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FINANCIAL DERIVATIVES IN THE SOUTH AFRICAN MINING INDUSTRY

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A Research Report submitted to the Faculty of Commerce, Law and Management, University of the Witwatersrand, Johannesburg, in partial fulfilment of the requirements for the degree of Master of Business Administration

Johannesburg

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ABSTRACT

The purpose of this research was to identify factors which influence the decision to use financial derivatives in the South African mining industry and then to establish their importance to the industry.

The research incorporated both qualitative and quantitative primary research phases. The qualitative survey formed the questionnaire framework for the quantitative phase. The quantitative survey formed the bulk of the analysis, and both mean rank tests and factor analysis were employed to interpret the data.

Thirteen factors, influencing the decision to use financial derivatives, were identified. However, statistically significant mean rank tests (where $p < 0.05$) indicated that, out of the initial thirteen factors, the South African mining industry viewed the following to be the most important:

1. Change the Volatility of Cash Flows
2. Improve Value of the Firm
3. Change the Volatility of Accounting Earnings
4. The Size of the Firm
5. The Perceptions of Derivatives Use by Investors, Regulators and the Public

It was also found that combinations of factors, rather than individual factors, influence the decision to use derivatives. Therefore, a factor analysis was conducted to identify these various combinations.

The analysis yielded seven broadly defined combinations of factors which incorporated the top five factors and were able to explain most of the variance observed from the original thirteen factors. These seven combinations were:

- Perceptions and External Finances
- Cost of Capital and the Value of the Firm
- Volatility of Accounting Earnings
- Size of Firm
- Availability of Information
- Financial Distress
- Political and Country Instability

Furthermore, outputs indicated that the use of financial derivatives and the relative importance of factors in terms of derivative usage may be influenced by factors other than those discussed in this research.

DECLARATION

I, Avichay Josef, declare that this research report is my own, unaided work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

Avichay Josef

22 December, 2006

DEDICATION

This research report is dedicated to my wife, Tracy, for all her patience, constant support and encouragement.

ACKNOWLEDGEMENTS

I would like to thank the following people for making this research possible:

- My supervisor, Mr. Frank Durand, for all his time, patience and guidance;

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CHAPTER 1

1. INTRODUCTION

This research aimed to develop an inductive understanding of what motivates management within the South African mining industry to use financial derivatives.

The term “risk management” denotes a situation where a firm or an individual engages in financial contracting in an effort to alter the risk or return profile of their future cash flows (Cummins *et al*. 1998). This research, however, only deals with risk management strategies that involved the use of financial derivatives.

Derivative instruments such as options, swaps, futures and forwards are used by corporations to alleviate exposure from fluctuations in interest rates, currency and commodity prices (Nguyen & Faff, 2002). In this research, the term “derivatives” is interchangeable with “risk management”.

The use of derivatives by non-financial corporations has grown rapidly over the last two decades. The Bank of International Settlements (2005), in its 2004 Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity, reported that the global position in the derivatives market as of June 2004 was US$ 220.1 trillion. This was a substantial increase from the 2001 figures, of US$ 99.7 trillion.

According to the Wharton Survey of Derivatives Usage by US Non-Financial Firms, it was found that nearly three-quarters of corporations have adopted at least some financial engineering techniques to control their exposure to interest rates, foreign exchange rates, and commodity prices (Bodnar *et al*. 1996).

Bartram *et al*. (2003) investigated the usage of derivatives globally, and reported that out of fifty eight non-financial South African firms which participated in their survey, 89.7% were using some form of derivatives. These included foreign exchange, interest rate or commodity price derivatives. The study also revealed that out of the 240 global mining firms which participated in the survey, 61.3% have incorporated derivatives into their financial strategy. Whilst studies have been conducted on the determinants for derivative usage by local firms, no sector specific study has been conducted regarding the South African mining sector.

This study identified the importance and influence of derivative determinants and explored which of these determinants were most likely to encourage the use of derivatives within the South African mining sector.

1.1 Context of the Study

South African mining companies are burdened with risks. These risks can vary from operational to exploration to logistical and financial. The financial risk, however, has the greatest potential of making or breaking a mining company (Murphy, 2003).

Tufano, (1996) suggested that the main volatilities, contributing to financial risk, in the mining industry were derived from three sources: the exchange rate, interest rates and commodity prices. Mining companies, therefore, need to consider the degree of financial risk they are willing to take and the degree of certainty that they would like to introduce.

According to the Chamber of Mines of South Africa, the South African mining industry was one of the most important industries for the growth and development of the economy. The sector accounted for 7.1% of Gross Domestic Product (GDP) in 2003. It directly accounted for 11.9% of total fixed investment in the economy and it continued to dominate the JSE Securities Exchange South Africa (JSE), accounting for 39% of the R1.4 trillion market capitalisation of the Exchange at the end of 2003. However, despite the global commodity boom, the Chamber reported that the 2003/2004 period was particularly difficult for the mining industry. The gold mining sector, in particular, was hard hit, as the effect of the stronger Rand, lower Rand gold price and cost pressures eroded margins (Annual Report, 2004).

These difficulties were again highlighted by the Chamber in 2005 which cited that the three main issues that affected the South African mining industry during the year were the continued strength of the Rand, the negative impact of rising input costs, and logistical constraints that impacted on export volumes. The industry's growth of 4.2% in 2004, however, exceeded the increase in the country's GDP (Annual Report, 2005).

It is within these economic and financial difficulties mines are faced with the decision of whether or not to use derivatives as a means of securing revenue streams. The study sought to identify which factors are most critical to this sector when using derivatives.

Moreover, according to Callahan (2002), firms in this industry manage their exposure to commodity price risk by using a wide variety of financial instruments including forwards, futures contracts, swaps and options (puts and calls). The research is therefore appropriate for the South African mining industry.

1.2 Problem Statement

The purpose of this research was to identify factors or determinants that influence the use of financial derivatives in the South African mining industry.

Sub-problems

The sub-problems of the research report were as follows:

- The first sub-problem: To identify the determinants that can explain financial derivatives usage.

- The second sub-problem: To rank the importance of these determinants.

1.3 Delimitations

- Although there are non listed mining companies in South Africa, the only mining companies studied in this research were listed on the JSE within the mining sector.

- This study was limited to financial derivatives only. These derivatives covered exposure in foreign currency exchange rates, interest rates and commodity prices only.

- In this research “derivatives” and “financial risk management” are interchangeable.

- The study used a sample of respondents drawn from different sources across a number of months. It is possible that respondents’ views could have been influenced by external or environmental events during the drawing of a sample which might then affect how respondents answered survey questions.

1.4 Significance of the Study

Previous studies have been undertaken in the field of derivatives usage, both in South Africa and around the world. The determinants for the usage of financial derivatives have also been established in these studies. However, the identified factors are prone to generality because the surveys were conducted across industries and across sectors of the economy. This study focused on the mining sector and therefore offers deeper insight in terms of industry behaviour. This study can also assist mining firms in designing and establishing a derivatives programme.

Theories explaining financial risk management require a considerable number of assumptions concerning the objectives of management (Benson & Oliver, 2004). Due to complex relationships within the firm, management objectives could be different in each organisation. These differences can be exacerbated

by examining derivative usage across industries and then projecting the findings to a specific industry, such as the mining industry.

This study focuses on the South African mining industry, and attempted to identify the main determinants for the usage of derivatives. It will also establish the importance of the factors that motivate management derivative usage and highlight the manner in which mining firms are utilising derivatives in their financial risk management strategies.

1.5 Assumptions

The following assumptions have been made:

- Respondents have been exposed to financial derivatives.

- The sample is representative of the mining industry.

- A certain level of financial understanding is required by the reader.

- All efforts were made to ensure reliability and representation. The measures taken to ensure the reliability and representation, have been incorporated in the methodology chapter

1.6 Subsequent Chapters of the Research Proposal

The following chapters of this research proposal are structured in the following manner:

Chapter 2: Literature Review

This section identifies determinants influencing the decision to use financial derivatives. Propositions based on the literature review will be provided at the end of the chapter.

Chapter 3: Methodology

This section explains the qualitative and quantitative methodologies used in the research. This includes the sampling procedures, methods of data collection and techniques used in the data analysis.

Chapter 4: Qualitative Survey Results & Interpretation

This section presents the findings of the qualitative study and the platform developed for the quantitative phase.

Chapter 5: Qualitative Survey Results

This section presents results of the quantitative survey as well as the statistical techniques employed.

Chapter 6: Interpretation of Quantitative Results

This section presents an interpretation of the quantitative results within the context of the literature review and the research propositions.

Chapter 7: Conclusions

This section presents the main findings of the research, their implications on the industry and suggestions for further research.

CHAPTER 2

2. LITERATURE REVIEW

2.1 Introduction

Financial literature proposes a multitude of theories to explain why firms manage risk and opt for the use of derivatives. This review attempts to identify the main determinants for derivatives usage.

The determinants mentioned in the literature contrast the work of Modigliani & Miller (1958), who suggested that in a perfect world, risk management is irrelevant because shareholders can replicate, at their level, any strategy adopted by the firm. However, financial markets may not be perfect and firms pay great attention to the way in which they manage risk since it seems to affect their value and management behaviour (Dionne & Triki, 2003).

Benson & Oliver (2004) have identified four key determinants that support the usage of derivatives and the management of financial risk:

- Financial risk management may reduce financial distress costs and agency costs.
- Economies of scale are present if risk management is undertaken at firm level rather than at shareholder level.
- Tax rates may differ between individuals and firms resulting in different outcomes.

- External financing costs may be minimised by the usage of derivatives and proper risk management.

These determinants, and others, are discussed in the following section.

2.2 The Determinants Motivating the Use of Derivatives

2.2.1 Reduction of Financial Distress and Bankruptcy

Smith & Stulz (1985) argued that firms with high expected financial distress costs and those with high risk premiums to pay, are more strongly inclined to hedge their risks in order to reduce these costs and increase the firm's net value. They also argued that, assuming a fixed investment policy, hedging can decrease the present value of financial distress costs even if hedging is costly. Therefore, under the financial distress argument, hedging increases shareholders' wealth because it decreases the expected value of direct bankruptcy costs and the loss of debt tax shield. One important implication of their model is that if hedging costs are proportional to the value of the firm, smaller corporations should hedge to a greater extent, as the reduction in financial distress costs is more important for them. Increases in financial risk may increase the volatility in earnings, signalling financial distress. Managing financial risks through derivatives may reduce volatility of earnings resulting in a reduction in the probability of bankruptcy and hence financial distress costs.

Dolde (1996) investigated whether there was a significant complementary relationship between risk management and the leverage of the firm. He found that highly leveraged firms were more likely to use derivatives to avoid the expected costs of financial distress. The risk of financial distress is also higher the more volatile the cash flows, the stronger the dependence on business cycles and the greater the operating leverage (Guay, 1999).

2.2.2 The Size of the Firm

The size of a firm also determines the extent of hedging and derivatives usage. Stulz (1996) claimed that larger firms have greater negotiating power and, therefore, are able to lower the average financing cost, which in turn, reduces the need to hedge risks. On the other hand, Nance *et al*. (1993) argued that smaller firms are more likely to hedge than larger firms because the direct costs of financial distress are less than proportional to the firm size.

However, empirical evidence from the same study suggested a positive relationship between size and the use of derivatives. One of the reasons cited for this outcome was that larger firms have more sophisticated financial management practices and are therefore more likely to use derivatives.

This was in agreement with Warner's (1977) argument which suggested that as transactional costs exhibit economies of scale, large firms are expected to gain more from derivative use. The reasons included their ability to bear these

costs, as well as the lower cost of setting up a derivative programme for risk management

Nguyen & Faff (2003), in their Australian survey, found that a firm's leverage, size and liquidity are important determinants of derivative use. The evidence was consistent with firms seeking to maximise shareholder value rather than managerial wealth.

2.2.3 Reduction of Taxation

A convex tax schedule is one in which the average tax rate of a firm rises as pre-tax income rises (Merrifield, 1998). Smith & Stulz (1985) were the first to introduce the tax argument that states that in presence of a convex tax function, hedging reduces the variability of the pre-tax firm value and the firm's tax liability, because it locks the taxable earnings in a predefined level.

Dionne & Garand (2003) also suggested that with a convex tax structure, hedging to cover risks may cut average taxes by reducing fluctuations in earnings. However, Nance *et al*. (1993) found weak support for the hypothesis that firms use derivatives to hedge taxable income.

South Africa does not have a progressive tax schedule and this factor should, therefore, not influence decisions by South African firms to use financial derivatives. However, offshore operations belonging to SA firms might be

exposed to such a tax structure. Therefore, firms might use derivatives to smooth earnings and reduce the tax burden (Merrisfield, 1998).

2.2.4 Usage of External Financing

Cummins *et al*. (1998) noted that there is strong evidence that firms use derivatives to reduce the variability of their income stream. This allows firms to ensure that adequate internal funds are available to take advantage of attractive projects.

Studies by Geczy *et al*. (1997) and Nance *et al*. (1993) of non-financial firms found that companies with less liquidity are more likely to use derivatives. This is to avoid circumstances under which a shock to the internal capital resources of the firm might force the company to forgo profitable projects. Therefore, the use of derivatives is positively related to measures of the firm's investment opportunity (Geczy *et al*. 1997).

Froot *et al*. (1993) argued that to reduce the fluctuation in internal earnings, hedging risk is necessary. This is used to minimise the need for external financing for investment projects due to low internal earnings. They hypothesised that if external sources of funds are more costly to a firm than internally generated funds, then the firm could benefit from using derivatives.

2.2.5 Reduction of the Cost of Capital

External financing is more costly because outside investors are in a situation where the investments required may be associated with risk. Reducing exposure to financial risks may increase shareholder value by harmonising financial and investment decisions (Froot *et al*. 1993).

Adam (2002) found a strong positive relationship between the minimum revenue guaranteed by hedging and investment expenditure. The results suggested that hedging increases the likelihood that investments can be financed internally. Firms that do hedge, finance a smaller fraction of their investment expenditures externally than do firms that do not hedge. This gave credibility to the Froot *et al*. (1993) argument.

Raising external capital is also costly due to transaction costs. For this reason, firms may under-invest. Derivatives can be used to increase shareholder value by coordinating the need for, and availability of, internal funds. Therefore, risk management can reduce underinvestment costs by reducing the volatility of firm value (Benson & Oliver 2004).

The hedging firm can effectively commit to meeting obligations in states where it otherwise could not and so negotiate better contract terms in the form of lower borrowing costs. Therefore risk management effectively expands the firm's debt capacity (Myers, 1977).

2.2.6 Improve Value of the Firm

Tufano (1996) suggested that managers have two key classes in their choice of risk management activities on behalf of their firms. The first class focuses on risk management as a means to maximise shareholder value and the second class focuses on risk as a means to maximise managers' private utility.

Within the shareholders value maximisation paradigm Tufano (1996) holds that there are three principal determinants required to justify risk management activities: financial distress, increasing investment opportunities, and reducing expected tax payments.

Gay & Nam (1998) found that firms with investment opportunities are more likely to use derivatives when their cash flow is relatively low. Their results indicate that firms use derivatives in order to maximise shareholder value.

2.2.7 Managerial Risk Aversion

Tufano (1996), Smith & Stulz (1985), and Rajgopal & Shevlin (2002) predicted that managers with greater share ownership prefer more risk management, while those with greater share option holding prefer less risk management.

Carpenter (2000) argued that share options create two opposing effects on managerial wealth. The first effect is that manager wealth becomes more

important as the volatility of the share return increases and options payoffs become more important. The first effect should cause less hedging on the part of managers. The second effect is that payoff from options becomes less important as the share price decreases. This results in risk-averse managers increasing their hedging to avoid a drop in the share price.

Nguyen & Faff (2002) suggested that managers are most likely to have an impact on the decision to use derivatives. The reason for this was twofold. Firstly, they have a large and non-diversifiable stake in the firm and secondly, they are the ones who make the decision regarding financial derivative use. They also argue that leverage, size and liquidity are important factors associated with the decision of derivatives usage.

Jensen & Meckling (1976) argued that conflict of interest within the firm might arise should managers hold an undiversified portfolio of equity and human capital invested in a single firm. Therefore, risk-averse managers may be motivated to reduce firm risk for personal gain, at the expense of diversified shareholders.

This aspect is even more relevant as managers typically have a relatively undiversified wealth position due to their employment in the firm. Consequently, they are particularly interested in considering their personal preferences towards risk in corporate risk management (Stulz, 1990).

2.2.8 Information Asymmetry

Guay & Kothari (2003) conducted a study of derivatives usage by large U.S. corporations and examined the amount of financial exposure managed via derivatives. Their findings suggested that the cash flow generated from derivatives is relatively small in comparison to economic exposure and operating cash flows. Therefore, they argued that an increase in firm value is not driven by derivative investment. Derivatives are merely a “noisy proxy” for risk management.

DeMarzo & Duffie (1991) argued that there are informational asymmetries between managers and shareholders. They concluded that corporations should, in certain circumstances hedge based on private information that cannot be conveyed at a low cost to shareholders.

Information held by management regarding the market place might also play a role in the decision to use derivatives (Benson & Oliver, 2004). Shareholders are unlikely to have sufficient information about firm activity in order to implement risk management strategies in a timely manner. Therefore, information available to shareholders is only a snapshot of firm activity and managers are more likely to make accurate decisions concerning risk management.

2.2.9 Volatility of Accounting Earnings

Merrifield (1998) investigated the characteristics of derivatives usage by non-financial firms in South Africa. The results indicated that foreign exchange risk undertaken by South African firms was used more extensively than any other form of risk (forward contracts were utilised far more than any other tool). The most important goal of hedging by SA firms was to management the volatility in accounting earnings.

Francis & Stephan (1993) suggested that larger firms will aim to reduce scrutiny of variable earnings by using derivatives to hedge accounting earnings.

Badrinath *et al*. (1989) found that institutional investors do not invest in companies that experience large variations in earnings. High earnings volatility also increases the likelihood of negative earnings surprises. Therefore, in response, managers have engaged in extensive earnings smoothing.

Trueman & Titman (1988) suggest that earnings smoothing reduces costs as it reduces a firm's perceived probability of default and, therefore, a firm's borrowing costs.

2.2.10 Volatility of Cash Flows

According to Judge (2006), the degree to which a firm's cash flows are affected by exchange rate changes should depend on the nature of its activities, such as the level of export and import activity, its involvement in foreign operations, and the competitiveness of its input and output markets. In the mining industry, the effects of commodity prices and interest rate exposure can also affect a firm's cash flow.

Merrifield (1998) noted that the stabilisation of cash flows is of importance, but not in terms of stabilisation of accounting earnings. In addition, the lack of skills available in South Africa to run a derivatives programme internally was a factor of concern.

Jin & Fang (1999) claimed that when a company becomes weaker financially, it becomes more difficult and expensive for that company to raise funds. The higher cost of external funding may force managers to give up profitable investment. As continuous exploration is important for ongoing operation of mining companies, underinvestment due to financial distress imposes high costs for investors. In this sense, derivatives, which smooth a company's cash flows, can also reduce the possible shock of company's insolvency and can therefore, be viewed as a substitute for equity capital.

Berkman *et al*. (1997) found that all of the New Zealand firms surveyed in their study use derivatives to reduce the volatility of earnings, cash flows and

firm value. This is similar to the findings of Prevost *et al*. (2000) who discovered that the most important reason firms hedge is to minimize fluctuations in real cash flow

Froot et al. (1993) suggested that firms will hedge cash flows to avoid a shortfall in funds that may require a costly visit to the capital markets.

2.2.11 Perceptions of Derivatives Usage

Rothman (2001) also researched the derivatives usage by non-financial South African firms. Her findings indicated that foreign exchange derivatives were most commonly used, followed by interest rate, commodity and equity derivatives respectively. The biggest concerns for derivatives users were the pricing and monitoring of these instruments.

Firms were also concerned about market perceptions regarding their derivatives activity, and that the perceptions would negatively affect their image in the market place. Issues such as market risk, monitoring, evaluating hedge results and disclosure requirements are also considered a concern.

2.3 Significance of the Determinants

The determinants presented in the literature review were tested in several studies and their significance was noted. The following section outlines the significances of these determinants:

Dionne & Garand (2003) noted that hedging activity by gold mines tends to be higher when the firm needs to invest and lower when there is no need to invest.

In their research into the hedging instruments used by 169 Fortune 500 companies, Nance *et al*. (1993) found supporting empirical evidence that a firm is more likely to use derivatives if it:

- Is large in size,
- Is highly leveraged,
- Has more growth opportunities,
- Has higher dividend yield, but is less liquid.

Geczy *et al*. (1997), in their investigation of foreign currency derivatives of 372 Fortune 500 firms, found supporting empirical evidence that a firm is more likely to use derivatives if it:

- Is large in size,

- Is experiencing growth opportunities but is not very liquid. In other words, firms with greater growth opportunities but with tighter financial constraints are more likely to use derivatives.

Mian (1996), after investigating derivatives instruments of 3022 US firms in 1992, found empirical evidence to support the notion that a firm is more likely to use derivatives if it is large in size.

2.4 Additional Research and Key Findings

From his US gold mining industry research, Tufano (1996) concluded that a firm uses derivatives more extensively if it is more liquid, has less executive option holdings but more executive shareholdings. This study was conducted by investigating derivative usage of forty eight gold mining companies.

These findings were concurred by Haushalter (2000), who investigated the hedging policies of 100 oil and gas producers, and found that a firm would use derivatives more extensively if is more liquid and has fewer executive option holdings. Should the tax function be convex and the firm highly levered, derivatives usage would likely to increase.

Berkman *et al*. (2002) showed that size and leverage are the main explanatory variables for derivatives usage in the mining industry of Australia.

Dionne & Triki (2003) found evidence to suggest that taxes, financial distress costs, information asymmetry and managerial risk aversion are important determinants in the decision to hedge. Their evidence also suggests that firms hedge to increase their debt capacity.

Allayannis & Weston (2001) found a positive relation between firm value and the use of Foreign Currency Derivatives (FDC). They also found certain evidence that suggests consistency in the hypothesis that hedging causes an increase in firm value.

2.5 Research Proposition

Based on the literature review and qualitative survey, thirteen factors have been identified as determinants for using financial derivatives.

The following propositions are therefore posited.

Proposition 1: The following factors are considered by management before using financial derivatives:

- Reduction of Financial Distress and Bankruptcy
- The Size of the Firm
- Reduction in Taxation
- Usage of External Financing

- Reduction of the Cost of Capital
- Improve the Value of the Firm
- Managerial Risk Aversion
- Information Asymmetry
- Change the Volatility of Accounting Earnings
- Change the Volatility of Cash Flows
- The Perceptions of Derivatives Use by Investors, Regulators and the Public
- Political/Country Instability
- In-House Skills

Proposition 2: The relative importance of these factors is different.

CHAPTER 3

3. METHODOLOGY

3.1 Introduction

The primary research method for this study was to collect data through a quantitative survey. The survey was based on information gathered from the literature review and from the results of a qualitative phase. The qualitative phase consisted of six in-depth interviews with industry experts, with the primary objective being to develop a framework for the quantitative phase.

The data collected from the quantitative survey was analysed using various relevant statistical techniques. The determinants or factors identified were used to confirm or reject the theoretical propositions posited through the literature review.

The methodology is represented graphically in the following flow chart.

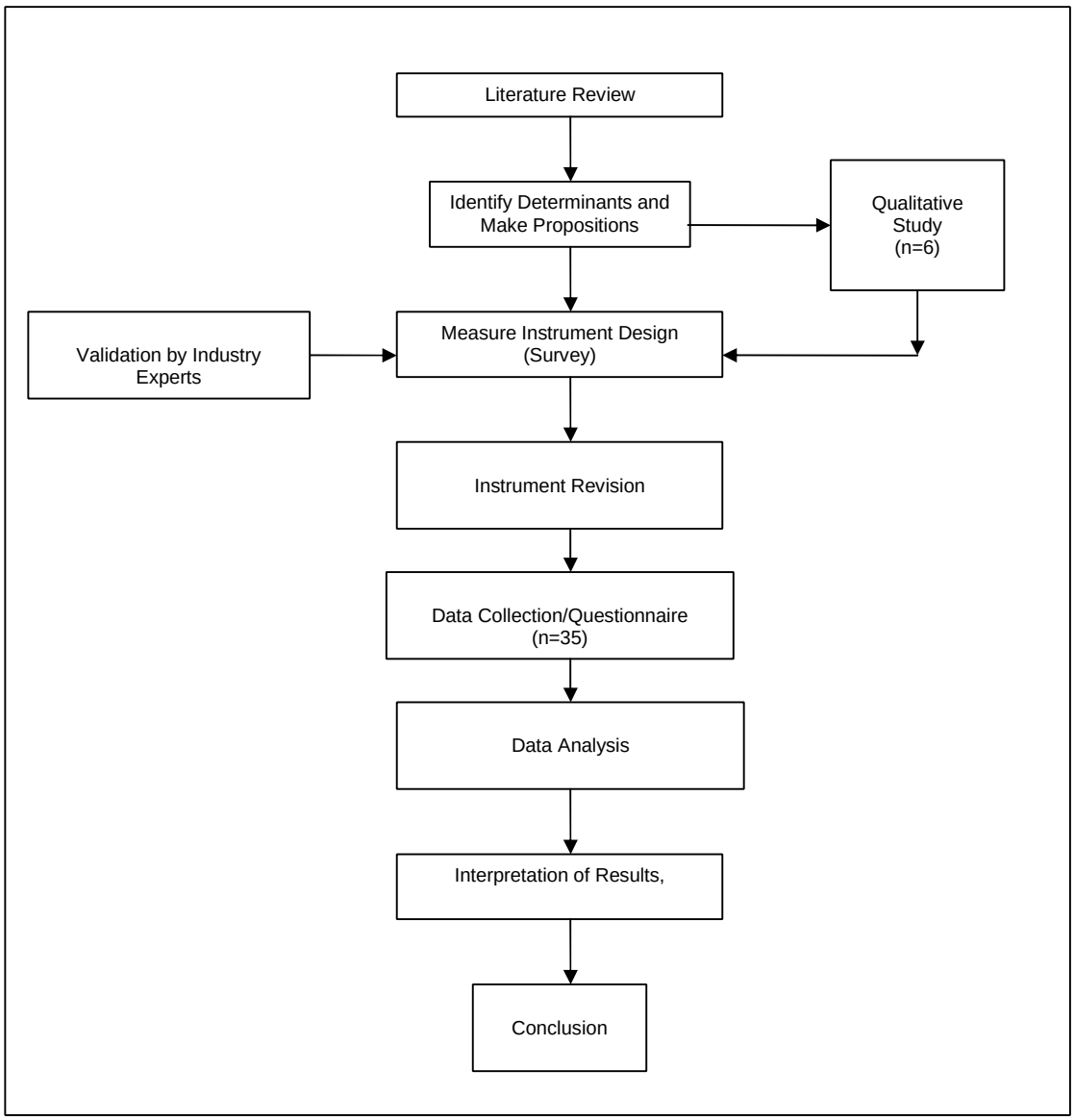

Figure 1: Methodology Flow Chart

3.2 Qualitative Phase

The purpose of the qualitative study was to determine whether the determinants identified in the literature review are relevant to the South African mining industry and whether any additional determinants can be included. This was then used to develop a questionnaire framework for the quantitative survey.

3.2.1 Research Population

The population comprised all financial directors of JSE-listed mining companies, financial specialists working for financial service groups and members of academia specialising in finance.

3.2.2 Sample Size

A judgement sample of six people, consisting of two financial directors, two financial derivatives experts from the financial services sector and two members of academia, were interviewed.

3.2.3 Sampling Methodology

The respondents represented a broad spectrum of industry opinions and judgement sampling was employed, subject to availability and readiness to participate.

3.2.4 Data Collection

The respondents were contacted telephonically and the purpose of the research was explained to them. Appointments to conduct the interviews were set up (see Appendix A.) and a copy of the discussion guide (see Appendix B.) was forwarded to each of the respondents for preparation purposes.

The purpose of conducting the interviews was to:

- Better understand the use of derivatives, and the factors influencing the decision to use such tools
- Introduce new factors pertaining to South Africa and, in particular, to the South African mining industry
- Develop an accurate and robust questionnaire framework for the quantitative phase

The discussion guide included several key questions pertinent to the objectives of the study and the open ended question structure allowed for the extraction of additional information regarding the determinants of derivatives usage.

3.2.5 Validity and Reliability

Validity is concerned with whether the instruments or constructs used in the research elicit valid conclusions.

Reliability is defined by Leedy & Ormrod (2001) as the consistency and accuracy with which the instruments used are able to yield a certain result even if the entity being measured has not changed.

