REAL OPTIONS PRACTICES IN CAPITAL INVESTMENT DECISIONS: AN EXPLORATORY SURVEY OF LISTED COMPANIES OF PAKISTAN

Umair Baig, and Dr. Manzoor Anwar Khalidi

ABSTRACT

The study aims to explore the role of the real options practices to an appraisal of capital investment decisions. We deployed the Binary logistic regression technique to test the hypotheses of the study. For the binary model, two equations were developed having two dependent variables, first the use of real options, and the second the real options familiarity. The independent variables of the study were the annual capital budget, Capex time, Net profit margin, and R&D. The finding showed listed companies relied on discounted cash flow techniques (DCF). A very few were practising real options only for supplement and to support results from other methods. The real options require too much sophistication and lack of top management support is the major reason for not using real options. The use of real options having a significant relation to the Annual Capital Budget, Net Profit Margin, and R & D, Capex time. Real options Familiarity having a significant relationship with Net Profit Margin and R & D and insignificant with Annual Capital Budget. DCF method is rigid and cannot incorporate the uncertain future and upcoming opportunities. Corporate and academia are suggested to concentrate on real options practised to make the right decision for the corporate, industry, and country progress.

INTRODUCTION

In the contemporary world, there is a lot of advancement, and changes have been occurring simultaneously in a corporate and economic world. Aggressive competition prevails among corporations in various forms and the battle among corporations is based upon the facts as to how firms can make valuable earnings, create extensive profit in existing situations, and

make a distinct position from others in various strategic fronts. Strategic corporate experts aim to the sustainable growth of their companies and adopt pragmatic policies and strategies to attain this goal. There are several strategies and choices available for making all dreams come true, and one of the significant strategic decision is the existence of a proper process of evaluating the capital investment in a company (Ehrhardt et al. 2018). Pivoriene, (2017) also mentioned in his study that corporates survival are reliant on upon capital investment decision. Future opportunities, profitability, shareholder worth creation, and sustainable growth and others directly related to the capital investment decision. Therefore, it is the core decision in recent times for the corporates in the world to handle these above-mentioned issues. According to Holmes (1998); Du Toit & Pienaar (2005) explained that long-term outlay happens to be a reason for significant concern to the top management, all concerning decisions related to capital investment deem to be crucial factors in certifying the future success of a company. Mintzberg et al., (1976) stated that the capital investment decision-making process usually failed due to a lack of understanding and awareness of capital investment evaluating procedure with all doubts distinctively related to capital investment.

Epstein, (2014) argued that capital investment is the foundation of the company to make the company sustainable in the future. Companies always look forward to exploring numerous opportunities for capital intensive investment to grow and to obtain the desired sustainable growth. After identifying the valuable alternatives of long term investment, multiple tools have been modified and even introduced with time to select one of the best options among available different alternatives. Modern time requires to adopt those particular methods of evaluation, which incorporates uncertainty of the risk due to abrupt changes occurred due to various reasons. Arnold, (2008) mentioned that capital investment provides the basis for any business. The appraisal of capital investment is the most important process of business planning and progression. Maximization of shareholders' wealth is the required outcome of this process. This process could be effective only in the presence of a powerful, realistic, and a well-calculated plan. Therefore, there is a process involving selecting the best possible options for the company. But still, the question is how the company decides which opportunity of investment is the best opportunity among the various alternatives. As stated by Myers, (1984), the business and industry decision-makers are facing multiple changes and

they are dealing with them. For instance, the discounted cash flow technique used by industry to value the long term investment. However, this method does not fulfil the criteria of current circumstances of evaluation due to the worth of flexibility besides misusing the resources in the shape of allocation.

The preceding studies of capital budgeting highlighted two important elements in the theory and practices of investment appraisal. First, the discounted method and the second being the real options technique to value any long-term investment.

