal phase: once an exploration well has encountered hydrocarbons, considerable effort will still be required to accurately assess the potential of the find. The amount of data acquired so far does not yet provide a precise picture of

the size and shape of the accumulation. The purpose of development appraisal in the context of field development is not to find additional volumes of oil or gas. The purpose of development appraisal is therefore to reduce the uncertainties, in particular those related to the producible volumes contained within structure.

- Development planning: based on the results of the feasibility study, and assuming that at least one option is economically viable, a field development plan can now be formulated and subsequently executed. The plan is a key document used for achieving proper communication, discussion and agreement on the activities required for the development of a new field, or extension to an existing development. It should give management and shareholders confidence that all aspects of the project have been identified, considered and discussed between the relevant parties. In particular, it should include: objectives of the development, petroleum engineering data, operating and maintenance principles, description of engineering facilities, cost and manpower estimates, project planning, and budget proposal. Once the field development plan(FDP) is approved, there follows a sequence of activities prior to the first production from the field: field development plan (FDP), detailed design of the materials of construction, fabrication of the facilities, installation of the facilities, and commissioning of all plant and equipment.

- Production phase: the production phase commences with the first commercial quantities of hydrocarbons "first oil" flowing through the wellhead. Development planning and production are usually based on the expected production profile which depends strongly on the mechanism providing the driving force in the reservoir. Production profile is characterized by three phases: build-up period (newly drilled producers are brought on stream), plateau period (initially new wells may still be brought on stream but the older wells start to decline), decline period (during this final and usually longest period all producers will exhibit declining production.

- Decommissioning: since towards the end of field life the capital spending and asset depreciation are generally negligible, economic decommissioning can be defined as the point at which gross income no longer covers operating costs (and royalties). It is of course still technically possible to continue producing the field, but at a financial loss. Most companies have at leas two ways in which to defer the commissioning of a field or installation: reduce the operating costs, or increase hydrocarbon throughput. In some cases, where production is subject to high taxation, tax concessions may be negotiated, but generally host governments will expect all other means to have been investigated first.

2.4. Project Life Cycle

An exploration project life cycle has phases which describe the beginning and the end of the project. Project managers in business side who are responsible to divide projects into more controllable phases and define project teams or partners indicate phases and each project life cycle. Project management concept requires perspectives which are unlike project management context in oil and gas industry. Project managers as defined in petroleum discipline textbooks identify phases of an exploration projects with respect to technical aspects. These phase definitions described in preceding section present unchangeable process of E&P projects. Project phases are identified unlikely in PMBOK and consider many parameters involving other factors in a project beside technical features.

In PM context, a feasibility study might be undertaken as a project rather than as the first stage of a project. PMI clarifies that where the outcome of preliminary efforts is not clearly identifiable, it is best to treat such efforts as a separate project. Studies of an undrilled prospect or an unapprised discovery at very early stages could be a stand-alone project. In PMBOK, typical sequence of phases in a project life cycle is introduced in three parts: initial, intermediate, and final. Initial phase is included Charter and Scope Statement and intermediate phase demonstrate plan, acceptance, and approval. These two stages consist of what project management in petroleum industry realize as exploration, appraisal, and development planning phases. Exploration phase, appraisal phase, and

development planning phase comprise feasibility studies, approval, portfolio documents, project approval, and preliminary activities before beginning drilling for oil acquisition. The final phase's output is project deliverable in PM concept, and comparing with present production phase of oil and gas industry. The commissioning phase in oil and gas, which describes activities after performing every project closure, introduces what project management discipline considers as every-day management and indeed project has already been closed. The commissioning phase could not be a phase of any project in PM context. Hereby, an unlike definition is realized between project managers in PM discipline and project managers in petroleum industry.

These arguments prove two major existing phases which can be identified regardless of different definitions in PM context and petroleum discipline, planning phase and execution phase. Planning phase presents activities usually called "soft" part of a project and include studies and prior activities before performing drilling and physical progress. Execution phase normally known as "hard" part of each project, demonstrates physical activities, establishes exploration and produces the project outcome. These two phases are employed as phases that identify major characteristics of every exploration and drilling project. In fact, announcements introducing exploration projects are clustered in one of these phases. In section related to "event analysis" it will be explained how events present activities based on characteristics of one of these phases.

PMBOK defines that "a project phase is generally concluded with a review of the work accomplished and the deliverables to determine acceptance, whether extra work is still required, or whether the phase should be considered closed". The activities of the next phase are held to reach a decision from authorities. Therefore, project managers and experts in oil and gas industry should identify project phases related to industry requirements and work conditions, but they can not define phases excluding a project. Most activities show management actions in providing every-day services. In the next section operation of a well is described to clarify what is sometime misunderstood in analyzing events.

2.4.1. Operation of a Well

As described, project management discipline and project managers in other domains of science might perceive unlike definition of similar context. This difference is seen obviously when company announcements and stock market news are compared. The variation is evident when certain events are announced. Managing an exploration or drilling project and managing an exploration and production oil field are the ones which their meanings are manipulated regularly. In this research project, operation is interpreted to operating a project from beginning to end during its life cycle including its initial phases and execution phases. While project operation is the major responsibility of a project manager; the operation management is not concerns of a project manager. Some part of this research in project operation has been lately investigated in the methodology, but not operation management.

Research in operation management can be defined as the use of quantitative methods to assist analysts and decision-makers in designing, analyzing, and improving the performance or operation of systems. The operation research field incorporates analytical tools from many different disciplines, so that they can be applied to a rational way to help decision-makers solve problems and control the operations of systems and organizations in the most practical way. This definition does not include projects and their processes such as an exploration project which are not delivered to the normal position of the production. In fact, the tools of operation, which can be used to optimize the performance of systems in oil productions, are not considered in project implementation. Therefore, company announcements may present an event relevant to a drilling project or an event related to operation of an oil well. As it will be noticed, identifying events and further their sequence during project life cycle or normal operation is the most difficult part of the event study methodology.

2.5. Strategic Decisions

The decision-making is a humanistic process that is often aided by intuition as well as facts. Intuitions may serve well in personal decisions, but decision made in political, governmental, commercial, and institutional settings affecting large numbers of people

require something more than intuition. The purpose of building models for systems is to develop an understanding of the real system; to predict its behaviour; to learn the limiting capabilities of a system; and eventually to make decisions about the design, development, fabrication, modification, or operation of the real system being modeled (Carter and Price 2001). Carter and Price in their book "*advice and caution*" suggest that before expending any substantial effort in solving or analyzing a problem or system, analysts and managers should try to confront and answer a few preliminary questions: "Does the problem need to be solved? Will it be possible to determine what the real problem is? If a model was developed and a solution proposed, would anybody care? Would anybody try to implement the solution? How much of the analyst's time and expense is it worth to try to solve this problem? Is there enough time and adequate resources available to make any significant progress toward solving this problem? Will the solution create other serious problems for which there is no apparent remedy?"

Decision analysis can usually be expressed as a problem of selecting among a set of possible alternatives or courses of action. After making a choice, and at some future time, there will be a number of external, uncontrollable variables that will influence the final outcome. These external variables are often referred to as state of nature or state variables. An underlying assumption in decision analysis is that, if it was possible to accurately predict the result of these external variables, then the final outcome would also be predictable and the correct alternative would become obvious.

Having defined the alternatives (decision variables) and the external factors (state variables), the next aspect of decision analysis is to consider the possible outcomes or payoffs that would result from each possible combination of decision and state variables. Here one do not deeply investigate decision alternatives and external factors that influence the strategic decisions' outcome. This study attempts to define most fundamental directions for project managers in oil and gas industry to control, screen, and manage project during its entire life cycle. Various features of strategic decisions related to managing a project in E&P will not be inspect.

2.6. Perceived Risk

The core notion of event-study method is to identify, predict, and estimate variation in company's stock price when company's announcement influence investors. Stockholders' concerns originated from an event demonstrate their perception of company's performance following project execution. This performance further presents values earned by company.

As (Arend 2004) defines, a primary goal of a company is to increase shareholder value. Shareholder value is a company's market value computed as the sum of its future net cash flows discounted by an expected rate of returns. The expected rate of return is proportional to the company's risk exposure due to shareholders' aversion to risk, where risk is the volatility of the future cash stream. Arend proves that the change in shareholder value due to an alliance announcement, whether measured by CAR or a simple difference in market value, assesses the combined effects of the cash flow change and the risk change. Respecting (Arend 2004), an exploration or drilling project that signalled by an announcement to the market may add significant positive cumulative abnormal returns to a company or reveal negative cumulative abnormal returns.

In the following part definition of risk, uncertainty, and change indicate relationship involving these parameters and what we expect the event-study outcomes estimate as perceived risks.

2.6.1. Risk and Uncertainties

The definition and use of the terms risk and uncertainty vary widely in the oil and gas industry. Similarly, and partly as a consequence of this lack of consistency, the methods used for the evaluation of projects at the exploration, appraisal or development stages of maturity have also varied significantly. As (Ross 2004) shows an important conceptual step is to consider the portfolio as a collection of projects of different degrees of maturity rather than as individual prospects and fields, as has generally been the practice historically. A project should be defined in terms of the basis on which a decision is made whether or not to proceed with that exploration or development activity. Each project can then be characterized in terms of (a) risk, the probability of the project achieving commercial production and hence revenue, and (b) uncertainty, being the range of

estimated recoverable volumes and monetary values resulting from that financial commitment, should the project proceed (Ross 2004). Portfolio management decision-making is not a process that can be fully automated through the use of computer software, however sophisticated the programs may be. Risk (or chance) can be defined as the probability that a discrete event will or will not occur. Risk is generally used in relation to the negative outcome, so the term "chance" may be used where a negative connection is not necessarily appropriate. In contrast, uncertainty reflects the inability to estimate a value exactly, such as the remaining recoverable volumes of oil and/or gas from a producing field or the future oil price. As with risk, probability values can be quoted in relation to uncertainty. However, in contrast with risk, it should be noted that in the case of a continuous distribution of uncertainty, probability values are always related to a range of estimates, never to a discrete outcomes, e.g. there is a 90% probability that the reserves lie between 20 and 100 million barrels. The use of the term risk as a synonym for uncertainty (as is sometimes the case in the financial industry) not only makes the word (risk) redundant, it can also mask the reality of the situation. Traditionally, rational investors are believed to consider that greater risk (all other things being equal0) is a bad thing. However, large uncertainty means greater upside (the source of real options value) as well as greater downside, so it cannot be concluded that less uncertainty is necessarily better than more uncertainty. In partial recognition of this issue, the S&P industry has tended to use a measure of the "downside" uncertainty (semi-standard deviation), but this ignores the fact that a diversified portfolio will have an essentially symmetrical distribution of uncertainty around the mean (the central limit theorem shows that it will tend to a normal distribution), so this will little additional value in characterizing the portfolio for comparative purposes. It is also noted that the term "volatility" is sometimes used in the portfolio context as a synonym for uncertainty. Two types of uncertainty can be identified in project evaluation: technical and economic, and both need to be considered. Technical uncertainty, in an estimate of the amount of oil initially in-place in a field, is not subject to "volatility". The true value does not change over time, but the estimated value and its associated uncertainty can be made more reliable by acquiring new information about the project. Resolving this type of uncertainty has been referred to as active learning (Hooper and Rutherford 2001). In contrast, economic (or input cost)

uncertainty, such as the oil price, is external to the project and is volatile. For each exploration project, estimations are made of the risk (change) that an exploration well will be a dry hole and the risk that, if a discovery is made, it will be too small to be commercially viable. Whatever the level of the maturity, however, there will also be a range of uncertainty in the estimated recoverable volume (and, consequently, in monetary value). In exploration, this principle is used to describe the range of potentially recoverable volumes and values that are estimated to be attributable to the prospect, on the assumption that the exploration well will be successful. This approach is standard industry practice and provides the information that is fed into corporate portfolio analysis. Consequently, the rest of the portfolio must be described using similar logic in order that projects maybe compared. The principles used in exploration evaluations can easily be extended to discovered resource. For example, an undeveloped field may be described as less mature than a field that is already under development as there will be a higher risk that it will not achieve commercial production. In both cases, however, there will be uncertainty in the estimated recoverable volumes and values, on the assumption that production does occur. Unfortunately, industry practice has been much less consistent in dealing with discoveries than it has been for exploration projects. This problem relates to the lack of (until recently) a meaningful resource classification system and inconsistent use of existing reserve definition system and inconsistent use of existing reserve definitions. Further, many companies have classified all discovered oil and gas quantities as reserves, partly because of the lack of any other "box" to put them in, even where commerciality was questionable, as may be the case with discoveries that are of marginal economic size or gas discoveries that are remote from potential markets. A few companies did recognize this problem many years ago (e.g. Mobil: see(Patricelli and McMichael 1994)), leading them to use the category "contingent resources" for discovered volumes that were, as yet, not commercial to develop. It should be clear that it is not appropriate to use the same valuation logic with both of these "possible reserves": 1. the best estimate of what would be recoverable if development occurred, where there is significant risk that will not proceed; and, 2. the upside potential outcome of a committed development, which could be a producing field (where there is no risk of the project not proceeding, but still significant uncertainty in the ultimate outcome) (Ross 2004).

2.6.2. Sensitivity

In primary step of literature review, we found that sensitivity analysis could also have an important role in estimating perceived risk in project proposal. Sensitivity analysis is employed during initial phase of project design and used for project need analysis. Its outcomes introduce sensitivity of a project to certain identified uncertainties. In Oxford pocket dictionary "sensitive" define that as "easily affected by something" and moreover "sensitivity" as "quality, degree, of being sensitive", thus; it can identify degree of being sensitive for particular factors. Although sensitivity analysis is not concerned in this research, investigation in perceived risk demands such a consideration.

More practically Wikipedia describes Sensitivity Analysis beside Uncertainty Analysis that can help concept of perceived risk evidently. In more general terms uncertainty and Sensitivity Analyses investigate the robustness of a study when the study includes some form of mathematical modeling. While Uncertainty Analysis studies the overall uncertainty in the conclusions of the study, Sensitivity Analysis tries to identify what source of uncertainty weights more on the study's conclusions.

Most mathematical problems met in social, economic or natural sciences entail the use of mathematical models, which are generally too complex for an easy appreciation of the relationship between input factors (what goes into the model) and output (the model's dependent variables). Such an appreciation, i.e. the understanding of how the model behaves in response to changes in its inputs, is of fundamental importance to ensure a correct use of the models.

A mathematical model is defined by a series of equations, input factors, parameters, and variables aimed to characterize the process being investigated. Input is subject to many sources of uncertainty including errors of measurement, absence of information and poor or partial understanding of the driving forces and mechanisms. This uncertainty imposes a limit on our confidence in the response or output of the model. Further, models may have to cope with the natural intrinsic variability of the system, such as the occurrence of stochastic events.

Uncertainty and Sensitivity Analysis offer valid tools for characterizing the uncertainty associated with a model. Uncertainty analysis (UA) quantifies the uncertainty in the outcome of a model. Sensitivity Analysis has the complementary role of ordering by importance the strength and relevance of the inputs in determining the variation in the output.

Sensitivity Analysis is popular in financial applications, risk analysis, signal processing, neural networks and any area where models are developed. In field of project risk management, project change management, and controlling project processes sensitivity analysis could be used obviously. The level of severity of uncertainties in initial stage of planning and designing can assist project managers and decision makers to estimate quality of each risk factor and be prepared to react reliably. They can redesign the project components or simply keep a watchful eye when managing the project. As well, the sensitivity analysis helps you to communicate to decision makers the extent of the uncertainty and risk in the project.

Analysis of gross sensitivity is also a good starting point from which we identify the main factors to which our model is more sensitive, eliminate relatively insensitive factors and go to a deeper study of joint sensitivity to the "main" factors. The effective sensitivity of a model to a particular factor is determined by 4 factors: I) Responsiveness of the model to changes in the factor; (Absolute value of the elasticity); II) Magnitude of the factor's range of plausible values; III) Volatility of the factor's value (The probability that the value of the factor will move within that range of plausible values); IV) Degree to which the range or volatility of the factor's values can be controlled.

We are most interested in the sensitivities that might change a positive decision on the project to a negative decision and vice versa. Four calculations help us estimate the likelihood of such a switch (the model changes its sign):

- What is the range of influence? That is, how much does the NPV change when the factor changes from its lowest plausible value to its highest plausible value?

- Does this range of influence contain an NPV of zero? If it does, then the factor has a switching value - that is, a value at which our appraisal of the project switches from positive to negative.

- What is the switching ratio for the factor? That is, by what percentage does the factor have to change to hit a switching value?

- What is the switching probability? That is, how likely is the factor to reach the switching value?

If most of the sensitivity in the model results from only two key variables, then a 2-variable sensitivity analysis is very instructive. Even if there are more than two key variables, two-variable analysis takes us at least one step closer to understanding the workings of the model in a realistic setting.

Once you have identified the key sensitivities among the risk factors, one by one (*ceteris paribus*), you can start to think about managing risk.

- Are there factors that are correlated and therefore weaken or enhance the influence?

- Can diversification help? That is, are there other investments that could be made at the same time where the same variable works in the opposite direction?

- Could you identify the value of the key factor with more certainty by gathering more information, and if so, is the information worth the cost to gather?

- Once you have answered these questions, you can formulate an action plan to minimize uncertainty and thereby limit risk.

In the first stage of the research we realize that understanding environment and recognizing significant factors associated with exploration projects help identify

influential variables. Knowledge of perceived risk and uncertainty from events produce confidentiality for researchers to identify events elicit reaction among investors, moreover to evaluate effective variable in research model. We define two domains that investors may perceive as risks. One concept related to projects and other one that involves business aspects.

Table 1 presented in Appendix, perceived risk from announcements is categorized in several domains regarding business-related terms. Several parameters in legal proceeding, financial, organizational, political, and oil & gas industry are identified in order to recognize different perspectives in risk analysis and investors' concerns.

Although investors in stock market are interested in profitability of prospect exploration projects (therefore financial parameters), associated risks with other factors may influence decisions. Table 2 in Appendix displays significant factors associated with exploration and drilling projects that affect investors.

2.6.3. External and Internal Factors

Besides the numerous potential sources of external risk, firms also face risks from inside. These are potentially less threatening because the firm has the potential to measure and control them directly. Technological uncertainty is the risk entailed in the probability that a firm's innovation may not work as required; generally more radical innovations face greater technological uncertainty. Operations uncertainty is the risk entailed in the variance in a firm's output- in its quantity and quality- and in the cost efficiency of production. Bankruptcy uncertainty is the risk of the firm being unable to meet its debt obligations. Firms may face further risks due to the type of product created, and whether its employees are doing what they are supposed to do(e.g., risk of fraud, misappropriation, misuse of company resources, or criminal activity). Firms can control some of these risks through structural choices. For example, the cost structure underlying operations uncertainty is dependent on the firm's choice of operating leverage- its fixed costs relative to its total costs. Its bankruptcy uncertainty is dependent on the firm's choice of financial leverage-its debt to equity ratio (Arend 2004).

