**Master in Management in Finance and Investment**

Master Thesis

# Financial Hedging Strategies of South African Multinational Corporations

An Exploratory Analysis


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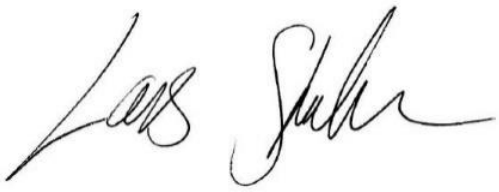
**Declaration**

I, Lars Stuber, declare that the research work reported in this dissertation is my own, except where otherwise indicated and acknowledged. It is submitted for the degree of Master of Management in Finance and Investment at the University of Witwatersrand Business School, Wits, Johannesburg. This thesis has not, either in whole or in part, been submitted for a degree or diploma to any other university.

Date: 6 April 2022 Signature: 

**Abstract**

Corporate risk management is an important element of a firm's overall business strategy. Hedging in its various implementations forms an integral part of the firm's corporate risk management.

The main objectives of the study are to develop an overview of the financial hedging framework implemented by South African Multinational Corporations (SAMNC) using a corporate survey and to evaluate the hedging determinants for the use of complex derivatives as well as to evaluate the hedging determinants of the firm value using an ordinary least square regression.

The comparison between our survey results, the survey results of South African firms by Lebata (2018) and the global survey results by Deloitte and Citi Bank shows that the South African Multinational Corporations' hedging strategies and operations are very similar to the global hedging strategies and experiences. Due to the lack of skills in local operations, the South African Multinational Corporations have concentrated the treasury functions at the headquarters and the policies are developed centrally. The main difference is that the South African Multinational Corporations are more risk-averse when evaluating and using derivative instruments. Mainly forwards with tenures up to 12 months are used. Only one South African Multinational Corporation used complex derivatives. But the firms adhere to the strict framework developed by the South African regulatory authorities and international standards.

Surprisingly, we found a mismatch between the product portfolio offered by South African financial institutions and the hedging requirements of the surveyed firms. The financial institutions offer spots, forward, futures, swaps and options. Generally, South African Multinational Corporations do not require or use options and futures for developing currencies. We conclude that there is a great potential to expand the use of the available products, but it requires substantial education of the treasury departments.

The results of the regression for the use of complex derivatives (UCD and CPX) show a positive significance at the 5% level for the determinant long-term debt to total assets (LTAS). LTAS describes the financial distress level. The remaining determinants do not show any significant influence on the use of derivatives.

Whilst not significant, the positive sign of the determinant 'use of complex derivatives' (UCD) of the dependent variable market-to-book ratio (MB) representing firm value would indicate that the use of complex derivatives increases the firm value compared to the use of simple, plain vanilla derivatives. This is similar to previous studies which compared firms not using derivatives at all with firms using derivatives.

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# 1 Introduction

Risk management is a key element of every firm's business strategy and hedging in its various implementations forms an integral part of the firm's risk management. Unsurprisingly, markets and risk management practices grow with business success. However, business and market growth increased the requirements for risk management. As a result, financial instruments evolved to manage the risks which are known as financial derivatives. Rao (2012) stated that derivatives are contracts where the yields of contracts depend upon on underlying value. Since the 1980s, a plethora of theoretical literature on corporate finance and risk management studied the use of derivatives by firms. The most common reasons for the use of derivatives are progressive taxation, financial distress, information asymmetry and agency costs. Already in the mid-eighties, Smith and Stulz (1985) conclude that firms hedge for 3 reasons: tax, cost of financial distress and managerial risk aversion. Berkman et al. (1996) and Nance et al. (1999) indicate that the availability of a variety of derivative instruments may be instrumental in enabling effective financial risk management by companies.

Prevost et al. (2000) found that the use of derivatives has grown in small and large economies. The increase of use of derivatives and its potential destructive consequences did sound alarm bells in the beginning of the 21st century. Unknown to Warren E. Buffett at the time, he made an absolutely true statement in the 2003 Berkshire Hathaway annual report:

---- Derivatives are financial weapons of mass destruction

The use of derivatives during the financial crisis of 2008-2009 was studied intensively. Bartram et al. (2011) concluded that firms use derivatives to reduce risk, in particular to reduce risk during down markets. This period was also marked by speculation replacing financial risk management. Rossi (2013) used balance sheet data and found that a significant number of Brazilian companies speculated in the derivative market. Summers (2010) singled out derivatives as the underlying cause for the financial crisis of 2008-2009. This monumental crisis has led to new scrutiny to the use of financial derivatives and calls for greater regulation for financial derivatives. Bartram et al. (2011) also listed regulations such as conditions for marking positions, trade registration, trade clearing, exchange trading, and higher capital and margin requirements. Ramzan (2018) summarised that there are two important functions associated with financial derivatives: hedging and speculation. As a consequence, the derivatives and hedging activities must be disclosed under the International Financial Reporting Standards in most countries.

