CAPITAL INVESTMENT DECISION MAKING UNDER UNCERTAINTY: PERSPECTIVES OF AN EMERGING ECONOMY

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ABSTRACT

This study examines the capital investment decision making under uncertainty since the application of investment appraisal practices trends towards increasing greater superiority with the performing of multiple tools and procedures in the current investment markets which are evolving within an increasingly volatile and intertwined with global network, investments are strongly exposed to uncertainties. Therefore, this study focused on investment decision making under uncertainty of emerging market economy of 186 Sri Lankan companies. A comprehensive primary survey was conducted to collect data and exploratory factor analysis had been performed to identify the uncertainty factors. The hierarchical multiple regression analysis was performed to investigate the impact of uncertainty on the application of capital budgeting practices in investment decision making. The results of the study revealed that an increase in financial uncertainty was associated with the application of net present value (NPV) based advanced capital budgeting and sophisticated capital budgeting practices and the size of the company was also related to the application of NPV based and sophisticated capital budgeting practices.

Keywords: capital budgeting practices, financial uncertainty, firm size, emerging economy.

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INTRODUCTION

Nowadays, complex methods are used for making capital investment decision purely depends on theories of capital budgeting because of risk factors, uncertainty, contingency factors and hazards (Kaczmarek, 2015; Singh, Jain & Yadav, 2012; Zhang, Huang & Tang, 2011; Kersyte, 2011; Bock & Truck, 2011; Byrne & Davis, 2005; Cooper et al., 2002; Arnold & Hatzopoulos, 2000; Mao, 1970 and Dickerson, 1963). After the advent of full-fledged globalization and in the era of cutthroat competition (Verma, Gupta & Batra, 2009), advanced developments in technologies, other macro environmental factors and demographic factors are intruding into the budgeting practices (Verbeeten, 2006). In a world of geo-political, social as well as economic uncertainty, strategic financial management is under the process of change, in turn requiring a re-examination of the fundamental assumption as in efficient market hypothesis (Fama, 1970) that cuts across traditional boundaries of the financial management. Increased volatility in unpredictable changes would create more cut-throat competition than ever before (Smith, Smithson & Wilford, 1989). Therefore, effective handling of uncertainty is an important and often complex task in analysis of capital investment decision (Macmillan, 2000).

This study focuses on *examining the extent to which uncertainty factors impact on application of capital budgeting practices in investment decision making* for an emerging country. A consideration of the impact of uncertainty, information asymmetry and other complications on the budgeting exercise gives one the view that there is no unique correct technique and that there is a need for multiple methods in practices (e.g; Pike, 1988; Arnold & Hatzopoulos, 2000; Verbeeten, 2006, Kaczmarek, 2015). Uncertainty factors and its influence on the use of capital budgeting practices in investment decision making vary across countries because of the nature of country, culture, politics, investment policy, monetary policy, taxation system besides the regulatory and legal framework. To the best of my knowledge, there is no studies on this focus in Sri Lanka. Therefore studying capital investment decision making under uncertainty for an emerging economy would provide invaluable knowledge into existing literature. Therefore the research question of the study would be: *to what extent uncertainty factors impact on the use of capital budgeting practices in investment decision making in the Sri Lankan emerging economy?*

LITERATURE REVIEW

Uncertainty

'Uncertainty is the gap between the information currently available and the information required to make the decision' (Verbeeten, 2006). Recently, *'uncertainty* is defined as the range of an outcome, and *risk* is the probability of gain or loss associated with a particular outcome' (Al-Harthy, 2010).

Classification of Uncertainties

There are many categorizations for the uncertainty concept related to investments presented in the literatures. Different authors viewed uncertainties in different way. Therefore, classifications of uncertainties are vary over the years. It was classified by Townsend (1969) as business uncertainties and project uncertainties. Later it was viewed in 1980s like market uncertainties and company uncertainties (Seidler & Carmichael, 1981), static uncertainties and dynamic uncertainties (Fanning, 1983). However, uncertainties were focused in 1990s that strategic uncertainties, operational uncertainties and financial uncertainties (Vojta, 1992), general uncertainties, industry uncertainties and firm uncertainties (Miller, 1992), direct and indirect uncertainties (Pringle & Cannoly, 1993) business and financial uncertainties (Baril, Benke & Buetow, 1996) and endogenous and exogenous uncertainties (Folta, 1998). Further, uncertainties were classified in 2000s as market, industry and firm specific uncertainties (Bulan, 2005) and input uncertainties, financial uncertainties, social uncertainties and market uncertainties (Verbeeten, 2006).

Capital Budgeting Practices

Verbeeten (2006) defined capital budgeting as 'capital budgeting practices are the methods and techniques used to evaluate and select an investment project' (i.e., the decision making role of the accounting system). Different perspectives on capital budgeting practices have been listed below

1. Organizations implement procedures and guidelines that require a systematic identification and uncertainty analysis to ensure that the uncertainty is taken into account in capital budgeting decisions that uncertainty is increasing day by day the world of globalization.