The respondents represented industry experts in each of the identified sectors and results reflected their opinions, as far as possible, accurately. The pilot qualitative study sought the opinions and views of experts in the field of financial derivatives to validate the determinants for using derivatives, identified, in the literature review. It was also used as a means of contextualising literature review findings in terms of the South African mining industry and internally validated the quantitative phase.

3.2.6 Data Analysis

In the qualitative study common themes were identified, important information was noted and conclusions with regard to the propositions were made. No data analysis was required.

3.3 Quantitative Phase

3.3.1 Research Population

The population consisted of forty JSE-listed mining companies with operations in South Africa.

3.3.2 Sample Size

Due to the limited size of the industry and key financial players a judgement sample was comprised of all key financial directors or financial managers of JSE-listed mining companies. The sample size was thirty five.

The sample chosen was based on all individuals who are either involved from a financial aspect or run a derivatives programme for listed companies in the mining sector of the JSE.

3.3.3 Data Collection

Overview

A self completion technique was employed. There are forty companies listed on the mining sector of the JSE. Financial managers or directors of these companies were contacted via telephone, fax and email. The purpose of the survey was explained to the participants and delivery and collection of the

survey was arranged (see Appendix C.). Alternatively, participants were able to answer the survey online and to submit their answers electronically. The reason for using such technique was due to low response rates associated with other techniques in a respondent group that has time pressures and do not respond well to incentives.

Due to the small number of respondents, follow-ups and collection of completed survey was monitored closely. The response rate meant that a census was almost achieved. Therefore, results could be confidently projected onto the population.

Measuring Instrument

The questionnaire consisted primarily of five-point Likert itemised rating scales (see Appendix D). Each of the thirteen determinants was represented by three statements of equal weighting. Therefore, a total of thirty-nine statements were presented in the survey. The determinants were developed based on the literature review and outputs of the qualitative study.

Introductory questions established the company's financial risk management policy and the existence of a derivatives programme. The five-point Likert scale ranged from Very Likely (1) to Very Unlikely (5). Each respondent was asked to rate the extent of likelihood of each statement to their operation.

3.3.4 Reliability and Validity

Reliability refers to the property of a measurement instrument that causes it to give similar results for similar inputs.

It is important to note that the sample was drawn from different sources across a number of months. It is possible that respondents' views could have been influenced by external or environmental events during the drawing of a sample which might then affect how respondents answered survey questions.

Using the Cronbach's Alpha test it was determined that the questions asked and that the overall constructs used were reliable in measuring the expected outcomes as the alpha was greater than 0.7 (See Appendix E for full calculations).

The measuring instrument was subjected to a pilot test before it was distributed. This was done in line with Leady & Ormrod's (2001) recommendation of using a brief pilot study to test the validity and reliability of the measurement instrument.

The pilot was tested on a sample of four respondents representing a cross-section of activities relating to financial derivatives. The pilot respondents were asked to check for clarity of instructions, or any ambiguities in the statements. After conducting the Cronbach's Alpha test, it was established

that no necessary modifications were required and the survey was then distributed.

External validity was achieved by using a representative sample of the population and internal validity was achieved by first completing a qualitative phase, which acted as a basis for the quantitative phase. Coupled with the pilot interviews, the measuring instrument was considered to be valid.

3.3.5 Data Analysis

The first part of the survey attempted to understand whether or not management employs risk management plans and the extent of derivatives usage.

In the second part of the survey each of the determinants, derived from the literature review and the qualitative survey, were represented by three statements to which respondents were requested to indicate the perceived importance of each statement.

The level of importance of each determinant was obtained by weighting the number of responses for each question and then ranking the weighted means. Based on this value, the most important reason regarding the use of derivatives was determined.

Factor analysis attempts to identify underlying variables, or factors, that explain the pattern of correlations within a set of observed variables (Leedy & Ormrod, 2001). This technique was used to identify a small number of factors that explain most of the variance observed in a much larger number of manifest variables.

Malhotra (1999) suggested that Factor analysis can also be used primarily for data reduction and summarisation. Then, a probe into the significance of relationships or groupings between different factors was conducted in order to identify factors which can be used as proxies when predicting financial derivative behaviour.

All statistical analysis was performed using the statistical package SPSS, version 14.0 (Standard version, for Windows; SPSS, Chicago, IL.)

CHAPTER 4

4. QUALITATIVE SURVEY RESULTS AND INTERPRETATION

4.1 Introduction

This chapter presents the results and output interpretation from the qualitative survey. The discussion guide was constructed in such a way that the respondents, via an open ended framework, were able to confirm whether factors identified in the literature review exist in a South African context. The phase also introduced additional factors that could affect the use of financial derivatives.

4.2 Confirmation of Factors

Each of the respondents was asked whether they agreed or disagreed with the list of factors identified in the literature review, which may influence the decision to use financial derivatives.

Table 1 represents the results of the survey in terms of confirming the relevance of each of the determinants. As noted this survey was based on a sample of six industry experts.

Table 1: Number of Confirmations for Determinants of Derivatives Usage

Determinant	**No. of Confirmations**
1. Reduction of Financial Distress & Bankruptcy	2
2. The Size of the Firm	4
3. Reduction of Taxation	1
4. Usage of External Financing (i.e. Increasing/Reducing debt finance)	3
5. Reduction of the Cost of Capital	3
6. Improve the Value of the Firm	5
7. Managerial Risk Aversion	1
8. Information Asymmetry	1
9. Volatility of Accounting Earnings	4
10. Volatility of Cash Flows	6
11. The Perceptions of Derivatives Usage (by Investors, Regulators and the Public)	2

The results indicated that each of the identified determinants may be a factor in the decision to use financial derivatives.

In the second part of the qualitative survey, the interviewees suggested the following additional factors:

Table 2: Additional Possible Determinants for Derivatives Usage

Determinant	**No. of Confirmations**
Political / Country Instability	2
In-House Skills	3

All of the respondents felt that the list factors do not have an equal importance in making a decision to use financial derivatives. This suggested that the second proposition of the research was relevant.

4.3 Conclusions

The qualitative survey confirmed that all eleven identified factors or determinants from the literature review may influence the decision of financial derivatives usage. However, two other factors were also identified as possible derivative influences. These additional factors were incorporated into the quantitative survey.

CHAPTER 5

5. THE QUANTITATIVE SURVEY RESULTS

5.1 Introduction

This chapter presents the results of the survey in terms of the statistical analysis performed.

5.2 Demographics of the Sample

The survey was aimed at the South African mining industry. The JSE has forty companies which are listed in its mining sector. Figure 2 presents a breakdown of their activities:

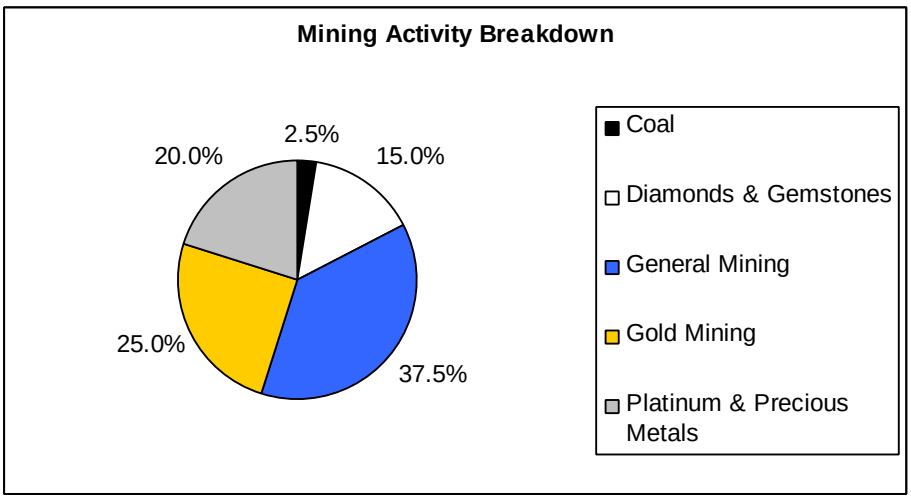

Figure 2: Mining Activities Breakdown of Listed Mining Companies

The number of respondents to this survey was thirty-five. This is equivalent to 87.5% of the entire population, and included all the major players and accordingly was judged reflective of the population.

Figure 3 shows the mining activity breakdown of the mining companies that responded to the survey.

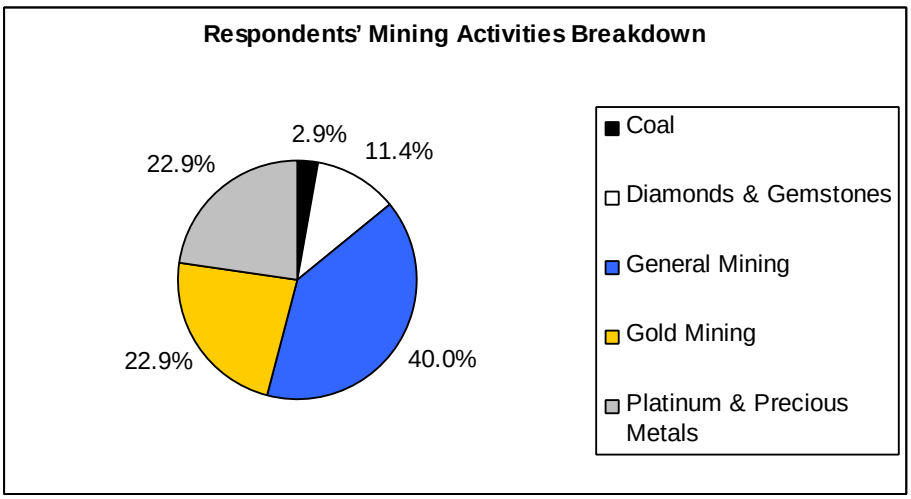

Figure 3: Respondents' Mining Activities Breakdown

5.3 Descriptive Statistics

73% of respondents had a documented financial risk management plan/policy:

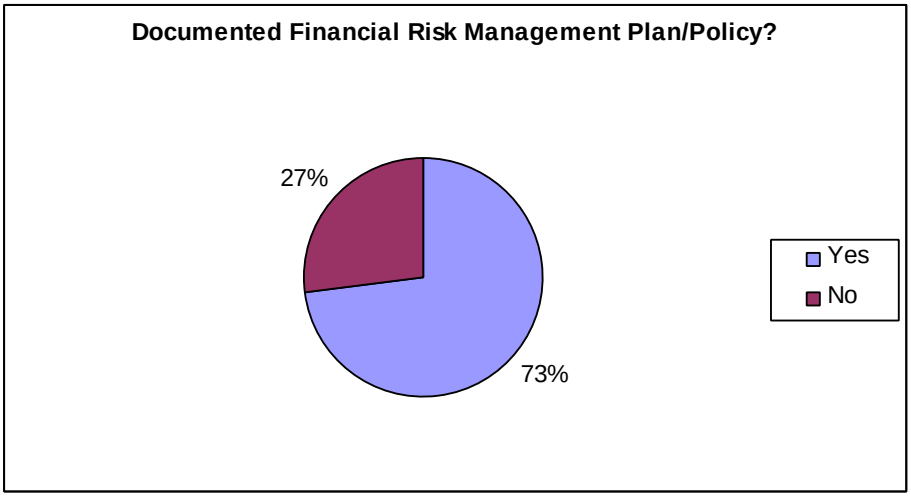

Figure 4: Documented Financial Risk Management Plan/Policy:

65% percent of respondents use financial derivatives.

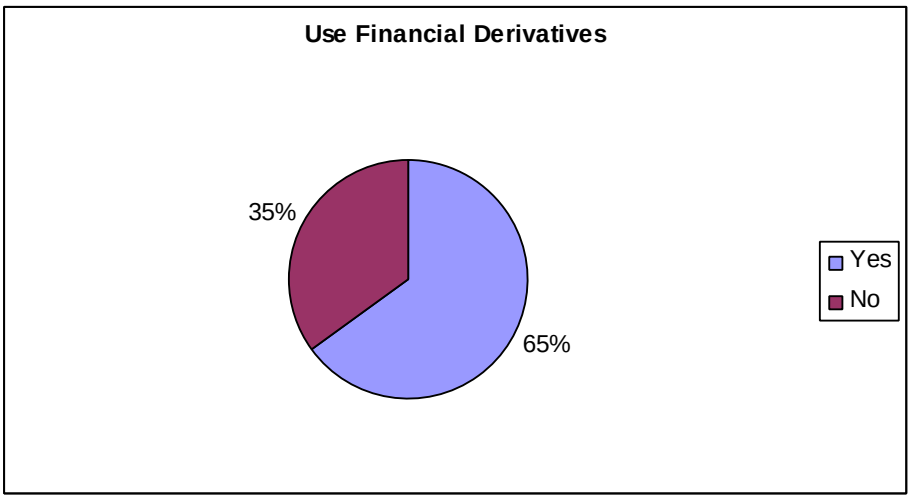

Figure 5: Usage of Financial Derivatives

Descriptive statistics were initially analysed, with the objective of gaining insight into the data set and aligning survey objectives and statistical analysis. In terms of the propositions posited in this research, the following statistics were generated:

5.3.1 Data Overview

To establish whether the factors identified in both the literature review and the qualitative phase of the research were relevant, the mean category score of each factor was calculated and then ranked. Ranking the mean category scores provided simple but accurate insight into which factors were considered, by managers before using financial derivatives.

As can be seen in Figure 6, all of the factors are considered to some extent by managers, however, factors such as Change the Volatility of Cash Flows (cash flow), Improve Value of the firm (value) and Change the Volatility of Accounting Earnings (earnings) are considered more important than factors such as Usage of External Financing (financing), Managerial Risk Aversion (risk) and Reduction of Taxation (taxation). (See Appendix G for survey results and fully tabulated mean scores)

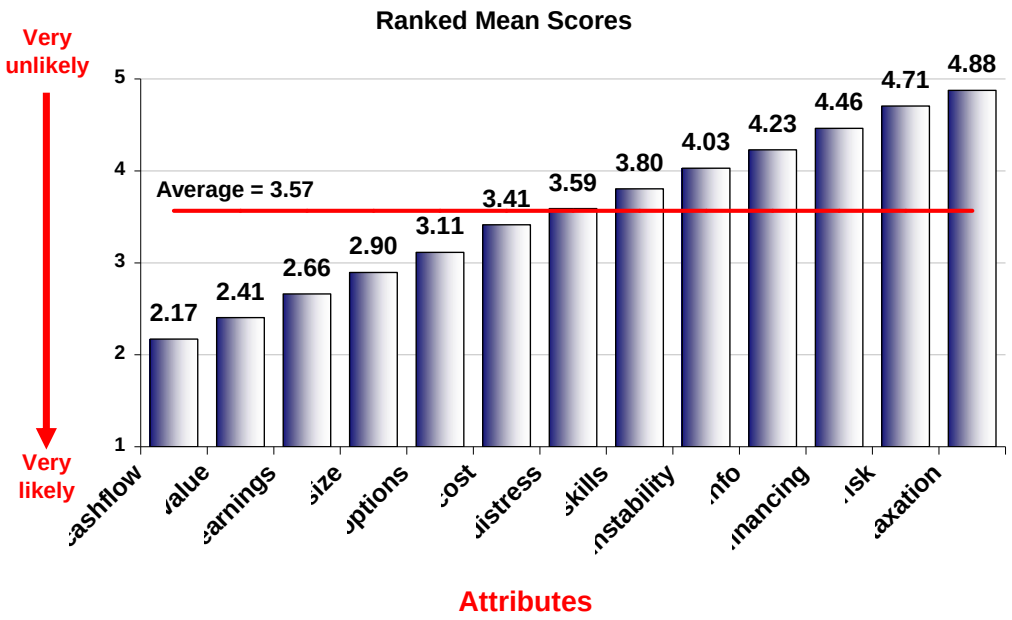

Figure 6: Ranked Mean Scores

5.3.2 Measures of Location, Variability and Shape

The descriptives and frequencies provided an understanding of the dataset in order to gain insight into the data.

Table 3 presents a tabulated summary of the descriptive statistics generated for each of the factors considered. The definitions of the terms used in the table are provided in Appendix H, as well as histograms for each of the statements making up the factors. A comprehensive table of all 39 statements with their respective descriptive statistics are also in Appendix H.

The quantitative phase made use of itemised Likert rating scales. Although technically considered to be ordinal in nature, they are assumed to be interval for many analyses (Malhotra, 1999). Due to the small sample size, and the data not being normally distributed (confirmed via a Kolmogorv-Smirnov Goodness-of-Fit Test), the scales were treated as ordinal and thus tested using nonparametric analysis. This type of testing is more appropriate (and accurate) than parametric testing for this type of data.

Table 3: Summary of Means, Standard Deviations, & Variances

	N	Mean	Minimum	Maximum	Sum	Std. Deviation	Variance	Skewness	Kurtosis
Cashflow	35	2.17	1	4	76	0.70	0.49	0.63	0.25
Value	35	2.40	1.5	4	84.17	0.54	0.29	0.96	1.36
Earnings	35	2.66	1.33	4.67	93.17	0.74	0.55	0.73	0.59
Size	35	2.90	1.67	4.67	101.33	0.74	0.54	0.08	-0.04
Options	35	3.11	1.5	4.67	109	1.08	1.16	-0.26	-1.47
Cost	35	3.41	1.67	5	119.5	1.03	1.06	-0.05	-1.47
Distress	35	3.59	1.67	4.67	125.67	0.86	0.74	-0.80	-0.26

	N	Mean	Minimum	Maximum	Sum	Std. Deviation	Variance	Skewness	Kurtosis
Skills	35	3.80	2.67	5	133.17	0.68	0.46	0.27	-1.11
Instability	35	4.03	2.67	5	141	0.64	0.41	-0.93	-0.22
Info	35	4.23	2.67	5	148	0.74	0.55	-0.88	-0.45
Financing	35	4.46	2.67	5	156.17	0.65	0.42	-1.33	0.99
Risk	35	4.70	4	5	164.67	0.27	0.07	-0.58	-0.08
Taxation	35	4.88	3.33	5	170.67	0.33	0.11	-3.44	13.42
Overall Avg.	35	3.57	2.87	4.19	124.82	0.36	0.13	-0.40	-0.70

5.4 Factor Analysis

There are two basic approaches to factor analysis: Principal Components Analysis and Common Factor Analysis (also known as Principal Axis Factoring) (SPSS Inc., 2005).

In Principal Components Analysis, the total variance in the data is considered. The main benefit of using this method (used in this analysis) is that it is the best method for determining the minimum number of factors that account for maximum variance in the data (SPSS Inc., 2005).

Factor analysis (which is similar to correspondence analysis in many aspects) reduces the number of attributes or questions that it takes to get the same results. Factor analysis seeks a combination of variables that are calculated as factors. When these factors account for more than 70% of the variance (which means that they will produce the same answer as using the original number of questions) these factors are then named to describe the groups of respondents they portray.

By using this method (See Appendix I) the determination of factors is either based on eigenvalues above 1 or a cumulative percentage of 70%. The table, in Appendix I, indicates that the optimum number of factors for this analysis is seven. That is, seven combinations of the original thirty-nine questions will produce a similar answer.

In the alternative method (see Figure 7), a Scree Plot of the eigenvalues was used to determine the number of factors in the extraction. The shape of the plot was used to determine the number of factors. As can be seen, the plot breaks after seven factors, confirming the results attained by the first method of Principal Components Analysis.

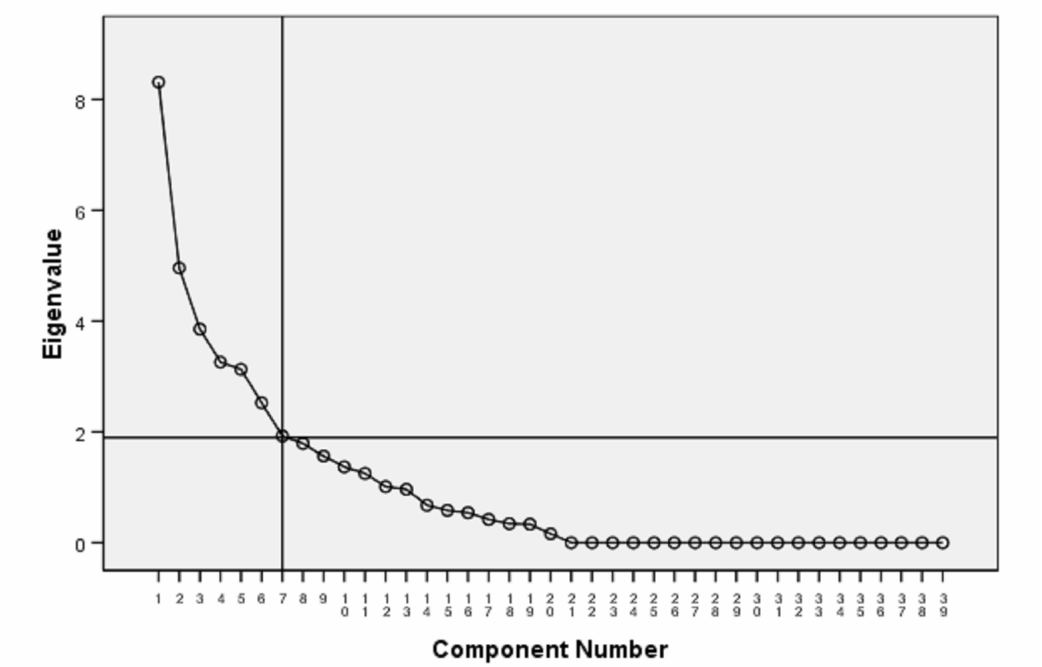

Figure 7: Scree Plot for Eigenvalues

The most important aspect of a factor analysis is the factor matrix, also called the factor pattern matrix. The factor matrix contains the coefficients used to express the standardised variables in terms of the factors. The coefficients, or factor loadings, represent the correlations between the factors and the variables. A coefficient with a large absolute value indicates that the factor and the variables are closely related.

The most commonly used method to determine which coefficients are associated with each of the seven factors is the Varimax procedure. This is an orthogonal (axes are maintained at right angles) method of rotation that minimises the number of variables with high loadings on a factor, thereby enhancing the interpretability of the factors. Orthogonal rotation results in factors that are not correlated. Interpretation is facilitated by identifying the variables that have large loadings on the same factor. That factor can then be interpreted in terms of the variables that load high on it. Variables that have the absolute highest loadings (correlations) on each factor are grouped. Results of the factor matrix are exhibited in Appendix I.

According to Hair *et al.* (1995) only those factors with loadings greater than 0.3, should be considered to meet the minimum level of significance. Loadings above 0.4 are considered important, whilst those greater than 0.5 are considered practically significant. Loadings above 0.7 are considered to be of very high significance.

Each factor is preliminarily named in the following section. Justification and interpretation is provided in the following chapter.

5.4.1 Factor 1 – Perceptions and External Financing

The statements that loaded onto this factor, with very high significance were Perception Held by Investors and Shareholders (“important what shareholder think”, “meeting shareholders demands”) , External Financing (“new project financing”, “stream of revenue guarantee”, “reliance on external financing”) and Availability of Information (“industry information”).

Other statements that loaded onto this factor and were considered practically significant, relate to Cash Flows (“change in interest rates”, “change in commodity prices”) and Managerial Risk Aversion (“mitigate financial risk”). This factor is named “Perceptions and External Financing”.

Table 4: Factor 1 – Perceptions and External Financing

FACTOR 1				
Statement Number	**Factor Loading**	**Statement**	**Concept**	**Rating**
28	0.81	If I had more industry information than others, I would be…	Availability of Information	Very High Significance
13	0.8	Shareholder perceptions are important to me, therefore I would be …	Perceptions Held by Investors & Shareholders	Very High Significance
32	0.79	To pursue new projects, I would be…	External Financing	Very High Significance
14	0.78	Shareholders increasingly expect management to be able to identify and manage exposures to market risks, therefore I would be…	Perceptions Held by Investors & Shareholders	Very High Significance
31	0.77	To 'lock-in' a certain stream of revenue, I would be…..	External Financing	Very High Significance
33	0.72	If I wanted to change my firm's reliance on external financing, I would be…	External Financing	Very High Significance
3	0.69	Interest rates impact my firm's cash flows, therefore I would be….	Cash Flows	Practical Significance
36	0.68	To mitigate financial risk, I would be…	Managerial Risk Aversion	Practical Significance
2	0.57	Commodity prices impact my firm's cash flows, therefore I would be….	Cash Flows	Practical Significance
15	0.55	I want investors to be comfortable with our financial risk management program, therefore I would be…	Perceptions Held by Investors & Shareholders	Practical Significance

5.4.2 Factor 2 – Cost of Capital and Value of the Firm

The statements that loaded onto this factor with very high significance were Cost of Capital ("assure specific return on investment", "lower borrowing costs") and Value of the Firm ("minimise firm's financial risks").

The other statements that loaded onto this factor and were considered practically significant related to Accounting Earnings ("interest rates", "commodity prices"), Cost of Capital ("mitigate financial risk") and Value of the Firm ("company's share price"). This factor is named "Cost of Capital and Value of the Firm".

Table 5: Factor 2 – Cost of Capital and Value of the Firm

FACTOR 2				
Statement Number	**Factor Loading**	**Statement**	**Concept**	**Rating**
17	**0.85**	**To assure investors of specific returns on their investments, I would be…**	**Cost of Capital**	**Very High Significance**
16	**0.71**	**To lower the cost of borrowing, I would be…**	**Cost of Capital**	**Very High Significance**
6	**-0.7**	**I would like to minimise my firm's financial risk, therefore I would be…**	**Value of the Firm**	**Very High Significance**
8	**0.69**	**To reduce volatility of long term earnings, I would be…**	**Accounting Earnings**	**Practical Significance**
18	**0.67**	**To avoid accessing capital markets. I would be…**	**Cost of Capital**	**Practical Significance**
5	**0.65**	**To improve my company's share price, I would be….**	**Value of the Firm**	**Practical Significance**

5.4.3 Factor 3 – Accounting Earnings

The statement that loaded onto this factor with very high significance was Political/Country Instability ("rules and regulations"). Other statements with loadings considered practically significant include Accounting Earning ("minimise variability in earnings", "consistent financial performance") and In-House Skills ("reliance on outside assistance with derivatives").

The statement considered important in terms of loading included Cash Flows ("exchange rates"). This factor is named "Accounting Earnings".

Table 6: Factor 3 –Accounting Earnings

FACTOR 3				
Statement Number	**Factor Loading**	**Statement**	**Concept**	**Rating**
27	**-0.75**	**Rules and regulations on selling our commodity into the market place may not be efficient enough, therefore I would be….**	**Political/Country Instability**	**Very High Significance**
22	**0.69**	**We rely heavily on outside advice to run our financial derivatives programmes, therefore I would be….**	**In House Skills**	**Practical Significance**
7	**0.53**	**To minimise variability in short term accounting earnings I would be ….**	**Accounting Earnings**	**Practical Significance**
9	**-0.67**	**To maintain a consistent financial performance for my firm, I would be…**	**Accounting Earnings**	**Practical Significance**
1	**0.42**	**Exchange rates impact my firm's cash flows, therefore I would be….**	**Cash Flows**	**Important**

5.4.4 Factor 4 – Size of the Firm

Statements with high loadings were related to Size of the Firm ("sophisticated financial management and controls").

Other statements with loadings that were considered practically significant included Value of the Firm ("shareholders value"), Taxation ("high taxes", "utilise tax shield") and Management Risk Aversion ("option to buy shares").

The statements considered important in terms of loading related to In-House Skills ("availability of skills", "shortage of skills to implement a derivative programme"). This factor is named "Size of the Firm".

Table 7: Factor 4 – Size of the Firm

FACTOR 4				
Statement Number	**Factor Loading**	**Statement**	**Concept**	**Rating**
12	**0.76**	**If my firm has sophisticated financial management practices and controls, I would be…**	**Size of the Firm**	**Very High Significance**
4	**0.64**	**To increase shareholder value, I would be …..**	**Value of the Firm**	**Practical Significance**
37	**0.59**	**If the average tax rate of my firm was to rise as the pre-tax income rises, I would be…**	**Taxation**	**Practical Significance**
35	**0.58**	**If I had options to buy shares in my firm in the future, I would be…**	**Managerial Risk Aversion**	**Practical Significance**
38	**0.51**	**To maximise our tax shields, I would be…**	**Taxation**	**Practical Significance**
11	**-0.55**	**My firm is small in size, therefore I would be…**	**Size of the Firm**	**Practical Significance**
23	**0.49**	**We have the proper in house skills to design, implement and control a derivatives programme, therefore I would be…**	**In House Skills**	**Important**

FACTOR 4				
24	**0.49**	**We lack the proper in house skills to design, implement and control derivatives programmes, therefore I would be…**	**In House Skills**	**Important**

5.4.5 Factor 5 – Availability of Information

The statement loading onto this factor with very high significance related to Availability of Information ("market signalling", "efficient flow of information to the firm").