## 1.1 Background of the study

The combination of volatile and integrated markets amid geopolitical uncertainty has increased the complexity of managing the various exposures. Managing these exposures with operational or financial hedges combined with regulatory compliance remains complicated. Hedging with or without derivatives is a key strategic choice for non-financial firms. Petersen and Thiagarajan (2000) examined how two gold mining firms managed the gold price risk. One firm is using operational hedges to reduce operating costs and the other firm is using derivatives to reduce the volatility of its cash-flows. Different incentives for risk reduction are the key drivers for the diagonally opposite hedging strategies.

The use of financial derivatives by non-financial firms has grown substantially over the last 20 years, particularly in developed markets. Similarly, financial markets have developed more and more sophisticated derivatives covering exchange rates, interest rates and commodities. Research into the growth in the use of derivatives by the corporate sector and the motives for the use of derivatives by this sector has thus far been centred mainly on companies in the USA, the UK, Europe and Australasia. In 1994 Gordon Bodnar (1994) from the George Weiss Center for International Financial Research of the Wharton School started comprehensive studies, known as Wharton School studies, on financial derivatives use by non-financial firms in the United States. These surveys differ from the previous mentioned in wider coverage of different types of financial derivatives. While early surveys covered derivatives for hedging interest rate risk, Wharton School surveys were extended to currency and commodity derivatives. The first survey by Bodnar et al. (1995) showed that 35% of the US non-financial firms used derivatives. The third survey by Bodnar et al. (1998) found that the percentage had increased to 50%.

There is a lack of published research studies on derivative use in emerging countries and even less in Africa. The underdeveloped financial markets in Africa only allowed detailed empirical studies in South Africa. Correia, Holman and Jareskog (2012) found that 90% of the reporting South African firms use derivatives which compares favourably to the level of use in developed countries. Correia, Holman, Pitt and Majoni (2012) analysed extensively the use of derivatives by 692 companies in 20 African countries. They found that the use of derivatives in South Africa at 54% is significantly higher than in the rest of Africa at 5%.

In parallel the disclosure requirements for listed companies have grown and the International Financial Reporting Standard (IFRS) 9 came into force on the 1st of January 2018.[1] IFRS 9 requires firms to disclose the financial derivative positions and updated the

[1] Source: www.ifrs.org

guidance for hedge accounting. At this point in time the adoption of hedge accounting is optional for firms in South Africa.

At the same time emerging market currencies have depreciated significantly over the two decades. In Africa, the South African Rand depreciated from 7 USDZAR to 15 USDZAR since 2011, the Nigerian Naira devalued from 150 USDNGN to 300 USDNGN since 2015 and the Kenyan Shilling has depreciated from 72 USDKES to 100 USDKES since 2010. Currency volatility has also increased substantially. Both effects were most pronounced in sub-Saharan Africa. Finally, the currency related financial products from developed markets such as derivatives (options etc.) are not available in the frontier and emerging markets in sub-Saharan Africa which makes currency hedging even more challenging. The results of the 2019 Triennial Survey by the Bank of International Settlements (BIS) show that the traded daily average of interest rate derivatives grew from 6.03 million USD in 2010 to almost 13.93 million USD in 2019 by all counterparties. The same tremendous increase was seen for the traded daily average of exchange rate derivatives from 14.37 million USD in 2010 to 20.37 million USD in 2019.[2] Prior to 2010, Adelegan (2009) reported that the daily trading volume in South Africa of over-the-counter derivatives grew from 8.44 million USD in 2001 to 15.04 million USD in 2007 which equates to a growth rate of 22.98%. The author also stated that the development of local derivatives markets would provide alternatives for the management of financial risks. The continued development of the derivatives market in South Africa is a step in the right direction for increased access to finance and financial risk management available to the South African Multinational Corporations (SAMNCs).

In summary, the increase of requirements in risk management, the complexity in international trade and the volatility of foreign exchange rates, interest rates and commodity prices over the last two decades lead to a significant increase of derivatives use.

## 1.2 Research problem statement

Whilst the South African economy is highly protectionist and relatively closed compared to European or North American economies, the SAMNCs have explored and expanded its footprint in Africa and the rest of the world since the end of apartheid. Subsequently the SAMNCs became more exposed to risks affecting cash-flows and profitability. Despite extensive international research on risk management addressing foreign exchange rate risks, interest rate risk and commodity price risk, there is no consensus on the most effective risk management strategies. The financial markets have introduced innovative financial instruments such as derivatives to help investors limit investment risks (Cheng, 2015). The use of such derivatives is one of the corporate risk management strategies and includes financial instruments such as spots, forwards, options, futures

[2] Source: https://www.bis.org/statistics/rpfx19.htm

and swaps. Hausin et al. (2008) stated that these instruments are used to minimise the risk attached with the underlying transaction.