Thus, capital budgeting practices are considered as ***an uncertainty management tool*** (Verbeeten, 2006) by identifying and price uncertainty, organizations strive to balance (costs) uncertainty and profit.

2. Uncertainty affects capital budgeting practices as composite of organizational structures and decision making processes. Thus, the capital budgeting practices are ***part of the system of governance of the organization*** (Verbeeten, 2006).

3. In order to make the suitable investment decision, capital budgeting is the 'process of evaluating and selecting long term investment consistent with the firm owners' goal of wealth maximization' (Gitman, 1988). Therefore, capital budgeting is an ***integral part of the corporate plan*** of an organization (Ekeha, 2011).

4. Capital budgeting is a fundamental element and used everywhere as a tool for planning, control and allocation of scare resources among competing demands. Capital budgeting is a ***vital part in financial planning and decision making*** since capital budgeting tools leads better decision making and would be able to justify selection of specific capital investments among competing alternatives (Sekwat, 1999).

Classification of Capital Budgeting

Capital budgeting practices help managers to select *n* out of *N* investment projects with the highest profits at an acceptable 'risk of ruin' (Verbeeten, 2006). Literature has generally distinguished among simple (or naive) and advanced capital budgeting practices (Haka, 1987; Haka, Gordon & Pinches, 1985). *Simple or naive capital budgeting practices* include payback (PB) and accounting rate of return (ARR) (Pike, 1988) which generally do not use cash flows, do not consider the time value of money and do not incorporate risk in a systematic manner. These are based on the accounting income, they do not include cash flows from a project (Pike, 1988).

Advanced/sophisticated capital budgeting practices include Discounted Cash Flow (DCF) methods, internal rate of return (IRR), net

present value (NPV) and profitability index (PI) that consider cash flows, risk, and the time value of money (Pike, 1988, Klammer, 1973). Further, Pike (1988) classified the capital investment evaluation methods were risk analysis techniques that included sensitivity analysis, analysis under different assumptions (best/worst), reduced payback periods, increased hurdle rates, probability analysis and beta analysis. Besides these analysis, they also covered the management science techniques that included mathematical programming, computer simulation, decision theory and critical path analysis. Both Pike (1988) and Haka, Gordon and Pinches (1985) mentioned in their studies that companies employing sophisticated capital budgeting techniques and controls (such as NPV, probability analysis and post completion audits) should, theoretically, be more effective in capital investment decision making than those employing naive methods (PB) with little way of control mechanism. Pike (1996) conducted longitudinal survey on capital budgeting practices and classified two groups of sophisticated capital budgeting practices which are financial techniques (including IRR, NPV and sensitivity analysis) and management science techniques (including probability analysis, beta analysis, computer simulation, decision theory, mathematical programming and critical path analysis). Farragher, Kleiman and Sahu (2001) suggested that degree of sophistication is represented by the use of the DCF techniques and incorporating risk in the analysis. Dixit and Pindyck (1994) and Trigeorgis (1993) have indicated that these discounted cash flow methods have serious shortcomings in analyzing investment projects when information concerning future investment decisions are not available.

One of the empirical studies in finance (Verbeeten, 2006) classified the capital budgeting practices into three group by performing exploratory factor analysis and the results presented as naive/simple, NPV based advanced and sophisticated capital budgeting practices. According to his findings, naive/ simple capital budgeting practices include PB, adaptation of required payback and ARR. NPV based advanced capital budgeting practices include Sensitivity analysis/break-even analysis, Scenario analysis, Adaptation of required return/discount rate , IRR, NPV and Uncertainty absorption in cash flows. Sophisticated capital budgeting practices include Monte Carlo simulations, Game Theory, Real Option Reasoning, Using certainty equivalents, Decision trees, CAPM analysis / ß analysis and Adjusting expected values.

Recently Wolffsen (2012) conducted a survey on 'modification of capital budgeting under uncertainty' and from his study he has grouped capital budgeting practices into three as sophisticated, advanced and simple/ naive. Findings of his study is consistent with findings of Verbeeten's (2006) classification of capital budgeting practices. Wolffsen's (2012) sophisticated capital budgeting practices include Monte Carlo Simulation, real option method, using certainty equivalents, Binomial Lattice, CAPM analysis/β analysis and Value at Risk (VAR). The advanced capital budgeting practices include sensitivity analysis/ breakeven analysis, scenario analysis, adaptation of hurdle rates, NPV, APV, IRR, MIRR and PI. Likewise in the simple/naive capital budgeting practices include PB, DPB, ARR, earnings multiplier and other equivalents multipliers.