Real options practices are the modern approach to use in capital investment decisions, especially when there is an uncertain future due to various reasons. The theory is very famous in the developed world and very useful for the top executives of multinationals in general and specifically in the oil and gas sectors. The word real in "real option" represents "tangible assets" and it is different from the financial instrument. In the corporate world, a real option facilitates the financial executives regarding the choices of investment opportunities, Many researchers have indicated the boundaries of discounted techniques, also, especially the appraisal process of long term investment and as far as real options are concerned, researchers mostly considered it due to flexibility and other factors which incorporated by real options analysis (Baker at el., 2011). According to Pivoriene, (2017) this modern era where the business environment is highly competitive, there is very difficult to make capital investment decisions. Discounted cash flow techniques are used to accept or reject CAPEX investment. However, these techniques are not suitable when uncertain situations exist in the corporate environment. Therefore, the real options approach is the modern techniques that have the potential to incorporate the opportunities and managed uncertainness.

According to Copeland, (2001) emphasized the argument that real options have the potential to be the main criteria for selecting CAPEX decisions under ten years. Nevertheless, a recent survey of the financial decision-makers Baker at el., (2011); Ryan & Ryan, (2002); Graham, (2001) depicted that the awareness of real options is still very low in contrast to other discounted techniques in the context of practices and popularity are concerned in the corporate sector.

According to Horn et al., (2015) who surveyed the 1500 major

corporations from Norway, Denmark, and Sweden to explore their process of evaluating CAPEX specifically in the context of real options analysis. However, interestingly available response rate only 6% used real options technique, although the majority of corporations are using the discounted techniques that are net present value 74%. Particularly energy and biotech sectors are using real options. Lack of familiarity is the most important motive for non-using real options; in other words, 70% of designed samples explore that familiarity with real options, ideas, and methods are very low. Moreover, the most important real options are seemed to be more complex for implementation in the industry.

Research Objectives

The study aims to explore the role of the real options practices to an appraisal of capital investment decisions in listed companies of Pakistan. those who had adopted real options analysis as a method for evaluating a capital investment, to explore the reasons for the non-utilizing valuable technique of real options, or if the discounted technique is using that which technique is mostly used by corporate, It is also crucial to know the relationship between the practice of real options and different characteristic of the corporation, for instance, an annual capital budget of companies, the capital budget for how many years, net profit margin and research & development in the context of Pakistan. Also, focus on why discounted cash flow is more important for corporate of Pakistan and how it differs from the valuation of real options. How much this argument is valid that real options are much better as matched to the discounted method of appraisal process of CAPEX through literature review. This research paper will disclose the reality of practices of real options in Pakistan and will reduce the uncertainty regarding current practices and explore worthwhile analysis in the context of Pakistan.

Significance of the Study

Its findings will be beneficial for the corporate sector and academia, Decision-makers will understand after going through this study about the significance of real options and limitations of discounted cash flow techniques. This will also be a driving force in academia; the university faculty of finance can incorporate the discussion and practices of real options in their classrooms to prepare valuable human capital for the industry. The future of Pakistan is very bright due to the new policies of Govt. regarding capital investment in general and particularly for CPEC.

Several foreign investments are ready to come to Pakistan as the security situation of the country is getting better as compared to the last ten years. Therefore, we need practitioners who should be experts in evaluating long term perspectives and suggest their companies the best options for capital investment. Moreover, this research study will reduce the gap between academia and the corporate world.

LITERATURE REVIEW

Recently theory of real options is a crucial topic in the field of finance. This realistic approach has received a remarkable response after comprehensive studies in the last decades on real options. Real options literature focuses on three areas; real options application, the theory of real options, and at the same time how real options analysis may support a discounted cash flow method. Moreover, the real application of real options analysis to evaluate capital investment decisions. Many researchers have highlighted the value and significance of real options analysis for capital investments decisions, for instance, (Myers, 1984; Mason & Merton, 1985; Copeland & Keenan, 1998; Brennan & Schwartz, 1985; Trigeorgis & Mason, 1988; Paddock, Siegel & Smith, 1988; Dixit & Pindyck, 1994; Ross, 1995; Luehrman, 1998; Pivoriene, 2017; Xi Chen et al., 2019).