Chaudry et al. (2014) summarised that firm size, financial distress (leverage), liquidity, exchange rate exposure and managerial risk aversion as main the determinants for the use of derivatives. Various empirical studies on these determinants have been completed for developed countries, but few were completed for developing countries. One of the studies was completed for Poland by Klimczak (2008) where he describes the corporate hedging models through four theories of the firm: financial theory, agency theory, stakeholder theory and new institutional economics. He attached a number of independent variables to each theory and evaluated the theories instead of single hypothesis. Unfortunately, the results did not show any significance for any of the four theories.

Despite an increase in recent studies in emerging markets, the corporate hedging strategies and the influence of financial hedging determinants on corporate hedging in South Africa has not been analysed extensively. Walker, Kruger, Migrio and Sulaiman (2014) studied 117 non-financial companies listed on the Johannesburg Stock Exchange and compared the results to firms in the United States. The results reject the hypothesis that hedging increases firm values. Toerien and Lambrechts (2016) studies the 40 largest non-financial firms on the Johannesburg Stock Exchange and found that the use of derivatives by South African firms had no significant impact on firm value. However, there was a strong correlation with market value added and the market value of shares.

This study contributes to fill this gap on corporate hedging knowledge in South Africa by analysing the extent to which SAMNCs use derivatives, investigating the drivers for derivative use and identifying the main financial hedging instruments.

## 1.3 Objectives of the study

The objectives of the study were crafted during three interviews with two SAMNC corporate treasury functions and one capital markets function of a financial institution. The interviews exposed several challenges:

1. Sub-Saharan Africa's currency markets are often volatile and illiquid. This also applies to South Africa. Financial institutions offer derivatives for only a few currency pairs. The respective corporate treasury organisations try to mitigate these challenges as good as possible,
2. The most common financial products used for hedging purposes by the SAMNCs are forward contracts which are often rolled forward,
3. Currency options are too expensive for the level of protection offered against currency volatility and depreciation. This is particularly important when AMNCs are raising debt and capital in South Africa to be deployed outside South Africa and

4. The hedging policies set by the treasury organisation differ from one firm to another although the main purposes of hedging are to reduce the volatility of cash flows, the earnings and the firm's market value.

Subsequently the study was divided into the general and specific objectives.

### 1.3.1 General objectives

The two general objectives are to develop an overview of the financial hedging strategies implemented by SAMNCs and to assess the influence of the financial determinants on corporate hedging for the SAMNCs listed on the Johannesburg Stock Exchange (JSE).

As the study focuses on financial hedging, natural hedges (e.g. contracts in local currency, netting) and operational hedges (i.e. relocation of production facilities) do not form part of this study.

### 1.3.2 Specific objectives related to the financial hedging strategies

The specific objectives related to the financial hedging strategies are:

1. To estimate the firms' foreign exchange exposure, the associated the foreign exchange cover and define the most effective hedging strategies used in the market,
2. To identify what problems SAMNCs encounter when implementing and executing their hedging strategies / policies,
3. To determine the most popular currency pairs used for hedging and define the most common hedging instruments used and
4. To investigate whether proxies such as real estate or cryptocurrencies are / could be used for hedging purposes.

The corporate survey aims to provide the input to these specific objectives.

### 1.3.3 Specific objectives related to the influence of the financial determinants on corporate hedging

The specific objectives related to the influence of the financial determinants on corporate hedging are:

1. To examine the determinants of derivative use by SAMNCs listed on the JSE as part of their corporate hedging strategy and
2. To study the effects of derivative use on firm valuation of SAMNCs listed on the JSE as part of their corporate hedging strategy.

## 1.4 Use of survey data

Research on capital markets is most often based on available market data from stock markets or other financial resources such as Bloomberg or Reuters. Market data is defined as the latest prices of financial instruments such as shares, derivatives, commodities and currencies. The use of survey data offers several advantages over the use of market data.

Firms' behaviour may be the result of a multitude of factors which might not be properly identifiable by using market data alone and more importantly the available market data in sub-Saharan Africa might not be as complete as required for an empirical analysis, particularly when dealing with illiquid markets.