Uncertainty and Application of Capital Budgeting Practices

Uncertainty and risk are the major influence in making investment decision and thus Mao (1970) says 'A central aspect of any theory of capital budgeting is the concept of risk' (p.352). Presently, there are number of risk analysis tools and investment assessment methods. Analysis of risk is a straightforward adaptation of Markowitz's quadratic programming model of portfolio selection (Mao, 1970). In this regard, portfolio theory is concerned with optimal diversification problem and assets allocation problem (Cuthbertson & Nitzsche, 2008). However, modern portfolio theory's tool for the better investment decisions are Efficient Frontier, Single Index Model (Sharpe, 1963), Capital Assets Pricing Model (CAPM) (Sharpe, 1964) and Arbitrage Pricing Theory (APT) (Ross, 1976). Despite the age of these tools, they are currently useful to manage investment risk and detect mispriced securities among other things (e.g., Trahan & Gitman, 1995; Graham & Harvey, 2001; Alkaraan & Northcott, 2006). A condition of uncertainty usually exists in the capital budget because investment decisions imply that the uncertain long-term results are important for the survival of the company and for which no information is available (e.g.,Zhu & Weyant, 2003; Simerly & Li, 2000; Smit & Ankum, 1993; McGrath, 1997; Bulan, 2005; Emmanuel, Harris & Komakech, 2010; Bock & Truck, 2011; Ghahremani, Aghaie & Abedzadeh, 2012).

Pike (1996) conducted a study on the application of tools for uncertainty analysis in capital budgeting practices that companies had lack

of information on macroeconomic factors, the reactions of competitors and trends in technology development, political information and public opinion. Therefore, he suggested capital investment decisions were taken under uncertainty. Investment decisions involve the allocation of resources of a company with plans to recover the initial investment plus sufficient earnings (or other income) from cash flows (or other benefits) generated during the economic life of an investment Macmillan (2000). Thus, such decisions are difficult to reverse without seriously disturbing the company economically and otherwise. Miller (2000) states that 'in the real world, virtually all numbers are estimates. The problem with estimates, of course, is that they are frequently wrong'. Therefore, a capital budgeting decision requires systematic and careful analysis in the current uncertain global environment for making capital investment.

On the basis of the previous literature, the following hypothesis were developed to carry out the survey

H_1: An increase in specific uncertainty will lead to the application of sophisticated capital budgeting practices.

$H_{1.1}$: If specific uncertainty factor lead to the application of sophisticated capital budgeting techniques, all dimensions/variables of specific uncertainty factor will lead to application of sophisticated capital budgeting practices

Still most of the companies over the world are using NPV based capital budgeting practices and they are also treated as sophisticated capital budgeting practices in the previous literature (e.g: Farragher, Kleiman & Sahu, 1999; Bennouna, Meredith & Marchant, 2010). Thus further current study leads to following hypothesis for an emerging market context.

H_2: An increase in specific uncertainty will be associated with the application of NPV Based/Advanced capital budgeting practices.

$H_{2.1}$: If specific uncertainty factor associated with the application of NPV based/advanced capital budgeting techniques, all dimensions of specific uncertainty factor will be associated to application of advanced capital budgeting techniques

MATERIALS AND METHODS

Participants

The samples were selected from 287 companies listed on Colombo Stock Exchange (CSE) in Sri Lanka, of which 64% of the CFOS responded to the survey.

Data Collection

Field work was carried to collect the primary data from June to November 2013. The self reporting structured questionnaire was used to collect the data from all listed companies. The questionnaire included a cover letter to the Chief Financial Officers of the companies to emphasize confidentiality, reason for conducting survey and beneficial nature of the research to practitioners and academics.

Measurement Variables

Uncertainty

Miller (1992) uncertainty framework was selected to conduct the current study on capital investment decision making under uncertainty. This framework provided an opportunity to analyze the impact of uncertainty factors on capital budgeting practices and this frame work covers uncertainty from external environment (competition, exchange rates, etc.) and internal environment (behavior, research and development, etc.). Moreover, it also provide the opportunity to cover the general, industry related and firm specific uncertainties factors. The purpose of adopting this framework, is for its possibility to distinguish between the uncertainties that are addressed in the investment decision and, therefore, uncertainties that are managed by operational decisions, financial or other decisions in an organization. Miller's (1992) framework applied by Verbeeten (2006) which offered the opportunity to investigate specific uncertainties that have an impact on practices of capital budgeting, apparently springboard for future research. According to Miller (1992), practitioners would be perceived as in categories of (1) the general environment, (2) the industry, or (3) organizational factors. Each of these categories encompasses a number of uncertain components, which is presented below:

Table 1: Uncertainty and Its Components

General environment uncertainty	Political	Terrorism, War, Changes in Government, Political instability,
	Government policy	Fiscal and monetary policies, Trade restrictions, Regulations affecting the business sector, Tax policy
	Macro Economic	Exchange rate, Interest rate, Inflation, Terms of trade
	Social	Social unrest, Shift in social concerns , (beliefs, values and attitudes reflected in current government policy or business practice)
	Natural	Variations in weather, Natural disaster
Industry specific uncertainties	Input market	Quality of inputs, Supply relative to industry demand
	Product market	Consumer preferences, Market demand, Availability of substitutes and complements
	Competition	Pricing and other forms of rivalry, New entrants, Product and process innovation, Technological uncertainty
Firm specific uncertainties	Operations	Labor relations, Availability of inputs, Production variability and downtime
	Liability	Product liability, Emission of pollutants
	R & D	R & D activities, Regulatory approval of new product
	Credit & fraud	Problems with collectibles, Fraudulent behavior of employees
	Cultural	Cultural friction
	Behavioral	Agency problems, Emotions, Overconfidence

Source: Adopted from Miller, (1992) pp.314-319

The participants were asked to indicate on a 5-point Likert scale (ranging from 1= not at all important, to 5 = very important) to what extent they consider a number of uncertainties relevant for their company within the time frame of an investment decision.

Capital Budgeting Practices

Capital budgeting practices were measured with questions originally developed and validated by (Graham & Harvey, 2001, Brounen, deJong & Koedijk, 2004; Verma, Gupta & Batra, 2009). The respondents were asked to indicate on a 5-point Likert scale (ranging from 1 = never, to 5 = always)

to what extent they consider several capital budgeting techniques useful or important in the investment process.

Control Variable

Size

Size of the firm is one of the major determinants in capital budgeting practices (e.g., Ho & Pike, 1992; Graham & Harvey, 2001; Farragher, Kleiman & Sahu, 2001; Brounen, deJong & Koedijk, 2004; Verbeeten, 2006). Researches supported that large firms adopts more innovative sophisticated capital budgeting methods to a large extent than smaller firms do (e.g., Rogers, 1995; Williams & Seaman, 2001) since the larger firms have the capacity and resources to use sophisticated capital budgeting practices (Ho & Pike, 1992). Payne, Heath and Gale (1999) and Ryan and Ryan (2002) documented that large firms were more inclined to use more sophisticated capital budgeting practices. This is due to the fact that larger firms involves larger projects and the use of sophisticated capital budgeting practices become less costly (Payne, Heath & Gale, 1999; Hermes, Smid, & Yao, 2007). The larger firms are much more likely to have full time staff members for capital budgeting (Verbeeten, 2006) and make considerable capital expenditure for new plant and equipment, which require the use of more sophisticated capital budgeting practices.

DATA ANALYSIS

Exploratory Factor Analysis to Identify the Uncertainty Factors

Factor analysis was performed to confirm the validity of the variables to measure the uncertainty factors and capital budgeting practices. Factor analysis has the ability to produce descriptive summaries of data matrices, which aids in detecting the presence of meaningful patterns among a set of variables (Dess & Davis, 1984). In this study, Principal Component Analysis (PCA) had been employed to test the discriminant validity of the dimensions in an emerging market context uncertainties and to verify whether the three uncertainty categories mentioned by Miller (1992) are actually present. Miller's framework was used by Verbeeten (2006) in Netherland, the results

were categorized as finance uncertainty, input uncertainty, social uncertainty and market uncertainty.

In order to employ PCA , it needs to be confirmed that the sampling adequacy of the data for the analysis which is measured by Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy (Hair et al., 2010). The individual variable's KMO can be obtained from anti-image matrix, and if any variable was found to be lower the level of acceptance (0.5) should be excluded from the factor analysis, one at a time, smallest is first (e.g., Hair et al., 2010). After removing the unsuitable variables from anti image matrix (uncertainties about output market, natural uncertainties, fluctuating results under research projects, uncertainties on payment behavior of customers and behavioral uncertainties) the remaining variables were grouped into four factors. Here KMO and Bartlett's test of Sphericity measure of sampling adequacy (George & Mallery, 2003) was used. A measure of sampling adequacy of 0.713 with a value of Bartlett's test of Sphericity (1168.502) with a high significant level ($P < 0.01$), indicates the suitability of factor analysis.

Factor loadings of the items on a factor are greater than 0.5 ensure that EFA has a practical significance to the analyzed data (Hair et al., 1998). Eigen value greater than one suggests that the four factors explain a sizable variation contained in the data. Since these four factors have Eigen values greater than one, which together explains a variance of 73.69%; therefore, the factors confirmed the factorial validity. Table 2 represents these results.