2.7. Stock Market Reactions as a Proxy

The stock market is one of the most important sources for companies to raise money and achieve their goals. This allows businesses to go public, or raise additional capital for expansion. The liquidity that an exchange provides affords investors the ability to quickly and easily sell securities. History has shown that the price of shares and other assets is an important part of the dynamics of economic activity, and can influence or be an indicator of social mood. Rising share prices, for instance, tend to be associated with increased business investment and vice versa. Share prices also affect the wealth of households and their consumption. To identify effective events in stock market we need to recognize market's behaviour as an alternative that enable ones to clarify real influential factors.

Market behaviour analysis establishes an approach that could assist managers in business side to draw their strategy regard accurate and reliable information released in stock markets. Following part explain market behaviour most often reveal in stock markets, and define some psychological movements in it. Irrational behaviour and its role to describe some actions in stock markets determine whether managers can predict market fluctuations.

2.7.1. Behaviour of the Stock Market

From experience we know that investors may temporarily pull financial prices away from their long term trend level. Over-reactions may occur so that excessive optimism (euphoria) may drive prices unduly high or excessive pessimism may drive prices unduly low. New theoretical and empirical arguments have been put forward against the notion that financial markets are efficient.

Various explanations for large price movements have been promulgated. For instance, some research has shown that changes in estimated risk, and the use of certain strategies, such as stop-loss limits and Value at Risk limits, theoretically could cause financial markets to overreact.

Other research has shown that psychological factors may result in exaggerated stock price movements. Psychological research has demonstrated that people are predisposed to 'seeing' patterns, and often will perceive a pattern in what is, in fact, just *noise*. (Something like seeing familiar shapes in *clouds* or *ink blots*.) In the present context this means that a succession of good news items about a company may lead investors to overreact positively (unjustifiably driving the price up). A period of good returns also boosts the investor's self-confidence, reducing his (psychological) risk threshold.

Another phenomenon—also from psychology—that works against an objective assessment is *group thinking*. As social animals, it is not easy to stick to an opinion that differs markedly from that of a majority of the group. An example with which one may be familiar is the reluctance to enter a restaurant that is empty; people generally prefer to have their opinion validated by those of others in the group.

In normal times the market behaves like a game of roulette; the probabilities are known and largely independent of the investment decisions of the different players. In times of market stress, however, the game becomes more like poker (herding behaviour takes over). The players now must give heavy weight to the psychology of other investors and how they are likely to react psychologically.

2.7.2. Irrational Behaviour

Sometimes the market tends to react irrationally to economic news, even if that news has no real affect on the technical value of securities itself. Therefore, the stock market can be swayed tremendously in either direction by press releases, rumours, euphoria and mass panic. Over the short-term, stocks and other securities can be battered or buoyed by any number of fast market-changing events, making the stock market difficult to predict.

2.7.3. Investors Rationality assumptions

In Wikipedia rationality is described as a term is related to the idea of reason, a word which following Webster's may be derived as much from older terms referring to thinking itself as from giving an account or an explanation. This lends the term a dual

aspect. One aspect associates it with comprehension, intelligence, or inference, particularly when an inference is drawn in ordered ways (thus a syllogism is a rational argument in this sense). The other part associates rationality with explanation, understanding or justification, particularly if it provides a ground or a motive. 'Irrational', therefore, is defined as that which is not endowed with reason or understanding.

In philosophy, rationality and reason are the key methods used to analyze the data gathered through systematically gathered observations. In economics, sociology, and political science, a decision or situation is often called "rational" if it is in some sense optimal, and individuals or organizations are often called rational if they tend to act somehow optimally in pursuit of their goals. Thus one speaks, for example, of a rational allocation of resources, or of a rational corporate strategy. In this concept of "rationality", the individual's goals or motives are taken for granted and not made subject to criticism, ethical or otherwise. Thus rationality simply refers to the success of goal attainment, whatever those goals may be. Sometimes, in this context, rationality is equated with behavior that is self-interested to the point of being selfish. Sometimes rationality implies having complete knowledge about all the details of a given situation.

Some models of human behavior in the social sciences assume that humans can be reasonably approximated or described as "rational" entities (see for example rational choice theory). Many economics models assume that people are on average rational, and can in large enough quantities be approximated to act according to their preferences. The concept of "bounded rationality" revises this assumption to account for the fact that perfectly rational decisions are often not feasible in practice due to the finite computational resources available for making them (Wikipedia).

Evidently, assumptions in investor rationality recognize average rational in certain environment. Market environment and stock market behavior draw a framework to consider the most important assumptions in oil and gas industry and related sectors. Therefore, project phases and project condition, the parameters playing significant role in exploration announcements, are identified as important assumptions during interpreting events.

Phases during project life cycle introduce all parameters and different conditions determining projects in petroleum industry. Project managers in petroleum industry determine project phases as important factors that should be clarified in order to manage drilling projects. Investors' concerns in stock market also pinpoint conditions in projects and three presented contingencies in the research model widely describe the project situations. Although there is no reliable tool to calculate magnitude of accuracy in the investor rationality, PMBOK assist project managers to assume project phases and conditions as significant parameters related to investors rationality.

These assumptions define that the most important part of the event identification is to identify project conditions including project phases, project objectives, and the way a project is being operated. The purposes of exploration and the impacts of project implementation define project managers' capability to deliver a project significantly. Thus, analysis of project characteristics reveals the most difficult part of interpreting the news. Project characteristics specify parameters that investors need to know in order to make decision with regards to the announcements.

3. Theory

The event study is a method that is employing more frequently in financial studies and research to measure the impact of regulatory events. As described in Wikipedia, Event study utilizes transactions data from financial markets to predict the financial gains and losses associated with newly disseminated information. The logic behind the event study methodology is explained within the specific context of mergers. (Warren-Boulton and Dalkir 2001) The use of an event-probability methodology was originally developed by (McGuckin, Warren-Boulton et al. 1992)in order to be applied to merger analysis. In fact, the logic behind that has initially been to analyze financial data of the alliance.

3.1. Event Study Method: Literature Review

The theoretical basis for the event study method is fairly straightforward, albeit based on certain key assumptions. Stock returns are evaluated, which are the day-to-day changes in the value of the stock sold on the open market. The event study method relies on the assumption that individual stock returns over time can be predicted to some degree. Then, the actual stock returns over the period of interest are observed and computed by the difference between the returns that were predicted and the returns that actually occurred. If the difference between the actual results and the predicted results is determined to be statistically different from zero, it may be concluded that the event under study did impact stock returns and does reflect an investor reaction to the event.

The first step in the event study methodology is to identify the event and the relevant event period over which to evaluate stock returns. This is often the most difficult step in the corresponding process as it is often hard to separate an event from all the other events happening in a given time period. Even in the cases where one knows there is a financial impact, the fact that the impact has spread out over a long period of time makes it more difficult to isolate the event under study from any and all other factors affecting the stock returns over the same period of time. In short, the price effect of the event under study may be lost in the 'noise' that is also reflected in stock price variations. After appropriate event is determined, firms that might be impacted by the event are then identified. The

event day may or may not be the same for all sample companies as some events affect some companies more than others in different period of time.

Once the event days are identified and the affected firms are identified, the next step is to estimate the 'normal' change in stock prices (i.e., the returns) for those firms. Several methods are available for estimating returns, including the mean-adjusted model, the market-adjusted model, and the market model. The preceding models are also employed in event studies. In this thesis, market adjusted model is considered since the market's mean return is used as the benchmark. That is, some proxy for the market, such as the S&P 500 Index, the NYSE Composite Index or some broader index containing NYSE, AMEX and NASDAQ listed companies, is used to measure the market's return. Each firm's observed event period returns are compared to the market's return to identify any investor reaction to the event.

The market model begins by estimating the 'beta' for each stock. Beta is a measure of a particular stock's market risk relative to the average stock. A stock with a beta equal to one is of average risk, while betas greater or smaller than one indicate higher or lower risks, correspondingly. Stocks with high betas would be expected to have higher-than-average returns in appropriate times and lower-than-average returns in bad times, therefore, a high-beta stock could show above-normal returns (at least, above normal relative to the 'average' stock) during an event period and yet still not be impacted by the event itself. That is, the high-beta stock might naturally show above-average returns, even without any reaction to an abnormal event. Therefore, the market model is often trusted to define the predicted returns over the event period in question. Betas are obtained in a number of ways, but most often by using regression analysis to assess individual daily returns against the market's returns over some estimation period. Again, this estimation period is typically prior to the event date. The intercept and slope from the regression and the market's daily returns are used to estimate the firm's daily stock return during the event period. As beta is a co-movement gauge with the market's return and is, therefore, a measure of market risk, this model is often selected in an effort to achieve a better estimate of returns when firms are of higher or lower natural risk than average.

After the estimation model is determined and both estimated and actual returns are obtained for each stock within the sample, the difference between the two returns is computed for each event day. These values are identified as unexpected or abnormal returns and are attributed to the effect of the event on stock returns. That is, if investors believe that an event affects a firm's value, the firm's stock price will be bid up or down, accordingly. Abnormal returns are returns that are statistically larger or smaller than predicted. It would, therefore, be concluded that stockholders have reacted positively to the announcement and believe in it or not.

Finally, the individual daily abnormal returns for the individual firms are aggregated across all firms in the sample for each day. These Standardized Abnormal Returns (SARs) are examined to determine whether, on average, the event produces returns (good or bad) are different from the returns that would be expected or not. That is, did the event cause investors to bid up or sell down the price of the sample stocks to a degree that would not be anticipated? Also, because it may be difficult to pinpoint a specific event day, a cumulative effect over a period may be present and observable. Cumulative Standardized Returns(CARs) are calculated by summing daily SARs across time, and the CARs are also standardized to determine if cumulative returns are statistically different from zero (Wells 2004).

3.1.1. Event Study Methodology

In (McWilliams, Siegel et al. 1999) the standard event study methodology, which is based on the market index model, is described as follows:
Daily, value-weighted returns for the firm and for the market are used to estimate the following equation for each firm for each event:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \quad (1)$$

Where R_{it} = rate of return on the share price of firm i over period t, R_{mt} = rate of return on a value-weighted market portfolio of stocks over period t, α_i = the intercept term, β_i = the systematic risk of stock i, and ε_{it} = the error term, with $E(\varepsilon_{it}) = 0$.

For example, R_{it} might be the rate of return for IBM stock over a specified period, usually about 200 trading days (250 to 50 days prior to the event). From estimation of the above equation, the researcher derives estimates of daily abnormal returns (AR) for the ith firm using the following equation:

$$AR_{it} = R_{it} - (a_i + b_i R_{mt}) \quad (2)$$

Where a_i and b_i are the ordinary least squares parameter estimates obtained from the regression of R_{it} on R_{mt} over an estimation period (T) preceding the event (250 to 50 days prior to the event). The abnormal return (AR_{it}) represents the return earned by the firm after adjusting for the "normal" return process on date t. That is, as shown in Equation (2), the rate of return on the stock is adjusted by subtracting the expected return from the actual return. Any significant difference is considered to be an abnormal or excess return. Following the example above, AR_{it} is an estimate of how the return on IBM stock differed, on day t, from its predicted return based on the average "movement" of the market and the firm-specific parameters (a_i and b_i).

Some stocks, such as technology stocks, are more volatile, relative to the market, than others. These stocks will have higher β values. Therefore, many authors compute a standardized abnormal return (SAR) in which the abnormal return is divided by its standard deviation. The standardized average return is

$$SAR_{it} = {AR_{it}}/{SD_{it}} \quad (3)$$

Where

$$SD_{it} = \left[\frac{S_i^2 \cdot \dfrac{1 + 1/T}{(R_{mt} - R_m)^2}}{\sum_{t=1}^{T} (R_{mt} - R_m)^2} \right]^{0.5} \quad (4)$$

Where S_i^2 is the residual variance from the market model as computed for firm i, R_m is the mean return on the market portfolio calculated during the estimation period, and T is the number of days in the estimation period. For example, IBM, as a technology company,

has more volatile stock than the market average, and it is important that its abnormal return be standardized.

The standardized abnormal returns can then be cumulated over a number of days, k (the event window), to derive a measure of the cumulative abnormal return (CAR) for each firm:

$$CAR_i = \left[\frac{1}{K^{0.5}}\right]\sum_{t=1}^{k} SAR_{it} \quad (5)$$

For example, CARi, where i represents IBM, would be the sum of the abnormal returns for IBM, summed over the length of the event window—usually 2 to 3 trading days.

A standard assumption is that the CARi are independent and identically distributed across firms. With this assumption, they convert these values to identically distributed variables by dividing each CARi by its standard deviation, which is equal to

$$\left((T-2)/(T-4)\right)^{0.5}.$$

Thus, they compute the average standardized cumulative abnormal return (ACAR) across n firms over the event window as

$$ACAR = \frac{1}{n} \cdot \frac{1}{\left(\frac{(T-2)}{(T-4)}\right)^{0.5}} \sum_{i=1}^{n} CAR_i \quad (6)$$

In this step, the cumulative returns of all firms in the sample are summed, and the sum is divided by the number of firms—to arrive at an average CAR, which is then standardized.

Expanding on the example of IBM, the researcher would then sum the CARs for all the firms in the sample, including IBM, which announced the event of interest (such as a merger) and calculate a standardized average. The test statistic used to assess whether the average cumulative abnormal return is significantly different from zero (its expected value) is

$$Z = ACAR \cdot n^{0.5} \quad (7)$$

If significant, the average cumulative abnormal return is assumed to measure the average effect of the event on the stock price of the firms that experienced the event. That is, the

significance of the average abnormal return allows the researcher to infer that the event had a significant impact on the value of the firms (McWilliams, Siegel et al. 1999).

3.1.2. The model specification and hypotheses

(Chou 2004) indicate model specification and hypotheses that may assist researchers to employ for managerial studies. Suppose N stocks (or assets) are affected simultaneously by a sequence of p events. Generally, they are interested in the analysis of the following systems of market models (Karafiath, 1988):

$$r_{it} = \alpha_i + \beta_i r_{mt} + \sum_{j=i}^{P} \gamma_{ij} d_{it} + \varepsilon_{it}, \quad i = 1,...,N; \quad t = 1,...,T_1, T+1,...,T1+P$$

Where:

$r_{i\,t}$ = return on asset i in period t;

r_{mt} = return on the market index m in period t;

$d_{i\,t}$ = a dummy variable, which equals 1 when $t = T1 + j$, and zero otherwise;

$\varepsilon_{i\,t}$ = an *iid* disturbance term with zero mean;

$\gamma_{i\,j}$ = the expected abnormal return on asset i at time $T1 + j$;

α_i, β_i = market-model parameters for asset i.

Let $T \equiv T1 + p$,

where $T1$ is the length of the estimation (or observation) period and p is the length of the event period. (Chou 2004) follow convention by specifying [0, $T1$] as the estimation period, and [$T1$ + 1, T] as the event period (or event window). Here, they assume that the events affect all assets simultaneously. The error terms are assumed only contemporaneously correlated with an unknown distribution P,

$\text{cov}(\varepsilon_{is}, \varepsilon_{j\,t}) = \sigma i\, j$ if $s = t$, $\text{cov}(\varepsilon_{is}, \varepsilon_{j\,t}) = 0$ otherwise (2)

The model (Eqs. (1) and (2)) can be rewritten more compactly as follows:

$$r_t = B' z_t + \Gamma' D_t + \varepsilon_t$$

$$= \Theta' x_t + \varepsilon_t,$$

Where $r_t = (r_{it},...,r_{Nt})'_{(N\times 1)}$, $\varepsilon_t = (\varepsilon_{1t},...,\varepsilon_{Nt})'_{N\times 1}$, and $z_t = (1 r_{mt})'_{(2\times 1)}$ the following notation is used:

$$B = \begin{pmatrix} \alpha_1 & \alpha_2 \ldots & \alpha_N \\ \beta_1 & \beta_2 \ldots & \beta_N \end{pmatrix}_{(2\times N)}$$

$D_t = (d_{1t},\ldots,d_{Nt})'_{(N\times 1)}$;

$$\Gamma = \begin{pmatrix} \gamma_{11} & \gamma_{21} & \cdots & \gamma_{N1} \\ . & : & : & : \\ . & : & : & : \\ \gamma_{1P} & \cdots & \cdots & \gamma_{NP} \end{pmatrix}_{(p\times N)}$$

$x_t = (z'_t D'_t)'_{((p+2)\times 1)}$

$$\Theta = \begin{pmatrix} B \\ \Theta \end{pmatrix}_{((p+2)\times N)}$$

The above model can be further rewritten as:

$R = X\Theta + E, \quad E \approx P(0, I_T \otimes \Sigma)$

Where

$$R = \begin{pmatrix} r'_1 \\ . \\ : \\ r'_T \end{pmatrix} = \begin{pmatrix} R_1 \\ R_2 \end{pmatrix}$$

$$R = \begin{pmatrix} x'_1 \\ . \\ : \\ x'_T \end{pmatrix} = \begin{pmatrix} Z_1 & 0 \\ Z_2 & I_p \end{pmatrix}$$

Researchers are generally interested in the following three forms of hypotheses (Chou 2004).

1. *Hypothesis 1*. The abnormal returns are simultaneously equal to zero for all firms for event j, i.e., $H1 : \gamma i\, j = 0, \ \forall\ i$ given j.

2. *Hypothesis 2*. The abnormal returns are zero for all events and for all firms, i.e., $H2$: $\gamma i\, j = 0, \ \forall\ i, j \cdot$ (or $H2 : \_ = 0$).

3. *Hypothesis 3*. The mean abnormal return across firms for event j is zero, i.e., $H3$:

$$\frac{1}{N}\sum_{i=1}^{N}\gamma_{ij} = 0, \text{ given } j.$$

While they will focus on tests of the three hypotheses, tests for several variants of these hypotheses are easily derived with similar test statistics.

(Chou 2004) shows that under the iid normality assumption for the error terms, the first hypothesis $H1$ can be tested with a Hotelling's T 2 statistic that has an exact F distribution (see Schipper and Thompson, 1985; Binder, 1985b; de Jong and Thompson, 1990). Similarly, it is easy to show that the third hypothesis $H3$ can be tested with a standardized statistic that has an exact t distribution. For a general form of the second hypothesis $H2$, exact tests may not be available. Based on Rao (1973), Binder (1985b) indicates that the hypothesis can be tested with asymptotic likelihood ratio tests, but the tests become exact when the rank of the parameter matrix under consideration is less than or equal to two (i.e., rank (Γ) $\leq$ 2).