Many surveys have been conducted in the United States and for countries outside the United States. The most well-known survey in the United States is the Wharton survey of U.S. nonfinancial firms which has been studied by Bodnar, Hayt and Marston (1996), (1998), Bodnar, Hayt, Marston and Smithson (1995), as well as other surveys of U.S. firms e.g., Nance, Smith, and Smithson (1993). According to Bartram, Brown and Conrad (2011) survey outside the United States are available for Belgium by De Ceuster, Durinck, Laveren and Lodewyckx (2000), Canada by Downie, McMillan and Nosal (1996), Germany by Bodnar and Gebhardt (1999), Hong Kong and Singapore by Sheedy (2002), the Netherlands by Bodnar, Jong and Macrae (2003), New Zealand by Berkman, Bradbury and Magan (1997), Sweden by Alkeback and Hagelin (1999), Switzerland by Loderer and Pichler (2000), and the United Kingdom by Grant and Marshall (1997). However, our literature review did not produce any substantial hedging related survey information for South Africa.

Of course, there are several difficulties related to survey research. The design of a comprehensive questionnaire, a potentially low response rate of the invited participants, selection bias and distorted and social desirability response bias. These fundamental concerns are addressed in section 3 when designing the survey.

## 1.5 Structure of the study

The study includes eight sections. In section 0 we outline the background of the study. In section 2 we review the literature on financial hedging strategies and the associated determinants for the use of derivatives. Section 3 provides an overview of the financial hedging policies and hedging instruments. Section 4 describes various hedging strategies, the determinants for the use of derivatives and the determinants of firm valuation. In section 5 the research methodology is described. In section 6 the results of the survey are presented. In section 7 we report the results of the two regressions for the use of derivatives and firm valuation. Section 8 concludes with a summary of the thesis and proposed further research.

# 2 Literature review

## 2.1 Introduction

Risk is a necessary part of doing business and in today's world where enormous amounts of data are being processed, where artificial intelligence is rapidly replacing human activities, identifying and effectively mitigating risks is a major challenge for any firm. Typically, risks are divided into two categories. Financial risk, while business risk refers to the company's ability to generate sufficient revenue to cover its operational expenses. Broadly speaking risk can divided into five types. Strategic risk refers to the company's strategy becoming less effective over time. Compliance risk refers to the constant change rules and regulations and its impact of non-compliance on the firm. Operational risk covers internal and external failures of technology, processes and 'people'. Reputational risk effects the firm in all aspects ranging from demoralized employees to reduction of goodwill ultimately leading to loss of revenue. Financial risk refers to the firm's ability to manage its debt and financial leverage. Financial risk can be divided into five categories. Market risk (cost and price) is defined as the increase of input costs and decrease of prices (or the decrease of the value of an investment) due to changes in market factors.[3] Market risk is also called "systematic risk" which is non-diversifiable. Credit risk is most simply defined as the potential that a bank borrower or counterparty will fail to meet its obligations in accordance with agreed terms. Liquidity risk is the risk that a company or bank may be unable to meet short term financial demands. Interest rate risk is simply defined as the risk of loss due to a change in interest rates. Exchange rate risk (or also referred to as foreign currency risk) is the risk that changes in the relative value of certain currencies will reduce the value of investments denominated in a foreign currency. This risk is generally elevated in frontier, emerging and developing markets.

Embrechts, Furrer and Kaufmann (2006) defined the market risk as the risk that will change the investment value resulting from the movement of market risk factors. According to Dowd (2022) and Embrechts et al. (2006) the market risk can be categorised into equity risk, interest rate risk, commodity risk and exchange rate risk. Market risk, credit risk and liquidity risk are not covered in this study. The main focus of the study is on exchange rate risk. According to Eun and Resnick (2015, p. 198) it is conventional to classify foreign currency exposures into three types. Transaction exposure arises from contractual obligations in a foreign currency in a world with randomly changing exchange rates. Economic exposure arises where the value of a firm is affected by unexpected changes in exchange rates. Translation exposure refers to the

[3] Fundamentals of Corporate Finance - Ross, Westerfield, Jordan (9th edition) p. 411

potential impact of changes in exchange rates on a firm's consolidated financial statements.

These three exposures can be de-risked through operational and financial hedging. The literature review is focusing on the transaction and economic exposure using financial hedging as per the objectives of the study.

## 2.2 Theoretical literature review

Classic financial theory relies on perfect markets, i.e. markets adjust without delay to clear market imbalances. This assumption states that markets are competitive and market participants are not subject to imperfections such as taxes, financial distress costs, agency costs and information asymmetry. Under such assumptions Modigliani and Miller (1958) developed the theorem that the capital structure of a firm is irrelevant for the value of the firm. Thus, risk management is irrelevant, firms do not have a reason to enter into derivative contracts. Thus, and hedging determinants are insignificant. The various financial crisis during the past century has shown that the markets are imperfect and the financial industry has witnessed the development of financial instruments to mitigate risks and protect firm value. Vural-Yavas (2016) indicates that the investors prefer the firm to mitigate risk on their behalf. In other words, the principle of hedging is to protect the initial investment or expenditure. Previous research has shown that internal factors such as liquidity, ownership, leverage, cash flow volatility, managerial behaviour, tax functions and growth opportunities affect hedging policies using derivatives.