Table 2: Total Variance Explained for Factors Indicating to the Uncertainty

Variables	Component			
	Market Uncertainty Factor 1	Social Uncertainty Factor 2	Operational Uncertainty Factor 3	Financial Uncertainty Factor 4
Eigen Value	3.021	2.459	2.104	1.996
Proportion of variance explained (%)	23.24%	18.91%	16.17%	15.36%
Cumulative percentage explained	23.24%	42.15%	58.34%	73.69%
Cronbach's Alpha – Reliability of the factors	0.915	0.876	0.825	0.816

The total variance explained for factors indicating to the uncertainty has been summarized in Table 2; the variables of market uncertainty (covering the components of competitive uncertainty, output market uncertainty and input market uncertainty), social uncertainty (covering the components of political uncertainty, policy uncertainty and social uncertainty), operational uncertainty (covering the components of input uncertainties, labour uncertainties and production uncertainties) and financial uncertainty (covering the components of interest rate, inflation and exchange rate uncertainties) are grouped into factors. The result illustrates that the uncertainty variables are grouped in four factors as the reviewed literature: market uncertainty, social uncertainty, operational uncertainty and financial uncertainty. The findings of this study is closely consisting with the study of Verbeeten (2006), with the exception that the input market uncertainty variable rotated into market uncertainties in the current study which was not in the Verbeeten's findings. However this finding is closely consistent with Miller's (1992) industry specific uncertainty factors (variable of input market) and the operational uncertainty factor is also consistent with the Miller's (1992) findings.

Principal Component Analysis for Capital Budgeting Practices

PCA was carried out to extract the capital budgeting practice as grouped in the literature. After removing the unsuitable variables (profitability index, economic internal rate of return, Monte Carlo Simulation, adjusting the required return, modified internal rate of return and complex mathematical model) from anti image matrix, the remaining variables are grouped into three factors. Here, KMO and Bartlett's test of Sphericity measure of sampling adequacy (George & Mallery, 2003) were used. A measure of sampling adequacy of 0.888 with a value of Bartlett's test of Sphericity (1221.845) with a high significant level ($P < 0.01$), indicates the suitability of factor analysis.

Table 3: Total Variance Explained for the Factors Indicating to the Capital Budgeting Practices

	Factors		
	Advanced / NPV Based Capital Budgeting Practices	**Sophisticated Capital Budgeting Practices**	**Simple/ Naïve Capital Budgeting Practices**
Eigen Value	5.822	2.108	1.365
Proportion of Variance Explained	38.815%	14.052%	9.101%
Cumulative Percentage Explained	38.815%	52.867%	61.968%
Cronbach's Alpha – Reliability of factors	0.890	0.809	0.744

The total variance explained for the factors indicating to the capital budgeting practices is shown in Table 3, the variables of capital budgeting practices are grouped into related factor. The variables that are grouped in three factors as the reviewed literature: Advanced/ NPV based capital budgeting practices include probability analysis, IRR, scenario analysis, break-even analysis, uncertainty absorption in cash flows, sensitivity analysis and NPV. Sophisticated capital budgeting practices consist of real option, CAPM/B analysis, game theory decisions and decision trees. Simple / Naive capital budgeting practices comprise DPB, ARR and PB. The findings of this study underpinning the theoretical base were consistent with the studies of Verbeeten (2006) and Wolffsen (2012).

Descriptive Analysis

Table 4 shows the descriptive statistics of the variables which consist the minimum, maximum, mean value and the standard deviation of the independent, dependent variables. As indicated, the measure of uncertainty (ranging from 1= not at all important, to 5 = very important) and capital budgeting variables (ranging from 1 = never to 5= always) were measured by 5 point Likert scale ranging from 1-5. The mean value of the financial and market uncertainty factors were 4.39 and 4.30 respectively which indicated that those two uncertainty factors were very important factors that affect the company's investment decision as it had a mean value of above 4. The mean value of uncertainty factors of social and operational factors were 3.56 and 3.06 respectively to impact the capital budgeting practices and when compared to the social and operational uncertainty factors, the

social uncertainty factors were significantly important than the operational uncertainty as it had lowest mean value among four uncertainty factors.

Table 4: Descriptive Statistics of the Variables

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Financial uncertainty	186	1.33	5.00	4.3996	.73507
Market uncertainty	186	2.00	5.00	4.3047	.67678
Social uncertainty	186	1.00	4.00	3.5627	.80908
Operational uncertainty	186	1.67	4.00	3.0699	.70724
Sophisticated capital budgeting practices	186	1.00	3.25	1.3091	.47916
Advanced/NPVBased capital budgeting practices	186	1.57	5.00	3.9209	.64694
Simple/NAÏVE capital budgeting practices	186	1.67	4.67	3.1900	.63131
Size of the company	186	6.90	11.59	9.3385	.70759

When considering the mean values of capital budgeting practices, the mean value of sophisticated capital budgeting practices was 1.30 which indicated that the application of sophisticated capital budgeting practices were very rare but it was not concluded that the sophisticated practices were not in practice in Sri Lanka. The mean value of the advanced/NPV based capital budgeting practices was nearly 4 which indicated that often they are in the practices. The mean value of the naive capital budgeting practices was 3.20 which indicated that second important capital budgeting practices next to NPV based. It was concluded that majority of the Sri Lankan firms were using NPV based advanced capital budgeting practices followed by simple capital budgeting practices. However, smaller number of companies were attempting to use sophisticated capital budgeting practices. Finally, the size of the company was calculated by logarithm of total assets which was measured with an average value of the 5 years total assets.