Exact tests for a more general form of the second hypothesis is proposed by Butler and Frost (1992), who propose the use of a "forward variable selection model" that allows the hypothesis to be of the form $H2 : C\_D = 0$, where C and D are known matrices. As the rank of $C\Gamma D$ is still restricted to be smaller than or equal to 2, Butler and Frost (1992) do not go much beyond Binder's result (Chou 2004).

3.1.3. Significant Parameters Affecting the Event Study

The event-study has been studies from different angles so far. Functionality of important factors is investigated including extraordinary events, stock market characteristic, firm's parameters, and period time. Any change in each of these parameters if being involved in the model may result in unreliable outcomes.

Many studies using the event-study methodology attempt to define consequences of occurring unexpected events such as political risk events (Ma, Sun et al. 2003; Jensen and Schmith 2005), terrorist attacks (David A. Carter 2004), information technology concerns (Anthony, Choi et al. 2005; Hovav and D'Arcy 2005), and even diseases (Tse and Hackard 2005).

(Ma, Sun et al. 2003) shows that Tiananmen Square incident had a significant impact on U.S. firms with joint ventures in China. The empirical results show significantly negative Abnormal Return on the event day. (Jensen and Schmith 2005) have studied how election of a politician that is expected to enact "market-friendly" policies, lead to increases in stock market returns. Lula, one of the 2002 presidential candidates, indeed revealed impact on Brazilian stock market. Conversely, political events that are expected to have a negative impact on the economy and specific firms lead to decreases in stock market returns. Stock market also has been investigated using the event-study to estimate other catastrophic events such as the 9/11 terrorist attacks and mad-cow disease. (Anthony, Choi et al. 2005) have employed the event-study for an unexpected event in IT. They found a significant negative correlation between website outage announcements and stock returns. Therefore, if an event is identified as a catastrophic event causing unusual movement, the even-study must be investigated considering that significance. Exploration projects are usual and expected events in oil and gas industry, and the methodology could be applied without establishing impacts of them.

Stock market performance creates a unique environment related to its characteristics. These features modify the event-study results, and should be considered throughout the methodology application. The terms including country of stock market or using events from several stock markets within different countries can change the event-study result to useless data. The major concern is to acquire appropriate events and obtaining reliable information in order to be able to identify events. Quantitative data and qualitative information provided in stock market in different countries and time zones are released unlikely (Park 2004). For instance (Park 2004) shows that the use of the single country market model in a multi-country event-study is likely to overestimate changes in firm value. Therefore, the event-study can be investigated with respect to several factors originating from stock market characteristics.

Firm's parameters identify characters introduced in firm's portfolio in financial markets such as size of the company, number of employees, and maturity of the company in performing projects. (David A. Carter 2004) has investigated the impacts of terrorist

attacks on large and small firms in different countries. In fact large companies mostly are investigated due to their potential and capabilities.

Period time and estimated time of the investigated events indeed are significant terms of the methodology. The estimation period is typically prior to the event date. It is most often defined as a period preceding the event, which is sufficiently long to enable the parameters of the chosen return-generating process to be properly estimated. In studies using daily data, a window going from day –250 to day –30 relative to the event date is usually (somewhat arbitrarily) chosen. This mechanical choice is, however, not free of complications (Jean-Gabriel, Bodt et al. 2007). The normal return is indeed considered in investigation. And the normal return is the first estimated over a period of time, referred to as the normal period, consisting of T days prior to the event (days -T to day -1, where -T < -1) (Andrew M Makenzie 2004).

In chapter 4, the important terms related to research model and the methodology that may affect the research model and calculated results will be explained.

3.2. Applications to Measuring Risk Perception

Particularly event studies attempt to measure abnormal changes in stock prices of publicly traded companies that occur in conjunction with an 'event' such as announcement of new regulatory initiatives. Since the price of those stocks is set in an auction market which is as close as leading one to the economic concept of a 'perfect market', the price of those publicly traded stocks should reflect the reaction of the financial markets to the introduction of new information. The new information that is often of interest is the market perception of which companies will be the winner and which will be the losers following the introduction of a new regulatory initiative. Then, the purpose of the event study is to detect whether financial markets react positively or negatively to those initiatives(Wells 2004).

(Park 2004) also describes that researchers need to consider global market movements, currency exchange rate issues, country-specific occasions, lack of synchronism in stock

market trading hours, and market sensitivity to firm-specific information between countries. Although these factors are not investigated in this research, they present concerns that produce risk perceptions in a stock market among investors.

The event study methodology has indeed become the standard method of measuring security price reaction to some announcement or event. In practice, event studies have been used for two major reasons: 1) to test the null hypothesis that the market efficiently incorporates information (see (Fama 1976) for a summary of this evidence), and 2) under the maintained hypothesis of market efficiency, at least with respect to publicly available information, to examine the impact of some event on the wealth of the firm's security holders (Binder 1998).

3.3. Application to Oil & Gas Projects

As explained in chapter one, strategic decision in exploration projects require considerations affecting market returns. In many reviewed literatures, researchers have attempted to investigate market reaction to companies who announce their performances of many types of projects. The event-study has been broadly employed for financial purposes of corporation alliances and implementing IT projects, and its results assist researchers. In this thesis, the event-study method is used to assess one sort of project in oil and gas industry, exploration and drilling projects which their fundamentals are significantly similar. The event-study approach could help us to perceive impacts of drilling project announcements on the market as the same as other industries. In fact, the event-study has not been interpreted for only certain industry. It has been also attempted to apply the methodology to discover important factors that are perceived as risks and elicit reaction among stockholders.

These contingency factors need to be identified in order to construct decision making both for managers in business side and project managers in exploration sites. M. Agrawal, R. Kishore and H. Raghav Rao in their research (Agrawal, Kishore et al. 2006) identify three contingencies: the strategic intend behind outsourcing; the project execution swiftness and the project task complexity, which influence the stock market

reactions to an E-business outsourcing decision. The Strategic Intend in their study could be replaced with Project Objectives which is used in project management discipline widely. Here they are not condemned using the word "strategic intend" rather than "project objectives" that presents an enhanced description of their research. Besides, their theoretical development has been also employed for our research. In this research model, their model identifying three contingencies has been used. These factors are significant in order to determine influential announcements. Based on the key factors in this kind of projects, it is argued that the abovementioned three contingencies define a structure for a strategic decision-making.

Three contingencies: project objectives, project risk factors, and project operation explain market reaction to an exploration or drilling project. These variables describe and contain almost all parameters influencing an exploration project in oil and gas industry and reflect major concerns in companies' announcements. These contingencies are identified with respect to what have been explicated in previous chapters related to "project management" and "project" based on PMBOK and petroleum discipline as well. In section 3.4 "Hypotheses", these variables will be more clarified.

Strategic intends behind the announcements of every project indicate company's strategy and thinking of acquiring revenues and producing returns in its stock. Purposes of implementing a drilling project regarding both long term or short term impact on business aspect and its impacts on company's assets elicit stockholder reaction. In chapter one, it was described how exploration and drilling projects confront with enormous risk factors, and how stocks in oil and gas industry encounter with external risk factors with various origins. Thus, the degree of risks undertaken to implement an exploration project determines the market respond. Project operation is a condition by which one assesses how a project can be executed and delivered from opening to closing date. This depends on project managers' capabilities and project circumstances. Any information about these contingencies makes fluctuation to move positively or negatively, and indeed has an effect on companies' stock price.

3.4. Hypotheses

Based on three variables, three hypotheses are introduced to estimate the market returns in case of emerging every level of changes in their characteristics. This analysis indicates three categories that reflect major concerns among investors and perceived as risks associated with exploration projects: 1) project objectives, project risk factors, and 3) project operation.

Project objectives present the strategy of a company in exploration oil and gas, in fact this estimation describe market's response to intents of performing the project. As indicated earlier, a project commonly has two highlighted phases recognizable by managers in oil and gas industry: planning and execution. Indeed, project objectives reflect these two major concepts. In following chapters, in identifying announcements, this will be detailed further.

Project risk factors involve uncertainties, risks, and any issues investors may notice as severe condition in project implementation. External and internal risks, project uncertainties, and project characteristics are included in the hypothesis evidently. This hypothesis elucidates concerns that may affect project execution. Contingency factors present market reply to uncertain conditions in project implementation.

And finally, project operation demonstrates project execution swiftness. Furthermore, it indicates regularity in project implementation. Any change during project life cycle from planning to closure is considered and evaluated in this hypothesis. Transformation of any parameter in project strategy, project design, project scope, partners, contractors, project managers, and etc. reveals irregularity in project operation. These modifications in the project characteristics are considered here.

These three hypotheses are described in the following parts in order to form a model for the methodology.

3.4.1. H1: Project Objectives

Regarding identified major phases in petroleum discipline (John, Cook et al. 1998) and project management (PMI 2004), project intents could be divided into two distinct areas: planning and execution. Events of digging new oil/gas wells mean development in oil production and will be remarked as earning among investors. Therefore, project announcements with planning objectives establish development and produce negative or positive returns with respect to other conditions of the projects. Instead, releasing information of projects, which are being implemented, has different impact on market.

Planning of an exploration means oil or gas acquisition and obviously more production and revenue for company. Oil wells add value to a company, and successful exploration projects can guarantee positive market returns in phase of designing or planning of a drilling project. New oil and gas fields might change face of a company financially and set up either enormous opportunities or rigorous conditions for company functionality. Uncertainties in estimations, possible inaccurate information and mistakes in technical investigation demonstrate risks in investment. Strategic decision depends on project conditions and many factors presenting project specifications and characteristics.

Another strategic intent of an exploration project which affect stockholders, is to develop existing oil wells. Increasing crude oil or natural gas production means stable business operation representing reliable strategic decisions. Announcement of any project development establish confidence in investors to rely on future profits and accomplish financial benefits. Shareholders have accurate data and information according to historical prices and records of an existing oil field. In contrast, new projects in exploration present uncertainty in project execution and project designing. Moreover, project implementation will be conditional and depend on many factors. Thus, it is hypothesized that:

H1: *There will be positive abnormal returns for exploration projects that oil and gas is being executed than projects that are launched with only planning intents. Any kind of oil and gas acquisition introduces execution and positively will be reacted by markets.*

3.4.2. H2: Project Risk Factors

As described earlier, drilling activities and exploration projects involve uncertainties and risk factors that set up rigorous conditions to deliver projects. Many of factors influence entire market and some other only force exploration companies. Despite external risk factors such as oil price, environmental and legal issues, stock market regulations, and business agreements, drilling projects confront with many factors with internal source. Projects with severe risks increase negative reaction in stock market, and projects with high degree of complexity establish volatility for company's stock price. Digging in harsh environments such as: deep sea waters, offshore, remote areas or far north, raises fears of unexpected result in project accomplishments.

Table 1 in Appendix presents noteworthy factors internally affecting companies and being considered as risk factors originated from business and its process. In addition, Table 2 demonstrates important parameters that influence projects execution and known as external risk factors that market recognize them. Therefore, it is expected that risk factors internally or externally influencing execution of an exploration produce negative returns depending on their severity.

H2: *Broadcasting a project with probability of occurring severe risk factors generate significant negative abnormal returns as compared to projects with lower degree of complexity in term of implementation.*

3.4.3. H3: Project Operation

Project life cycle consists of project processes from initial phases to closing day. Here, it means the condition that a project is delivered throughout its life cycle. According to PMBOK, planning phase of each project is part of project operation and announcement of appropriate planning showing regularity in operating a project. Regarding project needs and objectives emerged from project announcement; investors interpret if an exploration project can be delivered reliably.

In execution phase, project operation shows whether a project operates normally or experiences terrible situation. Project implementation evidently demonstrates important stage during project life cycle in order to be on-budget and on-time. Business activities may roughly change project deliverables and its functionality as well. Company's report and statement reflect business operation and provide information of drilling and oil production, thereby one can perceive whether an exploration project meet project requirements or a certain project needs to change its scope.

Project execution may be considered instead rather than project operation among project managers in different industries and disciplines; however, project proposal including project need analysis also is a part of project operation based on PMBOK. Project's parameters such as: technology needed, project need analysis, project managers' capabilities, and communication during project processes determine how a project is delivered.

Thus, information of projects operation and history of production of an oil field shows capabilities of a company to face difficulties during the project life cycle. Projects with regular execution will be awarded by market and projects with inaccurate information or unreliable operation during project execution experience negative returns. Therefore, it is hypothesized:

H3: *Any announced information during life cycle an exploration project introduces change in project implementation will be awarded negatively. Irregularity in parameters such as planning, budgeting, scheduling, tasks, opening and closing dates raise stockholders' concerns and demonstrate further negative abnormal returns.*

Relation between these three hypotheses as well as positive and negative abnormal returns regard their hypotheses are shown in Table 3.1. This Table is a summarized description of the research model. Project objectives introduce intents when a drilling project is announced, and the proposed hypotheses distribute positive reaction among investors. Project risk factors emerge abnormal returns negatively, and project operation illustrates negative abnormal returns.

Table 3.1 – Contingency Factors & Hypotheses

Contingency	Hypotheses	Abnormal Returns
Project objectives	H1	Positive
Project risk	H2	Negative
Project operation	H3	Negative

3.5. Calculation of Abnormal Returns

The results have been presented by means of the market model using financial markets (Yahoo Financial) database and compute the abnormal returns for specified event windows using specified model. Abnormal returns for firm i on Day t, $A_{i,t}$ are:

$A_{i,t} = R_{i,t} - (a_i + b_i R_{m,t})$ Market Model (1)

Where a_i, b_i are the coefficients from the market model for firm i; the abnormal returns for firm i on Day t; $R_{i,t}$ the returns to firm i on Day t; $R_{m,t}$ the returns to the S&P 500 composite index on Day t. the index used was the S&P 500 composite index obtained from the financial markets.

As (Agrawal, Kishore et al. 2006) have indicated, a cross-sectional egression model suggested by (MacKinlay 1997) was used in order to test for the influence of the contingency factors on market reactions,. In the cross-sectional regression, given a sample of N abnormal return observations and M characteristics, the regression model was:

$E(AB_j) = d_0 + d_1 . X_{1j} + \ldots + d_M . X_{Mj}$ (2)

Where, AB_j is the jth abnormal return observation; $X_{M\,j}$ the M characteristics for the jth observation; d_M the regression coefficients estimated using a linear regression model. Inferences were drawn from the sign, magnitude and significance of the regression coefficients. Summarizing the above, the equation estimated in the research was:

$$CAR_j(-2,2) = b0 + b1.\ Objectives_j + b2\ Risk\ Factors_j + b3\ Operation_j$$

Where CAR_j is the cumulative abnormal returns for firm j: $Objectives_j$ the project objectives for en exploration project of (i.e., firm) j; Risk $Factors_j$ the risk factors for the firm j; and $Operation_j$ the project operation fir the firm j.

Applied methodology will be presented in the next chapter including entire process of the sampling, identifying effectual events, abnormal returns calculations, and results of the hypotheses based on model defined.

4. Methodology

Hereby, an Event Study is proposed to clarify how publicly-traded companies manage market-perceived risks associated with major exploration and drilling projects during their life cycle in the Oil & Gas industry. It is identified, for a set of companies, news related to announcements of their major investment projects over 2 years (i.e., 2006-2007). An Event Study method is applied to measure the perceived risks by the market, and the relative effectiveness of strategies applied by the companies to manage risk at various life cycle stages of each project announced. The event-study is used as a statistical method to forecast the market response for companies whose information provided in financial markets in energy sector. In this research, the firms in two sections of Exploration & Drilling and Independent Oil & Gas in S&P500 index will be investigated. A total of 64 exploration/drilling announcements (from 2006 to 2007) regarding important contingencies are observed and analyzed. Events during project life cycle are assessed in order to draw appropriate and reliable directions for decision-making process.

The following sections detail the procedure performed including: 1) a research sample that provide the model we follow, 2) event identification during qualitative data gathering, 3) event analysis for three hypotheses and categorizing them in each, 4) stock market qualitative data gathering, and 5) hypotheses testing with CAR calculations.

One of the important parts of the research in event identification and categorizing the hypotheses was to review announcements regarding companies' condition at the several times. This portion warranties reliability and stability of the results that are based on relevant events and information accuracy. In fact, the first stage of the research which took time unexpectedly could be recognized as similar as experienced coders (Agrawal, Kishore et al. 2006).

4.1. Example Studies

As mentioned earlier, the adopted process for defining the model for this research is based on (Agrawal, Kishore et al. 2006). They perform the event-study method to find

out the reaction of stock markets to announcing of implementation of E-business projects for commercial exploitation. The model used in their research indicates that stock market react favourably to firms who announced their implementation of E-business projects for commercial exploitation. In fact, their investigation determines the consequences of outsourcing announcements on the market. Although there are many research in using the event-study cited in this thesis [(Subramani and Walden 2001; Ma, Sun et al. 2003; David A. Carter 2004; Telang and Wattal 2004; Anthony, Choi et al. 2005; Hovav and D'Arcy 2005; Jensen and Schmith 2005; Tse and Hackard 2005)], the most relevant methodology to (Agrawal, Kishore et al. 2006) has been employed.

Their findings prove the idea of outsourcing in IT that has already been socially-acceptable. They studied firm performance in the context of the contingency factors of interest. The methodology used in this research likely intends to employ the event-study results to define appropriate strategy in management course.

4.2. Research Phases

This research is performed in three main stages including: I) understanding environments of market and the industry, II) identifying events, analyze project characteristics, employ the event-study methodology, and estimate abnormal returns and CARs, III) discovering relevant and possible directions for decision-making process. Each stage contributes to the research outcome improvement for the next phase. Table 4 in Appendix demonstrates characteristics and contribution associated with each milestone including: investigated industry and number of companies in each phase, results and applied methodology and activities in each phase.

Contribution of phase 1 reveals three important hypotheses and categorizing events. In this phase, project concerning several aspects are investigated in order to clarify variables that market believes as perceived risks. Environment of stock market and drilling projects provide most remarkable risk and uncertainty that managers confront with, so that strategic decisions will be structured supplementary reliable.

In the second phase, the quantity of companies in Exploration & Drilling category (major related industry) is reduced by half to indicate proper companies. Events and project

news were observed to classify contingency factors based on (Wells 2004). Table 5 in Appendix shows companies and conditions that finally established certain companies and accurate data.