Myers, (1977) presented the first time the concept of real options and indicated the comparison between financial options and real options. The real options can be used to evaluate before making investment decisions. According to Ross (1986), the real option is an analysis of the uncertain and volatile capital investment. These analyses disclosed that the risky project has potential value and the opportunity to invest in it. Moreover, the authors of this study suggested that these sorts of opportunities are easily dealt with as real options.

Irreversibility is the basic phenomena and concept of traditional approaches to implementation or execution of the long-term investment. However, in this contemporary world, things are changing abruptly. Therefore, there is a need for a specific technique that must be flexible on the demand of the current circumstances of the corporate world. According to Trigeorgis, (1993) classified real options in seven important areas. These areas are the options to expend, the options to defer, the options to revise, options to abandon, options to fix, options to switch, and substitute options. Myers (1984) pointed out the limitation of discounted cash flows and

argued on the strategy of evaluating the investment process. He suggested that most important and complicated investment opportunities must select based on real options pricing as compared to discounted cash flow.

According to Atari, S. et al., (2019) found in the study that the real options method is a reliable, appropriate, and more authentic method as compare to the discounted method to evaluate capital investment projects. Slagmulder (1995) criticized rationally on the use of the traditional capital budgeting techniques and specifically suggested that never used in heavy industries especially in advanced manufacturing technology. Ragozzino et al., (2016) emphasized that all decisions related to a business perspective which deals in the future outcome of uncertainty, the implemented real options to condense the uncertainty and maintain the potential investment. The real options analysis of long term investment facilitates by providing flexibility in a valuable decision making which is required in the modern world due to the uncertainty of strategic issues of corporate and external factors, as well, for example: to expand, defer, abandon, switch, contract or otherwise selecting other capital investment techniques.

Botteron, (2001) stated that the number of opportunities regarding an investment comprises of many issues and managerial challenges, for instance, the decision to defer investments, to update investment, to change existing operating activities, to stop operations permanently or temporary basis, etc. These changes are only incorporated, and the value of investment maximized when necessary, the options are used and implemented at a suitable time. Therefore, according to Herath H., (2002) explored that real options are the modern approach to review and appraise capital investment decisions as options.

According to Trigeorgis, (1995) found that companies can create distinct points as compared to their competitors and increase the value of their firm by the allocation of resources properly and adopting a significant process of evaluating long term investments to obtain maximize benefits from available resources. Even American firms have been gradually losing their competitive and economical position as compared to their German and Japanese firms, although Americans are using more sophisticated discounted cash flow (DCF) analysis. According to Vintila N., (2001), it is the matter of the fact that traditional method of discounted cash flow as such cannot fulfil the basic requirement of modern CAPEX due to

irreversibility as compared to real options analysis which provides the flexibility that may have occurred due to the uncertain future.

Practice and uses of real options analysis for CAPEX are better than discounted method. According to Copeland, (2001) real options will be the most important tool for long term investment decisions within ten years. Recently it is very low in survey ranking (Trigeorgis 1988, 1993; van Putten & MacMillan, 2004). Many researchers have developed a model of valuation for evaluating long term investment for industry perspectives since the orientation of these real options in 1970 (Amram & Kulatilaka, 1999; Trigeorgis, 2016; Dixit & Pindyck, 1994; McDonald & Siegel, 1986).

Copeland, (2001) indicated that real options would be the most important tool for evaluating investment appraisal within ten years. Although according to the survey that real options are less popular as compared to others with technique. According to Davis, (1996) stated that the real options technique is more reliable as compared to the discounted technique of NPV. Hodder & Riggs, (1987) indicated that discounted cash flow is not suitable for appraisal of capital investment decisions. Due to certain reasons only use one discount rate through the process. The risk of the project usually decreases the passage of time.

Dixit & Pindyck, (1994) argued that traditional decision-makers assume that long term investment opportunities cannot be delayed and believed if they lose this opportunity it may never be revered in the future. Many times delays of any investment are good for the company, but the traditional approach always ignored these values. Real options analysis provides comprehensive awareness regarding uncertainty, for instance, Xi Chen et al., (2019) explored the decision tree framework to measure the value the investment decisions which guides us better options regarding delayed or adoption of investment opportunity. The discounted cash flow method is the reason for the multiple errors of any investment evaluation of the company. Similarly, Ross, (1992) argues and indicates that the Net Present Value and other discounted methods are not appropriate for evaluating long term investment, and still implementing discounted techniques is not good for the whole company.