**Liquidity**

Clark and Judge (2005) proved that liquidity has a significant positive effect on hedging policy whilst Nguyen & Faff (2002) found a significant negative effect.

**Ownership**

The question of managers' shareholding in their firm continues to be a hot research topic. Afza and Alam (2011) proved that managerial ownership has a significant positive effect on hedging policy using a sample data set of 105 non-financial firms listed on Karachi Stock Exchange. When managerial ownership increases, managers tend to minimize the risks that may be received so as to increase the value of the company through the use of derivative instruments.

**Leverage**

Graham and Rogers (2002) found that hedging allows for an increase in leverage but also that higher leverage can lead to an increase in hedging. Both effects can lead to unsustainable debt/leverage levels. Another leverage aspect is related to the exposure of foreign exchange debt and associated potential foreign exchange losses due to

exchange rate variations. Haushalter (2000) indicates that foreign exchange hedging contracts are used to minimise such potential foreign exchange losses in the oil and gas industry. Carter et al. (2003) analysed the airline industry with the conclusion that hedging and value increases in capital investment are positively correlated.

**Cashflow volatility**

Scharfstein and Stein (1993) prove that hedging can improve underinvestment in times of volatile cash flow and costly access to external financing. Tufano (1996) examined the North American Gold Industry and found some support of better gold price risk management by managers with equity stakes compared to those who hold derivative instruments.

**Managerial behaviour**

Bodnar et al. (1999) conclude that shareholders expect that senior management not only to identify the broad spectrum of financial risks but also effectively manage such financial risks Bodnar et al. (1999) conclude that shareholders expect that senior management not only to identify the broad spectrum of financial risks but also effectively manage such financial risks. De Marzo and Duffie (1995) found that managers chose the optimal hedging policy based on the accounting information made available to shareholders.

**Tax functions**

Nance, Smith and Smithson (1993) based their hedging research on a survey in 1986. In the sample 106 out of 169 used financial derivatives (61.5%) and the results show that firms using financial derivatives face more convex (progressive) tax functions where the effective tax rate increases in relation to pre-tax income and have more growth options.

**Growth opportunities**

Higher growth rates require more capital which is often funded through external debt. Ameer (2010) found in Malaysia higher growth opportunities have a positive effect on the use of foreign exchange and interest derivatives, i.e. firms do have a greater incentive to hedge their exposure. This finding is in line with Sprcic and Sevic (2012) who studied Slovenian and Croatian firms. Allayannis and Ofek (2001) concluded the same based on non-financial firms on the S&P 500.

## 2.3 Empirical literature review

The empirical literature review is based on quantitative and qualitative research studies and papers. The qualitative research mainly uses surveys. The quantitative and qualitative studies that have been completed do have a global view or focus on the developed countries. Very little research has been conducted on this topic in the South African context.

Empirical evidence shows that firms use derivatives to speculate rather than hedging. Rossi (2013) examined the Brazilian market using data from the 2007-2009 financial crisis and presented evidence that firms used derivatives for speculative purposes instead of hedging. Geczy, Minton and Schrand (2007) analysed well known US survey data and concluded that approximately 31% of the users of derivatives are speculators. They also concluded that investors reading public corporate disclosures are unable to identify firms that are speculating instead of hedging. Adam, Fernando and Salas (2015) examined North American gold mining firms and found evidence of a negative relation between selective hedging (speculation) and firm size indicating that smaller firms speculate more than larger firms which is in contradiction to Wahyudi (2019). Also, they found no evidence of a positive relation between selective hedging and firm value. Li et al. (2014) also concluded that foreign currency derivatives do no cause higher firm value in New Zealand.

On the other hand, Allayannis and Weston (2001) investigated 720 large non-financial firms between 1990 and 1995. They found a positive relationship between the firm value and the use of foreign currency derivatives (FCD). The FCD premium is on average 4.8% of firm value. Zhang (2012) used the same methodology as Allayannis and Weston (2001) but demonstrates that the use of derivatives does not significantly influence the value of a firm. The market value of a firm was measured using Tobin's Q.