The other statement that was loaded onto this factor, and considered practically significant, related to Taxation ("reduce taxes"). This factor is named "Availability of Information".

Table 8: Factor 5 – Availability of Information

FACTOR 5				
Statement Number	**Factor Loading**	**Statement**	**Concept**	**Rating**
30	**0.79**	**If I wanted to inform shareholders about future prospects of the firm, I would be…**	**Availability of Information**	**Very High Significance**
29	**0.78**	**If my firm was able to get information quicker than the market place, I would be…**	**Availability of Information**	**Very High Significance**
39	**0.63**	**To reduce taxation on our offshore operations, I would be…**	**Taxation**	**Practical Significance**

5.4.6 Factor 6 – Financial Distress and Bankruptcy

The statements loading onto this factor with very high significance concerned Financial Distress and Bankruptcy ("volatile business cycles", "financial obligation not being met", "firm highly leveraged").

The other statement which was loaded onto this factor and considered practically significant related to Size of Firm ("firm large in size"). This factor is named "Financial Distress".

Table 9: Factor 6 – Financial Distress

FACTOR 6				
Statement Number	**Factor Loading**	**Statement**	**Concept**	**Rating**
21	**0.92**	**During volatile business cycles, I would be…**	**Financial Distress & Bankruptcy**	**Very High Significance**
20	**0.7**	**At the risk of not meeting financial obligations I would be…**	**Financial Distress & Bankruptcy**	**Very High Significance**
10	**0.58**	**My firm is large in size, therefore I would be…**	**Size of the Firm**	**Practical Significance**
19	**0.48**	**If my firm is highly leveraged, I would be….**	**Financial Distress & Bankruptcy**	**Important**

5.4.7 Factor 7 – Political/Country Instability

The statements loading onto this factor with very high significance concerned Political/ Country Instability ("laws and regulations change", "political uncertainty").

The other statement which was loaded onto this factor and considered practically significant related to Management Risk Aversion ("shares in the firm"). This factor is named "Political/Country Instability".

Table 10: Factor 7 – Political/Country Instability

FACTOR 7				
Statement Number	**Factor Loading**	**Statement**	**Concept**	**Rating**
25	**0.79**	**Laws and regulations regarding mining activities are being changed, therefore I would be….**	**Political/Country Instability**	**Very High Significance**
26	**0.67**	**Political uncertainty is evident, therefore I would be….**	**Political/Country Instability**	**Practical Significance**
34	**-0.63**	**If I had shares in my firm, I would be….**	**Managerial Risk Aversion**	**Practical Significance**

5.5 Statistical Rankings (Kendall's W Test)

Proposition Two required that the relative importance of each factor was established. This proposition has limitations as it is does not describe a relationship to some other factor or variable. That is, the importance is described internally and not externally.

Therefore, nonparametric tests for multiple related samples are useful as these are considered alternatives to a repeated measures analysis of variance (Malhotra, 1999). They are especially appropriate for small samples such as this survey and can be used with nominal or ordinal test variables.

The Kendall's W procedure tests this proposition (SPSS Inc., 2005).

Table 11: Kendall's W Test (Ranks)

Concept	Mean Rank	Percentage (%)	Cumulative Percentage (%)
Cash flow	2.29	13%	13%
Value	3.04	12%	26%
Earnings	3.69	12%	37%
Size	4.70	10%	48%
Options	5.14	9%	56%
Cost	6.24	9%	65%
Distress	6.73	7%	72%
Skills	7.79	7%	79%
instability	8.09	6%	85%
Info	9.43	5%	90%
Financing	10.47	4%	94%
Risk	11.26	3%	97%
Taxation	12.14	3%	100%

Table 12 - Kendall's W Test (Statistics)

N	35
Kendall's W(a)	.689
Chi-Square	289.491
Degrees of Freedom (df)	12
Asymptotic Significance	**.000**

(a) Kendall's Coefficient of Concordance

Kendall's W is a measure of the agreement of the rankings of variables across cases. A Kendall's W value near 0 indicates little agreement across cases and a value near 1 indicates high agreement across cases (SPSS Inc., 2005). A value of 0.689 indicates that there is high agreement in terms of the assigned orders across the factors.

A chi-square value of 289.5 and an asymptotic significance level of less than 0.05 indicate that there is a significantly high probability of this ordering occurring in the future.

It is evident from these results that management considers 5 major factors (56%) before using financial derivatives; and that these 5 factors are highly likely to be used by other groups in the future bar external or environmental changes.

Table 13: Ranking of Factors

No.	Factor/ Determinant	%	Cum. %
1	**Change the Volatility of Cash Flows**	**13%**	**13%**
2	**Improve Value of the firm**	**12%**	**26%**
3	**Change the Volatility of Accounting Earnings**	**12%**	**37%**
4	**The Size of the Firm**	**10%**	**48%**
5	**The Perceptions of Derivatives Use by Investors, Regulators and the Public**	**9%**	**56%**
6	Reduction of the Cost of Capital	9%	65%
7	Reduction of Financial Distress & Bankruptcy	7%	72%
8	In-House Skills	7%	79%
9	Political / Country Instability	6%	85%
10	Information Asymmetry	5%	90%

No.	Factor/ Determinant	%	Cum. %
11	Usage of external Financing	4%	94%
12	Managerial Risk Aversion	3%	97%
13	Reduction Taxation	3%	100%

CHAPTER 6

6. INTERPRETATION OF QUANTITATIVE RESULTS

6.1 Introduction

The first section of this chapter presents an interpretation of the quantitative survey with reference to the two propositions made in Chapter 2. The second part of this chapter presents an interpretation of the seven identified factors in the factor analysis that contribute to the decision to use financial derivatives.

6.2 Propositions

The factors derived from the literature review and qualitative phase of this research were confirmed as being factors that were considered by management before using financial derivatives. However, not all of them are considered to be of equal importance. Their respective importance was identified in the analysis and it is evident from these results that management considers five major factors. These factors are ranked for the industry as a whole.

6.2.1 Cash Flows

The change and volatility of cash flows was cited as the most important factor or reason for using derivatives. With changing commodity prices, exchange rate fluctuations and interest rate movements, cash flows can be both positively and negatively impacted. Therefore, mining companies aim to remove as much volatility in their operations as possible, and stabilise their cash flows.

6.2.2 Value of Firm

The second most important factor to mining companies was to improve the value of the firm. There are many ways that a firm can add value to their shareholders but the obvious ones would be via a higher share price and generated profits. Mining companies in South Africa are acutely aware that they need to improve the value of their firm and, therefore, rate this factor very highly in their decision making process regarding financial derivatives usage.

6.2.3 Accounting Earnings

The volatility of accounting earnings was also a factor which is considered before employing derivatives. With fluctuating foreign exchange rates, mining companies aim to stabilise their financial performances and to reduce volatility and variation of both short and long-term earnings. Low earnings volatility may increase analysts' following and improve value (Lang *et al*., 2002), attract

a larger number of institutional investors (Badrinath *et al*., 1989), or reduce the perceived borrowing costs.

6.2.4 Size of Firm

According to the survey, respondents consider the size of a firm to be a factor in terms of derivatives usage. Whilst the size of the firm was cited as a factor when making a decision to use derivatives, no relationship was established between the size of a firm and the likelihood of hedging.

6.2.5 Perception Held by Shareholder and Investors

Respondents feel that shareholders have become more demanding and expect management to mitigate financial risk wherever possible. However, shareholders do not want mining companies to forgo any upswing in a commodity-driven market as a consequence of its hedging programme. The balancing of these requirements for the shareholders and investors is a factor respondents need to consider when embarking on a derivatives programme.

Whilst the other eight factors have been recognised as possible factors to consider, the survey has indicated that they would be less influential in initiating a derivatives undertaking. It is important to note that these factors still account for certain amount of variance, and are therefore incorporated in the factor analysis groupings.

6.3 Identified Factors

Even though the identified factors were ranked, it is more likely that combinations of factors, rather than individual factors, influence the decision to use derivatives.

Different groups within the industry placed importance on various combinations of factors. The factor analysis identified seven broadly defined factors of financial derivatives use. These seven factors, explained most of the variance observed from the thirteen original factors. They are presented below:

6.3.1 Perceptions and External Finances

Respondents that considered perceptions held by shareholders and investors over their derivatives programme as a highly significant factor, also take into account their ability to raise external finances with them.

A firm that has favourable risk management policies are able to attract a lower cost of capital and are, therefore, able to raise funds more easily. A firm that has a favourable perception with investors and shareholders will be able to straightforwardly access external capital.

6.3.2 Cost of Capital and Value of the Firm

Respondents considered the cost of capital to be an important determinant in using derivatives. Firms that require money to expand and invest in new projects need to have access to capital markets in order to assure potential investors of specific returns on their investments.

By using derivatives, firms can secure a stream of revenue and reduce the financial risk. They will therefore also be able to negotiate better terms on the cost of capital.

Respondents also felt that, through derivatives, they are able to reduce the volatility of long term earnings, improve their company's share price (value of the firm) and lower its financial risk, which in turn will lower the cost of capital.

6.3.3 Accounting Earnings

Respondents placed importance on the need to maintain consistent financial performance and to reduce the variability of their financial earnings. These parameters can be controlled in part by the exchange rate, which impacts the cash flows of the firm. By using exchange rate derivatives a firm is able to reduce the volatility of the earning.

Other elements of this factor have been identified as the lack of in-house skills and political and country instability. A well balanced and controlled derivatives

programme requires a certain level of understanding of derivatives and their mechanisms. One issue that has been raised with mining firms is the lack of in-house skills and shortage of professionals in South Africa. This will affect the firm's decision to venture into a complex derivatives programme if too much importance is placed on external perceptions.

6.3.4 Size of Firm

Respondents in this category considered the size of their firm to be an important factor in their decision to use derivatives. Different firms have different levels of sophisticated financial management practices and controls, and depending on how comfortable respondents are with these elements in place will influence their usage of derivatives. These practices and controls can be implemented via the skills available within the organisation.

Firms need to evaluate whether they have adequate in-house skills to design, implement and control a derivatives programme. Therefore, in-house skills are once again highlighted as a potential hindrance in financial derivatives usage.

Respondents in this category also look at how derivatives will assist in creating shareholder value.

6.3.5 Availability of Information

Respondents who feel that they have an advantage in terms of early, quick and efficient information access are more likely to consider the usage of financial derivatives. They would also use their access to this information to signal to their shareholders about future prospects of the firm via their derivatives usage.

6.3.6 Financial Distress

This factor has been identified in the literature review as one of the main reasons why firms use derivatives. Should a firm be highly leveraged and at risk of not meeting financial obligations, it would turn to using derivatives as a mean of smoothing earnings and reducing the volatility of cash flows. Respondents believed that managing financial risk through derivatives may reduce the volatility of earnings, especially in a business cycle downturn and as a means to avoid financial distress.

6.3.7 Political and Country Instability

Whilst little information and research is available in terms of the relationship between country instability and the usage of derivatives, it has emerged as an issue in the qualitative part of this research. This factor is a contributor to the usage of derivatives, according to respondents who consider there to be political uncertainty in the country or an indication that laws and regulations

regarding mining activities are being changed and consequently uncertainty regarding future operations sets in.

6.4 Summary

Respondents ranked the thirteen pre-determined factors. The results indicated that each of the factors was considered by management but at varying levels of importance.

However, the factor analysis enabled the results of the survey to be more adequately represented and to better understand the motives for the usage of financial derivatives in South Africa mining industry. The seven factors identified as determinants for the use of financial derivatives consist of the original thirteen factors identified in the literature review and qualitative survey. These new factors are used as proxies in understanding financial derivatives usage in the mining sector.

CHAPTER 7

7. CONCLUSIONS

7.1 Introduction

In this chapter the main findings of the research, in relation to the propositions, are presented, their implications for the industry are discussed, and suggestions for further research are put forward.

7.2 Main Findings

Ranking of the mean scores indicated that all determinants were considered to some extent when financial derivative usage was decided. Proposition 1, that all thirteen factors are considered, was therefore accepted.

It was also found that there were significant differences in importance of the factors contributing to the decision to use of financial derivatives. Therefore, Proposition 2, that each factor varies in importance, was also accepted.

Statistical rankings conducted on the survey results indicated that the top five factors, in terms of importance, were:

1. Change the Volatility of Cash Flows

2. Improve Value of the Firm

3. Change the Volatility of Accounting Earnings

4. The Size of the Firm

5. The Perceptions of Derivatives Use by Investors, Regulators and the Public.

Factor analysis indicated seven factors that acted as proxies for the original thirteen factors and identified in the literature review and the qualitative pilot study. These seven factors were:

- Perceptions and External Finances
- Cost of Capital and Value of the Firm
- Accounting Earnings
- Size of Firm
- Availability of Information
- Financial Distress
- Political and Country Instability

7.3 Limitations

Research limitations were linked to sample size. It is generally accepted that the minimum sample size that holds statistical significance is 30. This can limit the number of strata that can be analysed at any one time while

maintaining both a 90% confidence interval and the reliability of the data set (Mimmack *et al*. 2000). Due to the fact that the sample size was almost equal to the population size (a census was almost achieved) and that the sample was analysed as one segment, this rule did not apply.

The analysis that was performed on the data only supplied the differences between or among relevant data. Therefore, inferences could not be made in all cases. The sample was also drawn from different sources across a number of months. It was possible that respondents' views can be influenced by external or environmental events during the drawing of a sample (e.g. law change) (Malhotra, 1999), which might then affect how respondents answer survey questions.

7.4 Implications for the Mining Industry

The factors identified in both the literature review and qualitative phase proved to be relevant in terms of the decision to use financial derivatives, however, these factors have varying levels of importance which all influence the usage of financial derivatives.

The range of issues and responses in terms of the importance of these determinants suggested that the use of financial derivatives is influenced by a complex, and often unique, relationship of these issues within each firm. This was established through the Factor Analysis process.

The research provides a platform from which firms can evaluate and understand individual and sector derivatives usage, and develop a robust and powerful derivatives programme.

The industry survey revealed that, in general, mining firms were more likely to use derivatives if they are able to minimise the volatility of their cash flows, increase the value of their firm, and reduce the fluctuations in their accounting earnings. Other factors taken into consideration are the size of their firm and how the market will perceive their firm's derivatives programme.

Mining firms seemed to be less concerned with issues such as tax implications and managerial risk aversion.

7.4.1 Perceptions and External Finances

Overall, mining firms were concerned about the perceptions held by shareholders and investors with regards to the use of financial derivatives. They did not want to be perceived as firms that are not taking full advantage of upswings in the commodity markets, whilst at the same time firms feel that they are expected to manage financial risk more carefully. This is in line with the findings of previous research conducted by Rothman (2001), suggesting that firms are concerned about market perception regarding their derivative activities and the probable negative affect that will have on the firm's image.

The usage of external financing was also considered by firms before using derivatives. Mining firms felt that should they become financially weak, it would be more difficult and expensive to raise funds. Therefore, the higher cost of external finances may force managers to relinquish profitable investment.

This is supported by Froot *et al.* (1993) who argued that derivatives usage is used by firms to minimise the need for external financing for investment projects due to low internal funds. Mining firms that are able to use derivatives successfully to guarantee a specific stream of revenue will be less reliant on external finance.

7.4.2 Cost of Capital and Value of the Firm

Mining firms were concerned about raising capital for future expansion as the cost implications may be too high. As a consequence of this, mines may under-invest and attempt to find ways of using internal funds. Financial derivatives can have an adverse affect on the internal funds generated. Therefore, mines considered capital requirements and related costs as factors which influenced their use of financial derivatives.

The usage of derivatives as means of maximising value of the firm was also considered by the mines. Derivatives usage was considered if it allowed for minimising financial risk and at the same time could improve the firm's value.

The link between cost of capital and the value of the firm was made by Benson & Oliver (2004) who suggested that since raising capital can be costly, firms might opt for internal funds to finance new projects. Derivatives can be used to increase shareholder value by coordinating the need for, and availability of, internal funds.

7.4.3 Accounting Earnings

Mining firms use derivatives to secure cash flows and to smoothen their accounting earning going forward. This was noted as a crucial element in managing financial risk in the South African mining industry. Commodity prices and foreign exchange rates were cited as the most important criteria in the decision to use financial derivatives and concur with previous research, such as Merrifield's (1998), done in this field.

7.4.4 Size of Firm

No strong relationship emerged between the size of the firm and the usage of financial derivatives. However, respondents that considered the size of their firm as a factor in using derivatives will also consider how it can improve the value of their firm, and whether they have the right in-house skills for the implementation of a derivatives programme. An in-house skill was cited as a possible hindrance factor when using derivatives.

The relationship between the size of firm, in-house skill and the usage of derivatives was noted by Nance *et al.* (1993) who suggested that larger firms have more sophisticated financial risk management practices and therefore are more comfortable with derivatives usage. These sophisticated management practices are maintained and controlled by skilled personnel with specific related knowledge. Therefore, the level of in-house skills in larger firms, according to Nance *et al.*, allow for frequent use of derivatives.

7.4.5 Availability of Information

Respondents felt that if they could get information before the market place they would consider using financial derivatives for the benefit of their firm, by being able to implement risk management strategies in real-time. Also, in order to convey information to shareholders, respondents use derivatives to indicate where they perceive the market to be moving.

DeMarzo & Duffie (1991) asserted that shareholders are unlikely to have sufficient information to replicate firm risk management strategies in real time. Therefore, management is more likely to make more accurate decisions concerning risk management. Should that be the case, management can confidently consider using financial derivatives because they are in a position to execute such strategy more efficiently.

7.4.6 Financial Distress

As continuous exploration is important for ongoing operation of mining companies, underinvestment due to financial distress imposes costs for investors. In this sense, derivatives which smooth a company's cash flows can reduce the possible shock of a firm's insolvency and, therefore, be viewed as a substitute for equity capital.

Respondents, who used derivatives during volatile business cycles, and under the risk of not meeting financial obligations, considered using financial derivatives to assure lenders or investors of specific returns.

This was concurred by Guay (1999) who stated that the risk of financial distress is higher the more volatile the cash flow and the stronger the dependence on business cycle is.

7.4.7 Political and Country Instability

This factor has not been mentioned in the literature review but was mentioned by the panel of industry experts in the qualitative phase as a possible reason for using derivatives. Mining firms will consider risks such as political uncertainty or country instability as possible operational and financial risk factors before hedging or using financial derivatives to secure a position.

7.5 Suggestions for Further Research

There are several areas in which further research into this topic would supplement the findings of this study.

The survey was conducted specifically on the South African mining industry and as a result the sample was small and convenient in nature. It would be beneficial to extend the survey to global mining companies and to compare the results. This will give a greater understanding as to the usage of financial derivatives by international mining companies.

Further research incorporating a time series analysis can show trends within the industry over different times of the year or over several years. The impact of macro-economics or external factors, as well as the introduction of new factors on the usage of derivatives can also be investigated.

The factor analysis has identified determinants that are associated with different groups of respondents. The importance of determinants within these groups will influence derivatives usage. Deeper insight into this behaviour will broaden the understanding of the research topic.

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Appendix A: Formal Letter to Interviewees

The Wits Business School
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Website: http://wbs.mgmt.wits.ac.za

March 2006

University of the Witwatersrand

Dear Respondent,

I am a MBA student at the University of the Witwatersrand Business School. The following qualitative questionnaire forms part of the research I am conducting on the usage of financial derivatives within the South African mining industry.

This qualitative questionnaire will assist in developing a meaningful quantitative survey and your input on this would be highly appreciated. All responses will be completely anonymous and confidential.

Yours Sincerely



Avichay Josef
MBA Student
Wits Business School

I confirm that Avichay Josef is a bona fide MBA student at the Wits Business School and is conducting this research under my supervision.

Yours Sincerely



Mr. Frank Durand
Senior Lecturer
Faculty of Commerce, Law and Management
Graduate School of Business Administration
University of the Witwatersrand

Appendix B: Qualitative Study: Discussion Guidelines

Name	
Position:	
Company:	
Date:	

Part 1

The table below lists identified determinants (factors) which may, or may not influence a firm's decision to use financial derivatives. Please confirm whether or not you feel that the following identified factors contribute to the usage of financial derivatives in the South African mining industry.

Determinant / Factor	**Can this determinant contribute to your decision to use derivatives? (√ Yes/ X No)**
1. Reduction of Financial Distress & Bankruptcy	
Financial distress is defined as a condition where obligations are not met or are met with difficulty. A major disadvantage for a firm taking on higher levels of debt is that it increases the risk of financial distress, and ultimately **bankruptcy**. Therefore, By hedging different risks via derivatives the firm might be able to reduce the cost of financial distress.	
2. The Size of the Firm	
Larger firms have more sophisticated financial management practices and therefore are more likely to use derivatives. Also, there are transaction costs economies of scale in the use of derivatives.	
3. Reduction of Taxation	
For corporations facing tax-function convexity, hedging lowers expected tax liabilities, thereby providing an incentive to hedge. Whilst a convex tax function is not relevant to the SA context, offshore operations, belonging to SA firms, might be exposed to such tax structure. Therefore, firms might use derivatives to smooth earnings and **reduce the tax** burden.	

Determinant / Factor	Can this determinant contribute to your decision to use derivatives? (√ Yes/ X No)
4. Usage of External Financing (i.e. Increasing/Reducing debt finance)	
Firms use derivatives to smooth earnings and to reduce the cost of **external financing**. Financial institutions prefer to deal with firms that a steady flow of income. This is to guarantee that sufficient funds are there to repay a loan. Therefore these finance institutions are likely to give preferential rates and repayments structures to firms that secure a certain stream of revenue through hedging.	
5. Reduction of the Cost of Capital	
Firm using derivatives can effectively commit to meet obligations where it otherwise could not and so negotiate better contract terms in the form of lower borrowing costs. Therefore risk management effectively expands the firm's "debt capacity" and reduces the **cost of capital**.	
6. Improve the Value of the Firm	
The **value of the firm** depends entirely on how the market values the firm's shares. And the share's value must be affected by using derivatives.	
7. Managerial Risk Aversion	
Managers with greater share ownership use derivatives much more than mangers with share options. **Manager risk aversion** depends on compensation schemes and on their capacity to effectively diversify firm risk on a personal level. Insiders want to hedge risk, because they have un diversifiable risk in the firm.	
8. Information Asymmetry	
The corporation might hedge or use derivatives based on information held by management about the market place. Hedging can be used to reduce earnings variation and hence to mitigate **information asymmetry**. For example, put option is speculation, so management is signalling that it is very sure about the future prospects of the firm.	
9. Volatility of Accounting Earnings	
Accounting earnings are a company's **earnings** as reported in the income statement. The use of derivatives creates less variation in the future earnings.	

Determinant / Factor	Can this determinant contribute to your decision to use derivatives? (√ Yes/ X No)
10. Volatility of Cash Flows	
By using derivatives, firms can hedge **cash flows** to avoid a shortfall in funds that may require a costly visit to the capital markets.	
11. The Perceptions of Derivatives Usage (by Investors, Regulators & the Public)	
Perceptions held by investors, over the use of derivatives, might influence their decision to invest in the firm. Should investors feel that a firm is unable to capitalise on positive market trends due to its derivatives programme, they might decide not invest in such a company.	

Part 2

Do you feel that there are any additional determinants or factors which should be considered or have been overlooked?

Additional factors	Elaborate

Part 3

Do you think that all of the identified factors have equal or unequal importance?

Yes/ No. Elaborate…

Statements

Appendix C: Formal Letter to Survey Respondents

The Wits Business School
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Website: http://wbs.mgmt.wits.ac.za

March 2006

University of the Witwatersrand

Dear Respondent,

I am a MBA student at the University of the Witwatersrand Business School. The following survey forms part of the research I am conducting on the usage of financial derivatives within the South African mining industry.

The survey will not take more than 10-15 minutes to complete and your input on this would be highly appreciated. All responses will be completely anonymous and confidential. However, I will require the name of the firm which you represent, for record keeping purposes.

Yours Sincerely



Avichay Josef
MBA Student
Wits Business School

I confirm that Avichay Josef is a bona fide MBA student at the Wits Business School and is conducting this research under my supervision.

Yours Sincerely



Mr. Frank Durand
Senior Lecturer
Faculty of Commerce, Law and Management
Graduate School of Business Administration
University of the Witwatersrand

Appendix D: Quantitative Study: Questionnaire of Financial Derivatives Usage

Name *(Optional)*	
Position*(Optional)*:	
Company (Required):	

Please complete the questionnaire by following the instructions after each question.

1. Does your firm have a documented financial risk management plan/policy? **(*Please circle the appropriate response.)***

a. YES **b. NO**

2. Does your firm use derivatives? **(*Please circle the one that applies.)***

a. YES **b. NO**

3. Irrespective of whether your firm uses derivatives or not, please indicate to what extent you agree or disagree with the following statements as possible reasons for the usage of financial derivatives.

Please rank each reason:

1- Very Likely……5- Very Unlikely

Place a tick or cross in the appropriate box in each column.

Statement:	Ranking				
	1 Very Likely to use financial derivatives	**2 Likely to use financial derivatives**	**3 Neutral regarding the use of financial derivatives**	**4 Unlikely to use financial derivatives**	5 **Very Unlikely to use financial derivatives**
Financial Distress & Bankruptcy:					
1. If my firm is highly leveraged, I would be….					
2. At the risk of not meeting financial obligations I would be…					
3. During volatile business cycles, I would be…					
Size of the Firm:					
4. My firm is large in size, therefore I would be…					
5. My firm is small in size, therefore I would be…					
6. If my firm has sophisticated financial management practices and controls, I would be….					
Taxation:					
7. If the average tax rate of my firm was to rise as the pre-tax income rises, I would be…					
8. To maximise our tax shields, I would be…					
9. To reduce taxation on our offshore operations, I would be…					
External Financing:					
10. To 'lock-in' a certain stream of revenue, I would be…..					
11. To pursue new projects, I would be…					
12. If I wanted to change my firm's reliance on external financing, I would be…					
Cost of Capital:					
13. To lower the cost of borrowing, I would be…					
14. To assure investors of specific returns on their investments, I would be…					
15. To avoid accessing capital markets. I would be…					
Value of the Firm:					
16. To increase shareholder value, I would be …..					

Statement:	Ranking				
	1 Very Likely to use financial derivatives	**2 Likely to use financial derivatives**	**3 Neutral regarding the use of financial derivatives**	**4 Unlikely to use financial derivatives**	5 **Very Unlikely to use financial derivatives**
17. To improve my company's share price, I would be….					
18. I would like to minimise my firm's financial risk, therefore I would be…					
Managerial Risk Aversion:					
19. If I had shares in my firm, I would be….					
20. If I had options to buy shares in my firm in the future, I would be…					
21. To mitigate financial risk, I would be…					
Availability of Information:					
22. If I had more industry information than others, I would be…					
23. If my firm was able to get information quicker than the market place, I would be…					
24. If I wanted to inform shareholders about future prospects of the firm, I would be…					
Accounting Earnings:					
25. To minimise variability in short term accounting earnings I would be ….					
26. To reduce volatility of long term earnings, I would be…					
27. To maintain a consistent financial performance for my firm, I would be…					
Cash Flows:					
28. Exchange rates impact my firm's cash flows, therefore I would be….					
29. Commodity prices impact my firm's cash flows, therefore I would be….					
30. Interest rates impact my firm's cash flows, therefore I would be….					
Perceptions Held by Investors & Shareholders:					
31. Shareholder perceptions are important to me, therefore I would be …					
32. Shareholders increasingly expect management to be able to identify and manage exposures to market risks, therefore I would be…					

Statement:	Ranking				
	1 Very Likely to use financial derivatives	**2 Likely to use financial derivatives**	**3 Neutral regarding the use of financial derivatives**	**4 Unlikely to use financial derivatives**	5 **Very Unlikely to use financial derivatives**
33. I want investors to be comfortable with our financial risk management programme, therefore I would be…					
Political/Country Instability:					
34. Laws and regulations regarding mining activities are being changed, therefore I would be….					
35. Political uncertainty is evident, therefore I would be….					
36. Rules and regulations on selling our commodity into the market place may not be efficient enough, therefore I would be….					
In House Skills:					
37. We rely heavily on outside advice to run our financial derivatives programmes, therefore I would be….					
38. We have the proper in house skills to design, implement and control a derivatives programmes, therefore I would be…					
39. We lack the proper in house skills to design, implement and control a derivatives programmes, therefore I would be…					

Thank you for completing this survey.