H. Xia & Zeng, (2005) applied the real options analysis to evaluate the investment opportunity related to technology and disclosed that these

analyses might be used for predicting the company's investment strategy with theoretical and empirical support of new investment-related to execution and rejection of investment. Rychłowska-Musiał, E., (2019) emphasized that the real option is supporting an approach to evaluate capital investment decisions for years. Moreover, they endorsed that the real option provides a better comparison as compared to the discounted method. Eberly, (1996) realized that real options analysis is also useful to decide the initial investment required due to changes in demand in the market. Thus real options analysis guided the appropriate investment opportunity too. Lander & pinches, (1998) comprehensively highlighted the uses of real options analysis in various areas, for instance, merger and acquisition, corporate governance, real estate, interest rate, strategy related to business, research and development, natural resources, etc. Kester, (1984) found that the discounted valuation method is not able to cover and not comprehend even negative net present value capital investment may be worthwhile in a long term perspective. Therefore, real options analysis is the tool which can save companies from losses and opportunity cost.

According to Kulatilaka & marks, (1988) realized the strategic worth of real options and his studies based upon two concepts. One firm only can deal with discounted techniques and others may use many techniques and these flexible options to create the strategic value for the company. Previous studies recommended that real options theory is very much applicable in research and development (Lander & pinches, 1998). According to Morris, (1991), the risk of any investment may be reduced and the value of investments may be increased, but conditions are that the management must be vigilant to deal with long term investment efficiently and effectively.

Busby **(**1997**)** explored the significance of real options through a senior finance manager that studied how they take the decision related to long term investment. The researcher found that there are a different mindset and perceptions of different financial decision-makers related to the application of real options, half of them showed consent that they had applied and used real options techniques and some of them applied when they felt necessary, and few just had knowledge about real options analysis. Therefore, Xi Chen et al., (2019) revealed the real option values based on the size of the investment, investment characteristics, risk tolerance level of investors, etc. Rychłowska-Musiał E., (2019) explains

the real options through real options games approach to give basic understanding to managers, and researchers that the real option is important for evaluating long term investment decisions.

RESEARCH METHODOLOGY

This study designed on the quantitative research method; a questionnaire was adopted from Horn et al. (2015). Through this adopted questionnaire rigorous survey has been conducted to know the real options practice in the capital investment decision. This will cover the attitude of corporate evaluators about the appraisal of capital investment decisions. Moreover, this study also investigates that there are any relationships between an annual capital budget, CAPEX period, Net profit margin, and research and development of the corporate of Pakistan.

This questionnaire is based on four phases. The first phase is related to the general question, for instance, questions are related to CFO education, the industry information, company performance in terms of profitability and research and development. In the second phase of the questionnaire, it is based upon the core question on the topic related to real options. The third phase is related to those who are not using real options; the fourth phase is related to those who are practising real options in their companies.

We selected all index listed companies of Pakistan Stock Exchange (PSX) except for closed-end mutual funds. Moreover, we tried to approach all listed companies by email and made it possible to follow up regularly. The purpose of selecting listed companies in PSX is the reliability, accuracy, and serious attitude towards decision making of capital investment. However, it is difficult to get a 100% response due to various reasons. Therefore, we have received responses of 113 companies that are 20.5% response rate of the available sample. This response rate is the larger response as compared to the previous survey in general and specifically in Pakistan

Research Hypotheses

The following are the seven hypotheses of the study, that are designed after comprehensively reviewed past literature to explore the Real Options practices in capital investment decisions.

H₁: The use of real options doesn't relate significantly with an annual capital budget of any corporate.

H2: The use of real options doesn't relate significantly with capital expenditure prepared for the time of any corporate.

H3: The use of real options doesn't relate significantly to the net profit margin of any corporate.