Guay and Kothari (2003) show that the magnitude of the cash flows generated by hedge portfolios is modest and unlikely to account for such large changes in value. Consistent with this, Jin and Jorion (2006) use a sample of oil and gas producers and find insignificant effects of hedging on market value. Bartram, Brown and Conrad (2011) use a large sample with 6888 firms headquartered in 47 countries covering a wide range of derivatives use and risk measures. The results indicate that firms with higher exposure to exchange rates, interest rates and commodity prices, the use of derivatives is more prevalent. The statistical significance of the firm market value premium is low for derivative users. The most important determinants of derivatives use were surprising. They found that firm size, leverage, the multiple share class dummy variable, the stock options dummy variable, exchange rate exposure, and the foreign debt dummy variable are positively related to the probability of derivative use. Bartram et al (2011) found that firm size, leverage, and liquidity are important determinants of both total risk and systematic risk. Allayannis and Weston (2001) find that size, growth, leverage, and dividends are related to firm value. Brunzell, Hansson, Liljeblom (2009) find that the use of derivatives, size, cashflow, return on equity and long-term debt are related to firm value although these results give weak support for the value increasing effect of derivatives use.

Surveys are a common tool for research. In the UK Judge (2006) reported that 78% of the firms use derivatives. In Europe, the following studies reported the percentage of use of derivatives: 78% in Germany by Bodnar and Gebhardt (1999), 52% in Sweden by

Alkeback and Hagelin (1999), 66% in Belgium by De Ceuster et al. (2000), 88 % in Switzerland by Loderer and Pichler (2000) and 60% in the Netherlands by Bodnar et al. (2003). Prevost et al. (2000) reported that 53.1% of companies in New Zealand used derivatives. Berkman et al. (2002) found a similar level of derivative use in Australia with 52.8% in the industrial sector and 61.5% in the mining sector. Sheedy (2002) found that the use of derivatives does not differ significantly between Hong Kong with 81 %and Singapore with 75% of the surveyed firms.

# 3 Financial hedging policy and instruments

The following two chapters discuss corporate hedging policies and the financial hedging instruments.

## 3.1 Financial hedging policies

This chapter will describe the typical structure of a corporate treasury policy. The treasury policy covers the financial risk management and is generally signed off by the firms' board. Several group treasurers mentioned that the sign-off by the board is a lengthy process because of lack of knowledge of the board members. The treasury policy is the most important guideline with regards to currency, interest or commodity risk management. Generally, the application of the policy is strictly governed. The hedging policy typically includes the following sections:

1. Introduction
2. Role and structure of treasury
3. Philosophy and objectives
4. Treasury organisation
5. Roles and responsibilities
6. Delegation
7. Code of conduct
8. Value at risk model (level of financial risk in the firm over a specific time frame)
9. Interest rate risk
10. Foreign exchange risk
11. Commodity price risk
12. Counter party risk (default by one of the contractual parties)
13. Financial instruments
14. Accounting, compliance and reporting

These sections have also served as input to the design of the survey.

## 3.2 Financial hedging instruments

This chapter will describe the derivatives and hedging instruments available in sub-Saharan Africa, the IFRS requirements and the International Swaps and Derivatives Association Master Agreement.

The generic corporate requirements excluding institutional investors' requirements and the associated products are listed in Table 1 below. The products are described in Table 23 and Table 24 in Appendix A.

The black economic empowerment (BEE) requirement is very specific to South Africa whilst the associated products are generic. The highly complex and customised products credit default swaps (CDS), contingent credit default swaps (CCDS) and credit linked notes (CLN) are not directly used for interest, exchange rate and commodity risk management. Thus, they do not form part of the research.

*Table 1: Solutions and products in the financial markets, Standard Bank*[4]

| Requirements | Products |
|---|---|
| Corporate and project specific hedging solutions | Interest rate swaps, interest rate options, inflation-linked swaps |
| Foreign currency hedging solutions for importers and exporters and transaction specific structured FX solutions | FX forwards, FX swaps, FX options and cross currency interest rate swaps |
| Foreign currency funding solutions for commercial and central banks | Repos, FX swaps and cross currency interest rate swaps |
| Equity structuring and hedging for employee share incentive schemes and Black Economic Empowerment (BEE) schemes | Equity forwards and options |
| Collateralised funding solutions for individuals and corporates | Equity financing, monetised collars (zero cost collar with a margin loan) and equity repos |
| Commodity price risk management | Futures, forwards and options |
| Counterparty risk mitigation | Credit Default Swap (CDS), Contingent Credit Default Swap (CCDS) and Credit Linked Note (CLN) [5] |

[4] https://corporateandinvestment.standardbank.com/CIB/Products/Global-Markets/Client-Solutions
[5] Eun and Resnik (2015) International Financial Management Chapter 4

Through research and interviews with financial institutions we have developed a complexity ranking of the derivatives described above. The ranking ranges from zero to one (1). Zero corresponds to no use of financial hedging instruments, i.e. not even using spots. In the case of this study where SAMNCs are evaluated, there will not be any score of 0 because foreign currencies are part of the business operations. The ranking is based on the risk profile, i.e. risk of total loss of investment and the number of variables used for the valuation of the option. Both parameters are equally weighted and range from 0 to 5.