Appendix E: Reliability Test Using the Cronbach's Alpha

Cronbach's alpha (Cronbach, 1951) measures how well a set of items (or variables) measures a single unidimensional latent construct. When data have a multidimensional structure, Cronbach's alpha will usually be low.

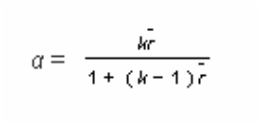
Technically speaking, Cronbach's alpha is not a statistical test - it is a coefficient of reliability (or consistency). Note that a reliability coefficient of .70 or higher is considered as "acceptable" (SPSS Inc., 2005).

Cronbach's alpha (Cronbach, 1951) is a measure of reliability. More specifically, alpha is a lower bound for the true reliability of the survey. Mathematically, reliability is defined as the proportion of the variability in the responses to the survey that is the result of differences in the respondents. That is, answers to a reliable survey will differ because respondents have different opinions, not because the survey is confusing or has multiple interpretations. The computation of Cronbach's alpha is based on the number of items on the survey (k) and the ratio of the average inter-item covariance to the average item variance.

$$\alpha = \frac{k(\overline{cov} / \overline{var})}{1 + (k-1)(\overline{cov} / \overline{var})}$$

Under the assumption that the item variances are all equal, this ratio simplifies to the average inter-item correlation, and the result is known as the

Standardized item alpha (or Spearman-Brown stepped-up reliability coefficient) (Cronbach, 1951).



Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based n Standardized Items	N of Items
.795	.796	39

This indicates that, overall, the constructs used (i.e. questions asked) were reliable in measuring the expected outcomes (greater than 0.7)

Appendix F: SA Listed Mining Companies

Sector Index - Basic Resources - Mining			
No.	Name	Mininig Activity	Code
1	Anglo American plc	General Mining	AGL
2	BHP Billiton Plc	General Mining	BIL
3	Anglo Platinum Ltd	Platinum & Precious Metals	AMS
4	AngloGold Ashanti Ltd	Gold Mining	ANG
5	Impala Platinum Holdings Ltd	Platinum & Precious Metals	IMP
6	Gold Fields Ltd	Gold Mining	GFI
7	Lonmin plc	Platinum & Precious Metals	LON
8	Harmony Gold Mining Company Ltd	Gold Mining	HAR
9	Kumba Resources Ltd	General Mining	KMB
10	African Rainbow Minerals Ltd	General Mining	ARI
11	Northam Platinum Ltd	Platinum & Precious Metals	NHM
12	Aquarius Platinum Ltd	Platinum & Precious Metals	AQP
13	Western Areas Ltd	Gold Mining	WAR
14	sxr Uranium One Inc	General Mining	SXR
15	Mvelaphanda Resources Ltd	General Mining	MVL
16	Assore Ltd	General Mining	ASR
17	DRDGOLD Ltd	Gold Mining	DRD
18	Metorex Ltd	General Mining	MTX
19	Barplats Investments Ltd	Platinum & Precious Metals	BPL
20	Simmer and Jack Mines Ltd	Gold Mining	SIM
21	Witwatersrand Consolidated Gold Resources	Gold Mining	WGR
22	Merafe Resources Ltd	General Mining	MRF
23	Eland Platinum Holdings Ltd	Platinum & Precious Metals	ELD
24	Scharrig Mining Ltd	General Mining	SCN
25	Aflease Gold Ltd	Gold Mining	AFO
26	Trans Hex Group Ltd	Diamonds & Gemstones	TSX
27	Wesizwe Platinum Ltd	Platinum & Precious Metals	WEZ
28	Petmin Ltd	General Mining	PET
29	Matodzi Resources Ltd	General Mining	MTZ
30	Diamond Core Resorces Ltd	Diamonds & Gemstones	DMR
31	Good Hope Diamonds (Kimberley) Ltd	Diamonds & Gemstones	GDH
32	Sallies Ltd	General Mining	SAL
33	Miranda Mineral Holdings Ltd	General Mining	MMH
34	Tawana Resources NL	Diamonds & Gemstones	TAW
35	Hwange Colliery Company Ltd	Coal	HWA
36	Afgem Ltd	Diamonds & Gemstones	AFG
37	Kelgran Ltd	General Mining	KLG
38	Halogen Holdings Societe Anonyme	Gold Mining	HAL
39	Thabex Exploration Ltd	Diamonds & Gemstones	TBX
40	Village Main Reef Gold Mining Co (1934) Ltd	Gold Mining	VIL

Appendix G: Results of Survey

No of Respondents	35							
			Likert Scale Ranking					
			1	2	3	4	5	
	Rank	Mean Score	Very Likely to use financial derivatives	Likely to use financial derivatives	Neutral regarding the use of financial derivatives	Unlikely to use financial derivatives	Very Unlikely to use financial derivatives	
Cash Flows:	1	2.17	27	44	26	5	3	105
Exchange rates impact my firm's cash flows, therefore I would be....		2.11	8	19	5	2	1	35
Commodity prices impact my firm's cash flows, therefore I would be....		2.37	10	17	6	1	1	35
Interest rates impact my firm's cash flows, therefore I would be....		2.03	9	8	15	2	1	35
Value of the Firm:	2	2.41	25	26	41	9	3	104
To increase shareholder value, I would be		2.14	12	10	9	4	0	35
To improve my company's share price, I would be....		2.41	6	12	12	4	0	34
I would like to minimise my firm's financial risk, therefore I would be...		2.69	7	4	20	1	3	35
Accounting Earnings:	3	2.66	24	28	25	13	14	104
To minimise variability in short term accounting earnings I would be		2.77	6	13	6	3	7	35
To reduce volatility of long term earnings, I would be...		2.24	13	10	5	2	4	34
To maintain a consistent financial performance for my firm, I would be...		2.97	5	5	14	8	3	35
Size of the Firm:	4	2.88	17	28	22	24	13	104
My firm is large in size, therefore I would be...		2.63	4	15	7	8	1	35
My firm is small in size, therefore I would be...		2.43	10	9	9	5	2	35
If my firm has sophisticated financial management practices and controls, I would be...		3.62	3	4	6	11	10	34
Perceptions Held by Investors & Shareholders:	5	3.11	14	22	21	29	16	102
Shareholder perceptions are important to me, therefore I would be ...		3.40	4	9	1	11	10	35
Shareholders increasingly expect management to be able to identify and manage exposures to market risks		2.82	6	8	10	6	4	34
I want investors to be comfortable with our financial risk management program, therefore I would be...		3.09	4	5	10	12	2	33
Cost of Capital:	6	3.38	2	26	33	13	28	102
To lower the cost of borrowing, I would be...		3.36	1	9	9	5	9	33
To assure investors of specific returns on their investments, I would be...		3.60	1	10	6	3	15	35
To avoid accessing capital markets. I would be...		3.18	0	7	18	5	4	34
Financial Distress & Bankruptcy:	7	3.61	4	9	32	35	22	102
If my firm is highly leveraged, I would be....		3.53	1	2	11	15	3	32
At the risk of not meeting financial obligations I would be...		3.46	2	3	12	13	5	35
During volatile business cycles, I would be...		3.83	1	4	9	7	14	35
In House Skills:	8	3.79	0	7	34	36	26	103
We rely heavily on outside advice to run our financial derivatives programmes, therefore I would be....		3.91	0	2	11	10	12	35
We have the proper in house skills to design, implement and control a derivatives programmes, therefore I w		3.64	0	4	10	13	6	33
We lack the proper in house skills to design, implement and control a derivatives programmes, therefore I w		3.80	0	1	13	13	8	35
Political/Country Instability:	9	4.03	0	3	31	30	40	104
Laws and regulations regarding mining activities are being changed, therefore I would be....		4.14	0	1	8	11	15	35
Political uncertainty is evident, therefore I would be....		4.29	0	1	8	5	20	34
Rules and regulations on selling our commodity into the market place may not be efficient enough, therefore		3.66	0	1	15	14	5	35
Availability of Information:	10	4.21	1	3	20	28	51	103
If I had more industry information than others, I would be...		3.91	1	2	6	15	10	34
If my firm was able to get information quicker than the market place, I would be...		4.53	0	0	5	6	23	34
If I wanted to inform shareholders about future prospects of the firm, I would be...		4.20	0	1	9	7	18	35
External Financing:	11	4.46	0	3	7	33	60	103
To 'lock-in' a certain stream of revenue, I would be.....		4.34	0	1	3	14	17	35
To pursue new projects, I would be...		4.61	0	1	1	8	23	33
If I wanted to change my firm's reliance on external financing, I would be...		4.43	0	1	3	11	20	35
Managerial Risk Aversion:	12	4.70	0	1	3	22	79	105
If I had shares in my firm, I would be....		4.83	0	0	0	6	29	35
f I had options to buy shares in my firm in the future, I would be...		4.83	0	0	0	6	29	35
To mitigate financial risk, I would be...		4.46	0	1	3	10	21	35
Taxation:	13	4.87	0	1	2	6	94	103
If the average tax rate of my firm was to rise as the pre-tax income rises, I would be...		4.94	0	0	0	2	32	34
To maximise our tax shields, I would be...		4.85	0	0	1	3	30	34
To reduce taxation on our offshore operations, I would be...		4.83	0	1	1	1	32	35

Appendix H: Statistical Terms, Statistical Table and Frequencies

Statistical Terms

N	The valid sample size per variable or question
Missing	Missing data points in the variable
Mean	Average of the specified consideration set
Mode	The value that occurs most frequently in the consideration set
Median	The value above which half of the values fall and below which half of the values fall
Skewness	A characteristic of a distribution that assesses its symmetry about the mean (i.e. either a positive or negative skew from the mean) The normal distribution is symmetric and has a skewness value of zero • A distribution with a significant positive skewness has a long right tail • A distribution with a significant negative skewness has a long left tail Although skewness provides some indication of departure from normality, the Kolmogorov-Smirnov Goodness-of-Fit test provides a more reliable indication
Kurtosis	A measure of the relative peakedness of the curve defined by the frequency distribution (i.e. height of curve in relation to a normal distribution, either flatter or more peaked)
Variance	The mean squared deviation from the mean
Standard deviation	The square root of the variance This is a useful measure as it is provides an indication of the spread of the data, i.e. how varied the responses (or attitudes and perceptions) were, as well as providing a measure of the likelihood of the results occurring should the same study were to be repeated many times
Frequency distribution	A mathematical distribution whose objective is to obtain a count of the number of responses associated with different values of one variable and to express these counts in percentage terms

Source: **Mahotra, 1999**
Mimmack, Meyer, Manas, 2000
SPSS Inc., 2005

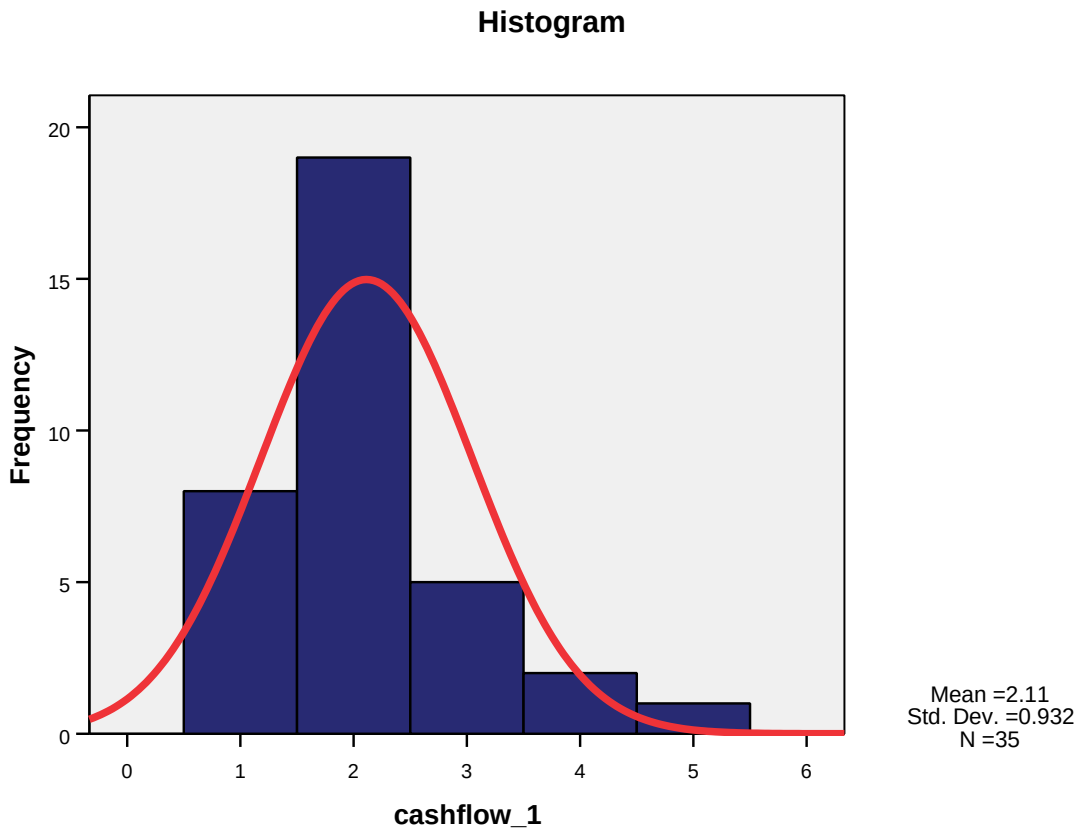
Measures of Location, Variability, and Shape

	N	Mean	Minimum	Maximum	Sum	Std. Deviation	Variance	Skewness	Kurtosis
cashflow_1	35	2.11	1	5	74	0.93	0.87	1.15	1.83
cashflow_2	35	2.03	1	5	71	0.92	0.85	1.13	2.01
cashflow_3	35	2.37	1	5	83	1.03	1.06	0.20	-0.30
value_1	35	2.14	1	4	75	1.03	1.07	0.38	-1.04
value_2	34	2.41	1	4	82	0.92	0.86	0.03	-0.76
value_3	35	2.69	1	5	94	1.11	1.22	0.12	0.16
earnings_1	35	2.77	1	5	97	1.40	1.95	0.50	-1.03
earnings_2	34	2.24	1	5	76	1.35	1.82	0.96	-0.17
earnings_3	35	2.97	1	5	104	1.15	1.32	-0.19	-0.48
size_1	35	2.63	1	5	92	1.06	1.12	0.35	-0.76
size_2	35	2.43	1	5	85	1.22	1.49	0.43	-0.73
size_3	34	3.62	1	5	123	1.28	1.64	-0.69	-0.50
Options_1	35	3.40	1	5	119	1.44	2.07	-0.38	-1.37
Options_2	34	2.82	1	5	96	1.27	1.60	0.16	-0.87
Options_3	33	3.09	1	5	102	1.13	1.27	-0.47	-0.55
cost_1	33	3.36	1	5	111	1.25	1.55	0.07	-1.30
cost_2	35	3.60	1	5	126	1.38	1.89	-0.22	-1.62
cost_3	34	3.18	2	5	108	0.90	0.82	0.68	-0.02
Distress_1	32	3.53	1	5	113	0.88	0.77	-0.71	1.11
Distress_2	35	3.46	1	5	121	1.04	1.08	-0.55	0.23
Distress_3	35	3.83	1	5	134	1.18	1.38	-0.57	-0.72
skills_1	35	3.91	2	5	137	0.95	0.90	-0.26	-1.09
skills_2	33	3.64	2	5	120	0.93	0.86	-0.18	-0.71
skills_3	35	3.80	2	5	133	0.83	0.69	0.08	-0.92
instability_1	35	4.14	2	5	145	0.88	0.77	-0.57	-0.77
instability_2	34	4.29	2	5	146	0.94	0.88	-0.88	-0.71
instability_3	35	3.66	2	5	128	0.76	0.58	0.27	-0.54
info_1	34	3.91	1	5	133	1.00	0.99	-0.99	1.02
info_2	34	4.53	3	5	154	0.75	0.56	-1.26	0.07
info_3	35	4.20	2	5	147	0.93	0.87	-0.65	-0.99
financing_1	35	4.34	2	5	152	0.76	0.58	-1.11	1.15
financing_2	33	4.61	2	5	152	0.70	0.50	-2.11	5.03
financing_3	35	4.43	2	5	155	0.78	0.61	-1.34	1.49
risk_1	35	4.83	4	5	169	0.38	0.15	-1.82	1.40
risk_2	35	4.83	4	5	169	0.38	0.15	-1.82	1.40
risk_3	35	4.46	2	5	156	0.78	0.61	-1.43	1.67
Taxation_1	34	4.94	4	5	168	0.24	0.06	-3.93	14.24
Taxation_2	34	4.85	3	5	165	0.44	0.19	-3.16	10.21
Taxation_3	35	4.83	2	5	169	0.62	0.38	-3.86	14.97

cashflow_1
(Exchange rates impact my firm's cash flows, therefore I would be….)

cashflow_1

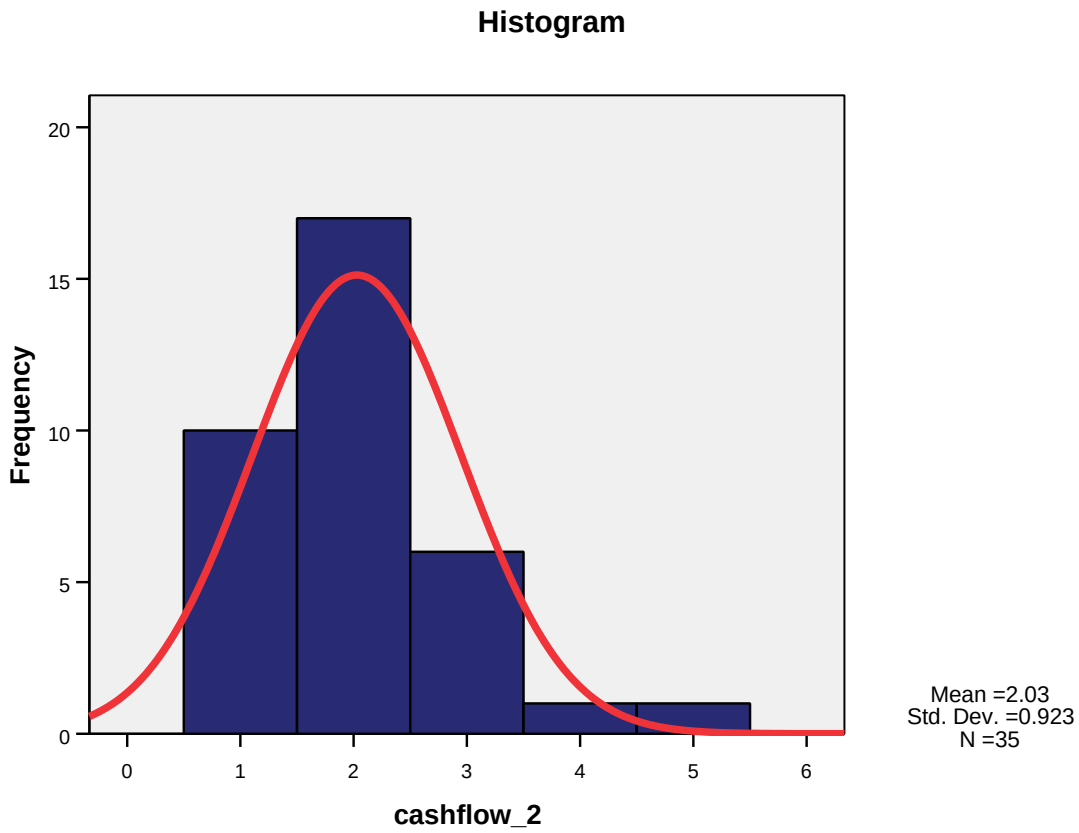
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	8	22.9	22.9	22.9
	2	19	54.3	54.3	77.1
	3	5	14.3	14.3	91.4
	4	2	5.7	5.7	97.1
	5	1	2.9	2.9	100.0
	Total	35	100.0	100.0	



cashflow_2
(Commodity prices impact my firm's cash flows, therefore I would be….)

cashflow_2

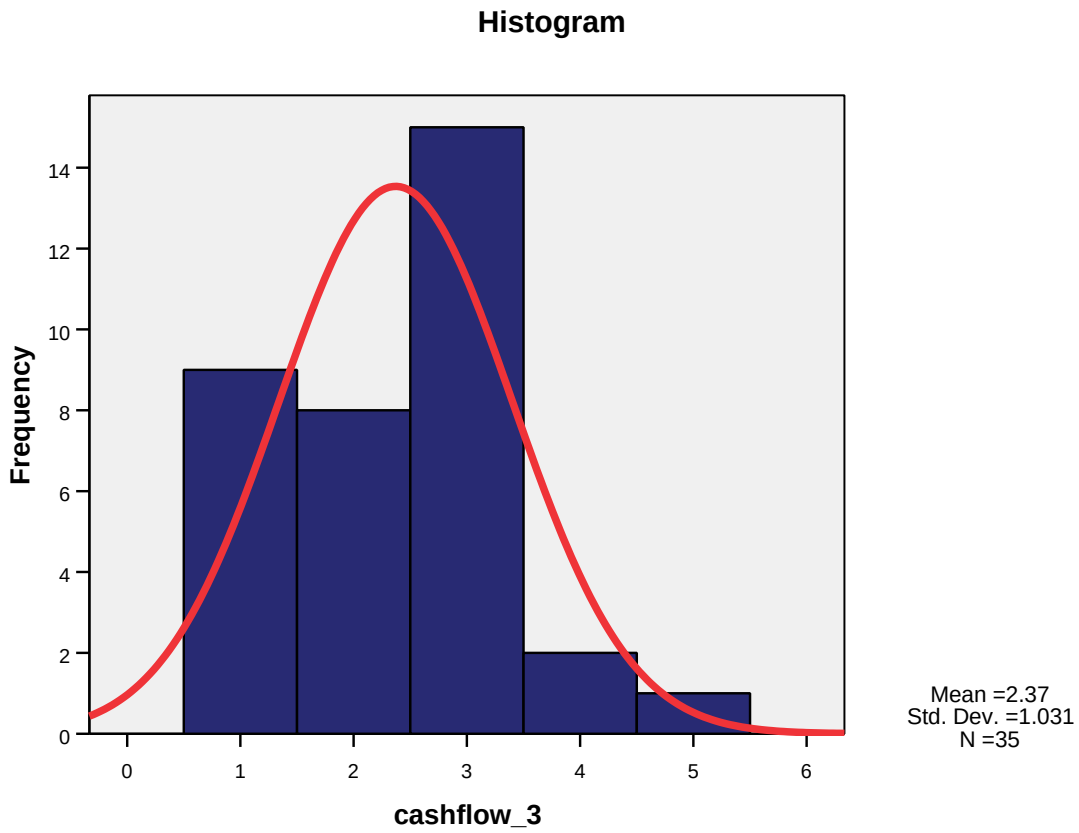
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	10	28.6	28.6	28.6
	2	17	48.6	48.6	77.1
	3	6	17.1	17.1	94.3
	4	1	2.9	2.9	97.1
	5	1	2.9	2.9	100.0
	Total	35	100.0	100.0	



cashflow_3
(Interest rates impact my firm's cash flows, therefore I would be….)

cashflow_3

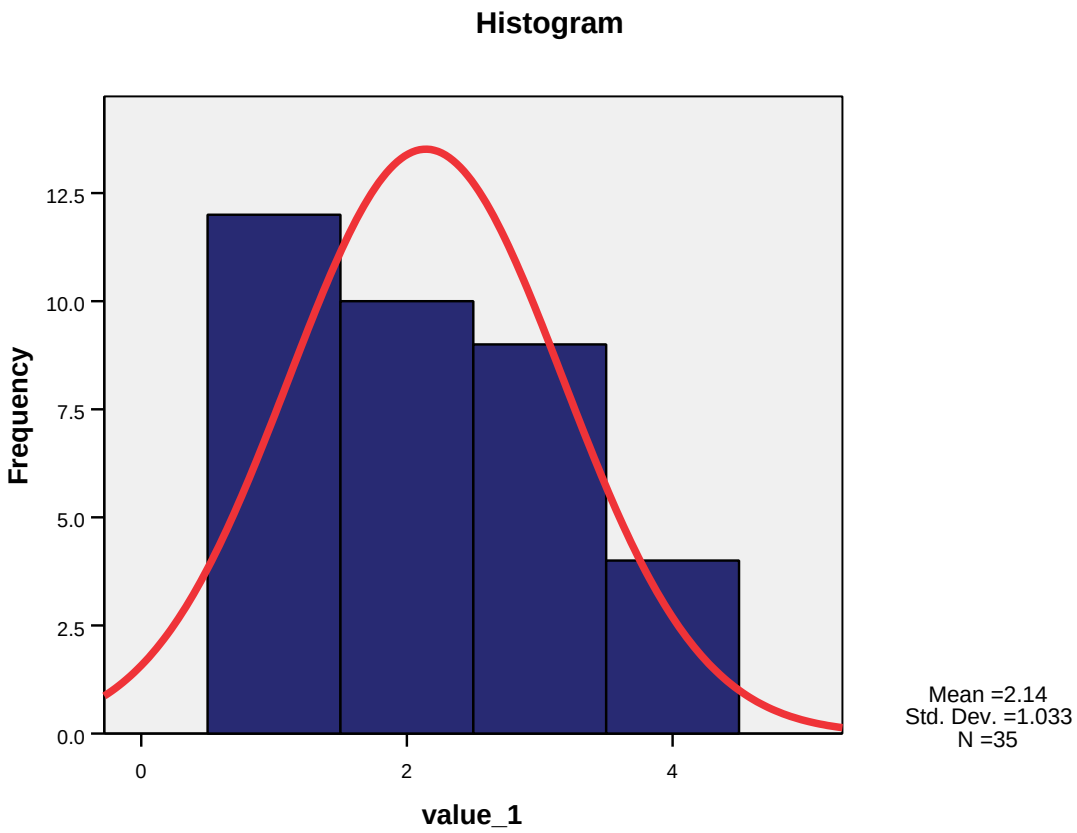
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	9	25.7	25.7	25.7
	2	8	22.9	22.9	48.6
	3	15	42.9	42.9	91.4
	4	2	5.7	5.7	97.1
	5	1	2.9	2.9	100.0
	Total	35	100.0	100.0	



value_1
(To increase shareholder value, I would be …)

value_1

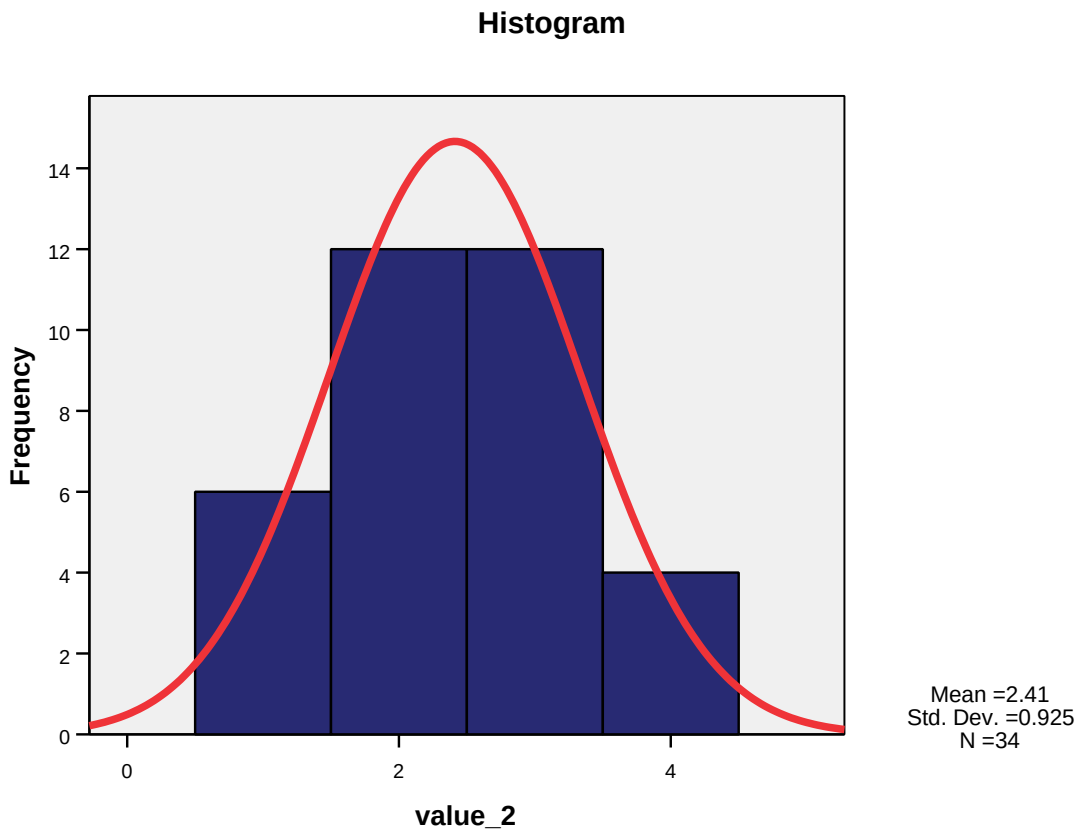
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	12	34.3	34.3	34.3
	2	10	28.6	28.6	62.9
	3	9	25.7	25.7	88.6
	4	4	11.4	11.4	100.0
	Total	35	100.0	100.0	