H4: The use of real options doesn't relate significantly with R & D activities of any corporate

H5: The real options familiarity doesn't relate significantly with an annual capital budget of any corporate.

H6: The real options familiarity doesn't relate significantly with the net profit margin of any corporate.

H7: The real options familiarity doesn't relate significantly with spent on R & D activities of any corporate.

Econometric Analysis

In this study, Descriptive statistics and inferential statistics used to explore the whole area regarding real options. In Descriptive, we have found the percentage and frequency of given information to describe the practices of real options in different companies. Further, in inferential, we test the hypothesis by using the most suitable techniques for this current study. To explore the relationship, the Binomial Logistic Regression Model applied for analysis, because data of the study is non-linear. The following are the two equations that explored real option practices in capital investment decisions.

Model I:

$$\text{LOGIT}[P(\text{URO}=1)] = \beta_0 + \beta_1 (ACB) + \beta_2 (CAPEXt) + \beta_3 (NPM) + \beta_4 (R \& D) + \mu_i \quad (3.1)$$

URO = Use of real options here, Use of real options=1, when not use of real options = 0
ACB = Annual capital budget
CAPEX = Capital expenditure budget is prepared for the time
NPM = Net profit margin

R & D = Spent on R& D

Model II:

$$\text{LOGIT}[P(\text{ROF}=1)] = \beta_0 + \beta_1 (ACB) + \beta_2 (CAPEXt) + \beta_3 (NPM) + \beta_4 (R \& D) + \mu_i \quad (3.2)$$

ROF = Real options familiarity, Here, Real options familiarity= 1, when not familiarity in real options=0
ACB = Annual capital budget
NPM = Net profit margin
R & D = Spent on R& D

RESULTS AND FINDING

In this section, results and findings are discussed regarding the myth or reality of real options practices in Pakistan. In this study, emphases on uses of real options, level of education of CFO, practices of discounted cash flow techniques, how does the company use real options analysis, use real options analysis for following the decision, techniques used for real options analysis, does the company use real options analysis once a decision has been made and explore the several relationships of the firm's characteristics with the uses and familiarity of real options analysis by a binary logistic regression model.

Use Real Options Analysis to Evaluate Capital Investment Decisions

The fundamental question of this research study to the respondent: "Does your company use real options analysis to evaluate projects or Long-term investments?" Only 4 out of 113 respondents answered "Yes" to this valuable question, in terms of percentage a real option utilization rate is 3.5 % in Pakistan.

Table 1. The use of Real Options

Use real options	Response %
Yes	3.5%
No	96.5%

This finding is lower as compared to current studies of the world, for instance, Horn et al., (2015) surveyed the CFOs of 1500 companies from Norway, Denmark, and Sweden Only 6% of the respondents practice real options for evaluating long term investment. Importantly, Scandinavian firms are smaller in size, have a lesser R&D budget, and not an advanced company in technology perspectives. Most famous survey Block (2007) of U.S. companies found the 16.8% utilization rate of real options analysis. Rigby (2001) who found the response of the user of real options is 6.5% among U.S. listed firms. There is no such real option practising except familiarity of these concepts of utilization for evaluating long term investment. This research finding is aligned from Block, (2007), who was surprised to find only two users within the industry. Similarly, Triantis & Borison (2001) highlighted that the use of real options is very low in the insurance and banking industry and finds that large industry is someway are aware and used real options analysis for long term investment.

Level of Education of CFO

This is an important finding of the level of education in Pakistan's

CFOs. The purpose of this question is to know what level of education is required for CFOs in Pakistan, and what will be the vision of strategic financial management of the companies of Pakistan. It is very encouraging to see the Pakistan CFO is highly advanced and updated regarding the worldwide practices and want to improve the system of corporate with time. The following table 2 shows the level of education in Pakistan.