*Table 2: Ranking of derivative instruments*

| Category | Tier | Category Description | Instrument | Risk loss of capital | Parameters for the valuation | Complexity Factor | Use of complex |
|---|---|---|---|---|---|---|---|
| | | | | Range 0 - 5 | Range 0 - 5 | | Derivatives |
| 1 | | Spots, forwards and swaps | | | | | |
| | Tier 1 | Spots | Spots | 0 | 1 | 0.1 | No = '0' |
| | Tier 2 | Forward Exchange Contracts (FEC) | Standard forward | 0 | 2 | 0.2 | No = '0' |
| | Tier 3 | Swaps | Interest rate swap | 0 | 2 | 0.2 | No = '0' |
| | | Complex forward | | | | | |
| | Tier 4 | | Range forward | 0 | 2 | 0.2 | No = '0' |
| | Tier 4 | | Synthetic foward | 0 | 2 | 0.2 | No = '0' |
| | Tier 4 | | Participating forward | 0 | 2 | 0.2 | No = '0' |
| | Tier 4 | | Leveraged forward | 1 | 2 | 0.3 | No = '0' |
| 2 | | Exchange traded futures | | 2 | 3 | 0.5 | Yes = '1' |
| 3 | | Standard / Vanilla Options | | | | | |
| | Tier 1 | Calls and Puts | Standard call and put options | 2 | 3 | 0.5 | Yes = '1' |
| | | Combination of vanilla options | | | | | |
| | Tier 2 | | Collar | 2 | 4 | 0.6 | Yes = '1' |
| | Tier 2 | | Cylinder | 2 | 4 | 0.6 | Yes = '1' |
| | Tier 2 | | Straddle | 2 | 4 | 0.6 | Yes = '1' |
| 4 | | Barrier Options | | 3 | 4 | 0.7 | Yes = '1' |
| 5 | | Digital / Binary Options | | | | | |
| | Tier 1 | | Discrete Option | 4 | 4 | 0.8 | Yes = '1' |
| | Tier 2 | | Double Option | 4 | 4 | 0.8 | Yes = '1' |
| | Tier 3 | | Sequential Option | 4 | 4 | 0.8 | Yes = '1' |
| 6 | | Asian Options | | | | | |
| | Tier 1 | | Average Rate | 4 | 5 | 0.9 | Yes = '1' |
| | Tier 2 | | Average Strike | 4 | 5 | 0.9 | Yes = '1' |
| | Tier 3 | | Lookback Options | 4 | 5 | 0.9 | Yes = '1' |
| 7 | | Exotic Options | | | | | |
| | Tier 1 | | Basket Options | 4 | 5 | 0.9 | Yes = '1' |
| | Tier 2 | | Compound Options | 5 | 5 | 1.0 | Yes = '1' |

Question 21: in the survey investigated the knowledge and use of derivatives. A selection of the complex derivatives above with at least one derivative per category was used to limit the complexity of the question:

- Complex forwards
    - Range
    - Synthetic
    - Participation
- Combination of calls and puts
    - Collar
    - Cylinder
    - Straddle
- Asian options
    - Lookback
- Exotic options
    - Compound

## 3.3 International Financial Reporting Standards

The standards detail the recognition and measurement requirements issued by the International Accounting Standards Board. There are in total 17 standards. The IFRS 9 Financial Instruments is the most relevant standard for this research. IFRS 9 includes requirements for recognition and measurement, impairment, derecognition and general hedge accounting. IFRSs are intended to be applied by profit-orientated entities. All the firms surveyed as part of this research are profit-orientated firms.

Price Waterhouse Coopers offers an IFRS9 for Corporates Diagnostic Tool which evaluates the corporates' readiness for the new financial instruments standard under IFRS and its key requirements. [6] Question 28: and Question 29: collect information about the use of IFRS 9.

## 3.4 International Swaps and Derivatives Association Master Agreement

The International Swaps and Derivatives Association Master Agreement is the standard document that is regularly used to govern over-the-counter (OTC) derivatives transactions. The Agreement, which is published by the International Swaps and Derivatives Association, outlines the terms to be applied to a derivatives transaction between two parties, typically a derivatives dealer and a counterparty. The Master Agreement itself is standard, but it is accompanied by a customized schedule and sometimes a credit support annex, both of which are signed by the two parties in a given transaction. The comprehensive master agreement includes approximately 45 pages with an enormous amount of details. Many OTC transactions use simplified versions though.

Question 27: investigates the use of the International Swaps and Derivatives Association master agreement.