The third stage deals with research model and methodology that produce results and estimate market returns. Research objectives and its approaches are established afterward, and the two prior phases only indicate significant events and environment of companies and drilling projects. Exploration companies, their announcement, and contingency factors are defined in this phase, moreover, hypotheses are evaluated. Cumulative Abnormal Returns and results of contingencies in the model are interpreted in order to identify perspectives for decision-making purposes. Table 5 in Appendix illustrates the total companies investigated, and also describes several parameters in each stage.

4.3. Event Data Gathering

Dow Jones Interactive database commonly is used in the event studies; however now access to this database is harder than ever. It is possible that provided data in financial markets are not prevalent to be cited in research, though Yahoo offers reliable and accurate information for many businesses researching in stock markets. The data base used in this research has been obtained as follows:

I) Reviewing qualitative data for identifying relevant events consisted of all textual information provided in financial markets (http://finance.yahoo.com/) and the market index used is S&P500. In "Investing" menu, Oil & Gas Industry has been chosen, and then publicly-traded companies were selected so that web pages related to the companies appear.

II) News & Info in each company's main page provide headlines, financial blogs, company events, and message board. The company profile was observed and the opinion was analyzed to identify influential news related to exploration announcements.

III) Information was collected using a full text search of announcements made by companies between 2005 to end of 2007 in the financial markets. Headlines in News & Info included all news and announcements relevant to the companies. It consisted of annual reports, monthly reports, quarterly reports, news, and company events and project announcements for a long period of time, although this period time is different in each company.

IV) Most companies have information and headlines for three years. Those companies enclosing further headlines in a short period of time were collected. Releasing more headlines and providing accurate information about projects implementing, showed reliable data to analyze.

The announcements which could be perceived as risks and could produce concerns among investors were collected and identified based on the contingency factors of the research model.

4.3.1. Collected Events

As shown earlier, PMBOK reflects the project definitions in petroleum discipline as well. Therefore, if the events with PM perspectives are analyzed, one will be able to accomplish perceptions project managers applying in oil and gas industry. Events are determined regarding three contingencies and major significant factors that include concerns in exploration projects.

In market, "events" have undoubtedly important impacts on investor's decisions and in business processes management. Furthermore, events and company news demonstrates business functionality. Financial statements, monthly and annual reports, interviews, exhibition, and announcements reflect a company's functionality. Huang, Goto and Nakamura consider decision-making in their study for the whole market movement and events which are most significant part of their decision-making suggestions (Huang, Goto et al. 2004). They explain how similar movement tendencies between individual events and whole sequences of related events exist in various fields. A general strategy is

suggested for decision-making which considers the relationships between any individual event and the whole sequence of related events. With this procedure, a higher reliability of decision-making for individual events can be achieved.

The events introducing any activity associated with oil field development, oil acquisition and production, digging activities identified as project, drilling and exploration, planning and designing for oil exploration, and business activities of a company prior and subsequent to a certain event, will be collected.

4.3.2. Announcement Identification

There has to be a distinction between managing an exploration project and managing oil and gas acquisition at oil fields. Identifying an event affecting stock market require considering essence of announcements and management style needed for particular environment. Operation management and project management styles are mixed usually during events identification. In section 4.4 "Event Data Analysis and Interpretation", the differences will be highlighted. Identifying mistaken events and projects reveals unreliable conclusion.

The following part introduces considerations for the event identification in different qualitative data:

- Annually, monthly, and quarterly reports: Any exploration and drilling project related to previously explored oil & gas fields including development, acquisition, implementation, and execution events are considered as Execution (EXE.). Generally, these reports are prepared to produce confidence among investors; thus, there is not any new event and any planning of an exploration project. These reports regularly do not release news about designing and planning of new exploration projects. Indeed, they present overall company's strategies and key business goals. Therefore, project condition and project implementation is reported and even pretended with low severity in risk and uncertainty. These reports usually describe projects with regularity in their operation as well.

- Headlines: Every news correlated with drilling or exploration is defined EXE if it provides information about production of existing wells. Announcements of performing a new project with unreliable condition as presented in Table 2 in Appendix (Significant Factors Associated with Exploration and Drilling Projects) reveals uncertainty and/or increase level of risk factors. Also Table 1 in Appendix (Significant Factors Associated with Business) demonstrates factors may change regularity in project operation during project life cycle.

- Companies' portfolio, analysis opinions, and news: These qualitative data were used to analyze directly related events and recognize reliable information regard company's background.

Analysis of the quantitative data indicates that the events that include several projects to be managed differently. Each event may essentially announce a project in several phases of its life cycle. Many events proclaim an acquisition project is not even a project, and in fact they report operation of oil production in an oil field. The events may indicate exploration which means oil production for a long period of time. However, projects are undertaken for a specific life cycle. Projects in this research are identified with their processes and the perspective that are originated by managers regardless where announcements are being broadcasted.

The results highlight the importance of explicitly controlling of unrelated events occurring during the estimation windows, especially in the presence of event-induced increase in return volatility (Jean-Gabriel, Bodt et al. 2007). The estimation period has attracted less attention. It is mostly defined as a period preceding the event, which is sufficiently long to enable the parameters of the chosen returns-generating process to be properly estimated. In studies using daily data, a window going from day-250 to day -30 relative to the event date is usually (somewhat arbitrarily) chosen. This mechanical choice is, however, not free of complications. In particular, unrelated events may be present during the chosen estimation window, which bias the estimation of the return-generating process parameters. (Jean-Gabriel, Bodt et al. 2007)

Table 4.1 displays number of events allied with different variables, their purposes, and number of announcements in each level.

Table 4.1 - Event analysis N=64 total

Variables	Levels	Events
Project objectives	Execution	45
	Planning	19
Project risk factors	Low	40
	High	24
Project operation	Regular	36
	irrigular	28

Events Data Analysis and Interpretation

Exploration and drilling project announcements are categorized concerning three described hypotheses that significantly affect a company's stock price and obviously project managers' decisions. Besides, there are some considerations required in order to identify certain events that influence market and investors. One of the most common mistakes in event analysis is distinction between project operation and field management.

Project operation considering PMBOK means performing and controlling a project throughout its life cycle from planning phase to final day of a project. Precisely project operation does not include managing and operating execution phases of a project. Many announcements evidently mix up meaning of managing a project (or project operation)

with field management that deal with every-day managing at site. Some events report operation of wells and announce oil acquisitions. Field managers control activities that might comprise many tasks of a project.

In the next sections, events are defined on the subject of three variables of our model and perspectives that reflect PM perception.

4.3.3. Project Objectives

Intents of exploration and drilling projects after reviewing qualitative data conduct one towards two major ideas in project phases: implementation and planning. Announcements during projects life cycle emerge different reaction in market.

Every project is known with its three well-known milestones: before, during, and after "doing project". As explained in chapter two, a project manager has nothing to do with a project after the project completion, and indeed managers take care of the operation. There is no distinction between explorations and drilling projects according to announcements reviewed in prior stage of the research. Thus, exploration announcement means drilling project and a drilling announcement results in oil exploration. Moreover, notion of variation between exploration and drilling does not change analytic content of events as practically both of them generate acquisition of oil. In this manner, when a project is being implementing, it will bring oil production and investors will not have any concern due to less probability of the project malfunction. In contrast, planning of an exploration or drilling requires a lot of activities for project closure and getting the results.

Therefore, announcements were classified from high (in terms of income and value for investors) for implementation and low for planning. If announcements explicitly describe as execution, they identify existing projects; therefore, project functionality shows abilities of project team to finish the job. In fact, the announcements include definitions referring to acquisition such as: development of existing wells, execution, project closing, exploration and drilling implementation). Stockholders evidently can predict

consequences of the events. These events are considered as high in this hypothesis. In contrast, if an announcement consists of signs of planning, designing, preparing, and testing that may relate to initial stage of a new exploration or drilling project, it can be coded as low.

- *Project implementation* defines activities that establish acquisition of oil/gas in term of exploration. According to this, announcements could be coded in this category when acknowledge: purchasing oil and gad properties and wells, leasing oil/gas fields, exploration drilling updates, employing new equipments (i.e., rigs, seismic tools, etc.), successful project, and partnership with existing exploration contractor/company. In annual reports, quarterly reports, financial statements, and publicizing regular operation of oil/gas production are classified in this category. These reports at least prove that a project is producing oil/gas and provide guaranteed income for business and create value for company. Information which clearly made statement of earning of oil and gas can be valued as high.

- *Project planning* involved announcements identifying projects which were in initial stage of their life cycle. Thereby, any event including intent of prospect oil/gas acquisition was categorized here. These headlines had information such as: contract agreement, planning of exploration in new fields, digging based on seismic data for new fields, plan of employing new technology and equipment, and performing new technology in exploration.

In fact these levels for variable of "project objective" demonstrate main concepts perceived from events broadcasting an exploration or drilling project.

4.3.4. Project Risk Factors

Risk factors can be viewed as either: 1) factors inwardly affecting project objectives as indicated in chapter two, and 2) parameters originated from project characteristics and conditions and usually considered as task complexity.

These identifications emanate from uncertainties that may influence oil and gas companies and their projects, or produce uncertainties in stock market. Therefore, two major aspects of complexity were measured: 1) business side of companies, and 2) project functionality and practical attribute of projects.

Company's portfolio and its background reveal company's capabilities of managing projects and implementing them. Experienced company with strong background in oil and gas business demonstrates company's ability in controlling the consequences of external risk factors changing stock market environment. Moreover, there would be more self-confidence among stockholders to rely on managers preventing projects from terrible results. Managers' capabilities in business side of company mitigate possible task complexities that may affect project execution. Other uncertainties depend on projects and project managers' ability to implement them. Historical news and reports about project operation illustrate how one particular project produces task complexity, and also demonstrate whether these tasks can cause problem for a particular company.

Basically in each sample company's portfolio was reviewed, they were categorized with respect to its business objectives and activities. Project risk factor is coded as follow:

- *Low* risk when company in business side: had many years of experience in exploration and drilling in different fields, had experienced partners and contractors, had many full time employees, provided enough information about projects implementing, had many related news in exploration projects. In other side, when task complexity and external risk factors (provided in Table 2- Significant Factors Associated with Exploration and Drilling Projects) indicated less uncertainty in project execution, announcement was identified as low.

- *High* risk was defined when company in its business feature: had a weak portfolio in term of business functionality, small number of full-time employees, limited activities, lack of information and announcements related to projects. In case of external factors that emerge from stock market or project environment, the news having terms was coded. This news includes: projects performing in rigorous weather

or geographically difficult projects, legal issues, governmental or association agreements, projects in foreign countries, terrorist attacks, and what were explained in chapter two.

4.3.5. Project Operation

As shown in Chapter 2, project operation illustrates operating of a project during its life cycle. Here "project operation" reflects level of regularity in different phases of the project and defines whether processes of the project are being executed properly or not. These processes may encompass initial stage of a project and continue until the project ends. Therefore, project operation demonstrates project management abilities further than other hypothesis. Both areas of knowledge of strategy management and change management are influential in this course. Hereby, the announcements were coded based on parameters that could transform an exploration and drilling project from oil production to a project without acquisition. Thus, regularity in project operation introduces swiftness in project operation from beginning (project proposal and project design) to the end (project closure phase). Hence, exploration and drilling project announcements with respect to their operation during project life cycle are coded in two categories:

- *Regularity* in operating a project from its initial stage to its deadline determines stability and consistency in conditions during project life cycle. These phases integrated: seismic studies for an exploration, designing technological stuff, implementing exploration, and the main goal, producing oil or gas. If project announcement was comparable to similar projects executed at the company or it was mentioned as regular operation and execution, it was coded as regular. Therefore, similarity with other projects was considered as regularity in estimation of a new field. Every event that involves management decision-making without generating new alternatives is further considered as regular.

- *Irregularity* was indicated as any change in project objectives, deliverables, and oil/gas production. Any signs of instability in oil and gas estimated, project implementation, and project outcomes were identified as irregular. Moreover,

announcements consisting of company's decision-making in order to mitigate uncertainties are coded as irregular.

Table 4.2 shows variables in the hypotheses of this research with their event analysis.

Table 4.2 - Variables

Variables	Event Analysis
Project objectives	execution
	planning
Project risk factors	low
	high
Project operation	regular
	irregular

4.4. Stock Market Data Gathering

Size of a firm can accomplish reliable results with CARs estimated through samples truly affected by events. Also large companies are expected to be influenced by events because of investors' concerns and their huge amount of trades. Small firms rarely get affected from unimportant extraneous events that might incite large companies with many investors. News related to large businesses can be tracked accurate and leaked information may be identified evidently. With collecting publicly traded companies provided in financial markets, company size may not be an issue anymore. Thereby, companies are selected from publicly traded category. Most event study research applied in a single country and companies with international interests and/or foreign companies active in a country has not been in the center of study. Multi-country event study research

present world market model (Park 2004) regards various stock markets, exchanges, time zones, and demonstrate how to simultaneously assess the financial impact of strategic actions in multi-countries. Another factor for collecting reliable samples is events, related events, and accurate quantitative and qualitative information to employ event study methodology. Identifying events are a rigorous part of the method in order to separate events from possible relevant events may be happening in a given time period (Wells 2004). To mitigate consequences of these uncertainties, the samples of this research have been collected through publicly traded companies whose announcements are consisted of accurate financial data and relevant events. As described in chapter two, scanning and skimming the companies whose web sites are presented in financial markets in this field are initial parts of the research in order to obtain reliable samples. Therefore, samples were collected regards of the following consideration:

- Companies whose stock are publicly traded in order to mitigate factors related to company size, irrelevant events, and possible leakage information

- Some companies do not have complete data and information either statistically and/or officially. The reason might be the fact that stock market establishes many rules, regulations, and laws relevant to the federal government. For smaller companies and/or foreign companies it would be difficult to match their results, data, reports, etc. with those rules.

Table 4.3 illustrates the number of companies sampled in each research milestone, and presents 46 samples providing accurate and reliable information through their web pages in S&F500 and financial markets. Total of 46 companies were collected after considerations of the environments and event identifications; therefore, the event-study was applied to these 46 samples. Table 5 provided in Appendix presents name of the companies.

In milestones 1 and 2, no company was selected and quantitative data was gathered when the corresponding methodology for 46 companies was applied.

Table 4.3 – Samples (Number of companies investigated)

Oil and gas industry	Milestone 1	Milestone 2	Milestone 3
Equipment & Services	18	0	0
Exploration & Drilling	45	51	38
Gas utilities	8	0	0
Independent Oil & Gas	9	9	8
Integrated Oil & Gas	9	0	0
Oil & Gas Pipelines	10	0	0
Refining & Marketing	8	0	0
Total	107	60	46

4.5. Stock Market Data and CAR Computation

As explained before, identifying affected companies are one of the key elements of event study method, thus gathering information is the significant part of the research in order to acquire reliable quantitative and qualitative data. Collections of affected companies also establish reliable results through the method. Therefore, the ultimate goal is to identify effective events and also appropriate samples for applying the methodology.

Data is gathered through Internet in this research. Financial markets in Yahoo, one of the most accurate websites, are chosen because of its on-line, up-to-date, and reliable information about companies publicly traded in stock market. Data is provided from different stock markets, businesses and many fields in industries. There are many publicly or privately traded companies whose stocks, portfolios, reports, news, and much

more are available in there. The world wide website of http://biz.yahoo.com/ic/ind_index.html was used to select companies that their historical prices also are available. Similarity in case of activities in the projects has impact on methodology due to wrong result in CAR calculated, so that abnormal returns do not show certain companies affected from event. In contrast, environment of the businesses establishes a perspective that one may identify events and select samples resulting in CARs differently. Several concerned factors affect collecting appropriate samples such as: foreign and international companies, size of the company, information accessibility, and availability of the relevant events or leaked information.

When Exploration and Drilling industry is selected on the main page of the expressed web site, the left-hand column on Company Index is clicked. In this page publicly traded companies with symbols in parenthesis are selected. Selected company displays the main page of the company with its all statistical and initial information for financial analysis of the company.

There are 127 companies indicated which publicly traded in Company Index in Yahoo Finance. Totally, 107 of these exploration companies were overlooked and their portfolios were reviewed to understand environment of the business and to be able to identify effective events and affected companies.

4.5.1. Obtaining Abnormal Returns

The process of information gathering presented in chapter two and the previous sections of this chapter established a procedure to collect samples, identify relevant events and announcement, period time, window day, and finally computing abnormal returns from Yahoo finance. The following part indicates instruction to achieve Excel file for each sample and calculation of Abnormal Returns:

1. In Historical prices on each company's web page in Yahoo Finance, the announcement is determined seven preceding day of the start day in order to have both (+2) window-day and observe any impact possibly produce unusual effect.

Therefore, seven days before the start day in each Excel file indicated as an announce day (the event days and companies presented in appendix A.)

2. The end day of the historical price is eight months prior to the announcement day.

3. After identifying start day and end day, the file is saved as an Excel file named in company's name.

4. Market index Excel files from S&F500 is collected as the same trend as each company's Excel file regarding the event date. Returns from these files are used for computing abnormal returns in companies' Excel files as described in the next paragraph.

The Excel files were employed to calculate abnormal returns and the steps for calculation are ordered as follow:

1- In each file only close and open columns price are used for company's Return calculation. Ri =Log (E2/B2).

2- Rm column is Returns in Market Index which is Dow Jones Market Index here. It' is calculated separately and copied here.

3- ERi which is expected return base on market index is obtained from regression of Ri on Rm.

4- Abnormal Returns AB (Ri) are difference between Actual returns (Ri) and Expected Returns (ERi).

5- Then AB (Ri) is standardized as SAR.

6- CAR which is cumulative abnormal return is computed using three or four days before and after event day as explained in the methodology section.

4.6. Hypotheses Testing

Using the defined model and applying the methodology for 46 sample and 64 events of exploration and drilling projects result in CARs different conditions of the used model. As shown in Table 4.1 "Event Identification", there are 45 executions, 17 planning, 40 low, 24 high, 36 regular, and 28 irregular events identified considering three factors of project Objectives, project Risk Factors, and project Operation.

CARs are calculated applying process described, and are presented in separate Excel files in different directory (for instance "Execution" Excel file include list all companies with events of execution, provide CARs in each company). Thus, each directory consists of all similar events with related companies and estimated CARs). Also, there are directories of CARs that provide the sum of the CARs in each level, which are presented in Table 4.4.

Table 4.4 - Summary of Estimated CARs for Hypotheses

Variables	Condition(1)	Condition(2)
Project objectives	Execution CAR= -7.101	Planning CAR= -0.278
Project risk factor	Low CAR= -0.103	High CAR= -3.399
Project operation	Regular CAR= -0.221	Irrigular CAR= -6.212

As mentioned earlier, in this research it is intended to introduce reliable strategies and possible directions for project managers using the results of the methodology. Although cross-sectional linear regression test allow us to test the statistical significance of the differences (Carter and Price 2001; Agrawal, Kishore et al. 2006), there is no need to them in this research. Indeed, the significance of the overall model during the event

window indicated that at least one of the hypothesized predictors significantly influenced abnormal stock market reactions around the event date in each model.