Correlation Analysis

In order to evaluate the relationship between variables correlation analysis was performed. The results of the analysis presented in Table 5.

Table 5: Correlations Matrix

		1	2	3	4	5	6	7	8
Size of the company (1)	Pearson Correlation	1							
	Sig. (2-tailed)								
Market uncertainty (2)	Pearson Correlation	.046	1						
	Sig. (2-tailed)	.531							
Social uncertainty (3)	Pearson Correlation	.044	.101	1					
	Sig. (2-tailed)	.555	.170						
Operational uncertainty (4)	Pearson Correlation	-.087	-.140	-.015	1				
	Sig. (2-tailed)	.239	.057	.844					
Financial uncertainty (5)	Pearson Correlation	.151*	.014	.095	-.003	1			
	Sig. (2-tailed)	.040	.855	.195	.966				
Sophisticated capital budgeting practices (6)	Pearson Correlation	.211**	.126	-.004	-.003	.324**	1		
	Sig. (2-tailed)	.004	.086	.959	.968	.000			
Advanced capital budgeting practices (7)	Pearson Correlation	.156*	-.038	.006	-.125	.248**	.402**	1	
	Sig. (2-tailed)	.033	.611	.932	.090	.001	.000		
Simple capital budgeting practices (8)	Pearson Correlation	-.111	-.050	-.060	-.047	-.188*	-.448**	-.433**	1
	Sig. (2-tailed)	.131	.494	.417	.521	.010	.000	.000	

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

Table 5 summarizes the results of the correlation analysis. There was a positive relationship between the size of the company and application of capital budgeting practices that: the size of the company positively related to sophisticated capital budgeting practices ($r = 0.211$, $P<0.01$). This reveals that when the size of the company increases, application of sophisticated capital budgeting practices will also increase. Further, there was a positive significant relationship between the size of the company and advanced capital budgeting practices ($r= 0.156$, $P< 0.05$). This also explains that when the size of the company increases, the application of the advanced capital budgeting practices will also increase; the size of the company negatively correlated with simple capital budgeting practices ($r = -0.111$, $P > 0.05$) but it was not statistically significant in the current study. Financial uncertainty was positively, related to the application of sophisticated capital budgeting techniques ($r =0.324$, $p < 0.01$) and the application of advanced capital budgeting techniques ($r = 0.248$, $p < 0.01$). However, there was a negative significant relationship between financial uncertainty and application of simple capital budgeting techniques as simple capital budgeting practices are not normally considered the uncertainty. There was no relationship between other uncertainty factors (market, social and operational) and application of capital budgeting practices (sophisticated, advanced and simple).

Impact of Uncertainty Factors on the Application of Capital Budgeting Practices

Impact of Uncertainty Factors on the Application of Sophisticated Capital Budgeting Practices

Hierarchical multiple regression was performed to investigate the impact of uncertainty factors to predict the application of sophisticated capital budgeting practices, after controlling for size of the organization. The results of the regression analysis were presented in Table 6.

Table 6: Hierarchical Regression Model of Sophisticated Capital Budgeting Practices

	R	R^2	R^2 change	df	F	F change	B	SE	β	t	P_ value
Model 1	0.211	0.045		(1,184)	8.593						0.004
Size							0.143	0.049	0.211	2.931	0.004
Model 2	0.385	0.148	0.104	(5,180)	6.276	5.487					0.000
Size							0.112	0.047	0.165	2.356	0.020
Financial Uncertainty							0.197	0.046	0.302	4.329	0.000
Market Uncertainty							0.088	0.049	0.124	1.771	0.078
Input Operational Uncertainty							0.020	0.047	0.029	0.414	0.679
Social Uncertainty							-0.031	0.041	-0.052	-0.747	0.456

R2 = amount of variance explained by IVs
R2 Change = additional variance in DV
B = Unstandardized coefficient
β = Standardized coefficient (values for each variable are converted to the same scale so they can be compared)
SE = Standard Error
t = estimated coefficient (B) divided by its own SE. If **t < 2** the IV does not belong to the model