Table 2. level of Education

Education	Response %
M.Com	4%
MBA	5%
Non-Management Science Master's degree	0%
MS	0%
CA	60%
ACMA	21%
ACCA	3%
PhD in Finance	0%
Other	7%
Total	100%

Graham & Harvey, (2001) emphasized that real options utilization is independent of the education of the CEO. Moreover, our finding also follows the study of Graham & Harvey, (2001). In Pakistan, CFOs are quite educated and aware of the corporate practices and financial system of Pakistan. Our results show no significant relationship between CFOs' highest level of education and the use of real options and primarily focusing on traditional techniques. Although they are aware of real options. However, not practising it due to the certain reason covered in table 8. Likewise, it is important to note that companies whose CFO is a Chartered Accountant seem somehow interested and try to practice real options to evaluate the long term investment in the future.

Industry Specification

Table 3 shows the industry responses to this survey and our finding explored that there are as such not any relationships of use of real options and industry. In Pakistan, it is a reality that companies are not using fully real options as a tool for evaluating any long-term investment. Which we have covered in table 1 only 3.5% of companies are using valuable real options. Therefore, following the table is explaining the response rate and industry participation in this survey.

Table 3. Industry Responses

List of Industry/Sector	Response %
Oil & Gas	8%
Automobile	6%
Pharmaceuticals	15%
Textile	22%
Chemical	6%
Food & Personal care product	6%
Bank/finance & insurance	10%
Transport	6%
Cement	6%
Other	15%

Practices of Discounted Cash Flow Techniques

Table 4 is focusing the valuable question regarding the practices of the sophisticated fundamental techniques of capital budgeting. The respondents of the questionnaire had the opportunity to select all given options. The results are demonstrated below:

Table 4. Discounted Cash Flow Techniques

Capital Budgeting Techniques	Response %
Net present value (NPV)	98%
Internal rate of return (IRR)	96%
Discounted Payback period	55%
Modified Internal rate of return (MIRR)	10%
Payback	78%
Accounting rate of return(ARR)	40%
Other	15%

The above table based on two basic investment criteria discounted and non-discounted techniques. The finding of our research is supported and followed by various past researchers for instance, according to Ryan, (2002) studied the capital investment appraisal technique which is used by the Fortune 1000 firms. the key observations were:

– NPV is recognized as the most favoured by companies, an approximately 96% capital budgeting technique, which represents

– Similarity exists between academia and American corporate.

– The large company that has huge capital budgets seems to favour NPV and IRR.

– PBP is practised 74.5% of the companies. Moreover, the discounted payback technique practised approximately 56.7% of the companies.

Arnolod, (2000) explored in his studies that UK based companies practised sophisticated capital budgeting techniques, the response rate of his studies was 32.4% and finding of his researched compared by (Pike**,** 1982; 1988; 1996; McIntyre & Coulthurst, (1985). Interestingly, important facts explored after comparison of other studies.

– The decline in the use of the Payback Period

– Theory and corporate understanding is much better in the UK

– More than 90% of SMEs are interested to use NPV or IRR

Our finding revealed that the Pakistan industry still depended on sophisticated capital budgeting techniques. Net Present Value (NPV) is the most used technique for capital budgeting in Pakistan. The internal rate of Return (IRR) is not far behind than NPV, whereas the Payback period follows IRR and then Discounted Payback Period for evaluating investment projects. As far as a real option is concerned only just according to our survey 3.5% of companies are using with the support of discounted techniques not independently.

How Does The Company Use Real Options Analysis
Table 5 shows the use of real options analysis based on the available response of companies who are using real options.

Table 5. Real Option Analysis

Real Options Analysis	Response %
Primary capital budgeting technique	0
One of several techniques	25
To supplement and support results from other methods	75
Other	25

In comparison, Block's (2007) survey explored that almost half of users specifically used real options as the main tool. Copeland & Antikarov (2001) emphasize the importance of real options that Real Options will be the main technique for evaluating long term investment very soon. The finding of this study is aligned with the previous surveys of financial experts. (Graham & Harvey, 2001; Ryan & Ryan, 2002; Baker, Dutta, & Saadi, 2011).

Use Real Options Analysis For The Following The Decision
Table 6 explores the extremely important matter regarding the uses of real options analysis. When financial experts are being interested in applying

real options analysis. In this section, respondents can select more than one option, subject to use real options analysis for the investment decision.