In the next chapter these results will be analyzed in order to define strategic decisions for project managers in controlling exploration and drilling projects.

5. Analysis

Table 4.4 indicates negative abnormal returns for projects with execution purposes with large amount of negative CAR (-6.8319) than projects with planning intents (-3.138) in variable of project objectives. Exploration and drilling projects with low risk factors have slight positive returns (0.787) and high level of risk factors expectedly produced negative cumulative abnormal return of -3.138. Any announcements of project operation reveal negative reaction from market with very small amount for regular operation -0.221 and evidently huge negative movement of CAR (-6.212) for irregularity of project operation.

Presented hypotheses in Table 5.1 evaluate strategic decisions behind every drilling project and the supported hypotheses indeed prove project managers' choices.

Table 5.1 – Results for Hypotheses

Contingency Factor	Strategic Decision	Hypotheses
Project Objectives	There will be positive abnormal returns for exploration projects that oil and gas is being executed than projects that are launched with only planning intents. Any kind of oil and gas acquisition introduces execution positively will be reacted by markets.	Not Supported
Project Risk Factors	Announcements of a project with probability of occurring severe risk factors generate significant negative abnormal returns as compared to projects with lower degree of complexity in term of implementation.	Supported
Project Operation	Any announced information during life cycle an exploration project introduces change in project implementation will be awarded negatively. Irregularity in parameters such as planning, budgeting, scheduling, tasks, opening and closing dates raise stockholders' concerns and demonstrate further negative abnormal returns.	Supported

Analysis of supported or not supported hypotheses of the proposed model of this research in fact assesses PMs' strategic decisions related to every exploration and drilling project announced in financial markets. In the following section, the results of the event-study methods for the proposed hypotheses are analyzed.

5.1. UnSupported Hypotheses

The first proposed hypothesis was positive abnormal returns for exploration projects with purpose of oil acquisition rather than projects being launched with only planning intents. The expectations were positive reactions by stock markets related to exploration projects in previous oil wells and the fact that investors reward already launched projects was more predictable. In contrast, planning of drilling projects supposedly could reveal negative returns due to their unknown prospect. Nevertheless, as Table 5.1 shows, markets perceive projects execution as risky activities may affect company's assets and interrupt company's functionality. Indeed, perceptions of cash-flow in each phase and the size of the investment on an exploration may influence stockholders.

Measurement of cash flow can be used to evaluate the state or performance of a business or project. Furthermore, cash flow can generate project rate of returns. The time of cash flows into and out of projects are used as inputs to financial models such as internal rate of return, and net present value. Operational and investment cash flows are two major aspects in this concept (Wikipedia).

Operating cash flow, often referred to as working capital, is the cash flow generated from internal operations. It comes from sales of the product or service of your business, and because it is generated internally, it is under the companies' control. Investing cash flow is generated internally from non-operating activities. This includes investments in plant and equipment or other fixed assets, nonrecurring gains or losses, or other sources and uses of cash outside of normal operations.

Decisions based on project development, production, acquisition, and implementation rising tasks, phases and process of available oil fields are considered as perceived risks related to exploration announcements. Operating cash flow is the fact that projects with

implementation purposes might increase investors' concerns. Any drilling project could manipulate every-day production and consequently reduce oil production. Investors mainly concern about company's capabilities to control wells development and think of new partners, contractors, and agreements.

Size of exploration projects increases investing cash flow with regards to the phase in which the project is performed. Stockholders consider size of the project and its financial characteristics. A massive exploration project with a lot of complexities produces negative reaction in the market among investors. In fact, strategic decisions should define project characteristics with regards to investing cash flow.

On the other hand, the plan of drilling demonstrates prior research and studies to explore oil fields. These studies introduce multi-discipline studies performed by highly qualified consulting firms that identify new exploration project characteristics. Preliminary investigations essentially required for prospect oil fields identify reliable strategic decisions. Projects portfolios clarify different aspects of prospect exploration projects and stockholders' concerns evidently have been considered in it. Therefore, financial markets consider projects with planning objectives as projects with less risk perception rather than projects with execution intents.

5.2. Supported Hypotheses

H2 is supported with negative amount of CARs for projects with lower risk factors versus projects with higher probability of risks and uncertainties. Indeed, announcements of a project with chance of severe risk factors occurrence generate significant negative reaction among stockholders as compared to projects with lower degree of complexity in term of implementation. Results for H2 also demonstrate a little positive magnitude of returns in low risk projects for exploration projects. In contrast, announcement of high risk projects originate concerns in stock market, and the results of the proposed model estimate them as perceived risks. These risk factors, defined in chapter 2, may be derived from the drilling projects and/or initiate from the stock markets. Announcements of exploration projects in harsh environment, overseas, offshore, countries with complicated

political situations, legal, and economical uncertainties reveals concerns in stock markets. Thus, as the event-study results shows, high risk drilling projects must be identified in order to mitigate negative market reaction. Project managers designing *project need analysis* should reliably perform risk analysis to control, avoid, or mitigate high risk factors during project life cycle.

H3 hypothesis presents project functionality and the way it is being managed and demonstrates company capability and project managers' abilities to serve drilling projects. Any event announced will be awarded negatively if introducing change in project operation during its life cycle. Irregularity in parameters such as planning, budgeting, scheduling, tasks, opening and closing dates raise investors' concerns and cause further negative abnormal returns. As the results of this study show, irregularity in operation of a drilling project establish significant negative abnormal returns compared to a regularly managed drilling project. In fact, lack of regularity in project operation demonstrates poor quality in project management and can be a sign for project failure. Any change in schedule, budget, task, scope, and other project characters is considered as irregularity and produce negative returns. This area determines project managers' capabilities and strategic decisions correlated to managing project change establish confidence among investors.

5.3. Project Characteristics

Three contingencies defined in the model involve parameters of project characteristics in planning and execution phases. Project planning consists of some fundamentals in phases introduced in petroleum science including: exploration, appraisal, and development planning. Project operation in the proposed model of this study is also correlated with production phases and decommissioning.

Project planning indicates initial aspects of the project, company's intends, and probability of success during a project life cycle. Besides, project operation shows level of regularity in project execution, so that company's reports reflect functionality in running the project. Information released about project represents characteristics related

to it; moreover, it determines level of sensitivity in each project. Each project has its own unique parameters defined in initial stage and considered in its portfolio. Observing a project with respect to many aspects (i.e. legal, governmental, international, technical, financial, etc.) help managers (especially in business side) to identify other alternatives when project being executed. Consideration of project characteristics discloses perspectives that managers can draw a framework for their decision.

In the next section, decision-making regarding business side of a company and project environment are discussed.

5.4. Using Epistemology Approaches

Basically, stock market is an enterprise acting as a business and operated such as an organization. Powerful regulatory agencies and commissions run stock market and federal government and industries' associations are involved in there. People realize stock markets with their financial data and statistical results of the companies. Data displayed in stock market's board are outcomes of companies' stock price based on many complicated factors to identify or analyze. Financial analysts employ various statistical methods and economics approaches to describe those quantitative data. Event study method used for effective events is one of the statistical instruments. Before looking at stock market in which several of these methods are used, the ideology of the event study methodology is assessed.

The only rational source of quantitative data that event study uses is economics theory, a science based on natural sciences. Neutral-observation is the trend that companies are observed and provided data in charts and/or historical prices are obtained with neutral-observation of financial analysis of companies. There is no other estimation of company's information except that displayed on the market windows. No social activity or evaluation is involved in data gathering, and obviously the only observation for any investigation on data would be neutral. In event study methodology, the first step is to identify the events that affect a company. Company's chart is observed to indicate specific events. Moreover, data provided in Historical Prices for companies are related to

the data obtained from transactions without considering human role in process of data gathering. The choice of what being studied can be determined by objective criteria rather than by human beliefs and interests (value freedom).

5.4.1. Statistics Techniques as Positivism Approaches

Event study uses statistical formulas to compute row data from tables without any qualitative result at the end. Researcher is not being able to apply his/her thought of the row numbers presented on tables, and furthermore, the analyzing computed results would be based on inflexible process. The researcher might achieve different analysis if qualitative data computed another time based on many factors that event study considers them as assumption. Also, one may indicate different events influencing companies and may cause fluctuation rather than other events. These reasons demonstrate positivism epistemology associated with event study methodology.

In stock market, many economics theory and methods are employed and positivism epistemology is the dominant knowledge. The aim of stock market is economic efficiency provided by numbers. 'Intellectual property rights and the means of creating them are presenting serious challenges to contemporary financial reporting because main financial reports acknowledges an expenditure but usually does not acknowledge the assets creating by the expenditures'(Robertson and Lanfraconi, 2001). The empirical relationship between the independent variables (earnings, price, intrinsic value) and the dependent variable(stock price) suggests that variables not yet part of reported accounting information have a powerful impact on stock prices and returns.

An environment with tight regulatory as well as explanations are being demanded across the board by powerful regulatory agencies and commissions, such as the Securities and Exchange Commission, Financial Accounting Standards Board, New York Stock Exchange, and National Association of Securities Dealers. The judiciary is becoming increasingly proactive, vocal and public in the way in which it attempts to ensure that the managerial, financial and accounting excesses and practices that featured so prominently in the stock market bubble of the 1990s are discontinued (Paulo 2003). There is no

denying that notion of an omnipotent market is the corner-stone of all the theories of financial economics, furthermore, the idea of shareholders' value maximization is the top of the hierarchy of the goal of the agent/manager (Frankfurter 1999). Powerful regulatory agencies and commissions establish limitation for companies regardless of their functionality and organization's interests. They identify causal explanations and fundamental laws that explain regularities, and there is no social science and interest involved in establishing law and regulations.

Evidently, the dominant epistemology in stock market is positivism and its reality of actual world. It seems that authorities pretend to represent stock market as a financial market illustrated with high quality of financial analysis based on neutral-observed quantitative data. This study attempts to clarify that there is not real epistemology behind stock market.

Companies with publicly traded stock in the market should be able to pinpoint events and risk associated with them. It is required to identify impacts of the events on the company, its data, and on its tables/charts. In order to enable managers and others who are interested to invest in particular company and understand severity of the events and impacts of them on company's stock price, measurement is needed. Therefore, event study method is a reliable statistical tool which enables one to measure the impacts of events and predict the fluctuation. As mentioned, positivism approach at least establishes a dimension and assesses impacts and severity of the events. Row data illustrated in tables do not make any sense of knowledge or information. Also, positivism epistemology approach provides empirical sciences (here referred as financial methods) to have neutral-observed data that is preferred for analyzing. On one hand, while event study computes useful numbers, on the other hand, based on positivism epistemology these numbers could not be determined complete evaluation of a company qualification. With respect to positivism domination in stock market and financial analysis provided by various agencies, managers in every company should define other parameters inside the market and particular company to describe the results.

5.4.2. Stock Market and Postmodernism

Postmodernism approach elicits a sense of doubt on confidence in the utility and ethicality of statistical methods (such as event study). This concept of stock market's reality conduct us to think of statistical assumptions and errors determined constant during calculations, or other mathematical assessments of a company's outcomes, furthermore, financial outputs might not be reliable to describe any factor. This highlights the needs for investigation from another perspective into stock market and/or involvement of social science into the research. Following parts define major indicators to understand philosophy of clarifying an object.

I) The language of probability: Stock market uses language to make the world out to be what it wants it to be. This is certainly true of the idea which eventually came to be known as 'market efficiency.' In using the language of probability, one not only creates a metaphor of markets as 'games of chance,' but also asserts that, as games of chance, markets are 'fair.' One cannot avoid mentally associating the markets with games of chance. The metaphor for market is a 'fair game' not of chance, but skills and financial methods. With employing statistical methods to identify parameters widely implement in stock market, it is expected that probability and considering assumptions is dominant language there. Therefore, statistical parameters and formulas are broadly used in analysis, and make an environment where economics experts create a world of statistical data, charts, numbers, and unprocessed quantitative material. There is a language of financial factors and uncertain parameters that related to several assumptions.

II) Conventions and stock market language: Stock market is a business with many powerful agencies, associations and firms including various business activities working with each other. Its environment establishes a strong enterprise with regulations, rules, and requirements that only experts in one field can deal with that environment. Regardless of stock market's functionality, which demands many experts with several interest and background, only financial analysts interpret stock market's outcomes. They employ statistical methods to interpret data and also use market language to express their analysis based on the language expectedly assumed by the investors and authorities in the

market. Therefore, two factors establish specific language: 1) experts of one particular science to analyze the result, and 2) supposedly using financial terminology to express the results and analysis (Hassard 1999).

No doubt people use specific technical words or terminology in any business to describe their activities. However, what occurs in the market is establishing an environment in which experts with specific knowledge enable to interpret results. Further, no one except financial analysts making comments on the outputs that require having variety of interpretations to discuss about company's productivity. Investors and even stock brokers look at the market with respect to that kind of language. Using market language eliminates different perspectives, interests, and companies' environments.

The analysis and news published about stock market are expected to have financial terminology and particular language. The language is assumed to be financially professional that social behaviours are not involved there. As a result, no one attempts to employ the language used in social sciences when financial analysis involved. This kind of language has become the dominant language used in stock market. In short, stock market's linguistic representations are seen to create reality. Stock market has its behaviour and everyone whose job is related to the market has same attitude of idea relevant to market.

III) Constructionist ontology: Rules and legislation that require companies to consider certain regulations with unpredictable events and might interpret differently regarding the events. Basically, stock market's board members do not intend to cause fluctuation and uncertainty in transactions among investors or stock brokers. Therefore, if new law legislation establishes unpredictable result on almost every industry and sectors, they will try to interpret the law in a trend not affecting the market unexpectedly. Always, there is an opportunity to adopt a new policy to mitigate consequences of new legislations. Those ones who monitor and manage the market and know its conventions can interpret toward market's desire.

5.4.3. Summary of Stock Markets Characteristic

As it is evident, the center of the stock market is regulations and financial sciences, and in postmodernism, the power is not seen as being possessed by conscious agents, whether they are individuals or collectivises. In the case of management, this ability is employed in relation to people who lack such a command and who have no social legitimate claim to such knowledge. Therefore, in a sense, the deployment of any discourse is seen as empowering investors and stockholders who have right to speak and analyze. Postmodernists see power as being everywhere yet nowhere- as a relationship between subjects yet also independent of subjects where, 'it is not possible for knowledge not to engender power' (P. Johnson 2000). Therefore, positivist epistemology is the dominant knowledge in stock market and empowered sellers, buyers, and related firms by establishing regulations.

Neutral-observation, which is positivism trend to implement a research, would be the main issue for data gathering. None of quantitative data can be reliable, and need for different perception is essential to accomplish statistical methods properly. There might be no other way to present an evaluation of a company except through numbers; however, positivism employing the empirical sciences in studying objects establishes at least a common ground. Event studying methodology or other financial methods often provide numbers that no authority can interpret them expectedly.

In an environment in which financial science is the basic trend to look at the outcomes, positivism elicit itself, thereby persuading investors/observer to recognize this, can establish better understanding of raw material. In fact, positivism has achieved enough mistakes in its research methods and one intends to rely on its approach merely.

6. Implications

The findings of this research indicate that project managers must pay attention to two significant factors of project objectives and project operation. Projects with irregularity in their operation and level of execution in their strategic decisions disclose enormous negative abnormal returns in these two variables. In fact, perceived risks for exploration and drilling projects mean change in project operation and implementation of exploration projects. Markets are sensitive about how projects are being operated and any kind of project execution including development, acquisition, and execution.

In contrast, exploration projects with planning purposes and regular operation expectedly are perceived as elements with lower negative feedbacks by investors.

Projects with high severity of risks during their life cycle elicit concerns among investors comparing to those projects with low level of risk while are being implemented.

6.1. New Lessons of Risk Perceptions for Strategic Decisions

As described in previous chapters, directions of management style and decision-making process are established in two environments: stock markets and projects. Before defining directions for decision-making processes, one needs to determine some considerations that stock market and project demand. These considerations help us to realize reliable and possible directions consistent with these two systems and to determine the level of required movement in decision-making process.

Project environment confronts with technical fundamentals and project characteristics regardless of the location being assessed. Project characteristics from management point of view and project quality from engineer's perspective affect project success and reflect into financial statements (which reveal market reaction). Both management and engineer's aspects of each project encounter risk and uncertainty during their life cycle, thus the risk perceived from projects would involve the management and engineer's disciplines. The considerations of this study for identifying directions for decision-making process include managing projects that involves any aspects of project management in oil and gas industry and project management discipline.

The results of this study indicate that at least three choices managers need to know about their engagement in alliance activity can have a significant impact on shareholder value related risk. There has been also found some indication of firm size effects, event year effects and day-of-the-week effects that are not reported. Essentially, managers have many levers which they can use to shape or estimate the risk effects arising from alliance activity; however, the existing available literature that would guide their estimates of multiple lever effects is scant. While the options and related finance literatures provide some tools for appreciating the value of volatility, managers have few sources to make their decisions. Managers have often been found to be poor at risk assessment (McNamara and Bromiley 1997) due to their use of decision biases like representative (Tversky and Kahneman 1971) and overconfidence (Alpert and Raiffa 1982) in complex decisions involving risk (e.g.,(Schachter 1989). This study and others related to the risk effects of alliance activity stresses the need for additional training, study and appreciation of the amount that shareholder value can be affected by changes in risk. (Arend 2004)

Stock markets environments and described philosophy of the system establish a unique character of the markets that require ones with experience to analyze its events and subsystems. Links between financial markets and their different parameters demands experts in each industry to correspond their interests with the capital markets. Knowledge of epistemology approaches expressed in chapter 5 would assist managers in business side of every oil and gas company to communicate with the stockholders appropriately. Project managers need to correlate characteristics of exploration projects with stock markets' characteristics. According to the results of this research, project managers have to identify consequences of irregularities in project operation and execution in project objectives onto stock markets. Besides, impacts of risk factors and uncertainties onto stock markets must be clarified. Project portfolio could be considered to provide all these descriptions.

Drilling companies in oil and gas industry require establishing a link between their strategic decisions and risk perceptions respecting investors. They need to review

previous exploration projects to evaluate key elements influencing the financial markets, as well as being able to make appropriate decisions regarding different situations.

6.1.1. Company

Business environment demands for administration to streamline communication and collaboration so that companies need to employ business solutions regardless their business specifications.