value_2
(To improve my company's share price, I would be…)

value_2

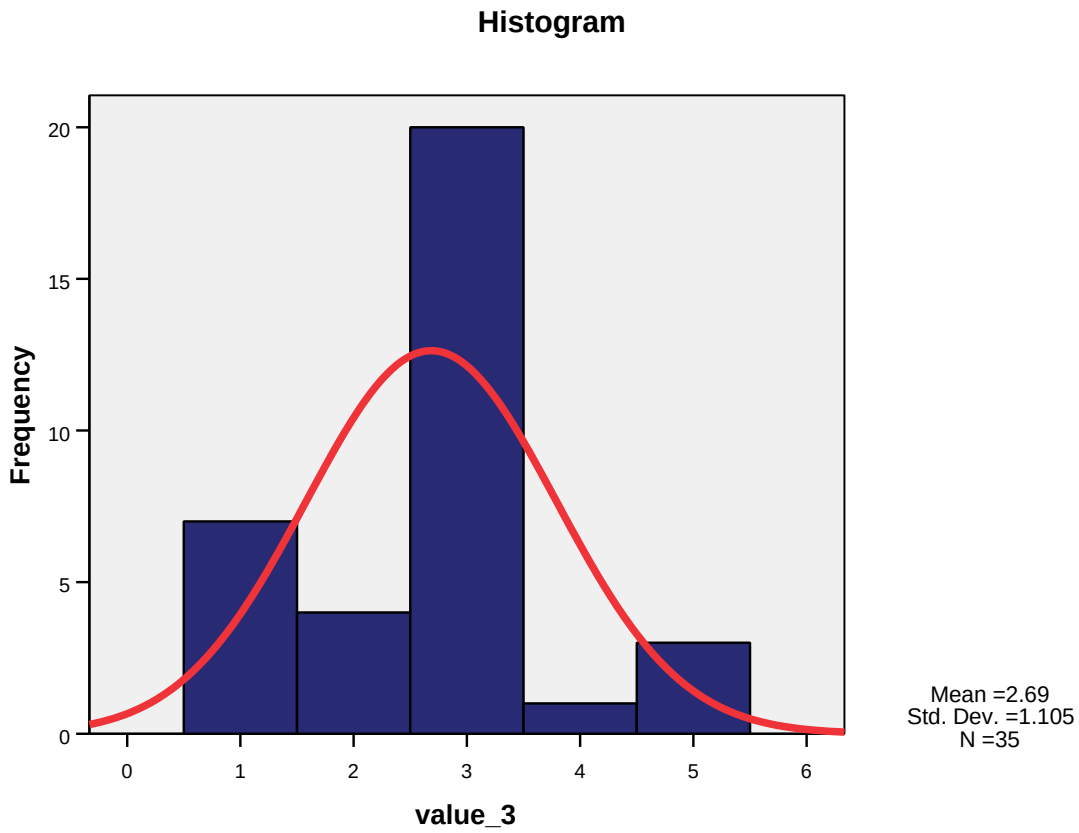
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	6	17.1	17.6	17.6
	2	12	34.3	35.3	52.9
	3	12	34.3	35.3	88.2
	4	4	11.4	11.8	100.0
	Total	34	97.1	100.0	
Missing	System	1	2.9		
Total		35	100.0		



value_3
(I would like to minimise my firm's financial risk, therefore I would be…)

value_3

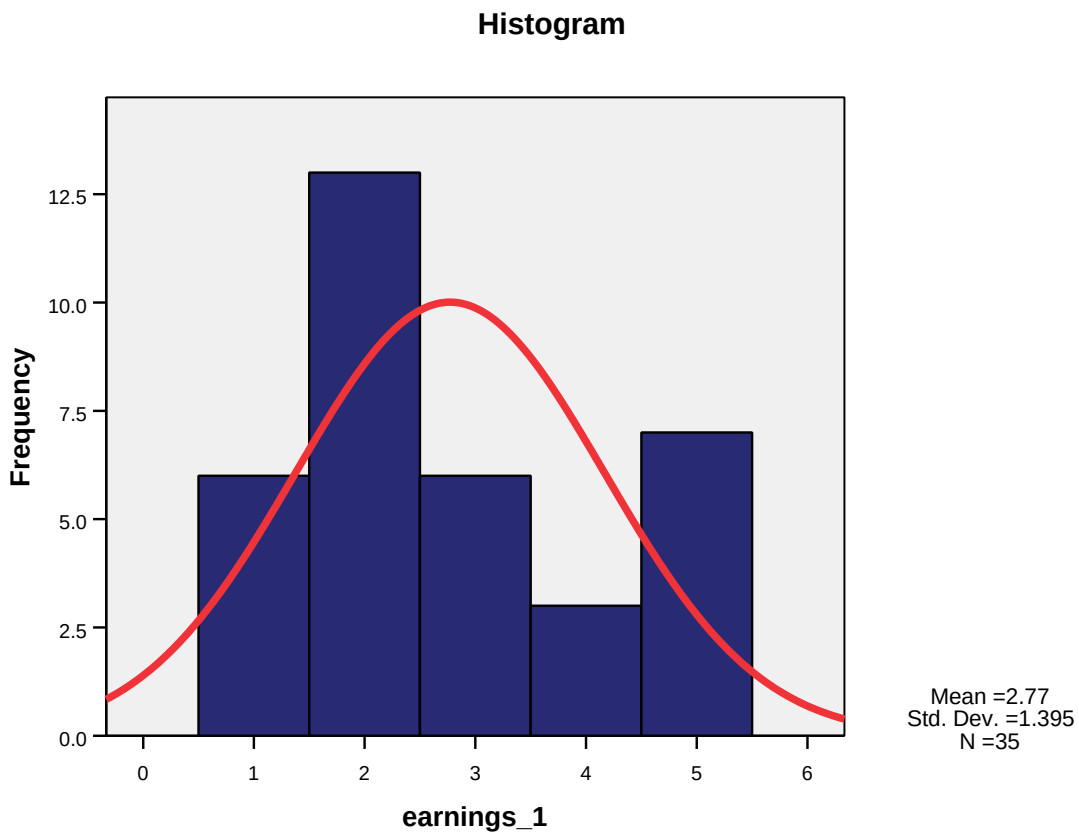
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	7	20.0	20.0	20.0
	2	4	11.4	11.4	31.4
	3	20	57.1	57.1	88.6
	4	1	2.9	2.9	91.4
	5	3	8.6	8.6	100.0
	Total	35	100.0	100.0	



earnings_1
(To minimise variability in short term accounting earnings I would be …)

earnings_1

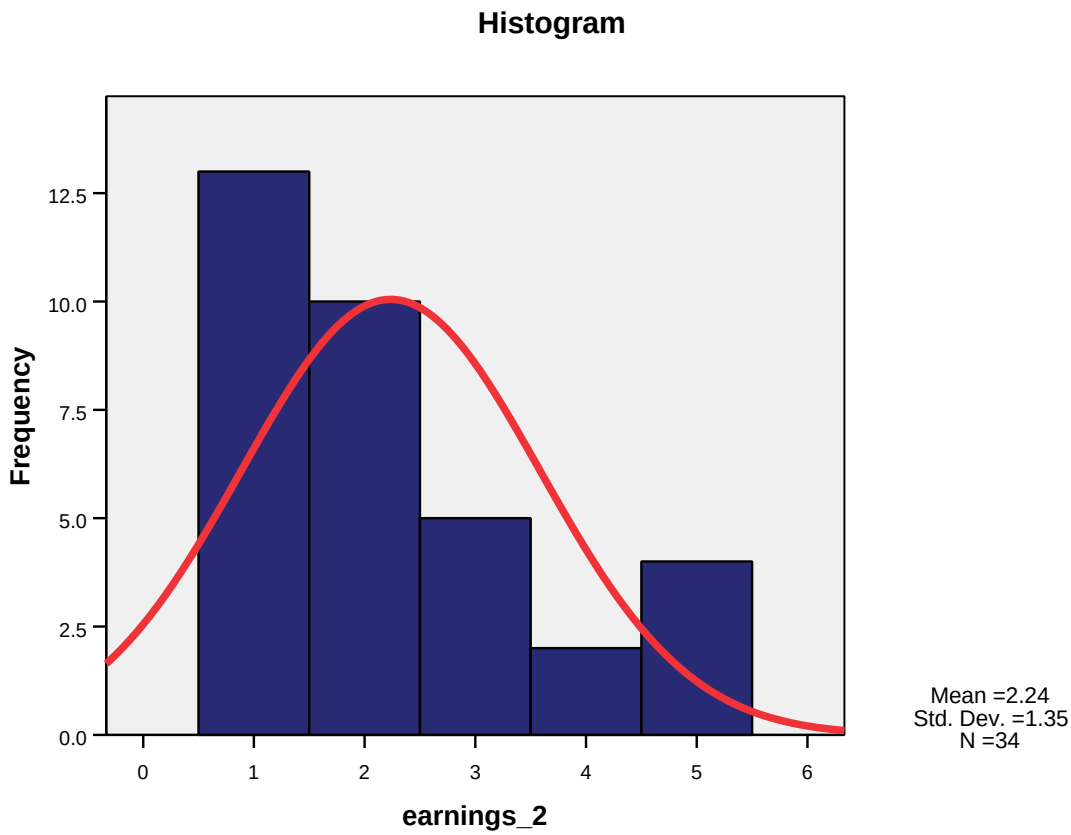
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	6	17.1	17.1	17.1
	2	13	37.1	37.1	54.3
	3	6	17.1	17.1	71.4
	4	3	8.6	8.6	80.0
	5	7	20.0	20.0	100.0
	Total	35	100.0	100.0	



earnings_2
(To reduce volatility of long term earnings, I would be…)

earnings_2

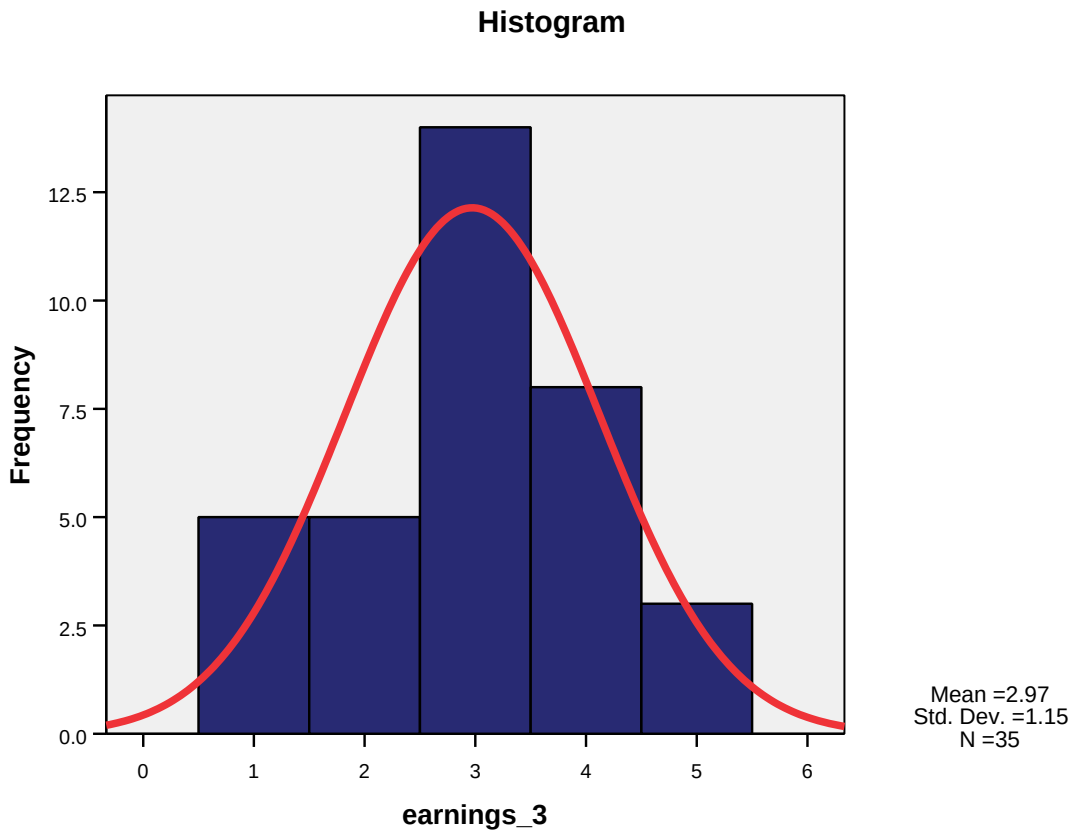
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	13	37.1	38.2	38.2
	2	10	28.6	29.4	67.6
	3	5	14.3	14.7	82.4
	4	2	5.7	5.9	88.2
	5	4	11.4	11.8	100.0
	Total	34	97.1	100.0	
Missing	System	1	2.9		
Total		35	100.0		



earnings_3
(To maintain a consistent financial performance for my firm, I would be…)

earnings_3

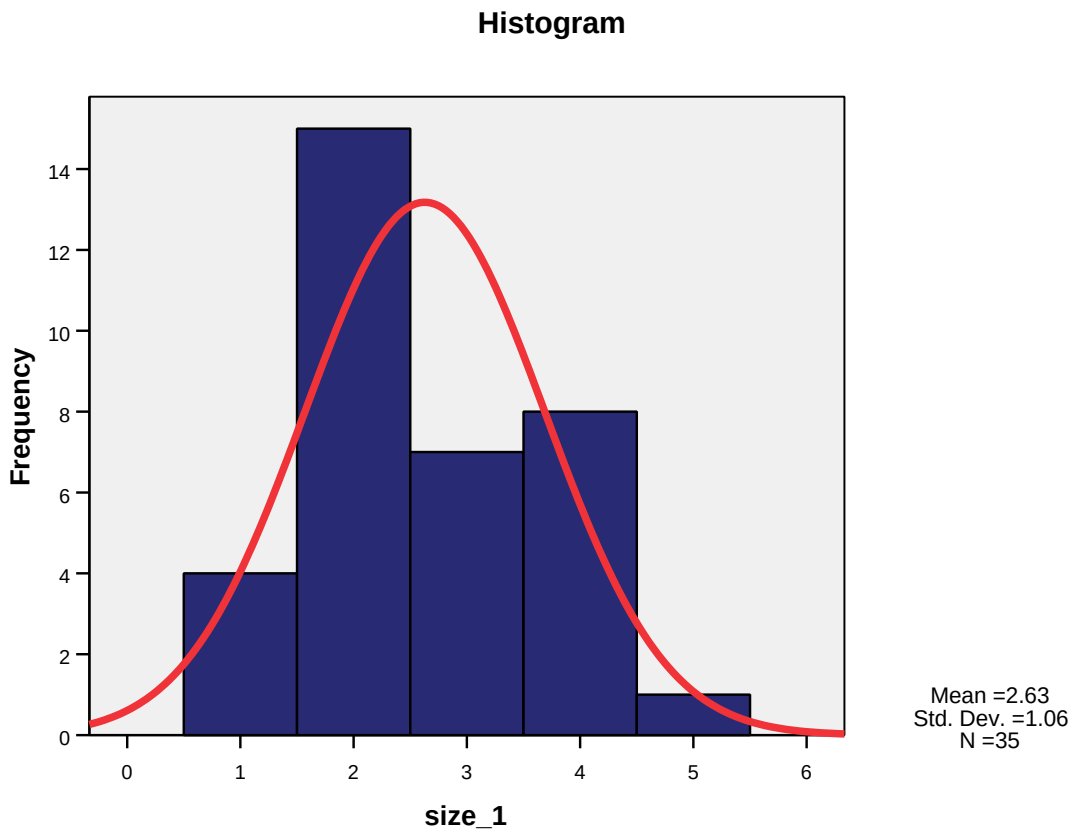
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	5	14.3	14.3	14.3
	2	5	14.3	14.3	28.6
	3	14	40.0	40.0	68.6
	4	8	22.9	22.9	91.4
	5	3	8.6	8.6	100.0
	Total	35	100.0	100.0	



size_1
(My firm is large in size, therefore I would be…)

size_1

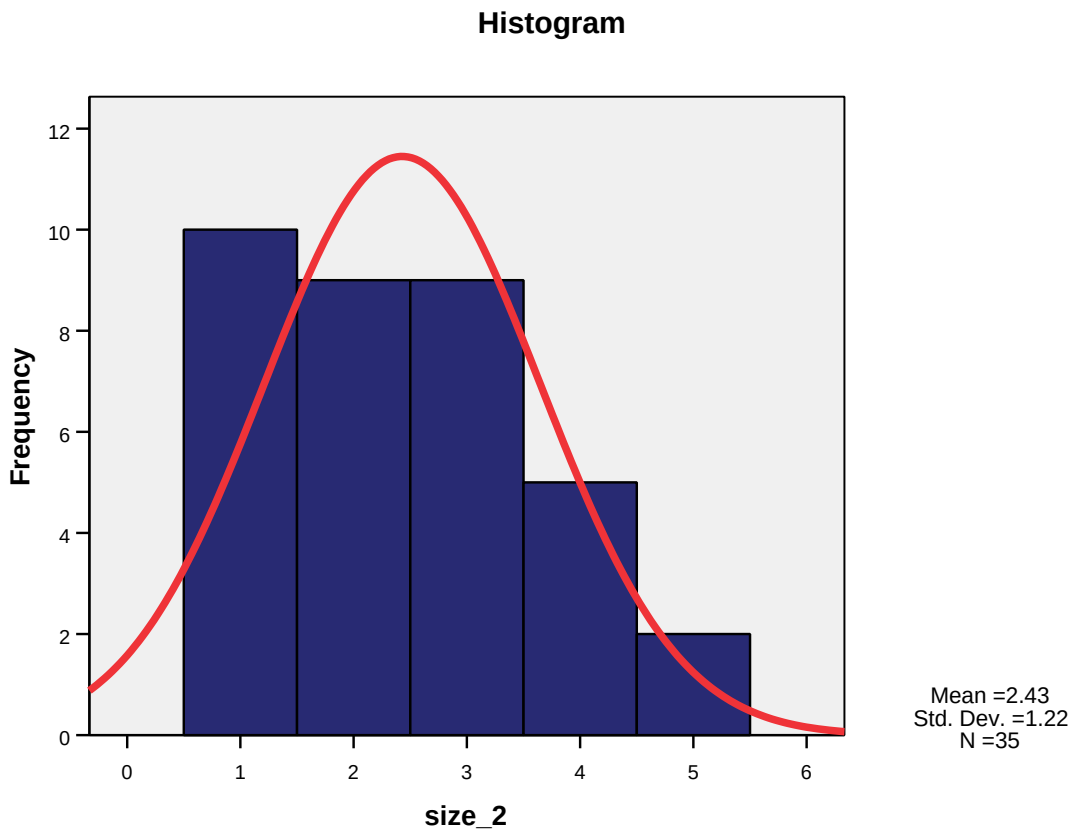
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	4	11.4	11.4	11.4
	2	15	42.9	42.9	54.3
	3	7	20.0	20.0	74.3
	4	8	22.9	22.9	97.1
	5	1	2.9	2.9	100.0
	Total	35	100.0	100.0	



size_2
(My firm is small in size, therefore I would be…)

size_2

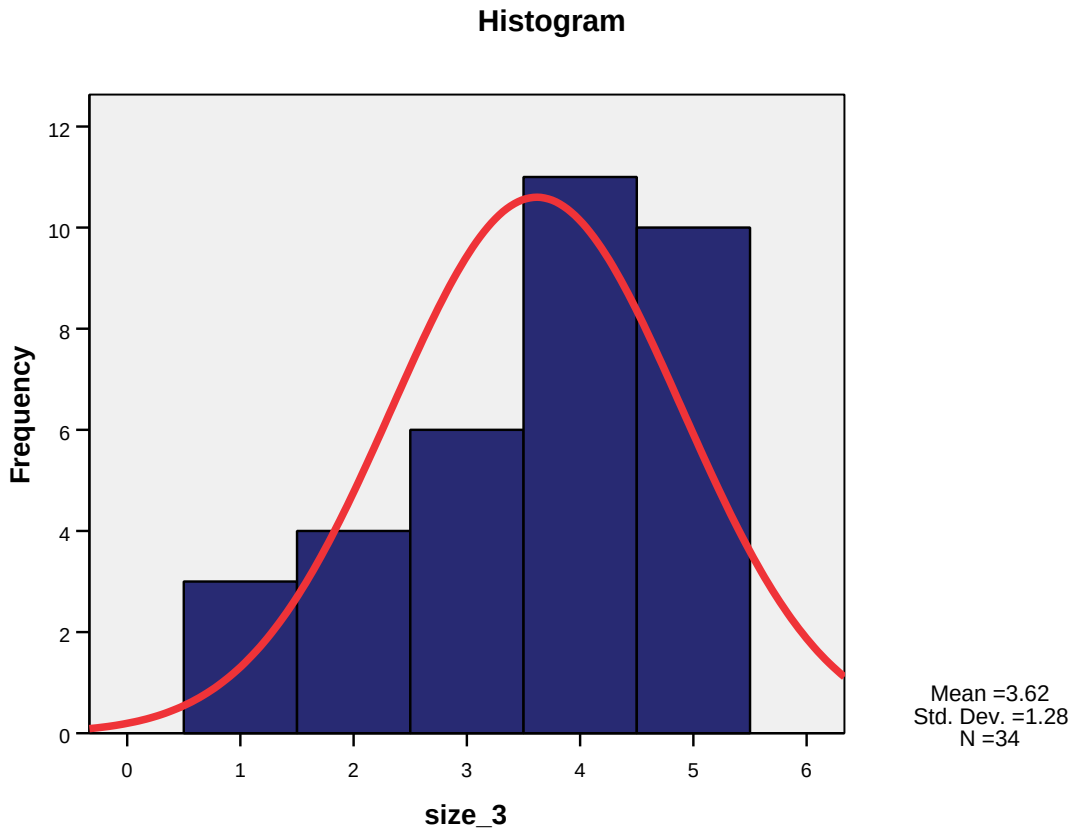
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	10	28.6	28.6	28.6
	2	9	25.7	25.7	54.3
	3	9	25.7	25.7	80.0
	4	5	14.3	14.3	94.3
	5	2	5.7	5.7	100.0
	Total	35	100.0	100.0	



size_3
(If my firm has sophisticated financial management practices and controls, I would be…)

size_3

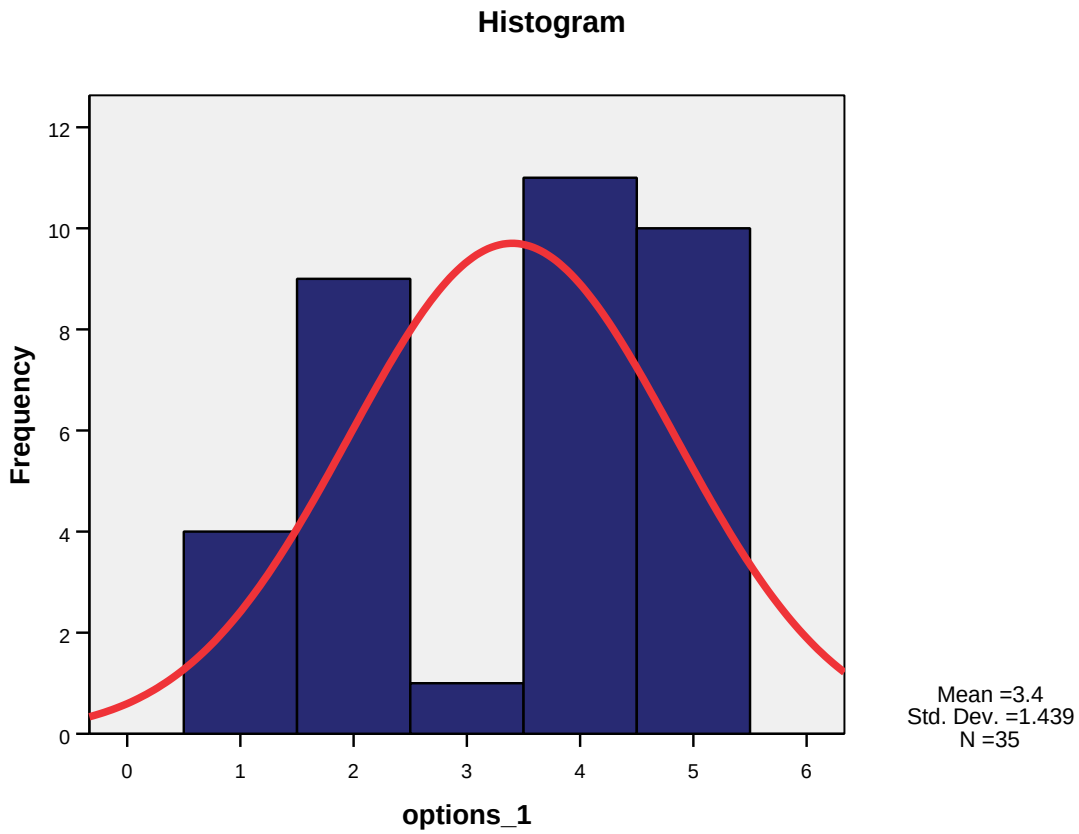
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	3	8.6	8.8	8.8
	2	4	11.4	11.8	20.6
	3	6	17.1	17.6	38.2
	4	11	31.4	32.4	70.6
	5	10	28.6	29.4	100.0
	Total	34	97.1	100.0	
Missing	System	1	2.9		
Total		35	100.0		



options_1
(Shareholder perceptions are important to me, therefore I would be …)

options_1

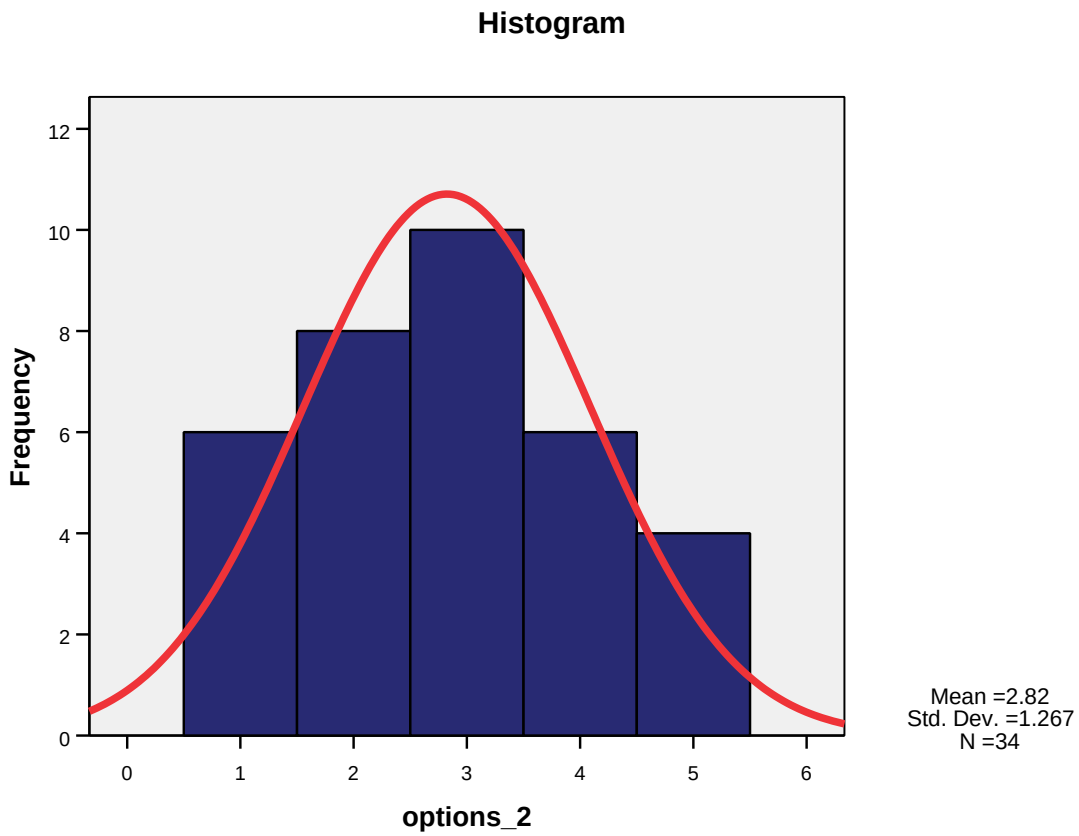
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	4	11.4	11.4	11.4
	2	9	25.7	25.7	37.1
	3	1	2.9	2.9	40.0
	4	11	31.4	31.4	71.4
	5	10	28.6	28.6	100.0
	Total	35	100.0	100.0	