Table 6. Real options analysis for decisions

Real options analysis for the following decisions	Response %
New product introduction	35%
Research and development	50%
Mergers or acquisitions	75%
Foreign investment	25%
Other	50%

The finding of this study explored that 75% responded practices real options analysis for mergers and acquisitions 35% for the new product introduction, 50% research & development. 25% for foreign investment and 50% other reasons. According to Block's, (2007) M&A is the third reason for using real options analysis, but contrary this current research found that 75% of companies' top management is interested in reviewing in the context of merger and acquisition. Moreover, researchers emphasized that many decision-makers are using real options techniques for evaluating merger and acquisition processes (Triantis & Borison, 2001; Horn A. et. al., 2015).

Techniques Use For Real Options Analysis
Table 7 highlights the uses of real options techniques; Financial Experts are practising several real options techniques as far as evaluating tools are concerned. The table below shows the particulars.

Table 7. Techniques of Real Option

Real Option Techniques	Response %
Binomial lattices	25%
Risk-adjusted decision trees	75%
Monte Carlo simulation	40%
Black-Scholes options pricing model	50%
Other	25%

According to this study, Risk-adjusted decision trees are the most useful technique in Pakistan. This distinct point of this technique is worked for risk adjustment, Moreover, it is an extension of a binomial model. the Black-Scholes model purposefully used in financial markets and it can measure and workable in very preventive conditions, provide a very accurate response and values. These observations aligned well with findings in Block's, (2007) survey, where only one of 40 real options users considered Black-Scholes as their primary technique. The use of Monte

Carlo simulation is behind the black-Scholes model. (Block, 2007; Horn A., 2015).

Reasons for Not Using Real Options Analysis

It is a very vital finding regarding non-users of real options. However, they are familiar with real options. This table exploring the reasons, why these familiar of real options practitioners are not adopting the technique to evaluate long term investment. Table 8 shows the finding of the reality of corporate Pakistan.

Table 8. Not Using Real Options Analysis

Reason for not using real options analysis	Response %
Lack of top management support	10
Requires too much sophistication	88
Encourages too much risk-taking	0
Other	15

Above table 8 explain that the majority of respondent responds that requires too much sophistication is the reason for not using real options analysis as a tool of evaluating long term investment. Moreover, the second reason is the lack of top management support. Somehow, other reasons are also in the mind of experts to not using real options as an analysis of the capital investment. These findings are also aligned with past researches, which concluded that the lack of knowledge is one of the reasons for not implementing the real options in companies. (Horn A., 2015; Block, 2007; Baker et al., 2011a)

Multivariate Regression Analysis

The findings of this study are approximately supported by previous survey findings and academic theories. The use of Real options seems to be influenced by an annual capital investment budget, capital expenditure budget prepared for 1 to more than 4 years, net profit margin, and research and development. To explore how these characteristics influenced uses and familiarity of real options analysis are measured by a Logit Binary Model on available data.

Table 9 shows the result of the Logit Binary Model of equation 1. In this equation use of the real options (URO) is used as dependent variables and annual capital budget (ACB), capital expenditure budget, net profit margin (NPM), and research and development (R & D) used as independent variables.

Table 9. Multivariate Regression Analysis

Dependent Variable: URO		
Method: ML - Binary Logit (Newton-Raphson / Marquardt steps)		
Variable	Coefficient (dy/dx)	Prob.
C	1.320818	0.402
ACB	0.0575788	0.091*
CapexT	-0.031869	0.033*
NPM	0.114457	0.025*
R & D	0.114457	0.037*
McFadden R-squared		0.696393
F- statistic		20.92
Prob(LR statistic)		0.0003

Statistics are considered at 5% significance Level

Let us discuss these results of equation 1, the variables annual capital budget, capital expenditure budget, net profit margin and research and development statistically significant and have the expected signs. It describes increases in a unit of the capital budget, there is the most probability that uses real options increase by 5%. It means when a company has a large capital budget for long term investment, so companies are more conscious of evaluating long term investment. Similarly, long term investment with long term effects does matter. It means an increase in one per cent or one unit in long term investment, there is the more probability that the use of real options will increase by 11% over the period. Therefore, companies seem to use real options techniques to evaluate long term investments — valuable opportunities being explored by research and development. Proper evaluation of capital investment is the reason for worthwhile returns in the shape of the net profit margin.