Appropriate closure of a project has significant benefit for reducing risk on future projects. Whether the project is considered a success or a failure, the results should be documented and reviewed. These data can then be used in future planning processes to improve planning and reduce risk of failure. A project retrospective should be conducted and actions to be taken on the suggestions to improve processes for the future. Lack of action will reduce participation in subsequent retrospectives. There are many Web-based applications and solutions provided in Internet. Project intelligence solution is one of them.

The goal of a project intelligence solution for oil and gas is to provide tools that oil companies can use to better manage their capital projects and to deliver better visibility into project intelligence across the enterprise and its value chain. Through centralization, information can be made available to all stakeholders. A Web-based portal can provide a set of tools to all project members. Using enterprise resource management tools, project teams can better utilize all resources available to them. Finally, through better collaboration across project teams, tasks can be completed on time.

6.1.2. Impacts on Business Side

With respect to postmodernism conventions and linguistic create stock market's fundamentals; therefore, results of event analysis might be interpreted in many way. Risk factors identified through financial methods might be interpreted in different way, and understanding stock market linguistic to create parameters could assist one to identify risks evidently. Some risk factors defined by the event-study can be eliminated because

of lack of impact on project implementation or even business operation. If managers understand philosophy of some events and the reason when they occur, they can make decision reliably and mitigate those issues. Not only every fluctuation identified by methods is significant, but also methods cannot indicate every real fluctuation in market. Awareness of stock market, several agencies, laws and regulations could assist managers in top-level to define real risk factors after employing statistical methods and considering stock market linguistic. Moreover, it is crucial to understand the role of the authorities, their interpretation and possible reaction to events.

Based on different possible epistemologies selected for stock market to perceive essence of the risk factors associated with it, it is attempted in this study to provide several perspectives using different epistemologies to recognize and mitigate the risks. Project managers confront with risks related to projects, and managers in business environment deal with risk factors related to business operation. Both of them need to know consequences of the risks to elicit from the environment belonging to. With respect to different epistemologies described in lectures for stock market, managers can not rely on a specific epistemology to identify risks and important events that might not be represented on the stock price.

Events, company's announcements, and market fluctuations are consequences of many parameters internally or externally affecting companies and managers need to analyze conditions for human inquiry rather than theoretically observation of events and qualitative data. There are explanations behind every table and historical prices of the company that managers must be able to analyze them critically. Critical realism demands accurate qualitative data of the company from different perspective (several references) to achieve possible realities that change the essence of the results.

6.1.3. Stock Market Analysis

Stock market identification modifies our perceptions of strategic decisions in managing an exploration project during its life cycle. Stock market characteristics and stock market behaviours can reform the perspectives of researchers using the event-study in term of

events identification and sampling. Therefore, these two factors make up the face of the investigations.

Stock market characteristics are formed based on its environment and market behaviour. Market analysis with respect to market behaviours can identify reliably market directions so that constructing a framework of decision-making process is defined. In section of "Epistemology Approaches in Market", the ideas of stock market based on its behaviour and environment will be further discussed. Considering market reactions to any events and external factors help one to determine directions for decision-making analysis.

Stock market behaviours require fundamentals that are not essentially concerns of project characteristic. Thus, there is no distinction between exploration, drilling, acquisition, development or other well digging projects in oil and gas industry. At least, the majority of ones influencing trade of stocks in market have not recognized these technical aspects so far. The most important indicator for investors is to know how data presented in windows and traded stock being advertised or purchased determine the level of severity of risk perceived from announcement. As (Walls 2004) demonstrates, markets consider newly financial statements rather than strategic statements and react swiftly to financial reports demonstrating profit. Therefore, company announcements including projects that are presented in financial statements would provide positive movement recognized as positive returns. In fact, the technical descriptions of projects might take sympathy from a few experts in market. It means that event-study estimate results of announcing one particular factor. Stock market's consideration should also be acknowledged to define directions. Project characteristics obviously affect results of project success and illustrate project profitability; nevertheless for decision-making process, stock market's environment demands considerations that are not related to project but financial statements. Focus of decision makers must be on announcement, reports, and information released regarding the financial consequences of projects rather than project specifications. Then, the consideration of this study for identification of the direction for decision-making must include business processes, management and functionality of stock market behaviour and company interaction as well.

6.2. New Lessons for Project Management in the Oil & Gas Industry

Project Change

As J.G. Ross defines in his research (Ross 2004), risk and change have connectivity so that for defining probability of occurring an event. Risks during an exploration or drilling project represent change based on related sources including: scope, budget, timetable, or other concepts of the project. The results prove that change during project life cycle reveals negative Returns significantly. Therefore, managers should pay attention to any change released through company announcements in order to control fluctuation in company's stock price. Changes during project life cycle represent risk associated with exploration projects that managers should mitigate or control them. Project change management and studies in that domain could assist managers to operate projects regularly. Regular operation of a project both in its planning and execution phases shows company's capabilities of managing projects.

Another lesson that project managers learn from previously performed projects is to evaluate exploration projects in order to decrease the concerns among investors. Firms typically learn more about the value of a project as they invest over time and as uncertainties are resolved. Moreover, they often have managerial flexibility (also known as operating flexibility) to respond actively to this new information.

These aspects in decision-making process identify possible directions for project managers which will be discussed more in details in the following sections.

6.2.1. Evaluating Large Engineer Projects

Operating flexibility allows the decision maker to take a sequence of intermediate decisions, as new information is presented, and to eliminate unfavourable outcomes. The limitations such as discounted cash flow have led to the recommendation of real option (RO) and contingent claim analyses, which are natural extensions of financial option pricing theory to real life capital expenditure projects with option-like characteristics due to managerial flexibility. (Mattar and Charles 2006) would suggest that many large-scale

engineering and infrastructure projects are filled with private rather than straightforward unique risks; since they are either intentionally retained in the portfolio or cannot be diversified away (lessons learned in PM terminology).

The value of the portfolio is then simply the sum of the value of its parts. The risk-neutral approach is another mathematically equivalent way of applying the no-arbitrage principle to compute the option value (Cox and Ross 1976). This suggests that a solution for the problem, assuming a particular risk preference structure, must also be the solution for the problem for any other preference structures.

Other assumption is "complete market" that states that a replicating portfolio can be constructed whose value is perfectly correlated with the value of the project. In other words, stochastic changes in the value of the project are spanned by the existing market securities. If the market is complete with respect to the risks of a project, these risks can be perfectly hedged by trading securities. In fact, most real project risks can only be partly replicated by financial market. Since these risks are not spanned by market securities, they are not priced in the financial market. Valuing an undeveloped oil reserve is an example of a capital budgeting investment where RO valuation is extremely useful and fairly easy to apply (assuming that the development cost and the size of the reserve are known variables). The owner of the project has the option to acquire a developed reserve by exercising his option and incurring the development cost. On the other hand, consider an oil *exploration* project: In this case, the risks of not finding oil and the uncertainty about the size of the reserve are conventionally classified as unique risks. If the investor is an oil and gas firm possessing proprietary knowledge of the project and cutting-edge technology in exploration, it would make sense for the firm to hold the risk of the unknown size of the reserve. Thus, instead of evaluating this as a form of unique risk, the uncertainty about the size of the reserve would become a private risk that has happened to be uncorrelated with the market. Despite the fact that it is potentially diversifiable in a market context, the firm has chosen not to trade it. Therefore, project-specific risks can be private risks- it all depends on whether such risks possess the additional characteristics described above. Since the valuation procedures differ, the

distinction between market, unique and private risks is not an academic one and indeed bears significant implications (Mattar and Charles 2006).

6.2.2. During Project Life cycle

Project managers in oil and gas industry and project managers with different background define project life cycle processes unlikely. Whatever project phases and its processes are defined, there are two certain milestones in each project: soft part and hard part of a project. Hereby, soft part of a project is the time when a project is proposed, planned, and designed or initiated before doing any execution activities undertaken. Planning and execution phases demonstrate almost major project life cycle. In next sections, remarkable terms in planning phase showing course of action will be defined. Section of Execution Phase provides significant functions- time and budget, communication, and project characteristics- that influence decision-making process.

There are several sights to define project phases and processes with respect to academic disciplines and business aspects. As shown in chapter 2, in petroleum industry, managing exploration projects are taught in its own academic or business way. Projects in petroleum industry are based on field development including: exploration phase, appraisal phase, development planning, production phase, and decommissioning. Essentiality of this definition shows that project in oil and gas industry is identified with respect to field activities and mostly technical features of project. Investigation of phases introduced in this manner demonstrates financial concerns in development and decommissioning phases and technical aspects in exploration, appraisal, and production phases. Other parameters that describe a project accurately originate better belief of project environment. In this case, project management discipline can assist to find out reliable directions in both planning and execution phases.

The book of Project Management Institute "PMBOK" as a reference may confer broader description of project and its processes. The PMBOK provides several stages of a project: initiation, planning, controlling, executing and closure. Hereby, they are divided into two concepts: 1) planning/designing and 2) execution. Planning/designing is consistent with

initial and planning stages in PMBOK and execution part in this thesis covers controlling, executing, and closing in PMI's reference. The reason of this format is due to similar environment in those stages and consequently similar direction for decision-making.

6.2.3. Planning Phase

Now, the appropriate direction can be decided based on identified phases known for projects either in petroleum industry or PMBOK as both discipline afford this part anyhow. To manage and control factors influencing projects in this phase there is a need to consider the most effective term in project plan processes. All activities, studies, technical measurement and evaluations for oil reservoirs before exploration pinpoint appraisal and portfolio management to improve project selection in an Exploration and Production firm. Knowledge of appraisal and portfolio management define the appropriate courses as well as a plan of action in decision-making process.

6.2.3.1. Appraisal

Appraisal can be described as information provided for evaluating various conditions of production and development of a certain project. Thus, decisions with understanding uncertainties in an exploration project are more reliable. Based on significant factor of any risk and uncertain factors in announcements, the negative market reaction can be reduced with introducing accurate information of an exploration project appraisal.

The objective of performing appraisal activities on discovered accumulations is to reduce the uncertainty in the description of the hydrocarbon reservoir, and to provide information with which to make a decision on the next action. Appraisal activity, if performed, is the step in the field life cycle between the discovery of a hydrocarbon accumulation and its development. The role of appraisal is to provide cost-effective information with which the subsequent decision can be made. Cost-effective means that the value of a decision with provided information in appraisal is greater than the value of the decision without the appraisal.

Field appraisal is most commonly targeted at reducing the range of uncertainty in the volumes of hydrocarbons in place, where the hydrocarbons are, and the prediction of the performance of the reservoir during production. In this manner, seismic surveys are traditionally an exploration and appraisal tool.

Instead of reducing the uncertainty to optimize the development plan before development starts, appraisal and development may be performed simultaneously. The results of appraisal during the early development are used to determine the gathering with early production, which considerably helps the cash flow of a project.

6.2.3.2. Portfolio Management

Portfolio management also provides several options and courses which can be evaluated during decision-making process. Identified directions subsequent to portfolio analysis in planning stage offer likely decisions in order to reduce uncertainties both in business side and project environment.

Oil companies are increasingly applying techniques from several disciplines for decision analysis to improve the overall decision making. Portfolio analysis is one of those approaches which provide the exploration and production (E&P) decision maker a set of efficient portfolios, based on minimizing risk subject to a particular return. The portfolio analysis alone does not provide managerial guidance about which of these efficient portfolios is best for the firm. There are, however, important attributes of the decision analysis paradigm that link directly to choices made by the firm regarding modern portfolio analysis. Preference analysis, an important element of a comprehensive decision analysis, provides us a mechanism for measuring and applying a corporate risk-taking policy. Knowing the firm's attitude about taking financial risk is of significance in terms of selecting the appropriate portfolio of activities. (Walls 2004) employed modern portfolio management provided by (Markovitz 1991) in his research to improve project selection in exploration and production firms.

Much of modern portfolio management has been motivated by the seminal work of Harry Markowitz and his well known Markowitz optimization approach. Markowitz demonstrated how stock investors could select an efficient set of portfolios that would minimize the standard deviation (risk), subject to a particular portfolio return (expected return). (Markovitz 1991) showed through a classic quadratic optimization technique that investors could virtually eliminate their exposure to the unique or unsystematic risk associated with individual securities. The unsystematic risks are those risks specific to the business or industry. This ability to diversify away the unsystematic risk leaves the stock investor with a portfolio containing only the systematic or market-specific risks, such as inflation, purchasing power, and other market-wide risks. (Walls 2004) expectedly made the very reasonable assumption that investors and decision makers prefer less risk to more risk, all other things held constant. In other words, given a certain expected return, rational investors will always prefer assets and/or portfolios that have lower risk. It is important to note that in the case of capital projects, especially in the E&P sector, returns on projects may not be normally distributed. In any case, the notion behind diversification is that it works to reduce risk because returns of different assets do not move exactly together.

Then ,(Walls 2004) applied the Markowitz optimization approach to construct an "efficient set" of portfolios based on the notion of minimizing risk subject to a certain return. In order to undertake this analysis, it should be specified how much one can change the mix of assets in order to minimize risk at a specific return.

The portfolio optimization provides some interesting insights regarding the optimal mix of assets for the firm.

The basic principles of preference analysis imply that the attractiveness of alternatives should depend on the likelihood of the possible consequences of each alternative and the preferences of the decision makers for those consequences. By utilizing preference analysis, decision makers can incorporate their firm's financial risk propensity into their choices among alternative portfolios of projects. Though managers are evaluating portfolios which are very different in terms of their risk characteristics, the firm's

strength of preference for outcomes and aversion to risk can be consistently applied in the choice process. Preference analysis is appealing since it enables the firm's decision makers to utilize a relatively consistent measure of valuation across a broad range of portfolios. In addition, this approach provides a true measure of the financial expectation foregone when firms act in a risk-averse manner. Preference analysis provides a practical way for the firm to formulate and affect a consistent risk policy. This approach provides us a mean of mapping the firm's attitude about taking on risky projects in the form of a utility function.

In an empirical study of U.S.-based oil companies, (Dyer 1996) have shown that firms are risk-averse and that financial risk tolerance does significantly impact firm performance (Walls 2004). Employing portfolio management techniques help project managers and the ones in oil and gas exploration companies to determine strategic decisions regarding identified risk perceptions.

6.2.4. Execution Phase

Results of the analysis need to be communicated and the adjustments need to be made through a change management and/or issue resolution process. Not surprisingly, time and budget are the most remarkable term described in each section that include project management concept in entire industries. In addition, rarely other responsibilities of project managers are investigated. These responsibilities can be transformed into capabilities. This offers new directions for decision-making process and emerges innovation in it. Hereby, communication is presented as an important factor in preparing announcement, and also project characteristics as significant factors in controlling and preventing uncertainties during project execution.

6.2.4.1. Time and Budget

Project managers are concerned about time, schedule, and budget while managing projects in hydrocarbon exploration and production disciplines. Even managers in business environment think of project managers as the ones mostly controlling project processes to be implemented on-time and on-budget. For instance, Frank John, Mark

Cook and Mark Graham in their book (John, Cook et al. 1998), Hydrocarbon Exploration and Production, explain process, responsibilities, and approaches project managers undertake to deliver a project. They focus on controlling and monitoring projects to be on-time and on-budget. In fact, the most significant part of project managers' responsibilities is to deliver a project on-time and on-budget and any announcement of project failure in term of schedule and cost elicit market reaction in negative way. As event-study's results in this research show, change in financial cost of a project or delay in project closure reveals negative returns and managers in both side (field and business) should avoid that. As a result:

- Managers in companies must identify courses that minimize the consequences of overtime and/or over-budget of a project in company's announcement. They cannot perform techniques against overtime and over-budget, but they can employ different techniques to eliminate the penalty of overtime and over-budget on stock market. In decision-making this approaches are defined.

- Project managers in oil and gas production fields must be able to avoid project failure in term of schedule and cost. There are many techniques in petroleum industry and project management discipline to cope with financial and schedule issues. In forthcoming sections, some related solutions are provided.

6.2.4.2. Communication

According to the existing literature, none of the previous works determined the term of communication despite of its momentous role in changing events and company's action in stock market. Although managers believe in communication as important factor that affects regulations, functionality of communication has not been assessed during decision-making analysis so far. Particularly announcing exploration projects demand communication with respect to the market sensitivity on project change and risk factors. Relationship between managements in business and project managers establish a direction which can mitigate the results of negative returns in market. Reducing irregularity reported in company announcement could be performed only with good

understanding of project's condition among managers and project managers. Project managers already recognize communication as important criteria for controlling and monitoring projects, however, it could be perceived as course of action during process of decision-making.

Using communication to analyze and prepare announcements also help managers in business side to identify effective events. Content analysis which is widely used to identify events in event-study requires accurate communication among managers involved in stock market and project managers concerned about projects. Therefore, communication as one major direction is proposed during project life cycle.

6.2.5. Projects in Exploration Fields: Lessons Learned

(Eduardo Bautista 2000) shows how Management Improvement Program improves management and performance of an agricultural system through structured diagnosis, planning, and implementation activities with the participation of system stakeholders. They categorize lessons about the project's management in six areas: the initial exploration phase, initial planning, participant on-boarding, formation of the process management team, development of the local control group, and evaluation of the project. A key aspect of conducting a change process such as the MIP for improving the performance of agriculture systems is that issues affecting the system may be difficult to identify early in the process or may require longer-term solution extending beyond the life of the formal process. Because of this uncertainty, a detailed action plan, the role of participants and measures for evaluating progress or impact are also likely to be uncertain early in the project. Although their findings targeted agriculture systems, provided conclusions of this study for exploration projects can be applied because of the fact that they recognize fundamentals of the projects in a system. Likely it enables us to employ the scheme of project characteristics for project planning and project change management. They define that the initial exploration serves to:

- Define the intervention's objectives and its expected outcomes

- Differentiate between broad objectives/outcomes and the range of potential changes/activities that may be required in response to findings,

- Identify stakeholders who need to be involved and define their roles.

The initial exploration, as carried out, was successful in the following respects:

- It created the required level of understanding and excitement about the process among agencies.

- It developed objectives that were broad enough to set the process in motion and adaptable to the particular circumstances of the irrigated area that would be selected.

A more likely scenario is that an MIP would be sought by stakeholder group with some specifically defined objectives in mind. In such situations, carrying out the initial planning, identifying expected outcomes, defining the role of management team, and identifying the initial local leadership should be more straightforward (Eduardo Bautista 2000). Indeed, project managers could implement these finding to manage projects in oil and gas industry. Projects are technically different in unlike industries, nevertheless from management's perspective they have same routines.