options_2
(Shareholders increasingly expect management to be able to identify and manage exposures to market risks, therefore I would be…)

options_2

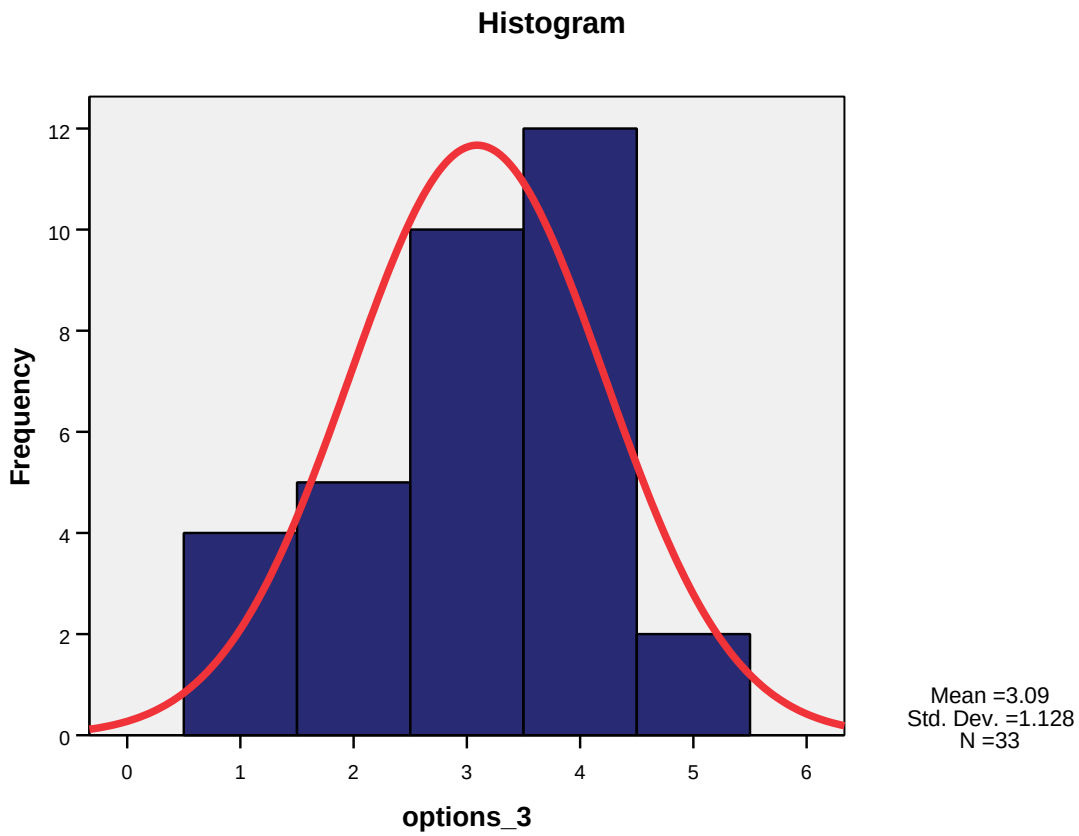
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	6	17.1	17.6	17.6
	2	8	22.9	23.5	41.2
	3	10	28.6	29.4	70.6
	4	6	17.1	17.6	88.2
	5	4	11.4	11.8	100.0
	Total	34	97.1	100.0	
Missing	System	1	2.9		
Total		35	100.0		



options_3
(I want investors to be comfortable with our financial risk management programme, therefore I would be…)

options_3

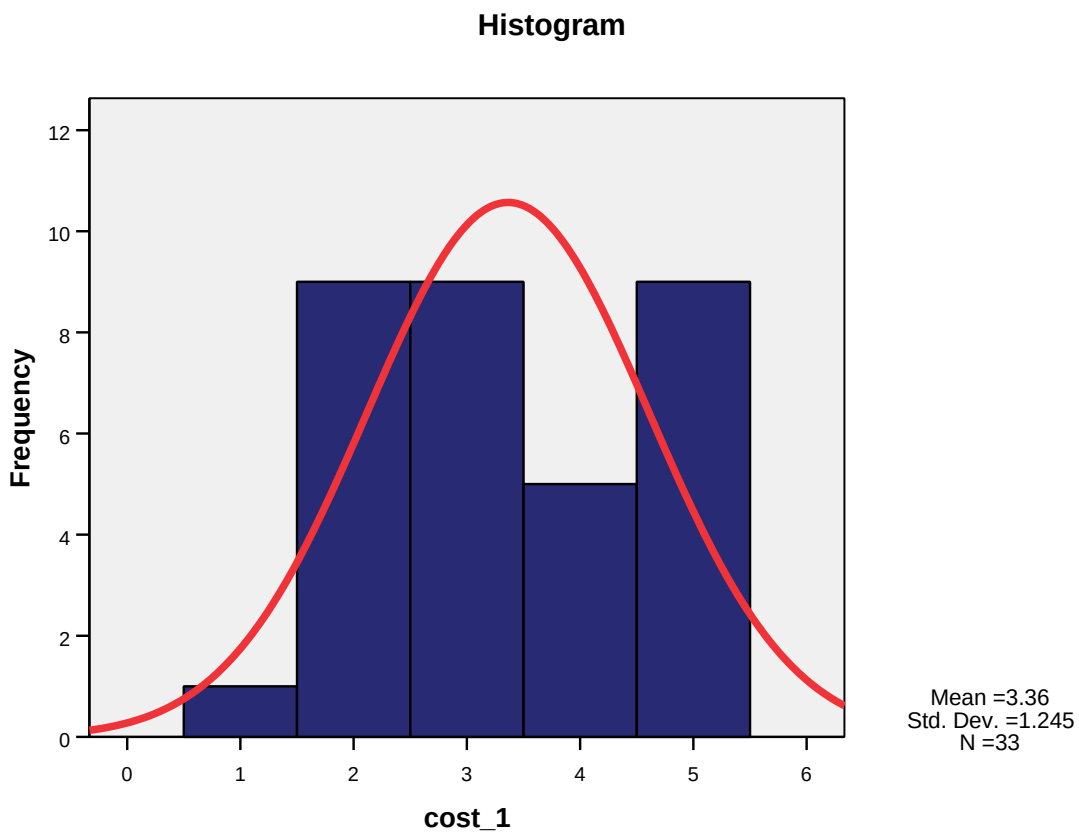
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	4	11.4	12.1	12.1
	2	5	14.3	15.2	27.3
	3	10	28.6	30.3	57.6
	4	12	34.3	36.4	93.9
	5	2	5.7	6.1	100.0
	Total	33	94.3	100.0	
Missing	System	2	5.7		
Total		35	100.0		



cost_1
(To lower the cost of borrowing, I would be…)

cost_1

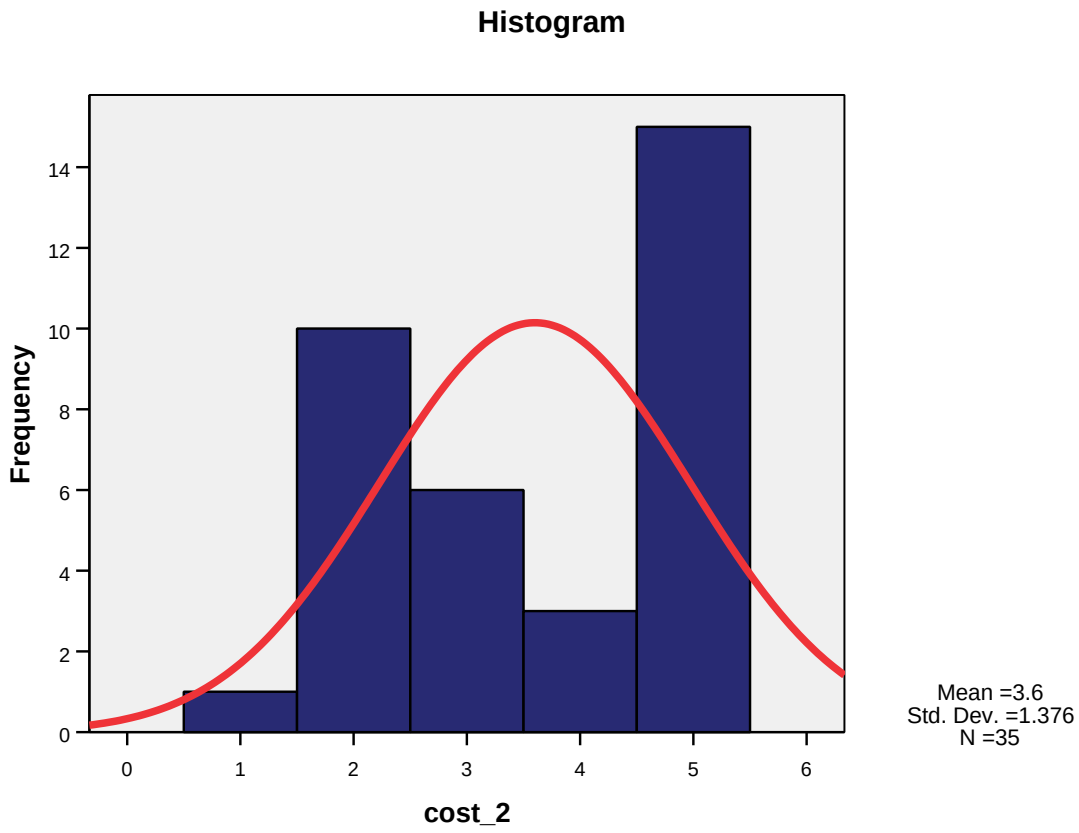
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	2.9	3.0	3.0
	2	9	25.7	27.3	30.3
	3	9	25.7	27.3	57.6
	4	5	14.3	15.2	72.7
	5	9	25.7	27.3	100.0
	Total	33	94.3	100.0	
Missing	System	2	5.7		
Total		35	100.0		



cost_2
(To assure investors of specific returns on their investments, I would be…)

cost_2

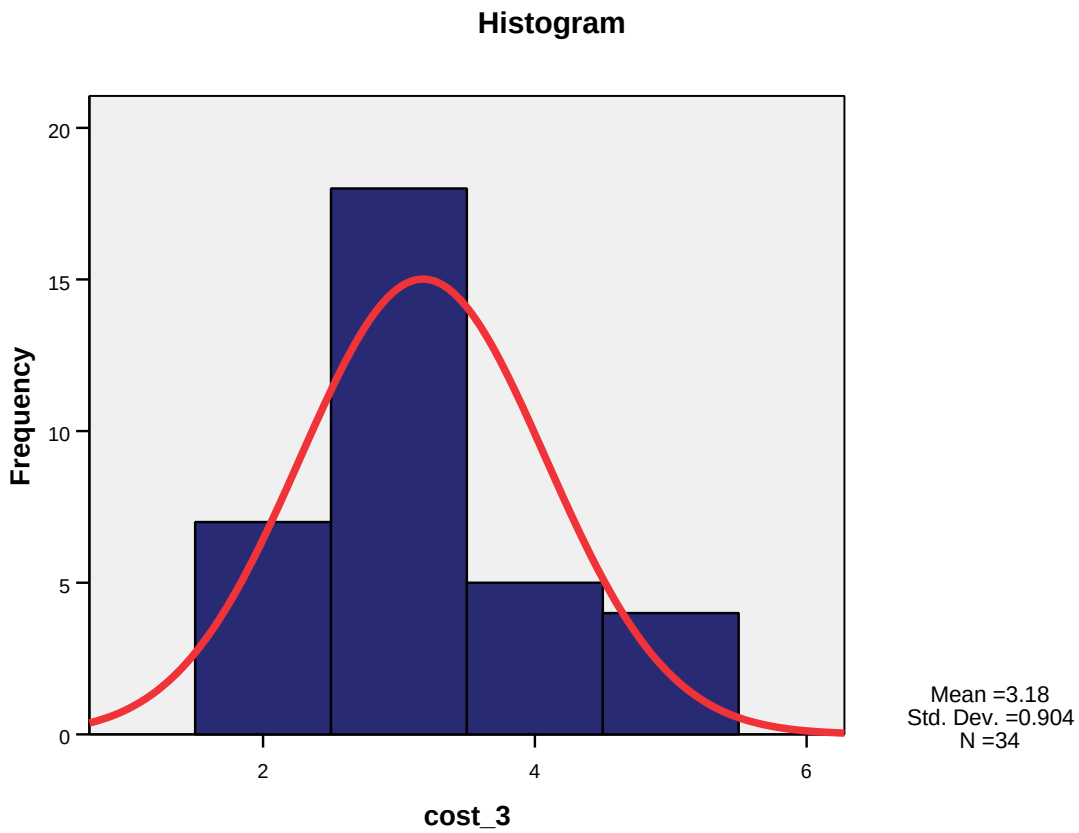
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	2.9	2.9	2.9
	2	10	28.6	28.6	31.4
	3	6	17.1	17.1	48.6
	4	3	8.6	8.6	57.1
	5	15	42.9	42.9	100.0
	Total	35	100.0	100.0	



cost_3
(To avoid accessing capital markets. I would be…)

cost_3

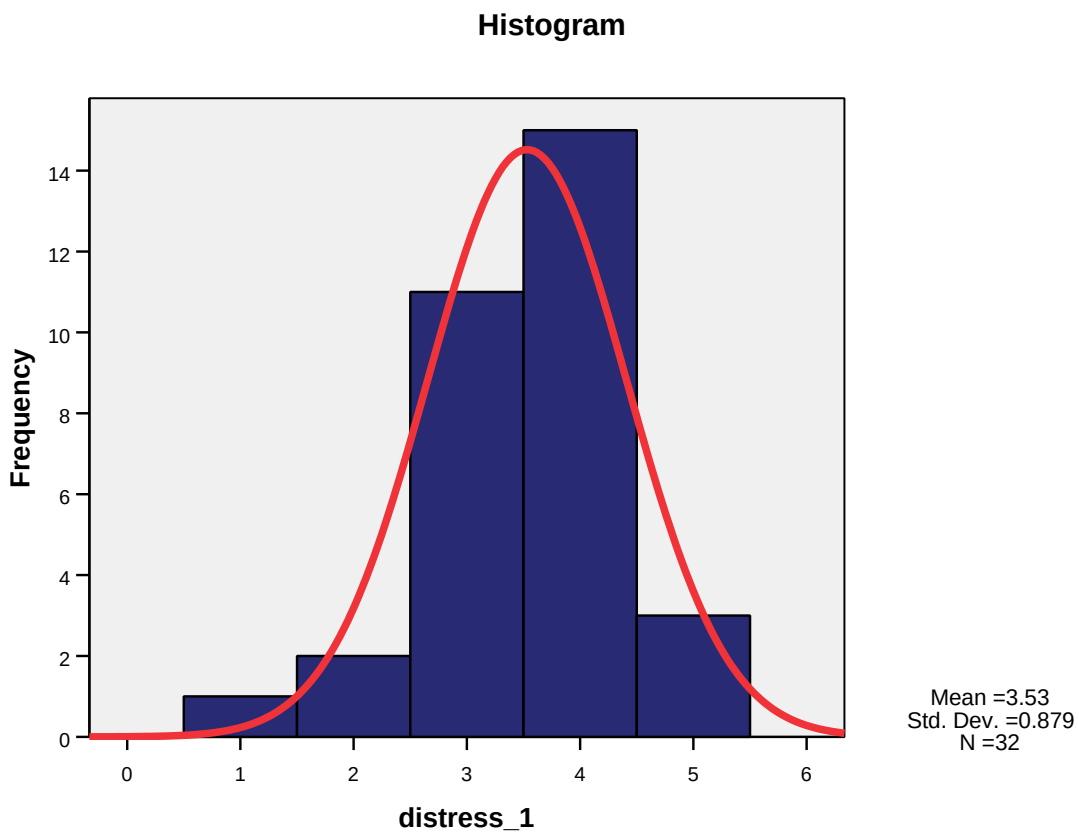
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	7	20.0	20.6	20.6
	3	18	51.4	52.9	73.5
	4	5	14.3	14.7	88.2
	5	4	11.4	11.8	100.0
	Total	34	97.1	100.0	
Missing	System	1	2.9		
Total		35	100.0		



distress_1
(If my firm is highly leveraged, I would be…)

distress_1

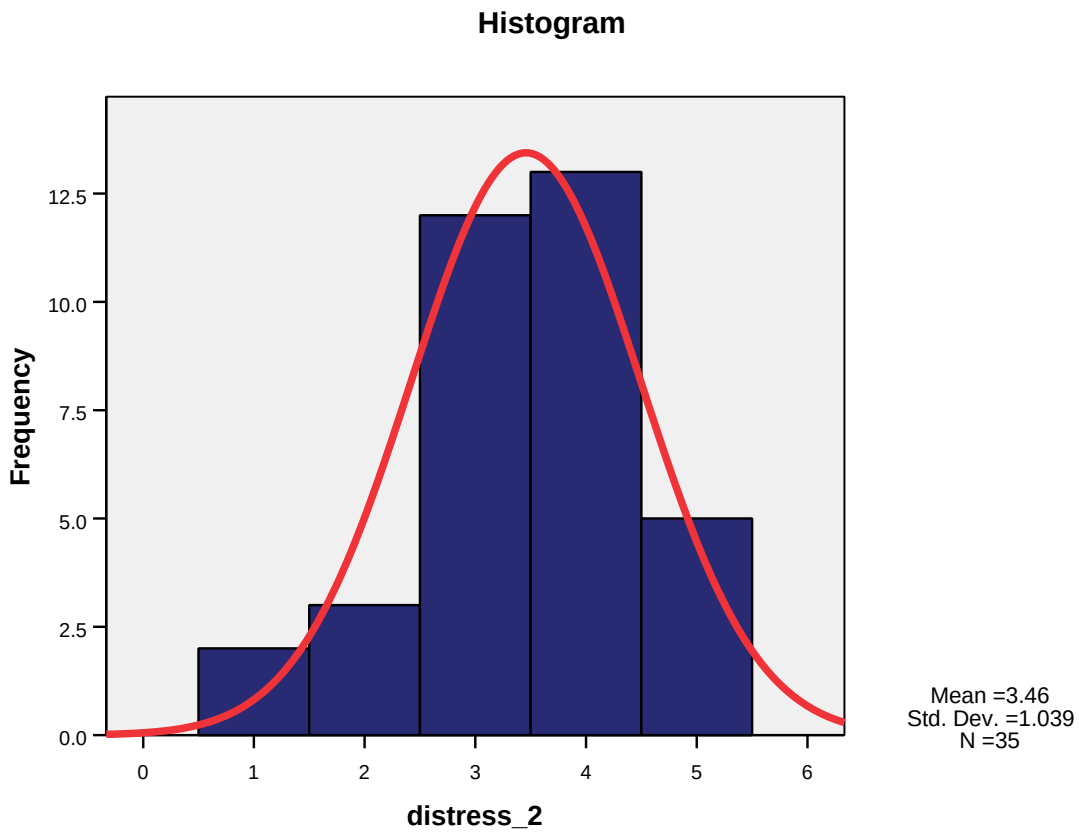
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	2.9	3.1	3.1
	2	2	5.7	6.3	9.4
	3	11	31.4	34.4	43.8
	4	15	42.9	46.9	90.6
	5	3	8.6	9.4	100.0
	Total	32	91.4	100.0	
Missing	System	3	8.6		
Total		35	100.0		



distress_2
(At the risk of not meeting financial obligations I would be…)

distress_2

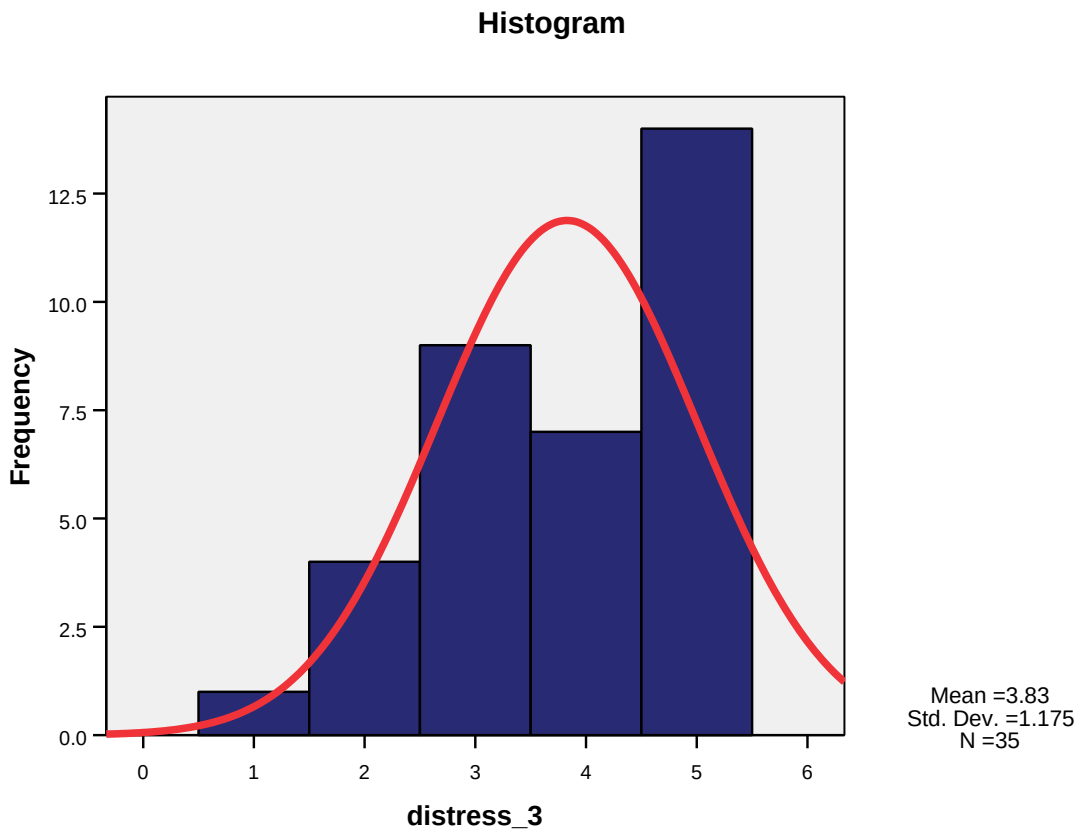
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	2	5.7	5.7	5.7
	2	3	8.6	8.6	14.3
	3	12	34.3	34.3	48.6
	4	13	37.1	37.1	85.7
	5	5	14.3	14.3	100.0
	Total	35	100.0	100.0	



distress_3
(During volatile business cycles, I would be…)

distress_3

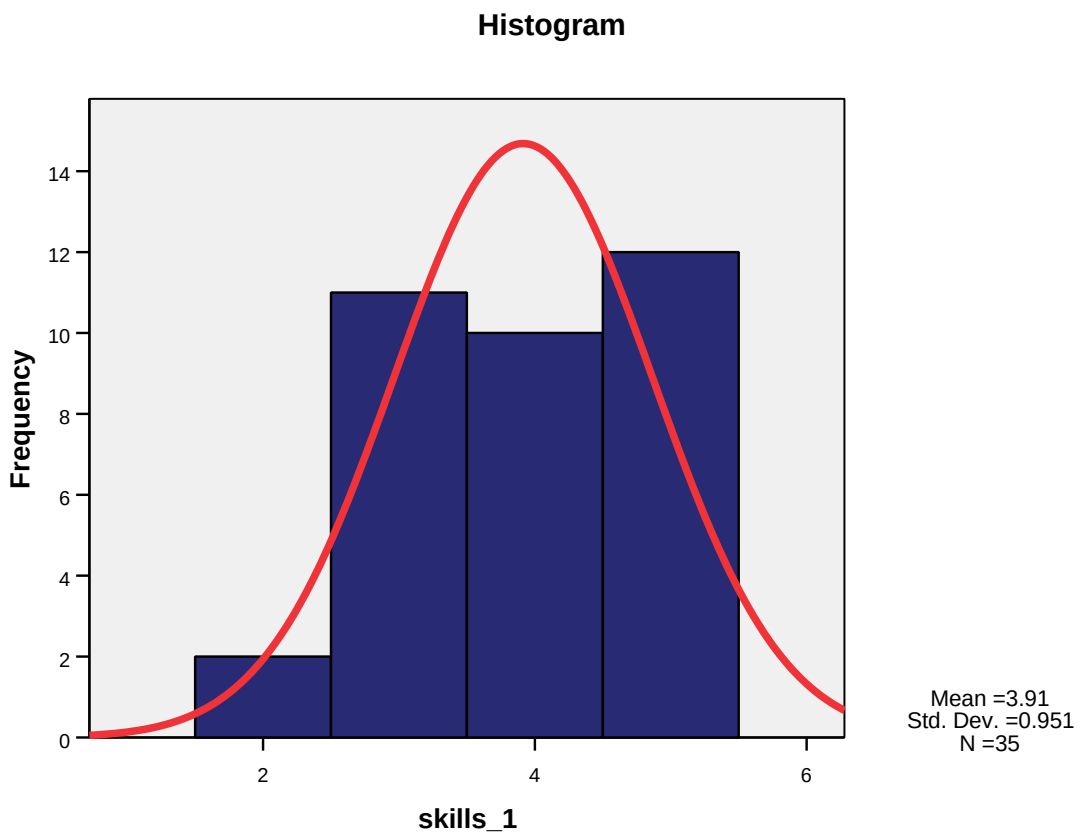
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	2.9	2.9	2.9
	2	4	11.4	11.4	14.3
	3	9	25.7	25.7	40.0
	4	7	20.0	20.0	60.0
	5	14	40.0	40.0	100.0
	Total	35	100.0	100.0	



skills_1
(We rely heavily on outside advice to run our financial derivatives programmes, therefore I would be….)