Results found that detailed capital expenditure budgets are prepared for 1 year to 5 years are significant. However, the negative sign due to several reasons in Pakistan. for instance, instability of economic issues, political, etc. The F–statistic's results depict the model is jointly significant.

Table 10 shows the result of the binary logit model of equation 2. In this equation; Real option familiarity (ROF) is used as a dependent variable and annual capital budget (ACB), net profit margin (NPM), and research and development (R & D) used as independent variables. How familiarity of real options analysis does matter for annual capital budget (ACB), Net profit margin (NPM), and Research and development.

Table 10. Binary Logit Model

Dependent Variable: ROF		
Method: ML - Binary Logit (Newton-Raphson / Marquardt steps)		
Variable	Coefficient	Prob.
C	2.843536	0.006**
ACB	-0.1956696	0.375
NPM	0.1076431	0.075*
R & D	0.029029	0.104*
McFadden R-squared		0.627882
F- statistic		10.07
Prob(LR statistic)		0.001234

Statistics are considered at 5% and 10% significance level

Table 10 shows the result of equation 2. The variables Net profit margin (NPM) and R&D statistically significant and have positive signs. The Annual Capital budget is statistically insignificant. According to findings that the NMP is an increase in one unit will increase the real options familiarity by 10%. Furthermore, R & D is also significant at a 10% confidence interval. If increases one unit in R & D, there is the most probability the real options familiarity will increase by 2%. Finding depicts that those companies who are working on R & D are very much interested to work with highly advanced techniques to evaluate long term investment to refrain from the upcoming and abrupt changes of various factors in the future in the view of economic, political, technical, financial, etc.

CONCLUSION

This research is based on the listed companies of Pakistan Stock Exchange to explore the real options practices in capital investment decisions. The results found that real options are still not practised on a larger scale in Pakistan. Those companies who are trying to practice real options analysis, they are only using real options analysis to supplement and to support results computed from other evaluating methods; specifically discounted cash flow method. Therefore, in Pakistan rate of utilization of real options is still very low as compared to the previous findings from the developed countries in general and particularly in developing countries. Research findings revealed that the CFOs are not implementing real options due to the requirement of sophistication for implementing the real options as compare to discounted cash flow techniques. Still, CFOs believe in the primary capital budgeting technique for evaluating long term investment. A binary logistic regression model was applied to explore the broad area of practices of

real option evaluating capital investment decisions. In this study, two equations developed to explore the practices of real options analysis in capital investment decisions in Pakistan. Uses of real options (URO) used as the dependent variable in the first equation and real options familiarity (ROF) used as the dependent variable in the second equation. Moreover, the annual capital budget, capital expenditure budget, net profit margin, R & D used as an independent variable for equations that are already mentioned in methodology.

Real options analysis used as the supplement and to support results computed from other methods of evaluation. Several qualified professionals are trying to take the support of real options for evaluating long term investment. Results found that the relationships between real options use and variables annual capital budget, Capital expenditure budget, Net profit margin and research and development statistically significant and have the expected signs. Which shows that companies have a large capital budget for long term investment are more sensible to appraise long term investment. As far as the second equation is concerned, where the familiarity of the real options (ROF) is used as a dependent variable and independent variables are annual capital budget (ACB), net profit margin (NPM), and research and development (R & D). The research found that the variables' net profit margin and R&D statistically significant and have positive signs and an annual capital budget is statistically insignificant. These are the findings that are near to reality, those companies who are working on R & D are interested to work with highly advanced techniques to evaluate long term investment to refrain from the upcoming and abrupt changes of various factors in the future. Companies' CFOs are aware and recognize the significance of the real options analysis, However, they don't have implemented yet proper framework of real option in their respective companies, due to a lot of trusts only on capital budgeting techniques and lack of knowledge regarding the sophistication and implementation are the barrier of real options.

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