As described earlier, project management has distinct concept of what is perceived in petroleum industry and relevant sectors such as: gas pipeline, exploration and production, marine and mine industry. Project management is described technically in some textbooks (for instance (John, Cook et al. 1998) in petroleum discipline. Project managers in oil and gas industry deliver and conduct projects technically rather than managerially. Although that seems manifest, managers can employ PM's perceptions to manage projects in petroleum discipline according to the results of this study which present PM definitions applicable in exploration projects. Project phases are determined chronologically based on exploring and then producing oil in energy sector.

Hence, application of research displayed in Table (1) defines a summary on how project managers can utilize this research's contribution.

Table 1 - Applications

Applicable-in	Applications
Terminology	• Determining elements of a project and its processes based on PMI's definitions • Assuming a project regards management's point of view as well as engineer elements in project proposal and initial phases
Exploration & Appraisal phases	• Portfolio management and prospective oil and gas fields • Reduce uncertainties and sensitivity analysis • Feasibility studies • Evaluation of production capacity
Development Planning phase	• Preparing Communication documentation • Giving shareholders confidence with providing accurate and appropriate information (reports, announcements...) • During decision-making process with top-managers • Project planning and budget proposal
Decommissioning & production phases	• Project change management & project implication

7. Conclusion

So far, the results of an event-study have been presented which have examined and estimated stock market reactions to attributes of publicly announced exploration projects. Now, the findings and deliverables of this research can construct a framework for strategic decision process. Research contribution and its implications enable project managers in petroleum discipline to manage drilling projects based on stockholders and stock market fluctuations. The event-study's results determine the directions for project managers to apply techniques that project managers from other disciplines employ.

Philosophy behind the financial markets investigated in this thesis assist project managers in the business side to prepare, interpret, and evaluate exploration projects announced in stock markets. Moreover, analysts in many relevant sectors could utilize contributions of the research to predict and analyze market behaviours.

The following parts introduce research outcomes and deliverables which establish an approach to employ a statistical technique for strategic decision process.

7.1. Summary of Findings

This study improves managerial style used by project managers dealing with exploration and drilling projects in oil and gas industry. Project managers in many relative industries can employ techniques and approaches provided in this research deliverables. Table 1 summarizes the hypotheses and corresponding findings.

This research has used cumulative abnormal returns as a dependent variable to estimate market reaction and to evaluate project managers' strategic decisions. The results of this study determine that not only the market recognized an exploration project when it is announced, but also awarded negatively or positively depending on different variables identified in the proposed model. These variables shown in Table 7.1 have been tested to define level of influences associated with exploration projects.

Table 7.1 – Summary of Findings

Hypotheses	variables	Hypothesized Influence on Abnormal Returns	Confirmed?
Positive abnormal returns for exploration projects that oil and gas is being executed than projects that are launched with only planning intents. Oil and gas acquisition introducing execution positively will be reacted by markets	Project Objective	Positive	Not Supported
Announcements of a project with probability of occurring severe risk factors generate significant negative abnormal returns as compared to projects with lower degree of complexity in term of implementation.	Project risk Factors	Negative	Supported
Change in project implementation will be awarded negatively. Irregularity in planning, budgeting, scheduling, tasks, opening and closing dates raise stockholders' concerns and demonstrate further negative abnormal returns.	Project Operation	Negative	Supported

The findings of this investigation did not support the fact that exploration project with development and oil acquisition intents positively rewarded more than projects with planning purposes. The calculated results also supported hypotheses of negative returns of an exploration project with high level of risk factors being either internal or external. Furthermore, the event-study's outcomes indicate that changes during project planning or designing elicit significant negative returns and demonstrate maximum risks that investors perceived from project operation.

Thus, some directions should be addressed in order to deal with "change" and "risk factors" during project life cycle. Portfolio management, as a procedure that consists of major project characteristics is introduced for planning phases presenting major negative market returns. Moreover, epistemology approaches show solutions for event identification, market characteristic analysis, and clarify market behaviours. In term of project execution, Project Management approaches described by PMI in PMBOK were used to manage projects in project execution (these techniques can be used for project portfolio).

To remain competitive, companies must effectively deploy their capital to maximize returns and minimize risks. For oil companies, this deployment of capital (the portfolio of properties where they invest, and the type, timing, magnitude and shape of the investments they make in these properties) is also influenced, among other things, by the firm's tolerance for financial risk. Most companies generally do not have a systematic process in place to evaluate projects outside of their current inventory or, more importantly, alternative mixes of their current project inventory. As another benefit, integrating portfolio management and the performance analysis approach also enables the firm to incorporate their financial risk tolerance into the portfolio selection process. This step is generally intuitive to the decision maker who has an abundance of knowledge about the individual characteristics of the assets in the portfolio- and what financial risks he/she faces. This approach enables the manager to evaluate and understand the explicit tradeoffs between risks and return the impact of the firms' attitude about those tradeoffs (Walls 2004).

7.1.1. Deliverables

This research describes how the proposed framework could be exploited in a number of finance applications such as portfolio selection, risk management and etc.

The main idea of using PMBOK techniques and applying event-study in decision-making process is the most significant contribution of this research. Event-study rarely has been employed to assist managers during different stages of decision-making. Besides, event-

study is always used because of its assistance to business processes and evaluation of particular projects. The methodology is known for its assessments of business functionality after applying specific modification into business. This modification could be any type of project for business development or any kind of strategic performances. To achieve the primary goals of this study, the estimated results of market returns for managers were exploited in order to enable them to identify appropriate decisions during life cycle of exploration projects in oil and gas industry. Besides, event-study is utilized for managing a particular project instead of evaluating its functionality.

Three contingencies have been identified in this research: project objectives, project risk factors, and project operation that mostly cover stakeholders concerns including investors and the ones analyzing the events. These variables describe various characteristics of exploration projects and present parameters expectedly investors recognize as risk associated with a drilling announcement. The estimated results of this research show that market response positively to announcement of planning a drilling project more than exploration in a prior oil/gas field. Furthermore, projects with high severity of risk cause negative abnormal returns and projects with low level of risk receive positive respond even though these variations are not significant. Computed results also expose that any change in project operation reveal negative respond among stockholders more than what is expected.

With respect to several decisions made by companies and the performed literature review, the solutions concerning business features and functionality of projects have been classified. Project management terminology is provided as an important perspective to define project characteristics throughout project life cycle. Several techniques presented in PMBOK are suggested to construct a decision-making analysis for managing projects. Portfolio management has been provided as another answer to mitigate consequences of announcements in market. Furthermore, epistemology approaches were employed to comprehend capital market's environment and clarify business's realities. Stock market behaviour conducts capital market toward unpredictable movement that statistical methods can not estimate. This sort of climate demands understanding knowledge beyond

market that forms most movements. A framework was provided which enables project managers widely to analyze different situations and obtain reliable strategies to control drilling and exploration projects.

The applications of this study were indicated directly related to the topic: managing exploration projects and stock market. It has been also argued how estimated results of the methodology could assist managers to conduct solid projects in field of exploration and drilling. In addition, the directions for managers in business side were presented to make decision during project execution.

7.1.2. Application

Research contributions reveal applications that can be applied in I) managing exploration projects, and II) stock market. In course of identifying strategies in the model, several areas have been realized that research outcome can be applied including: project phases, project need analysis, portfolio management, project change management, decision-making process, and project management in petroleum industry. All these areas indicate domain of project management specifically "exploration" in oil and gas industry. Thus, project management in petroleum industry can exercise these approaches as applications in term of decision-making process. Application of several approaches accomplished from the research can be employed to analyze financial markets. Based on different perspective shown in stock market, their applications may be applied to analyze stock market characteristics.

7.1.3. Using PM Techniques and Approaches

Based on contingencies defined, the PM techniques and approaches were provided to establish reliable alternatives. Managers can redesign project components with using PM perspective. Project management area of knowledge involves processes that include most concerns in every exploration project. PMBOK defines project phases more detailed with capability of applying to many disciplines and businesses.

The proposed research model of this study shows "changes" and "high risks" playing a significant role in earning negative returns. Therefore, chapters dealing with these important factors in PM assist project management teams in different departments (either in site or at office) to manage projects and related materials (announcements, documents, reports, financial statements, and so on). In the next section, chapters in PMBOK that may help entire industry are introduced.

Knowledge areas consist of: Project Integration Management, Project Scope Management, Project Time Management, Project Cost Management, Project Communications Management, Project Risk Management, and Project Procurement management. PMI indicates introductory material applicable to all these domains.

- Project Integration Management, describes the processes and activities that integrate the various elements of project management, which are identified, defined, combined unified and coordinated within the Project Management Process Groups. It consists of the Development Project Charter, Development Preliminary Project Scope Statement, Develop Project Management Plan, Direct and Manage Project Execution, Monitor and Control Project Work, Integrated Change control, and Close Project management processes.

- Project Scope Management, describes the processes involved in ascertaining that the project includes all the work required, and only the work required, to complete the project successfully. It consists of the Scope Planning, Scope definition, Create WBS, scope Verification, and Scope Control project management processes.

- Project Time Management, describes the processes concerning the timely completion of the project. It consists of the Activity Definition, Activity Sequencing, Activity Resource Estimating, Activity Duration Estimating, Schedule Development, and Schedule Control project management processes.

- Project Cost Management, describes the processes involved in planning, estimating, budgeting, and controlling costs so that the project is completed with the approved

budget. It consists of the Cost Estimating, Cost Budgeting, and Cost Control project management processes.

- Project Communication Management, describes the processes concerning the timely and appropriate generation, collection, dissemination, storage and ultimate disposition of project information. It consists of the Communications Planning, Information Distribution, Performance Reporting, and manage Stakeholders project management processes.

- Project Risk Management, describes the processes concerned with conducting risk management on a project. It consists of the Risk Management Planning, Risk Identification, Qualitative Risks Analysis, Quantitative Risk Analysis, Risk Response Planning, and Risk Monitoring and Control project management processes.

Project change management, based on the research model, should be considered in order to deal with any change during project life cycle and to establish confidence among stockholders. Change management also concerns about changes in project scope, characteristics, time, budget, and objectives. Some techniques defined in PMBOK could solve these issues. Either planning phase or execution phase could be linked to areas defined in PMBOK to mitigate the impacts of changes, or avoid them, and estimate the consequences of them.

7.1.4. Portfolio Management

In this research, portfolio is deemed as an important part of a project that describes many levels and layers of exploration project. The research model defines the significant role of portfolio in characterizing drilling projects. Portfolio management as a trend can assist project managers to screen exploration projects during their life cycle.

In portfolio, an important conceptual step is to consider the portfolio as a collection of projects. Indeed, portfolio demonstrates projects in different degrees of maturity rather than as individual prospects and fields, so that changes uncertainties and perceived risks defined accurately. Defined projects are the link between the petroleum accumulation and

the decision-making process, including budget allocation (Ross 2004). An individual project may, for example, constitute the drilling of an exploration well on a prospect, the development of a single reservoir or field, an incremental development for a producing field, or the integrated development of a group of fields. A project should be defined in terms of the bias on which a decision made whether or not to proceed with that exploration or development activity. Each project can be characterized in terms of (a) risk, the probability of the project achieving commercial production and hence revenue, and (b) uncertainty, being the range of estimated recoverable volumes and monetary values resulting from that financial commitment, should the project proceed. By classifying and evaluating projects with respect to their maturity, both the application of portfolio techniques and the decision-making process itself can be facilitated.

Establishing and implementing a meaningful basis for characterizing projects within an exploration and production (E&P) portfolio is a fundamental step that must precede any consideration of portfolio management, such as the use of portfolio analysis and optimization techniques. Assets within the portfolio should first be defined in terms of projects that can be evaluated on a consistent basis regardless of their level of maturity so that a composite database of projects, incorporating their associated risks and uncertainties, can be subjected to comparative analysis methods. The value of any project must incorporate consideration of both risk and uncertainty, and can be determined on a standalone basis relatively easily. More difficult, but extremely important, is the recognition and incorporation of potential dependencies between projects and the additional value that should be derived from any real options that each project may bring to the portfolio.

While the limitations of single deterministic estimates of volume or value are well recognized, the incorporation of uncertainty in analyses has still not overcome the desire to characterize projects or even entire portfolios too simplistically, e.g. with two single numbers (such as value and "risk"). Portfolio management decision-making is not a process that can be fully automated through the use of computer software, however sophisticated programs may be. The analysis tools can nevertheless provide an excellence

on which combinations of projects, and their timing, are more likely to satisfy the incorporative objectives when subject to its constraints (such as funding) than others. However, for such a process to be successful, it is axiomatic for the portfolio being evaluated and characterized using a consistent philosophy.

7.1.5. Uncertainty

Uncertainty may be addressed by constructing a base case which represents the most probable outcome, and then performing sensitivities around this case to determine which of the inputs the project is most vulnerable to. The most influential parameters may then be studied more carefully. Fiscal, technical, and economic data gathered to construct a project cash flow carry uncertainty.

In order to test the economic performance of the project to variation in the base case estimates for the input data, sensitivity analysis is performed. This shows how robust the project is to variation in one or more parameters, and also highlights which of the inputs the project economics is more sensitive to. These inputs can then be addressed more specifically.

Respecting two environments of the research and their characteristics, two major perspectives are constructed for management directions in each system. A direction related to the soft part of every company and business processes are touched in section 6.3 in which philosophy of the stock market with respect to its behaviours is assessed. Understanding knowledge behind stock market enables managers in business part to draw their framework during decision-making process. Also, direction in the part of company executing projects demands deeply understanding of project life cycle. Planning and execution phases of each project are explained in order to determine possible direction and reliable management style.

7.1.6. Relevant Sectors in Stock Market

Many businesses and organizations may gain profit of the event-study results related to a specific project in several sectors in stock markets. Investigation in markets behaviours

and characteristics introduce perspectives that transform managers' decision and businesses performances into more reliable functions.

Managers in business side of a company whose stock is traded publicly confront with market fluctuations and many financial aspects of a project. Results of this research indicate that managers in oil and gas companies can set up approaches used in this research to understand market behaviour. This kind of perception was revealed in the course of event identification while contingency factors and variables were determined. Epistemology approaches described here are valid and useful in terms of analyzing and identifying influential events, and also for interaction between company and firms relevant to stock market.

7.2. Limitations of This Study

In cases where the event date is difficult to identify or the event is partially anticipated, studies have been less useful. For example, the wealth effects of regulatory changes for affected entities can be difficult to detect using event study methodology. The problem is that regulatory changes are often a debate in the political arena over time and any accompanying wealth effects generally will gradually be incorporated into the value of a corporation as the probability of the changes being adopted increases.

(Graddy, Kyle et al. 2004) illustrate the board conclusion of (MacKinlay 1997) literature review. "An important characteristic of a successful event study is the ability to identify precisely the date of the event". In cases where the event date is difficult to identify or the event is partially anticipated, studies have been less useful. Therefore, although this study has attempted to identify influential events affecting the market, it is not possible to identify date of direct impact and specify its time period. This is weakness of the methodology that relies on researcher understanding and evaluation. In fact, there is not reliable way for event analysis and identification. The results may change if the event-study is applied for the same events.

As (Baum and Oliver 1991) indicate, there are number of limitations to that study given the sample. At worst, the analysis and results may be interrupted to apply only to leading large firms. Even if this interpretation is the case, the lessons regarding the strategic decisions are valuable as most of the exploration projects and activities involve leading large firms. There might be some additional considerations applied in order to make strategic decisions for small size companies performing drilling including sub-contractors and/or partners in projects. Some partners and contractors participate in a project with another company set up conditions during project life cycle that make it difficult to compose a project portfolio reliably with accurate information.

7.3. Recommendations for future works

The results of the research elicit new domains to investigate: I) applying project management style in petroleum industry, II) employing project management techniques in portfolio management, III) investigating the role of the event-study in entire project process, and IV) stock market identification.

Research contributions to oil and gas industry point out unlike perceptions of project management in petroleum discipline. Project process definitions and characteristics would be important criteria to challenge traditional beliefs in petroleum discipline of project division into: exploration, appraisal, development planning, production, and decommissioning. Based on PMBOK perspective, project phases are defined unlikely. Correspondence project management with Exploration and Production identifies new area of research. Engineers and project managers can involve PMI perspectives for their project identification and analysis. Project management provides techniques and define considerations mostly influencing any kind of projects and its approaches can be employed to identify them in oil and gas industry as well. Corresponding petroleum discipline's perceptions related to project management with PMBOK needs deliberations that should be established. Project managers in petroleum industry are the ones who can perform and define that correlation.

Another field of investigation could be enhancement of the present research in area of portfolio management. Variables of project operation and project objectives highlight the major concerns in each project announcement, and parameters of these two contingencies are significant elements of every project portfolio. Therefore, research in utilizing portfolio management assists project managers for the strategic decision during project life cycle.

Researchers may develop this topic in order to pinpoint the event-study's role in entire process of decision-making from project design to project closure. Although the event-study methodology has been one of the interesting financial methods to identify perceived risks, it could be applied for project management purposes as well.

The third possible domain of study may be stock market identifications and characteristics. Epistemology approaches contributed in this thesis involve several perspectives to analyze stock market's outputs and criticize event-study results. Thus, role of market behaviour in event-study methodology and determining reliability of its results reveal another area of research.

Appendix

Table 1 - Significant Factors Associated with Business

Business-related index	Terms
Legal proceeding	• agreements (merger, contract, association, partnership, and so on), Private Securities Litigation Reform Act, indemnification, permits, leasing, insurances
Financial	• changing in foreign currency exchange rates, inability of the company to deliver its backlog on time, volatility in general economic and social conditions, transaction gains or losses, change in foreign tax laws, market interest rate, stock market fluctuations
Organizational	• board members, portfolio, awards, association memberships, business behaviours, management, business partners, administration
Politics and governments	• nationalization, expropriation, war, act of terrorism and civil disturbance, restrictive action by local government
Oil and gas industry	• volatility in demand and price, OPEC decisions, Non-OPEC countries, exploration technologies

Table 2 Significant Factors Associated with Exploration and Drilling Projects

Project-related index	Terms
Business	administration and communication, partners and contractors, market and financial factors, permits and agreements
Technology	engineering, manufacturing, tools and equipments, maintenance, designing, transportation
Environment	weather, seasons, location, pollution(sea or water, sand), waste material disposal
Management	project management, operation management, contract management,

Table 3- Activities Related to Projects Regard Several Factors

Index	Company's portfolio
Material	Oil, gas, natural gas special fluids, gasoline, natural gas, crude oil, diesel, jet heating oil, synthetic gas, ethane, propane, butanes, pentanes fuel, Liquid Petroleum Gas(LPG), refined products, distillates, aviation fuels, lubricants, and so on
Industry	Exploration, drilling, independent, integrated, refining, marketing, equipment & services, gas utility, pipeline, emerging businesses
Nationality	North America, Middle East, South America, Europe, Africa, Asia
Area of	Locally, nation wide, international, offshore, onshore, deep sea

activity	
Interesting regions	U.S gulf of Mexico, the North Sea, West Africa, the Mediterranean Sea, South East Asia, South America, The Middle East, Canada, China, Turkmenistan, Kazakhstan, Trinidad & Tobago, Azerbaijan, Russia, Asia Pacific, Australia, and so on
Size	Full-time employee, assets, services
Sector	Energy, environment, mining, marine, petrochemical
Capabilities	Development, production, transportation, exploration, acquisition, engineering, manufacturing, contracting (rental equipments and tools, labour contract drilling, services), chemical, marketing, pipeline, refining
Engineering	Designing, planning, execution, contracting, geological, software, laboratory, maintenance, mineral, operating, compressing, mineral, treating, processing, fractionating, environmental services (dredging, oil sludge disposal), sweet water processing & gathering systems, pumping, exploratory & development oil and gas wells, installation, drilling rigs, production platform, seismic data transcription, convention and transcription software, water injection services, dehydrating, fractionates NGL products, Jack-up rigs, monitoring of gas utilization, operating hazards, and etc.