skills_1

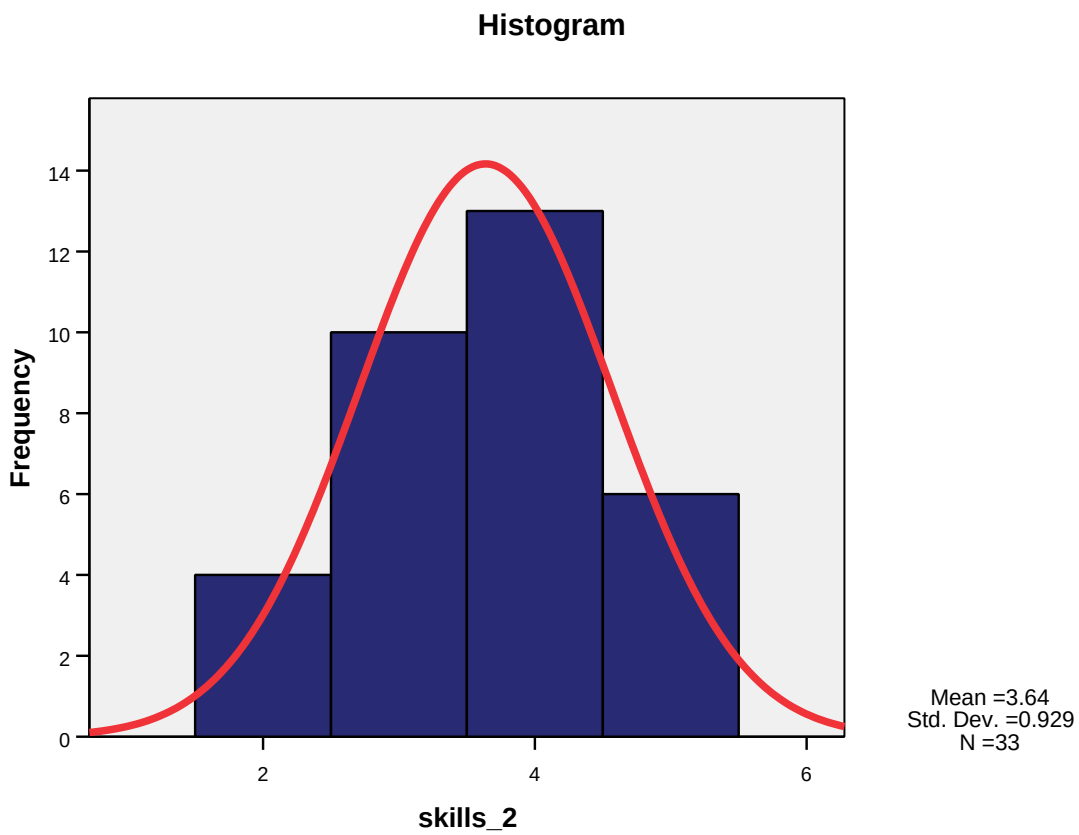
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	2	5.7	5.7	5.7
	3	11	31.4	31.4	37.1
	4	10	28.6	28.6	65.7
	5	12	34.3	34.3	100.0
	Total	35	100.0	100.0	



skills_2
(We have the proper in house skills to design, implement and control a derivatives programme, therefore I would be…)

skills_2

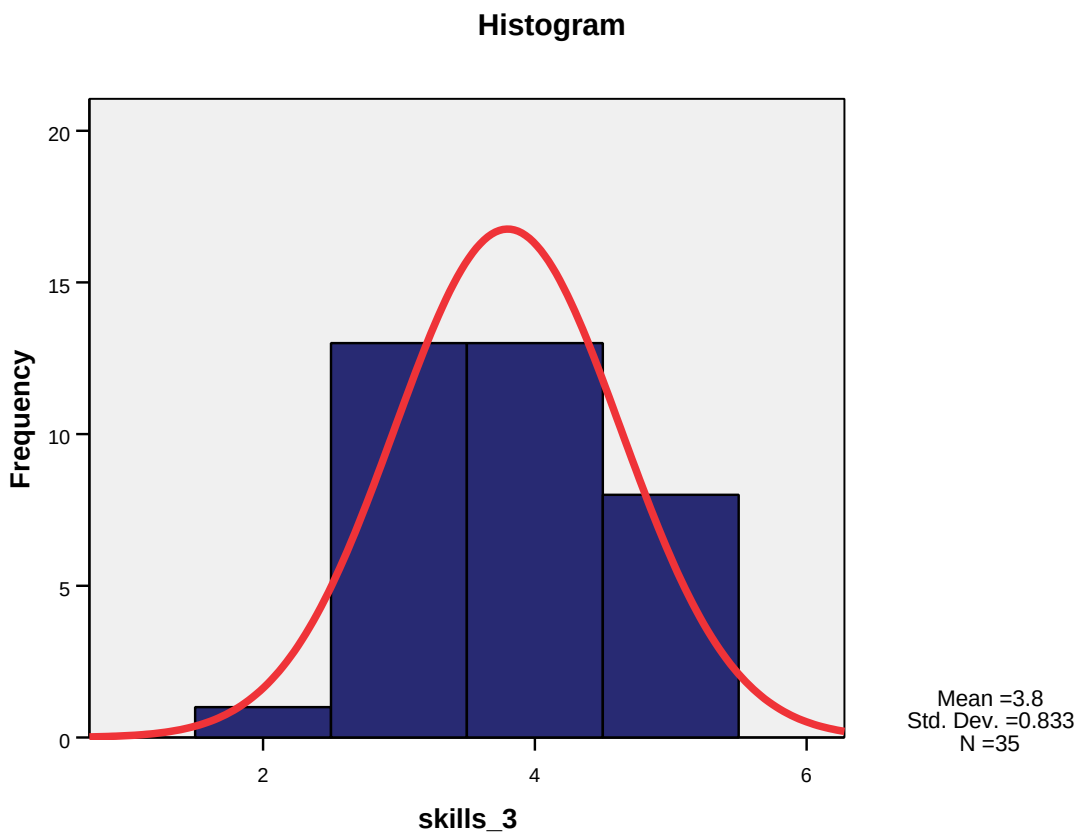
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	4	11.4	12.1	12.1
	3	10	28.6	30.3	42.4
	4	13	37.1	39.4	81.8
	5	6	17.1	18.2	100.0
	Total	33	94.3	100.0	
Missing	System	2	5.7		
Total		35	100.0		



skills_3
(We lack the proper in house skills to design, implement and control a derivatives programme, therefore I would be…)

skills_3

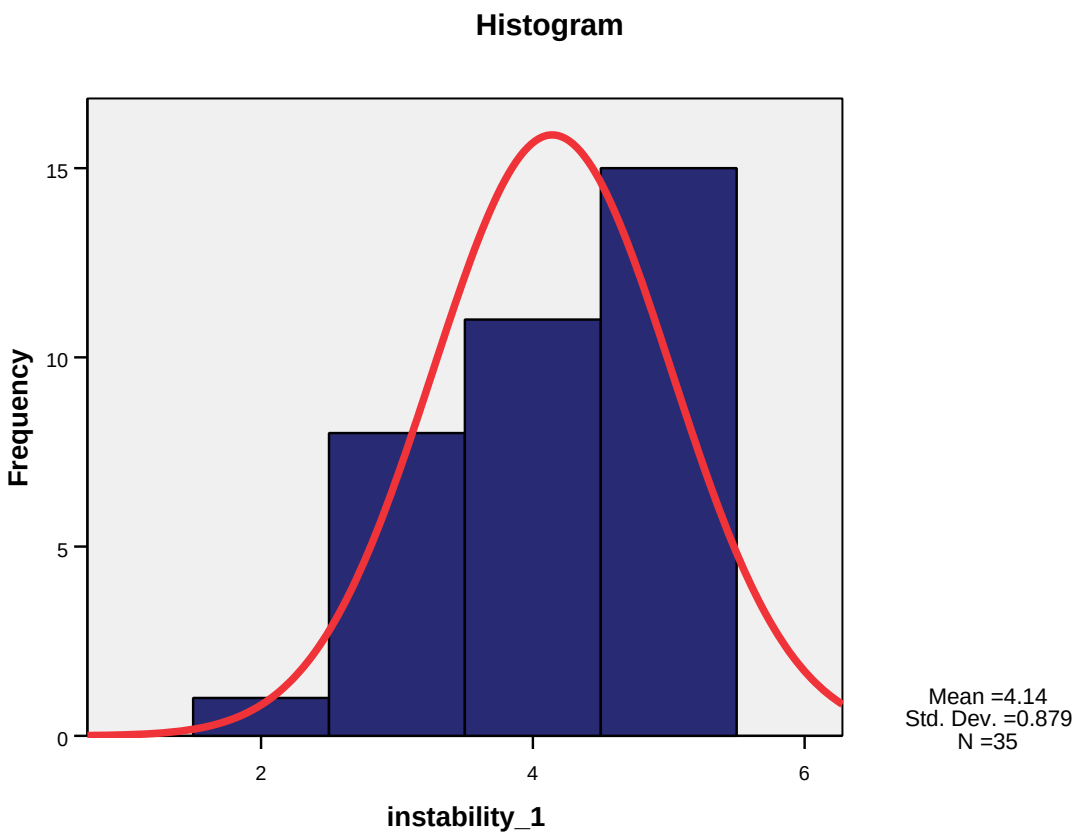
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	1	2.9	2.9	2.9
	3	13	37.1	37.1	40.0
	4	13	37.1	37.1	77.1
	5	8	22.9	22.9	100.0
	Total	35	100.0	100.0	



instability_1
(Laws and regulations regarding mining activities are being changed, therefore I would be…)

instability_1

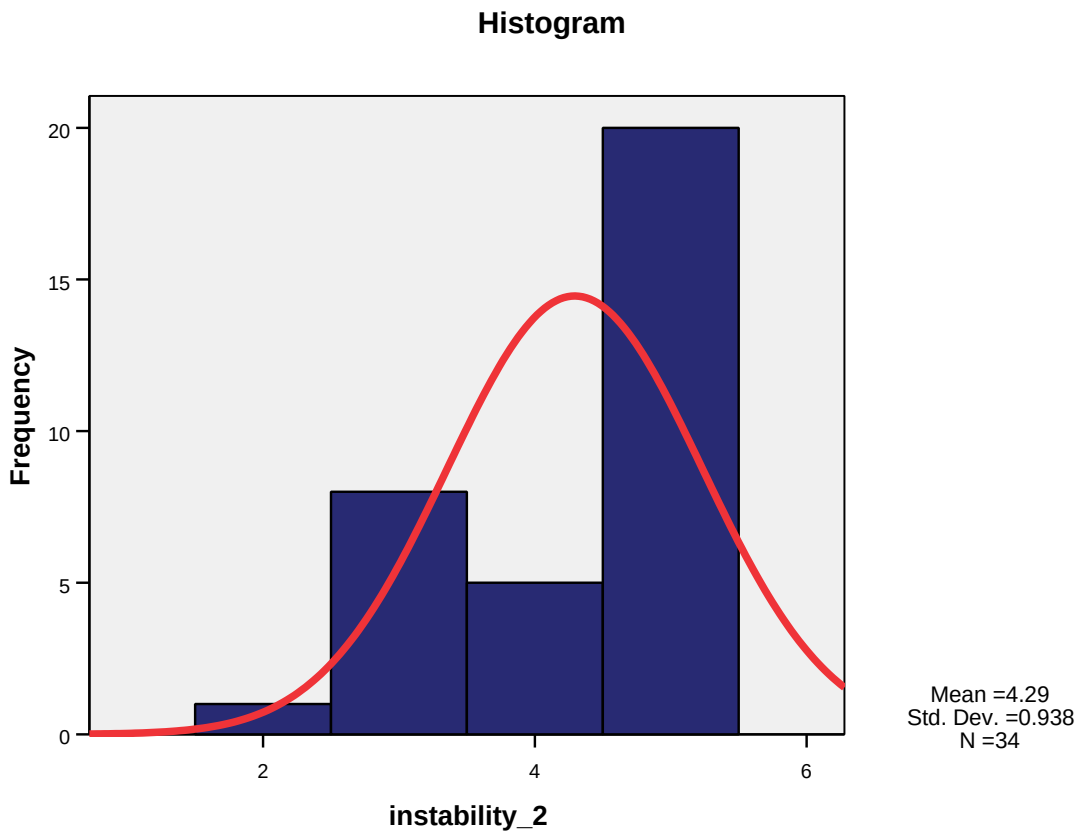
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	1	2.9	2.9	2.9
	3	8	22.9	22.9	25.7
	4	11	31.4	31.4	57.1
	5	15	42.9	42.9	100.0
	Total	35	100.0	100.0	



instability_2
(Political uncertainty is evident, therefore I would be…)

instability_2

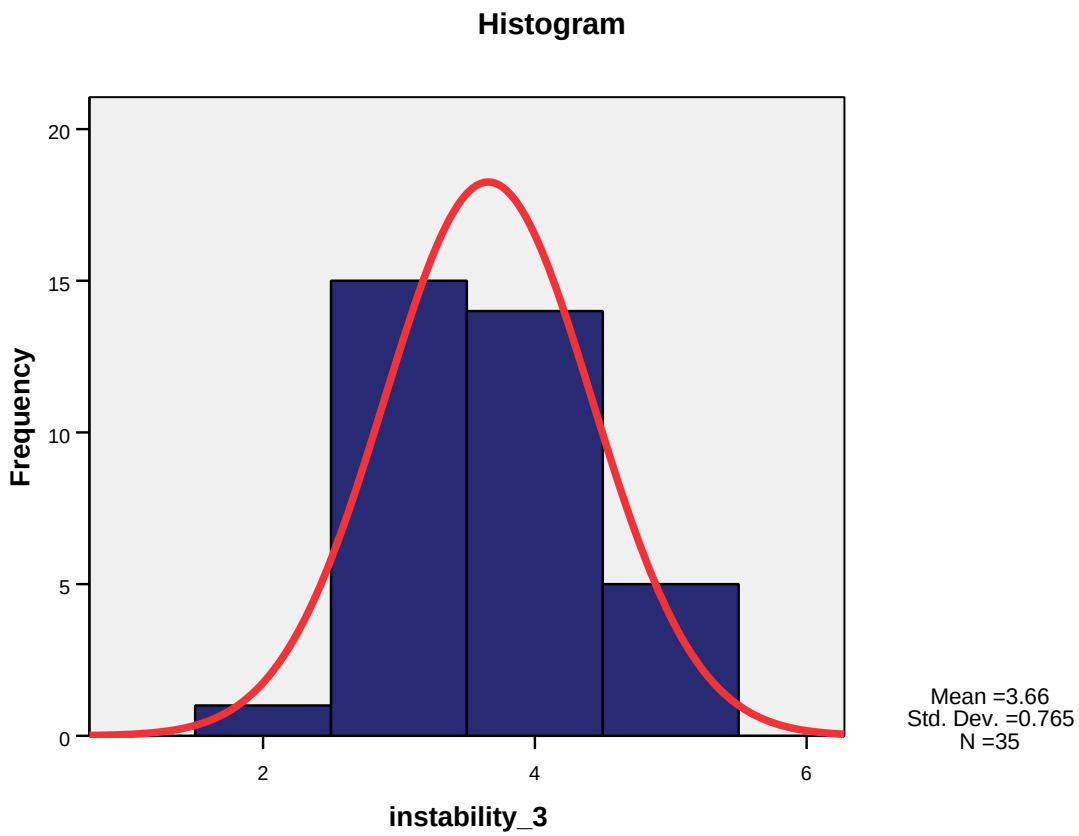
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	1	2.9	2.9	2.9
	3	8	22.9	23.5	26.5
	4	5	14.3	14.7	41.2
	5	20	57.1	58.8	100.0
	Total	34	97.1	100.0	
Missing	System	1	2.9		
Total		35	100.0		



instability_3
(Rules and regulations on selling our commodity into the market place may not be efficient enough, therefore I would be…)

instability_3

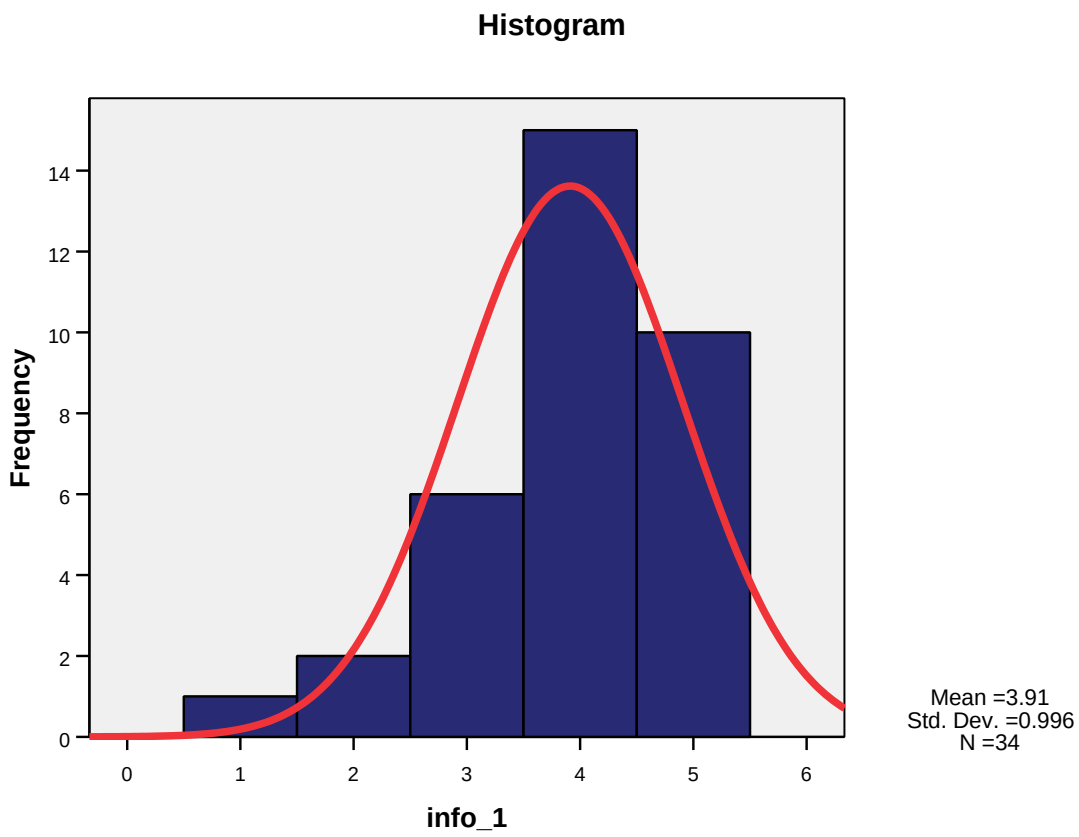
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	1	2.9	2.9	2.9
	3	15	42.9	42.9	45.7
	4	14	40.0	40.0	85.7
	5	5	14.3	14.3	100.0
	Total	35	100.0	100.0	



info_1
(If I had more industry information than others, I would be…)

info_1

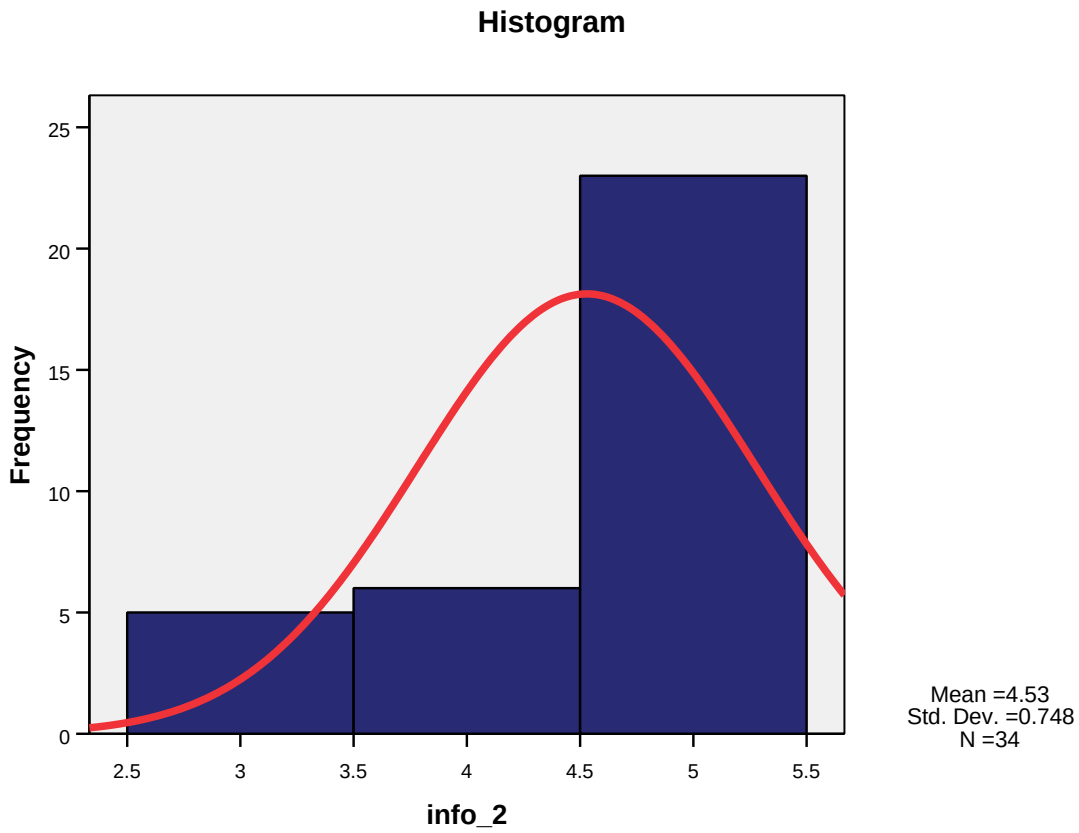
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	2.9	2.9	2.9
	2	2	5.7	5.9	8.8
	3	6	17.1	17.6	26.5
	4	15	42.9	44.1	70.6
	5	10	28.6	29.4	100.0
	Total	34	97.1	100.0	
Missing	System	1	2.9		
Total		35	100.0		



info_2
(If my firm was able to get information quicker than the market place, I would be…)

info_2

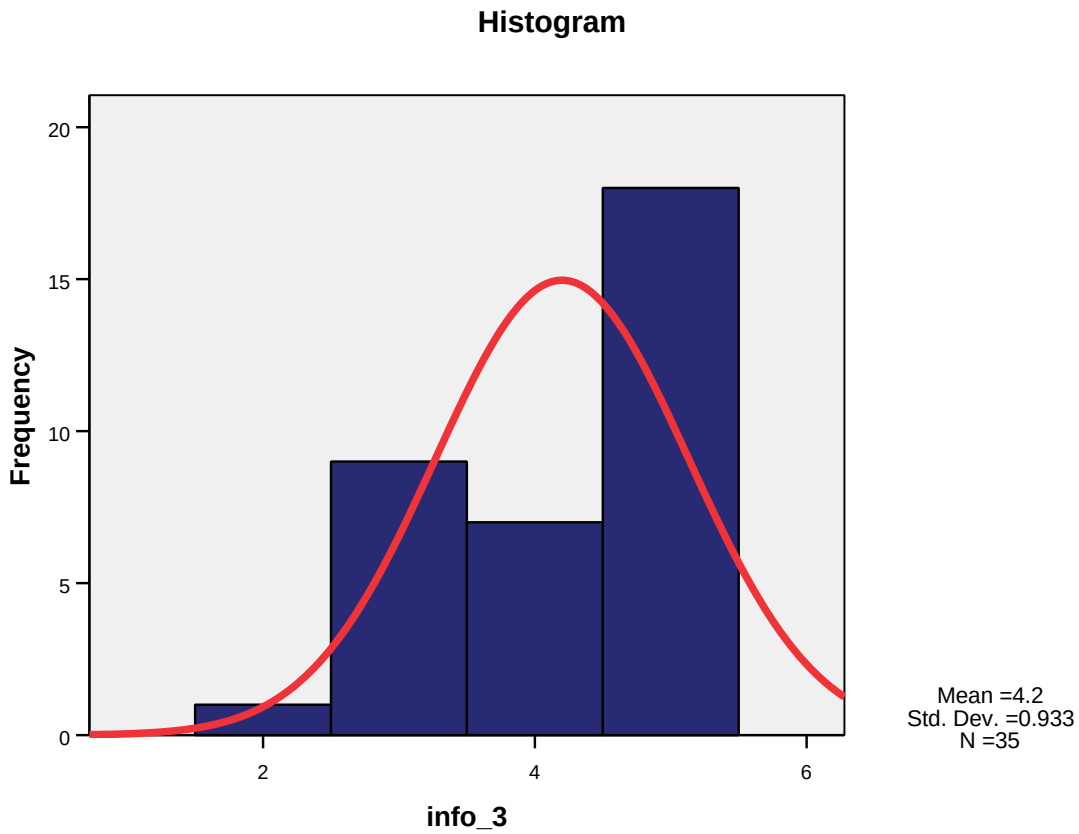
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	5	14.3	14.7	14.7
	4	6	17.1	17.6	32.4
	5	23	65.7	67.6	100.0
	Total	34	97.1	100.0	
Missing	System	1	2.9		
Total		35	100.0		



info_3
(If I wanted to inform shareholders about future prospects of the firm, I would be…)

info_3

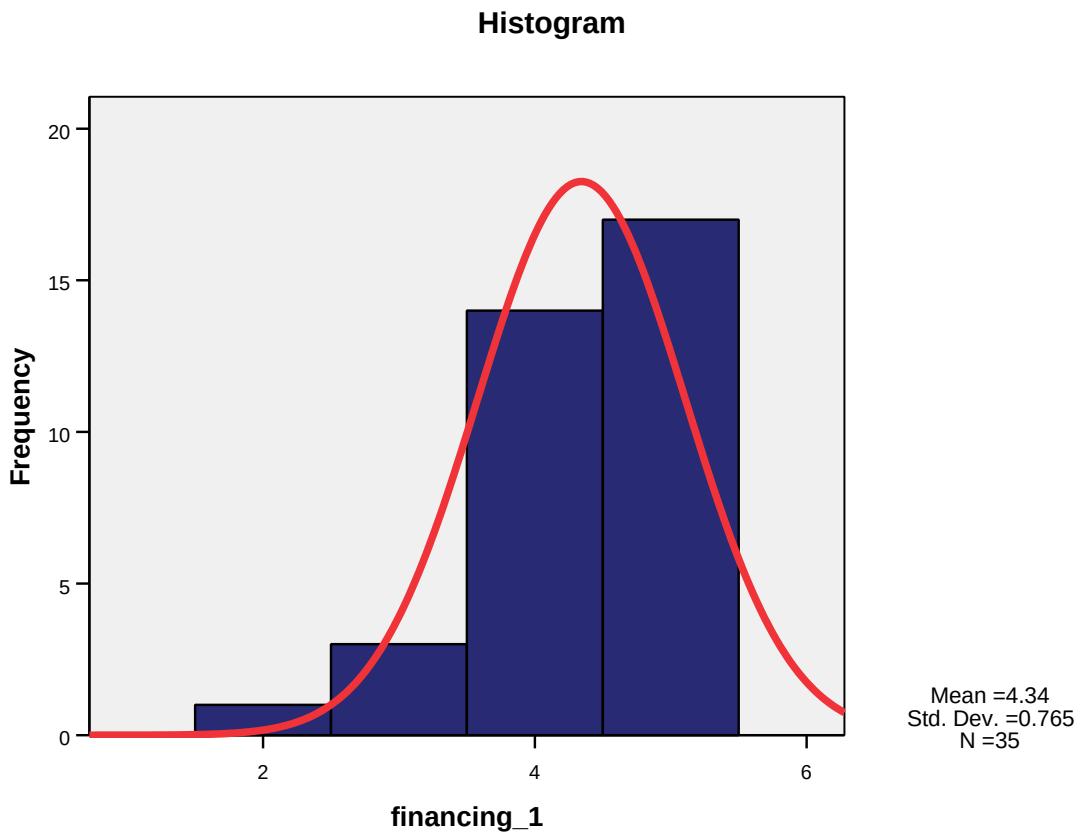
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	1	2.9	2.9	2.9
	3	9	25.7	25.7	28.6
	4	7	20.0	20.0	48.6
	5	18	51.4	51.4	100.0
	Total	35	100.0	100.0	



financing_1
(To 'lock-in' a certain stream of revenue, I would be…)

financing_1

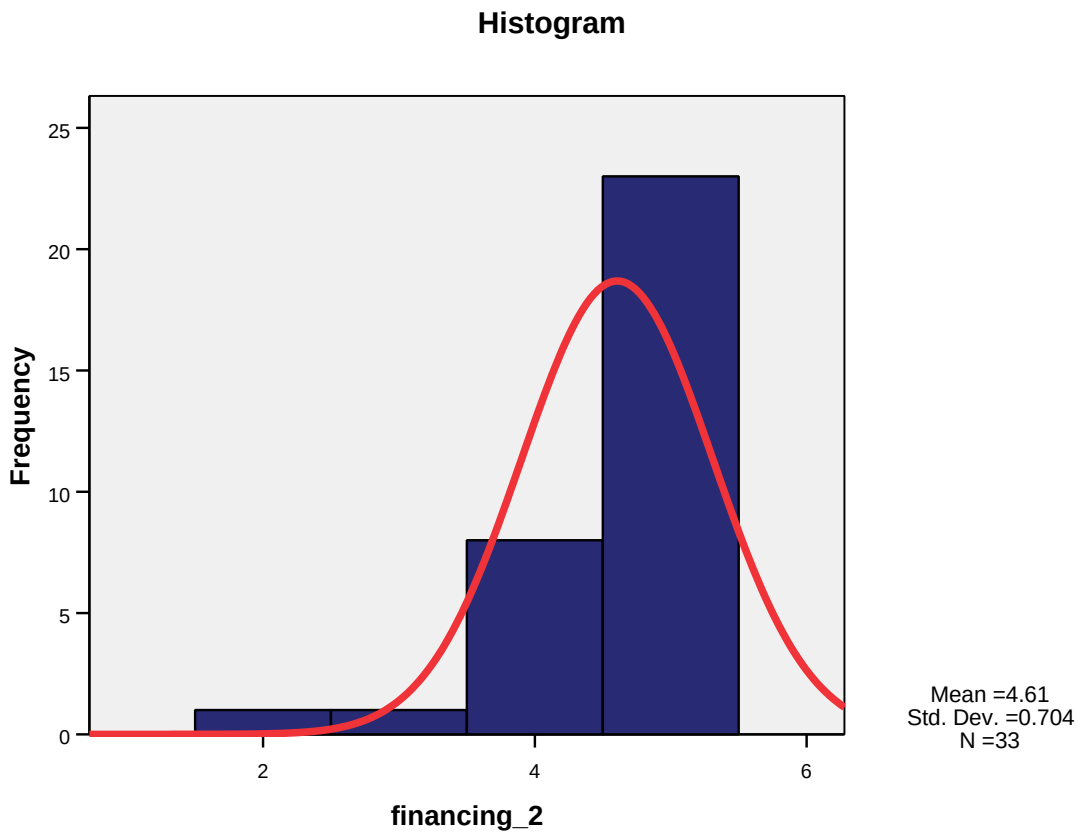
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	1	2.9	2.9	2.9
	3	3	8.6	8.6	11.4
	4	14	40.0	40.0	51.4
	5	17	48.6	48.6	100.0
	Total	35	100.0	100.0	