In the first model of hierarchical multiple regression, size was entered as it was control variable in this analysis. This model was statistically significant $F(1, 184) = 8.593$; $p < .01$ and explained 5 % of variance in sophisticated capital budgeting practices (Table 6). After entry of four

uncertainty factors which were financial, market, operational and social uncertainty at model 2, the total variance explained by the model as a whole was 15% ($F (5, 180) = 6.276$; $p < .01$). The impact of uncertainty explained additional 10 % variance in application of sophisticated capital budgeting practices, after controlling for size of the organization (R^2 Change = .10; $F (4,180) = 5.487$; $p < .01$). In the final model, two out of five predictor variables were statistically significant, with financial uncertainty recording a higher beta value ($\beta = .302$, $p < .000$) than the size of the organization ($\beta = .165$, $p < .020$). Hypothesis 1 stated that *an increase in specific uncertainty will lead to the application of sophisticated capital budgeting practices.* The results illustrated that the financial uncertainty factors had positive significant impact on application of sophisticated capital budgeting practices. Therefore, it could be concluded that increase in financial uncertainty lead to the application of sophisticated capital budgeting practices and thus H_1 has supported by study and there were no significant impact of market, social and operational uncertainty factors on the application of sophisticated capital budgeting practices.

From the analysis, it was concluded that financial uncertainty had significant impact on application of sophisticated capital budgeting techniques. Therefore, it is forced to a question if all dimensions/variables of financial uncertainty factor have an impact on application of sophisticated capital budgeting practices. Thus hierarchical multiple regression was performed to investigate the impact of dimensions of financial uncertainty factor to predict the application of sophisticated capital budgeting practices, after controlling for size of the organization and the results were indicated in the Table 7.

Table 7: Hierarchical Regression Model of Sophisticated Capital Budgeting Practices

	R	R^2	R^2 change	df	F	F change	B	SE	β	T	P_ value
Model 1	0.211	0.045	0.045	(1,184)	8.593	8.593					0.004
Size							0.143	0.049	0.211	2.931	0.004
Model 2	0.372	0.138	0.094	(4,181)	7.253	6.548					0.000
Size							0.111	0.047	0.165	2.356	0.020
Interest rate Uncertainty							0.009	0.052	0.017	0.177	0.860
Inflation Uncertainty							0.111	0.053	0.203	2.108	0.036
Exchange rate Uncertainty							0.076	0.051	0.131	1.486	0.139

In the first model of hierarchical multiple regression, size was entered. This model was statistically significant F (1, 184) = 8.593; $p < .0.01$ and explained 5 % of variance in capital budgeting practices as shown in Table 6. After entry of three dimensions of financial uncertainty factor which were interest rate, inflation and exchange rate uncertainty at model 2, the total variance explained by the model as a whole was 14% (F (4, 181) = 7.253; $p < 0.01$). The impact of uncertainty explained additional 9 % variance in application of sophisticated capital budgeting practices, after controlling for size of the organization (R^2 Change = .0.094; F (4,181) = 6.543; $p < 0.001$). In the final model, only one out of the three dimensions of financial uncertainty was statistically significant, with inflation uncertainty recording a beta value ($\beta = .203$, $p < .05$). $H_{1.1}$ stated that *If specific uncertainty factor lead to the application of sophisticated capital budgeting techniques, all dimensions of specific uncertainty factors will lead to application of capital budgeting practices*. The results illustrated that only one dimension of financial uncertainty had an impact on the application of sophisticated capital budgeting practices. Therefore, the hypothesis was not supported; only one dimension of inflation uncertainty was associated with the application of sophisticated capital budgeting practices.

Impact of Uncertainty Factors on the Application of NPV Based Capital Budgeting Practices

Table 8: Hierarchical Regression Model of NPV based Capital Budgeting Practices

	R	R^2	R^2 change	df	F	F change	B	SE	β	t	P_ value
Model 1	0.156	0.024	0.024	(1,184)	4.598	4.598					0.033
Size							0.143	0.067	0.156	2.144	0.033
Model 2	0.305	0.093	0.068	(5,180)	3.685	3.397					0.010
Size							0.104	0.066	0.114	1.580	0.116
Financial Uncertainty							0.205	0.063	0.232	3.224	0.002
Market Uncertainty							-0.059	0.069	-0.061	-0.853	0.395
Input Uncertainty							-0.112	0.066	-0.123	-1.707	0.090
Social Uncertainty							-0.013	0.057	-0.016	-0.229	0.819

Hierarchical multiple regression was performed to investigate the impact of uncertainty factors to predict the application of NPV based capital budgeting practices, after controlling for size of the organization.