Table 4 – Contribution & Parameters in Each Phase

Phases	Milestone 1	Milestone 2	Milestone 3
Investigated Industry	• Equipment & Services • Exploration & Drilling • Gas utilities • Independent Oil & Gas • Integrated Oil & Gas • Oil & Gas Pipelines • Refining & Marketing	• Exploration & Drilling • Independent Oil & Gas	• Exploration & Drilling • Independent Oil & Gas
Companies	107	60	46
Which Data	• Quotes • Historical prices, Basic chart, • Headlines, Company events, • profile Key statistics, Analyst opinion	• Headlines • Basic chart • Company events	• Headlines • Company events
How	• Scan, skim, and review qualitative information	Compare, investigate, and evaluate announcements	Analyze and categorize events

How	• Observe quantitative data • Compare charts		
Methodology	Event Study not applied	Determining Period time, estimated time, and window in order to identify events	• Identifying contingency factors • Determining model of the methodology
Results	• Defining particular industry • Defining risk factors • Understanding research environment • Recognizing stock market parameters	• Identifying Key elements of the research • Indicating significant events and companies • Collecting companies(sampling) • Evaluating affective events	• Calculated CARs • Identifying Significance hypotheses • Determining possible directions for decision-making process • Proposing applicable management style regard directions

Table 5 – List of Companies

Exploration & Drilling	
Arena Resources Inc.(ARD)	Rowan Companies Inc.(RDC)
Atlas Energy Recources(ATN)	Statoil ASA(STO)
Atwood Oceanics Inc.(ATW)	Tengasco Inc.(TGC)
Bronco Drilling COMP(BRNC)	Transmeridian Exploration Inc.(TMY)
Big Sky Energy Corp.(BSKO.PK)	United Heritage Corp.(UHCP)
China North East(CNEH.OB)	Unit Corp.(UNT)
Cygnus Oil(CYNS.PK)	Westside Energy Corp.(WHI)
Diamond Offshore Drilling Inc.(DO)	Whiting Petroleum Corp.(WLL)
Deepwill Oil & Gas(DWOG.PK)	W&T Offshoring inc.(WTI)
Energy Exploration Inc.(ENXTF.OB)	Nexen(NXY)
Ensco International Inc.(ESV)	Pioneer Drilling Co.(PDC)
Georesources Inc. (GEOI)	Pride International Inc.(PDE)
Geoglobal Resources Inc.(GGR)	Parker Drilling Co.(PKD)
Hyperdinamics Corp.(HDY)	Quest Resource Corp.(QRCP)
Hiland Partners(HLND)	
Ivanhoe Energy Inc.(IVAN)	
Jedoil Inc.(JDO)	
Key Energy Services Inc.(KEG)	
Markwest Energy PartnersLP(MWE)	

Nobel Corp.(NE)	
Nessenergy International Inc.(NESS.PK)	
Ngas Resources Inc.(NGAS)	
Independent Oil & Gas	
Anadarko Petroleum Corp.(APC)	
BG Group(BG.L)	
Cabot Oil(COG)	
Canadian National Resources Inc.(CNQ)	
Delta Petroleum Corp.(DPTR)	
Goodrich Petroleum Corp.(GDP)	
Mexco Energy(MXC)	
National Energy Inc.(NEGI)	

Table 6 – Announcements and Their Identifications

Company Index	Event Date	Announcement	Event Analysis
ARD	Dec 12th,07	Adds an estimated 8Mill barrels of oil equivalent of proved reserves in West Texas (Buys oil and Gas Properties)- Acquisition	exe-low-reg
ATN	Sep4th,07	Purchased on Additional 5.2 Bcfe of Proved natural gas reserves for $ 10.7 Mill already operates in Northern Michigan - acuisition	exe- low-reg
ATN	Aug15th,07	Announces Acquisition of application assets" it has completed the acquisition of gas gathering and processing assets located in McKean Country, Pennsylvania" - acquisition	exe-low-reg

ATN	Mar 27th,07	Annual Report : Drilling project successful	exe-low-reg
ATW	Dec 4th,07	Offshore drilling's shares weakened as oil prices dropped-uncertainty over weather the OPEC will raise production quotes at its meeting	exe-high-irreg
ATW	Nov 29th,07	Annual Report	exe-low-reg
ATW	Nov 28th,07	Announcement of two drilling-exploration and development conditional	exe-high-irreg
BRNC	Dec 11th,07	Announces monthly operating-going down rigs operates-conditional	exe-high-irreg
BRNC	Mar 8th,07	Annual Report- projects development and acquisitions	exe-low-reg
BSKO.PK	Nov 7th,07	International court in Almaty Kazakhstan not sooner	exe-high-irreg
CNEH.OB	Apr 16th,07	Annual Report- acquisition, development, and production	exe-low-reg
CYNS.PK	Apr 5th ,07	Apr 3rd, 07 Bankruptcy field....	exe-high-irreg
DO	Dec 4th ,07	Oil price affect entire industry	exe-high-irreg
DO	Dec 3rd ,07	Diamond offshore gets four contracts worth $2.3billion deep water work offshore Brazil 1 new & 3 extensions	plan-high-irreg
DO	Nov 29th,07	Announces new semisubmersible rig commitments-exploration	plan-high-irreg
DWOG.PK	Dec 10th,07	Purchases seismic information and plans winter drilling program- development and production	plan-low-reg
DWOG.PK	Feb 23rd,07	Annual Report	exe-low-reg

ENXTF.OB	Dec 5th, 07	Announce drilling plans on stress-field detection- development	exe-low-irreg
ESV	Dec 17th,07	Development and production announcement	plan-low-reg
GGR	Dec 5th,07	The current status of its exploration drilling activities on their exploration blocks in India – (plan/design & implication)- development and production conditional	exe-high-irreg
GGR	Sep 24th,07	Announces successful test & provides exploration drilling update design test	exe-low-reg
GIFI	Mar 16th,07	Annual Report – production and acquisition	exe-low-reg
HDY	Nov 26th,07	Hyper-dynamics documents evidence of oil prone hydrocarbon systems offshore Guinea	Plan-low-irreg
HLND	Mar 16th,07	Annual Report – production and acquisition	exe-low-reg
IVAN	Jan 4th,07	Ivanhoe to enter phase II of the Sichuan gas project in China – exploration and production	exe-low-reg
IVAN	Nov 8th,07	Third quarter results & operation update – production and development	exe-low-reg
JDO	Nov 29th,07	Announces production and drilling update	exe-low-reg
MWE	Nov 5th,07	Annual Report	exe-low-reg
NE	Nov 29th,07	Report on incident aboard the drillship Nobel Roger Eason – exploration	exe-high-irreg
KEG	Dec 10th,07	Announces "it has acquired the well service assets of Kings oil tools." – acquisition and production	exe-low-reg
KEG	Dec 14th,07	Announces " Rig and trucking hours" – acquisition and production – operation	exe-low-reg
KEG	Nov 7th,07	Announces " rig operation and truck hours"	exe-low-reg

KEG	Oct 29th,07	Acquisition of oil and rig operator	exe-low-reg
NESS.PK	Apr 17th,07	Annual Report – Future abandonment costs include costs to dismantle & relocate or dispose of production platforms, gathering systems	exe-high-irreg
NGAS	Nov 1st,07	Annual Report – development, acquisition	exe-low-reg
NGAS	May 31rd,07	Comments on Hurricane season and possible effects on oil prices	exe-high-irreg
NXY	Nov 13th,07	Announces that" following repairs made over the weekend, the buzzard platform....last week shutdown.	exe-low-reg
NXY	Nov 8th,07	Announces "upper section of one of the three power generation turbine exhaust stacks was damaged.	exe-high-iireg
PDC	Nov 2nd,07	Announces" Quarterly earning down 49.8%:due to company's operations in Colombia, additional turnkey and footage contracts, and slightly higher labour costs	exe-low-irreg
PDE	Aug 27th,07	Reports" No damage to Mexico-based fleet following hurricane Dean".	Exe-low-reg
PKD	Nov 7th,07	Gets 3 rig contracts	plan-high-irreg
QRCP	May 3rd,07		Plan-high-irreg
RDC	Dec 13th,07	Le Tourneau Technologies and Lamprell Energy contract for new build jack-up kit	Plan-low-reg
STO	Dec 14th,07	Hose said to cause Norway oil spill	Exe-high-irreg
STO	Nov 14th,07	Azerbaijan production may double potential for significant discovery in Caspian sea	Plan-high-irreg
TGC	Sep 21th,07	Announces "New Kansas oil well drilling program"	Plan-high-irreg
TMY	Oct 22nd,07	Announces "Increase in approved gas flaring volumes for South Alibek field: approval for its gas utilization program	Plan-low-irreg

		with increased gas	
TMY	Oct 18th,07	Announces "Start of oil exports via its proprietary pipeline and elimination of third party processing fee	Exe-low-reg
UHCP	Jul 25th,07	Notice of delisting or fail;ure to satisfy a continued listing rule or standard – until Aug 3rd,07 to provide	Exe-low-irreg
UNT	Nov 15th,07	The sweet small of seismic	Plan-low-irreg
WHT	Nov 27th,07	Production exceeds 6 MMCFE/D withcompletion of new wells in Johnson & Hill counties – report of exploration and development	Plan-low-reg
WLL	Jul 4th,07	Old structure a new trend for energy firms	Plan-high-irreg
WTI	Jul 13th,07	8-K results of operations and financial condition	Exe-low-reg
APC	Dec 4th,07	Announces " Gulf of Mexico discovery	Plan-high-reg
COG	Dec 14th,07	Dep regets gas drilling in State Park & denies permit for gas wells in there.	Plan-high-irreg
COG	Nov 15th,07	Announces " Horizontal drilling success (county Line and hurricane Positive continue	Exe-low-reg
CNQ	Oct 31rd,07	Announces "Third quarter update on the progress of the horizon oil sand project	Exe-high-irreg
DPTR	Dec 13rd,07	The company has drilled the Federal 28-11 to a depth of 9,472 feet on Nov 19th,07	Exe-low-reg
DPTR	Nov 19th,07		Plan-low-reg
GDP	Mar 16th,07	Announces of operation	Exe-low-reg
MXC	Jun 29th,07	Annual Report - Increase of production	Exe-low-reg

NEGI	May 10th,07	Results of operations & financial condition	Exe-low-reg
GEOI	Dec 7th,07	Files SEC form 8-k, regulation FD disclosure, financial statements	Plan, high irreg

References

Agrawal, M., R. Kishore, et al. (2006). "Market Reaction to E-business Outsourcing Announcements: An Event Study." Information & Management **43**: 861-873.

Alpert, M. and H. Raiffa (1982). Judgement Under Uncertainty: Heuristics and Biases. New York, Cambridge University Press.

Andrew M Makenzie, M. R. T., Bruce L Dixon (2004). "The Performance of Event Study Approaches Using Daily Commodity Futures Returns " The Journal of Futures Markets **24**(6): 533.

Anthony, J. H., W. Choi, et al. (2005). "Market Reaction to E-commerce Impairments Evidenced by Website Outages." International Journal of Accounting Information Systems **7**: 60-78.

Arend, R. J. (2004). "Volatility-based Effects on Shareholder Value: Alliance Activity in the Computing Industry." journal of Management **30**(4): 487-508.

Baum, J. A. C. and C. Oliver (1991). "Industrial Linkages and Organizational Mortality." Administrative Sciences Quarterly **36**: 187-218.

Binder, J. J. (1998). "The Event Study Methodology Since 1969." Review of Quantitative finance and Accounting **11**: 111-137.

Carter, M. W. and C. C. Price (2001). Operation Research: A Practical Introduction, Boca Raton, CRC Press**:** 394.

Chou, P.-H. (2004). "Bootstrap Tests for Multivariate Event Studies." Review of Quantitative finance and Accounting **23**: 275-290.

Cox, J. C. and S. A. Ross (1976). "The Valuation of Operations for Alternative Stochastic Processes." Journal of Financial Economics **7**: 229-264.

David A. Carter, B. J. S. (2004). "The Market's Reaction to Unexpected, Catasrophic Events: The Case of Airline Stock Returns and the September 11th Attacks." The Quarterly Review of economics and finance **44**: 539-558.

Dyer, M. R. W. J. S. (1996). "Risk Propensity and Firm performance: A Study of the Petrolum Exploration Industry " Management Science **42**(7): 1004-1021.

Eduardo Bautista, S. A. R., William E. Le Clere, Allen R. Dedrick, David B. levine & Wayne Clyma (2000). "Lessons from the Demonstration Management Improvement Program." Irrigation and Drainage Systems **14**: 69-91.

Fama, E. F., Ed. (1976). Foundation of Finance. Basic Books. New York.

Frankfurter, G. M. (1999). "Ideology and the theory of Financial Economics." Journal of economic Behavior & Organization **39**: 159-177.

Graddy, D. B., R. Kyle, et al. (2004). "Dating Structural Changes: An Illustration from Financial Deregulation." Journal of Economics and Finance **28**(2): 155.

Hassard, J. (1999). Postmodernism, Philosophy and Management: Concepts and Controversies. Blachwell Publisher Ltd.

Hooper, H. T. and S. R. Rutherford (2001). Real Option and Probabilistic Economics: Bridging the gap. SPE Annual technical Conference and Exhibition. New Orleans, LA, USA, PAper SPE. **71408**.

Hovav, A. and J. D'Arcy (2005). "Capital Market Reaction to Defective IT products: The Case of Computer Viruses." Computers & Security **24**: 409-4424.

Huang, W., S. Goto, et al. (2004). "Decision-making for Stock Trading Based on Trading probability by considering Whole Market movement." European Journal of Operation Research **157**: 227-241.

Jean-Gabriel, C., E. d. Bodt, et al. (2007). "Event Studies with a Contaminated Estimation Period." Journal of corporate Finance **13**: 129-145.

Jensen, N. M. and S. Schmith (2005). "Market Responses to Politics: The Rise of Lula and the decline of the Brazilizn Stock Market." Comparative political studies **33**(10): 1245-1270.

John, F., M. Cook, et al. (1998). Hydrocarbon Exploration and production amesterdam: New York : Elsevier.

Ma, Y., H.-L. Sun, et al. (2003). "The Stock Return Effect of Political Risk Event on Foreign Joint Ventures: Evidence from the Tiananmen Square Incident " Global Finance Journal **14**: 49-64.

MacKinlay, A. (1997). "Event Studies in Economics and Finance." Journal of Economic Literature **35**: 13-39.

Markovitz, H. (1991). Portfolio Selection: Efficient Diversification of Investments. Oxford.

Mattar, M. H. and C. Y. J. Charles (2006). "Valuing Large Engineering Projects Under Uncertainty." Construction Management and Economics **24**(8): 847-860.

McGuckin, R. H., F. R. Warren-Boulton, et al. (1992). "The Use of Stock Market Returns in Antitrust Analysis of Mergers." Review of Industrial Organization **7**.

McNamara, G. and P. Bromiley (1997). "Decision-making in an Organizational Setting: Cognitive and Organizational Influences on Risk Assessment in Commercial Lending." Academy of Management Journal **40**: 1063-1088.

McWilliams, A., D. Siegel, et al. (1999). "Issues in the Use of the Event Stusdy Methodology: A Critical Analysis of Corporate Social Responsibility Studies." Organizational Research Methods **2**(4): 340-365.

P. Johnson, J. D. (2000). Understanding Management Research: An introduction to Epistemology. London.

Park, N. K. (2004). "A Guide to Using Event Study Methods in Multi-Country Settings." Startegic Management Journal **25**(7).

Patricelli, J. A. and C. L. McMichael (1994). An Integrated Deterministic/Probabilistic Approach to Reserve Estimations. SPE Annual Technical Conference and Exhibition. New Orleans, LA, USA, Paper SPE. **28329**.

Paulo, S. (2003). "Epistemology, Research Methodology and Rule 702 of the Federal rules of Evidence Versus Eva." journal of Business Ethics **44**: 327-341.

PMI (2004). PMBOK. Pennsylvania, USA, PMI, Inc.

Ross, J. G. (2004). "Risk and Uncertainty in Portfolio Characterisation " Journal of Petroleum Science & Engineering **44**: 41-53.

Schachter, S. J. B. B. (1989). "The investment Decision: Estimation Risk and Risk Adjusted Discount Rates." Financial Management **18**(4): 13-22.

Subramani, M. and E. Walden (2001). "The Impact of E-Commerce Announcements on the Market Value of Firms." Information System Research **12**(2): 135-154.

Telang, R. and S. Wattal (2004). Impact of Software Vulnerability Announcements on the Market Value of Softwqare Vendors - An Emperical Investigation. Workshop on Information Systems and Economics.

Tse, Y. and J. C. Hackard (2005). "Holy Mad Cow! Facts or (Mis)Perceptions: A Clinical Study." The Journal of Futures Markets **26**(4): 315-341.

Tversky, A. and D. Kahneman (1971). "The Belief in the "Law of Small numbers"." Psychological Bulletin **76**: 105-110.

Walls, M. R. (2004). "Combining Decision Analysis and portfolio Management to Improve Project Selection in the Exploration and Production Firm." Journal of Petroleum Science & Engineering **44**: 55-65.

Warren-Boulton and F. a. S. Dalkir (2001). "Staples and Office Depot: An Event-Probability Case Study." Review of Industrial Organization **19**(4).

Wells, W. H. (2004). "A Biginner's Guide to Event Studies." ABI/INFORM Global **22**(4): 61.