financing_2
(To pursue new projects, I would be…)

financing_2

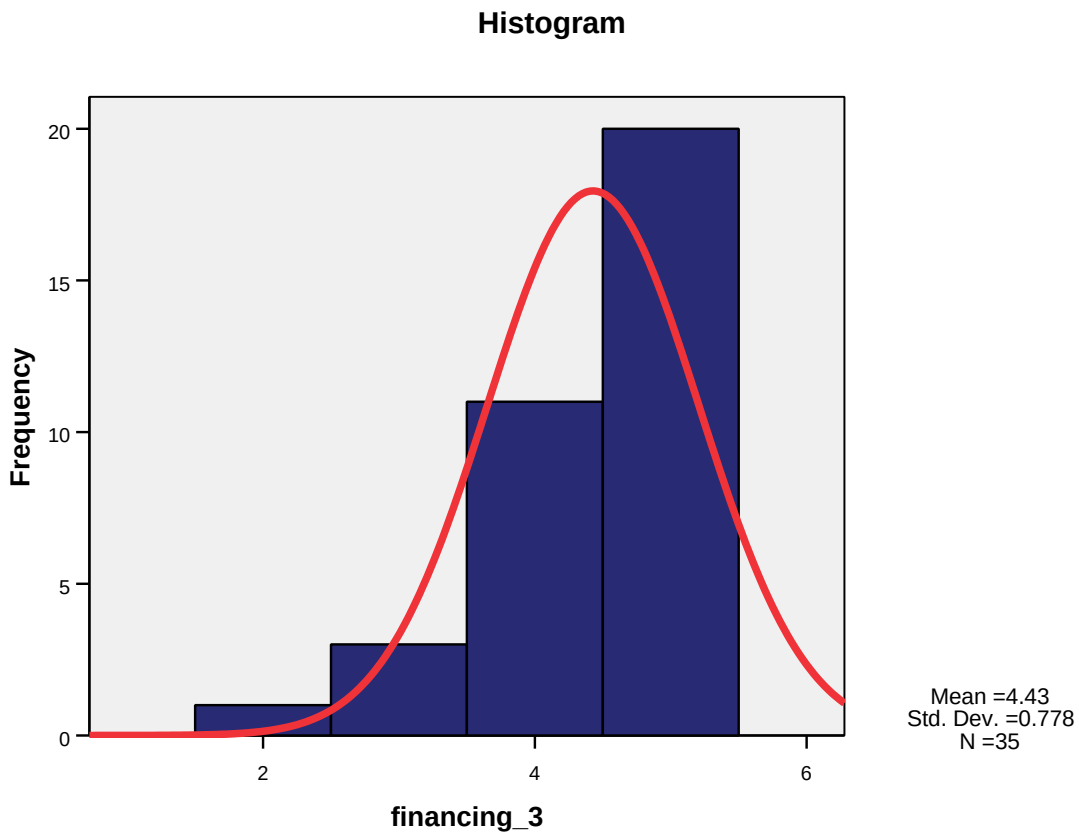
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	1	2.9	3.0	3.0
	3	1	2.9	3.0	6.1
	4	8	22.9	24.2	30.3
	5	23	65.7	69.7	100.0
	Total	33	94.3	100.0	
Missing	System	2	5.7		
Total		35	100.0		



financing_3
(If I wanted to change my firm's reliance on external financing, I would be…)

financing_3

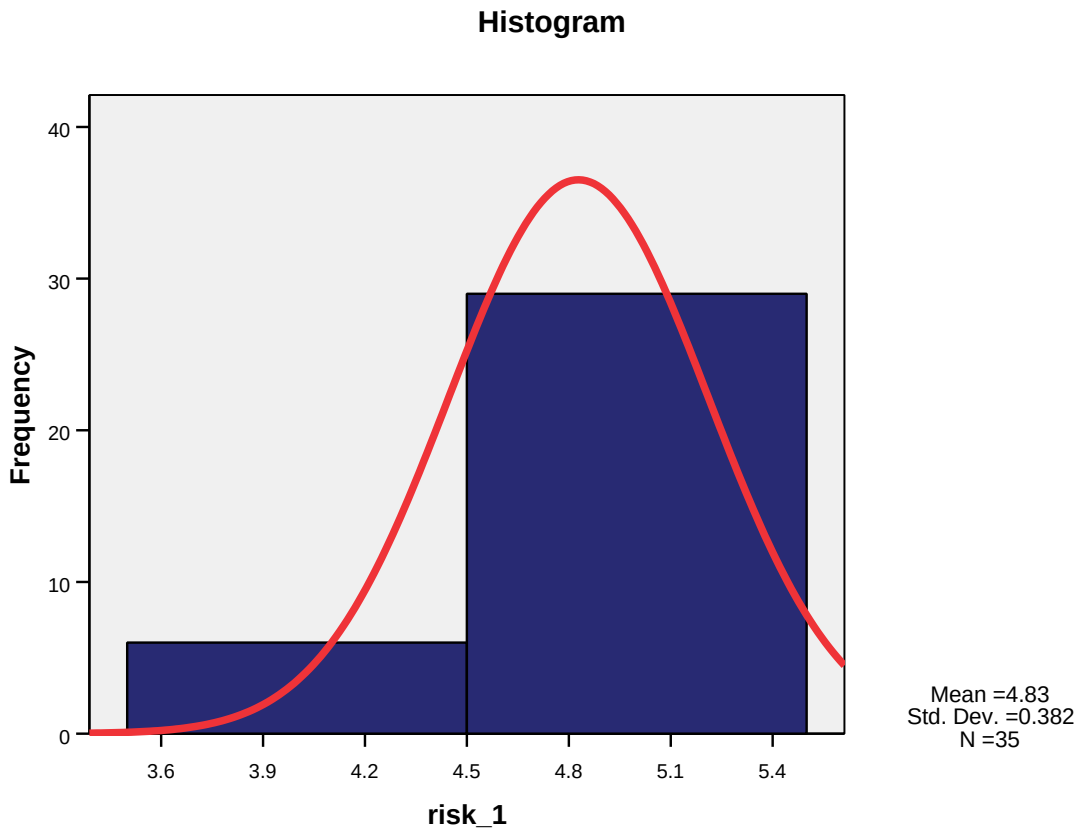
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	1	2.9	2.9	2.9
	3	3	8.6	8.6	11.4
	4	11	31.4	31.4	42.9
	5	20	57.1	57.1	100.0
	Total	35	100.0	100.0	



risk_1
(If I had shares in my firm, I would be…)

risk_1

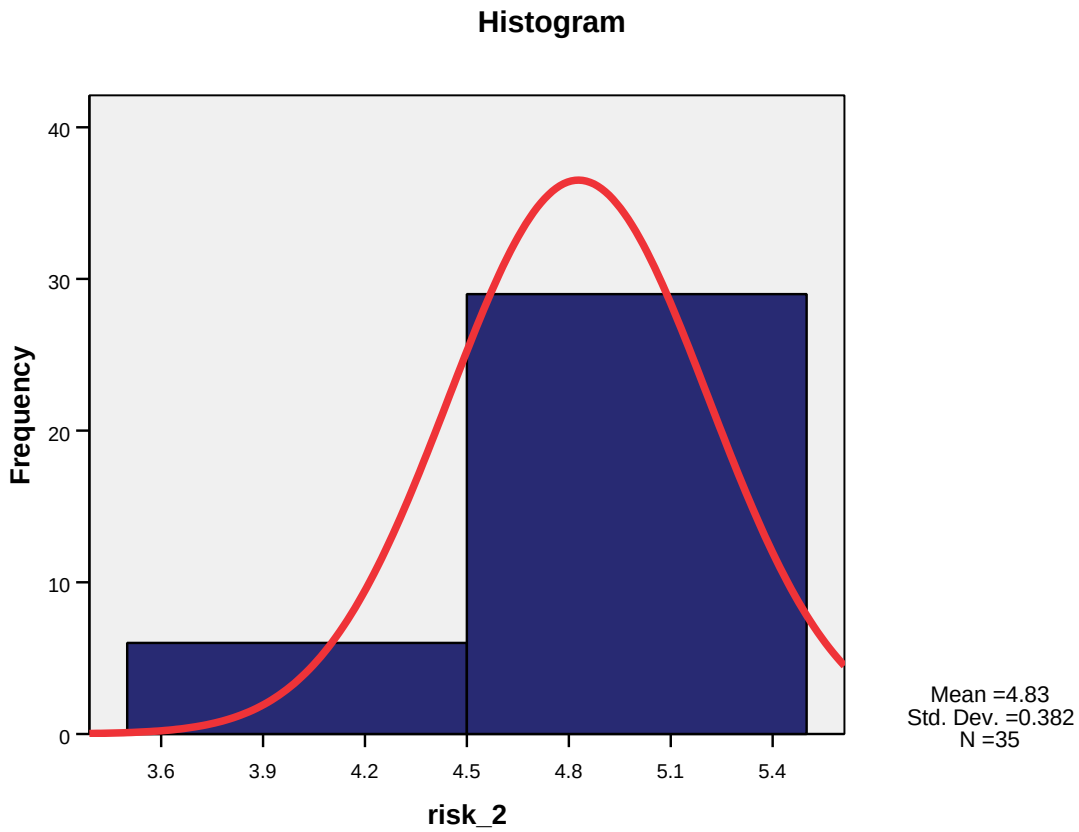
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	4	6	17.1	17.1	17.1
	5	29	82.9	82.9	100.0
	Total	35	100.0	100.0	



risk_2
(If I had options to buy shares in my firm in the future, I would be…)

risk_2

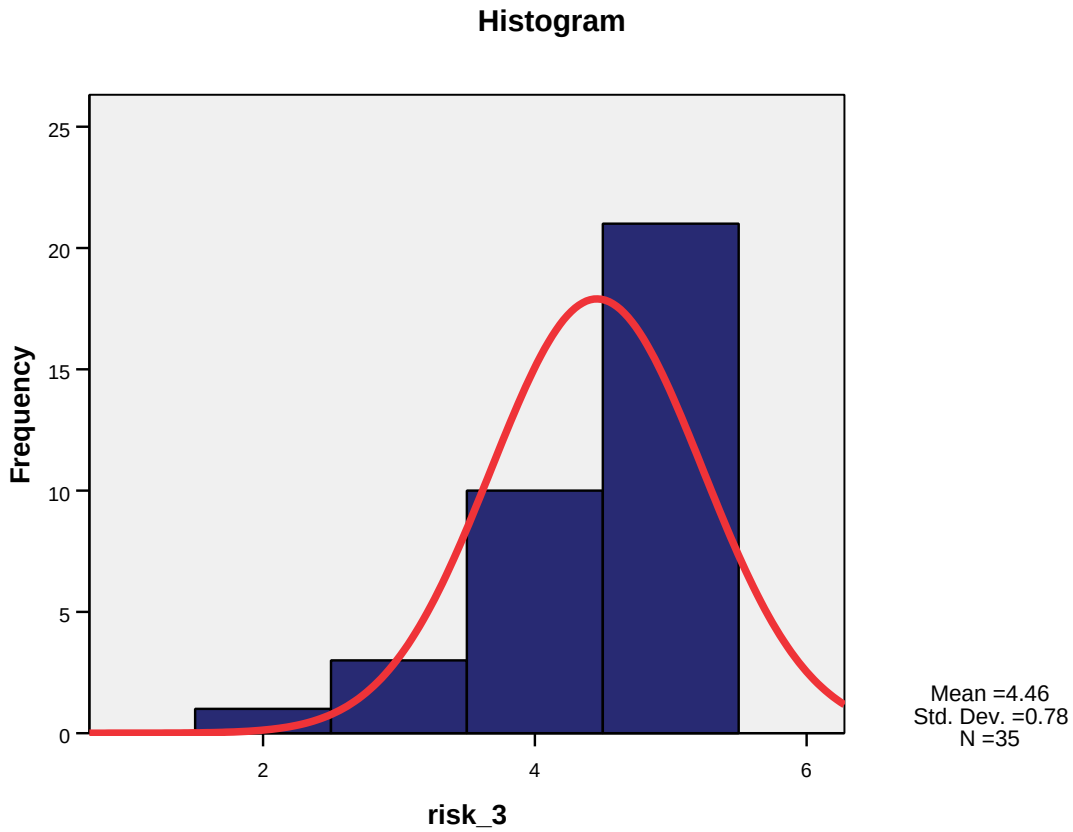
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	4	6	17.1	17.1	17.1
	5	29	82.9	82.9	100.0
	Total	35	100.0	100.0	



risk_3
(To mitigate financial risk, I would be…)

risk_3

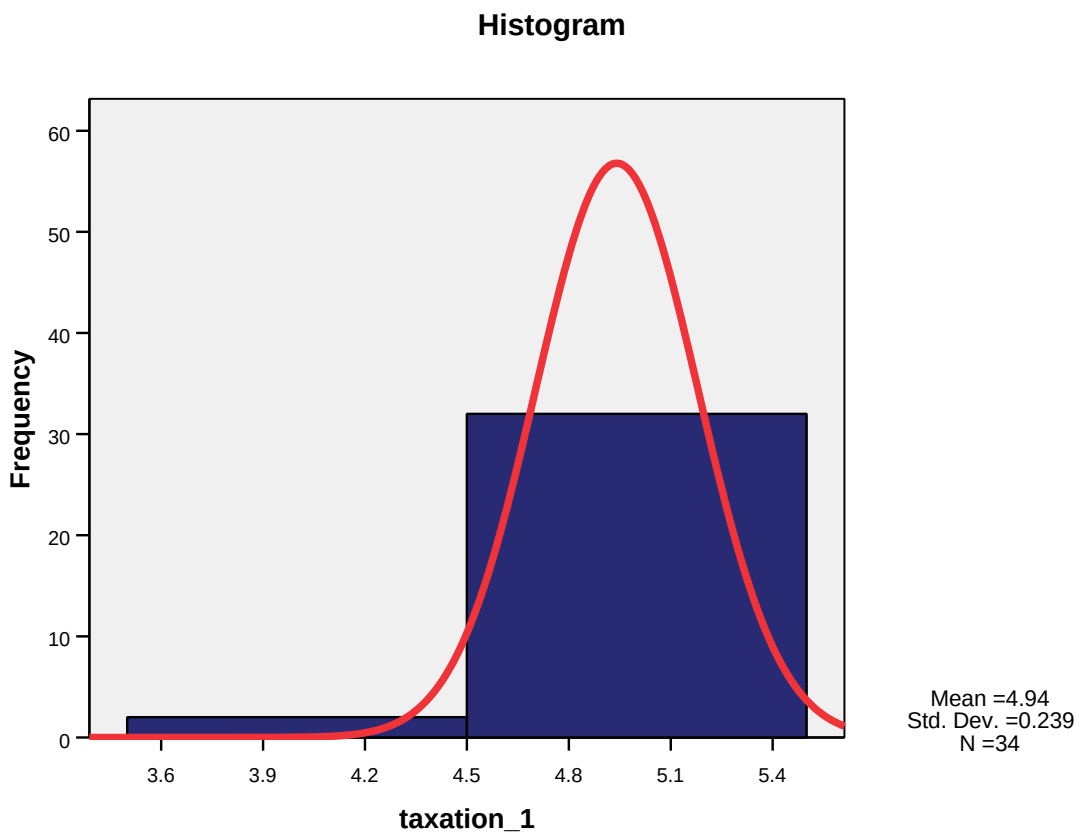
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	1	2.9	2.9	2.9
	3	3	8.6	8.6	11.4
	4	10	28.6	28.6	40.0
	5	21	60.0	60.0	100.0
	Total	35	100.0	100.0	



taxation_1
(If the average tax rate of my firm was to rise as the pre-tax income rises, I would be…)

taxation_1

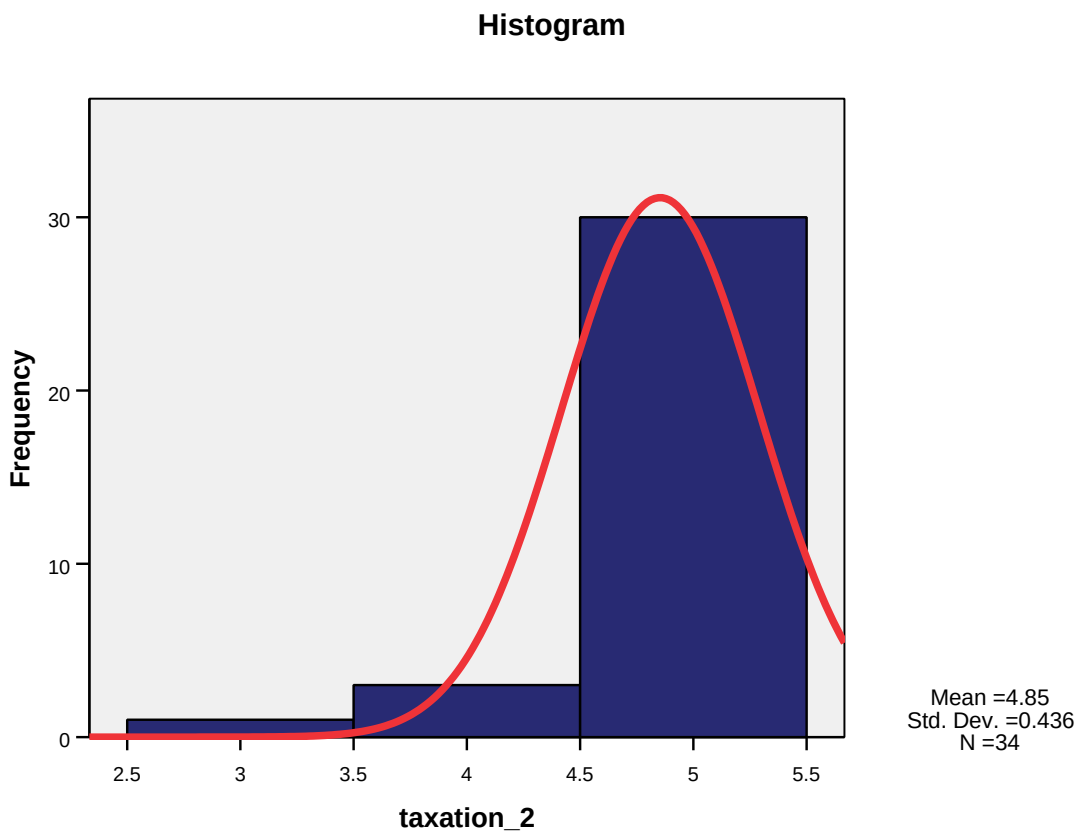
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	4	2	5.7	5.9	5.9
	5	32	91.4	94.1	100.0
	Total	34	97.1	100.0	
Missing	System	1	2.9		
Total		35	100.0		



taxation_2
(To maximise our tax shields, I would be…)

taxation_2

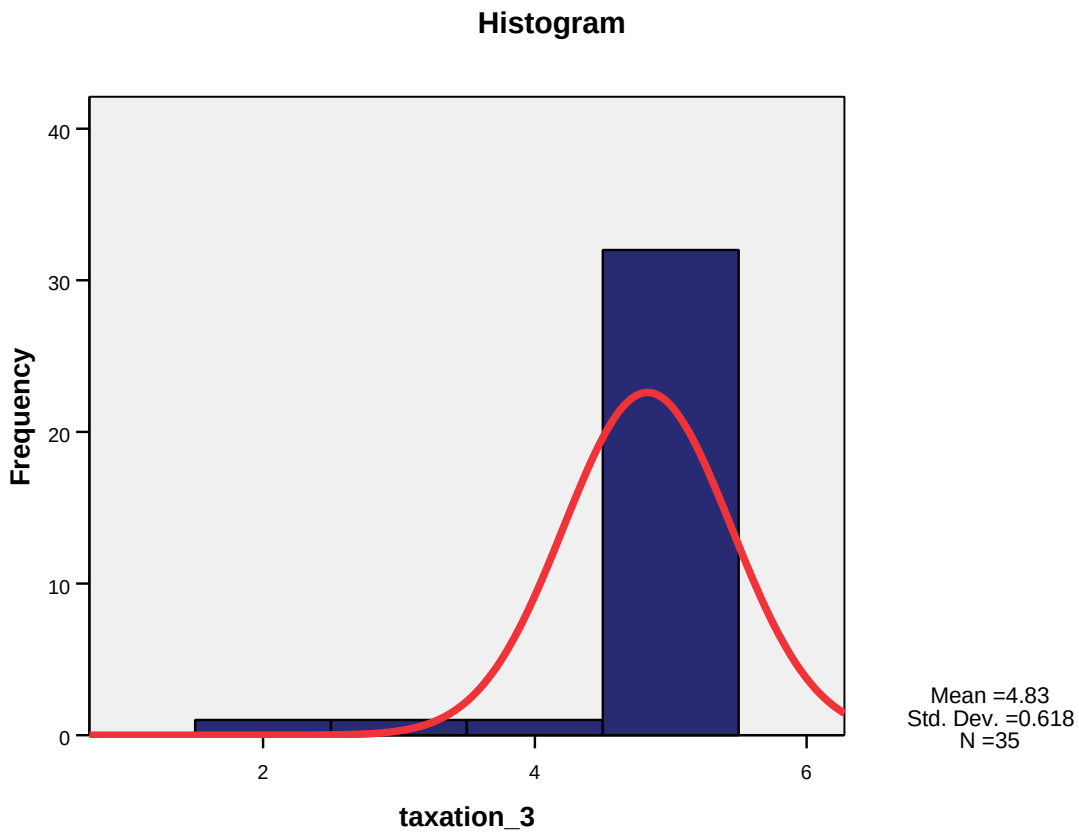
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	1	2.9	2.9	2.9
	4	3	8.6	8.8	11.8
	5	30	85.7	88.2	100.0
	Total	34	97.1	100.0	
Missing	System	1	2.9		
Total		35	100.0		



taxation_3
(To reduce taxation on our offshore operations, I would be…)

taxation_3

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	1	2.9	2.9	2.9
	3	1	2.9	2.9	5.7
	4	1	2.9	2.9	8.6
	5	32	91.4	91.4	100.0
	Total	35	100.0	100.0	



Appendix I: Factor Analysis Tables

Total Variance Explained Table

Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	**8.311**	**21.311**	**21.311**	**8.311**	**21.311**	**21.311**	**6.986**	**17.914**	**17.914**
2	**4.958**	**12.713**	**34.024**	**4.958**	**12.713**	**34.024**	**4.457**	**11.429**	**29.342**
3	**3.855**	**9.885**	**43.909**	**3.855**	**9.885**	**43.909**	**3.422**	**8.775**	**38.118**
4	**3.260**	**8.358**	**52.267**	**3.260**	**8.358**	**52.267**	**3.385**	**8.679**	**46.797**
5	**3.130**	**8.026**	**60.293**	**3.130**	**8.026**	**60.293**	**3.364**	**8.626**	**55.423**
6	**2.526**	**6.477**	**66.770**	**2.526**	**6.477**	**66.770**	**3.192**	**8.184**	**63.607**
7	**1.927**	**4.940**	**71.710**	**1.927**	**4.940**	**71.710**	**3.160**	**8.103**	**71.710**
8	1.794	4.599	76.309						
9	1.565	4.013	80.322						
10	1.369	3.510	83.831						
11	1.251	3.208	87.039						
12	1.016	2.605	89.643						
13	0.966	2.477	92.121						
14	0.676	1.734	93.855						
15	0.583	1.496	95.351						
16	0.543	1.391	96.742						
17	0.424	1.087	97.829						
18	0.346	0.888	98.717						
19	0.338	0.866	99.583						
20	0.163	0.417	100.000						
21	0.000	0.000	100.000						
22	0.000	0.000	100.000						
23	0.000	0.000	100.000						
24	0.000	0.000	100.000						
25	0.000	0.000	100.000						
26	0.000	0.000	100.000						
27	0.000	0.000	100.000						
28	0.000	0.000	100.000						
29	0.000	0.000	100.000						
30	0.000	0.000	100.000						
31	0.000	0.000	100.000						
32	0.000	0.000	100.000						
33	0.000	0.000	100.000						
34	0.000	0.000	100.000						
35	0.000	0.000	100.000						
36	0.000	0.000	100.000						
37	0.000	0.000	100.000						
38	0.000	0.000	100.000						
39	0.000	0.000	100.000						
Extraction Method: Principal Component Analysis.									

Please note that the “component” column in the table above is not the actual question, but rather a combination of a number of questions.

Factor Matrix

Factor	1	2	3	4	5	6	7
Info_1	0.81	0.21	0.20	0.03	0.26	-0.05	0.06
options_1	0.80	-0.04	-0.36	-0.02	0.05	-0.05	0.13
financing_2	0.79	0.14	0.25	0.06	-0.14	-0.09	0.22
options_2	0.78	-0.06	-0.08	-0.06	-0.27	0.18	-0.02
financing_1	0.77	0.09	-0.43	-0.01	0.19	0.00	0.05
financing_3	0.72	0.02	0.38	-0.19	0.18	-0.01	0.26
cashflow_3	0.69	-0.05	0.07	0.30	0.33	-0.02	-0.15
risk_3	0.68	0.05	0.00	0.26	0.38	0.10	0.29
cashflow_2	0.57	0.24	0.05	-0.13	-0.05	0.30	-0.24
options_3	0.55	0.33	0.03	0.05	0.25	0.32	0.46
Cost_2	0.14	0.85	-0.06	-0.09	0.09	0.24	-0.11
Cost_1	0.40	0.71	0.06	-0.30	-0.02	-0.02	0.10
earnings_2	0.07	0.69	-0.26	-0.06	-0.10	0.21	0.29
Cost_3	0.33	0.67	-0.03	0.03	-0.25	0.02	-0.29
value_2	-0.01	0.65	0.15	0.09	-0.42	-0.33	-0.07
value_3	0.21	-0.70	-0.05	-0.11	-0.05	0.20	0.20
skills_1	-0.29	-0.18	0.69	0.27	-0.21	-0.09	-0.08
earnings_1	0.26	-0.25	0.53	0.24	0.02	0.29	0.22
cashflow_1	0.47	-0.44	0.42	-0.24	-0.16	0.02	0.26
earnings_3	0.06	0.13	-0.67	0.25	-0.33	-0.13	0.18
instability_3	-0.13	-0.24	-0.75	-0.03	-0.18	0.08	0.04
Size_3	-0.28	-0.01	0.12	0.76	0.01	0.10	-0.24
value_1	0.33	-0.19	-0.09	0.64	0.09	-0.23	-0.28
taxation_1	0.18	0.12	0.34	0.59	-0.49	0.05	0.17
risk_2	-0.05	-0.07	0.28	0.58	-0.33	-0.24	0.23
taxation_2	0.46	0.14	-0.06	0.51	0.15	0.25	0.08
skills_2	0.49	-0.11	-0.14	0.49	0.28	0.45	0.17
skills_3	0.13	-0.14	-0.03	0.45	0.19	0.41	0.09
Size_2	0.23	-0.20	0.34	-0.55	0.07	0.16	0.40
Info_3	0.17	-0.16	0.07	0.05	0.79	0.03	0.39
Info_2	0.04	-0.13	0.19	-0.11	0.78	0.04	0.22
taxation_3	0.36	0.14	0.00	0.21	0.63	0.17	-0.28
distress_3	-0.06	-0.04	0.08	0.05	0.03	0.92	-0.09
distress_2	-0.13	-0.47	0.35	-0.11	-0.12	0.70	-0.02
Size_1	0.22	0.11	-0.04	-0.07	0.20	0.58	0.02
distress_1	0.01	0.16	-0.08	0.05	-0.06	0.48	-0.27
instability_1	0.14	-0.17	-0.11	-0.05	0.04	-0.15	0.79
instability_2	0.10	-0.38	-0.42	-0.14	0.15	-0.16	0.67
risk_1	-0.14	-0.37	-0.28	0.02	-0.35	0.11	-0.63