In the first model of hierarchical multiple regression, size was entered. This model was statistically significant F (1, 184) = 4.598; $p < .0.05$ and explained 2 % of variance in capital budgeting practices. After entry of four uncertainty factors which were financial, market, operational and social uncertainty at model 2, the total variance explained by the model as a whole was 9% (F (5, 180) = 3.685; $p < 0.01$). The impact of uncertainty explained additional 7 % variance in application of NPV_Based capital budgeting practices, after controlling for size of the organization (R^2 Change = .0.068; F (5,180) = 3.397.; $p < 0.01$). In the final model, one out of five predictor variables were statistically significant, with financial uncertainty recording beta value ($\beta = .232$, $p < .002$). Hypothesis 2 stated that *an increase in specific uncertainty will be associated with the application of NPV Based/Advanced capital budgeting practices.* The results illustrated that the financial uncertainty factors had positive significant impact on application of advanced/ NPV based capital budgeting practices. Therefore, it could be concluded that increase in financial uncertainty associated to the application of advanced/ NPV based capital budgeting practices and thus H_2 was supported by the study and there was no significant impact of market,

social and operational uncertainty factors on the application of advanced capital budgeting practices.

From the previous analysis, it was concluded that financial uncertainty had significant impact on application of NPV_Based capital budgeting techniques. Therefore, it is also questioned if all dimensions of financial uncertainty factors have an impact on application of NPVBased capital budgeting techniques. Another hierarchical multiple regression was performed to investigate the impact of dimensions of financial uncertainty factor to predict the application of NPV based capital budgeting practices, after controlling for size of the organization and the results were presented in Table 9.

Table 9: Hierarchical Regression Model of NPV based Capital Budgeting Practices

	R	R^2	R^2 change	df	F	F change	B	SE	β	t	P_ value
Model 1	0.156	0.024	0.024	(1,184)	4.598	4.598					0.033
Size							0.143	0.067	0.156	2.144	0.033
Model 2	0.284	0.081	0.056	(4,181)	3.981	3.708					0.004
Size							0.111	0.066	0.122	1.689	0.093
Interest Uncertainty							0.115	0.073	0.157	1573	0.118
Inflation Uncertainty							0.078	0.074	0.105	1.057	0.292
Exchange rate Uncertainty							0.002	0.072	0.002	0.021	0.983

In the first model of hierarchical multiple regression, size was entered. This model was statistically significant F (1, 184) = 4.598; $p < .0.05$ and explained 2 % of variance in capital budgeting practices. After entry of three dimensions of financial uncertainty factors; interest rate, inflation and exchange rate uncertainty at model 2, the total variance explained by the model as a whole was 8% (F (4, 181) = 3.981; $p < 0.01$). The impact of uncertainty explained additional 6 % variance in application of sophisticated capital budgeting practices, after controlling for size of the organization (R^2 Change = .0.056; F (4,181) = 3.708; $p < 0.01$). In the final model, none of the variable was statistically significant. $H_{2.1}$ stated that *If specific uncertainty factor associated with the application of NPV based advanced capital budgeting techniques, all dimensions of specific uncertainty factor will be associated to application of advanced capital budgeting techniques.*

The results illustrated that none of the dimensions of financial uncertainty had an impact on the application of NPV based advanced capital budgeting practices. Therefore, hypothesis $H_{2.1}$ was not supported; none of the variable of financial uncertainty had association with the application of NPV based advanced capital budgeting practices.

DISCUSSION

Finance and strategic management theory suggest that organization specific uncertainties in the investment decisions should respond by adopting advanced capital budgeting practices. Having understood the importance of uncertainty on investment decision making, the current study was conducted to identify the uncertainty factors and its impact on application of capital budgeting practices. Findings of the study identified several uncertainty factors which were financial uncertainty (interest rate, inflation and exchange rate), market uncertainty (input market, output market and competitive factors), operational uncertainty (input, labor and production) and social uncertainty (policy, political and social). Empirical evidence shows that the theoretical application of the sophisticated capital budgeting involves the use of multiple tools and procedures (e.g., Monte Carlo simulation, certainty equivalents). In line with the theoretical underpinning and empirical evidence, capital budgeting practices had been confirmed into three groups; as sophisticated capital budgeting practices, NPV based/ advanced capital budgeting and simple capital budgeting practices (Verbeeten, 2006; Wolffsen, 2012). Among the four uncertainty factors, an increase in financial uncertainty was significantly associated to the application of sophisticated capital budgeting practices and advanced capital budgeting practices. The findings are in line with the theoretical underpinning and empirical evidence (Verbeeten, 2006). Size was considered as control variable as per empirical evidence of Payne, Heath and Gale (1999) and Ryan and Ryan (2002) documented that large firms were more inclined to use more sophisticated capital budgeting practices. Size was accordance with the expectations, that it was positively significantly related to sophisticated capital budgeting practices and advanced capital budgeting practices. Further analysis was extended that all dimensions / variables of financial uncertainty factors impact on application of capital budgeting practices. The findings showed that among the three variables of financial uncertainty, inflation was only

influenced on the application of sophisticated capital budgeting practices which was not influenced even in NPV based /advanced capital budgeting practices.

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