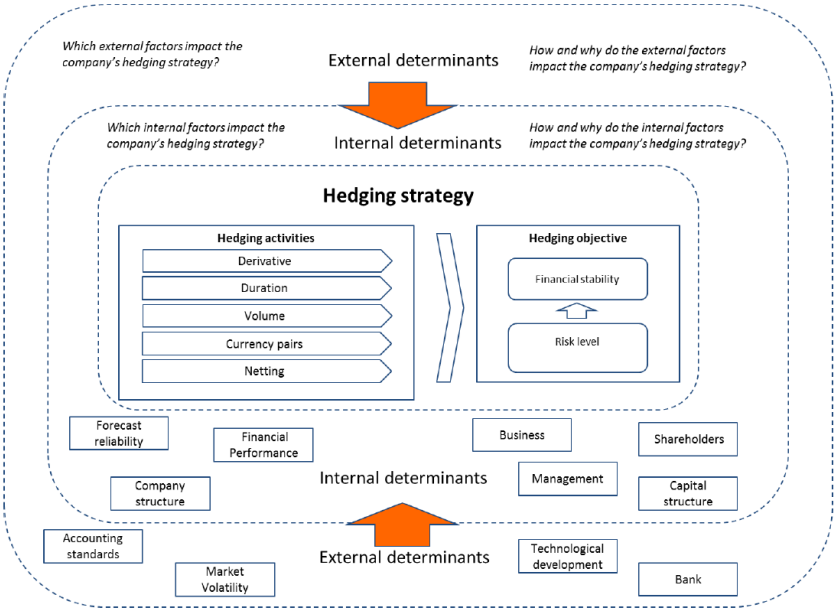
# 4 Determinants of financial hedging

The literature review gave some initial insights to the determinants for the use of derivatives and the firm value. In this section we examine the internal and external determinants. Birnbo and Wernersson (2013) have used an informative graphic that summarises the external and internal determinants. Two questions were used to describe the external determinants:

- What external factors impact or influence the company's hedging strategy?
- How and why do the external factors impact the company / hedging strategy?

[6] https://ifrs9.pwc.com/en/

*Table 3: External and internal determinants*




The external determinants refer mainly to determinants that can't be controlled by a firm. The accounting standards refer to the International Financial Reporting Standards (IFRS). that are continuously changing to reflect the development of industries and financial markets. [7] The latest change relates to IFRS 9 for financial instruments which is applicable from the 1st of January 2018[8]. IFRS 9 contains a section on hedge accounting and it gives companies a free choice on whether to adopt its new hedge accounting requirements when the rest of IFRS 9 becomes mandatory for 2018. Question 28: in my survey addresses exactly this choice.

The economic and financial globalisation has amplified the market volatility. Especially domestic firms cannot diversify the adverse impact from the domestic economy. Most of the firms that participated in this survey operate within sub-Saharan Africa and are exposed to the sub-Saharan economy. The South African economy serves largely as the engine for sub-Saharan Africa although the growth rates in South Africa have been muted over the past decade.

Today huge volumes of data are available to finance managers and chief financial officers to design strategies, craft transactions and comply with regulation. The technological development has introduced various efficiencies to manage such volumes of data and allows to develop bespoke hedging solutions. Blockchain, artificial intelligence and robotic-advising are some of the most recent buzz words used in this context.

[7] www.ifrs.org
[8] https://www.ifrs.org/issued-standards/list-of-standards/ifrs-9-financial-instruments/

The banks play an important role in the space of external determinants because the banks typically develop and offer the products used to execute the hedging strategy. As we mentioned through this research the financial markets in Africa are rather illiquid and underdeveloped. Later in the research we present the mismatch between the requirements from African multinationals (demand) and the products by African or international banks (offers).

The very same two questions were used to describe the internal determinants:

- What external factors impact or influence the company's hedging strategy?
- How and why do the external factors impact the company / hedging strategy?

The capital structure indicates what sources of funding the firm uses to the finance its activities and growth. Often the capital structure refers to the ratio between debt and equity. The firm or corporate structure refers firstly to the legal type of the firm. Firms can operate under several different legal forms. The main differentiating factor is whether the structure offers the owners limited liability or not. Secondly, the corporate structure refers to the type of holding structure (yes or no) and finally it refers to the organisation of the different business units and the associated geographical responsibilities. Questions 7 and 8 examine the set-up of the treasury function of the SAMNCs participating in the survey. The shareholder structure plays an important role with the focus being on shareholder concentration. La Porta, Lopez-de-Silanes, Shleifer and Vishny (1998) find that in countries with relatively poor legal protection of investors, publicly listed companies are likely to have large blockholders. We used blockholding as a determinant in the regression in section 7. The success of corporate management is judged by its ability to create shareholder value. Remuneration incentives are very often used to motivate corporate management to maximise shareholder value. On the other hand, Dionne and Triki (2013) have shown that managers with large share/option holdings prefer to increase the risk management compared to manager with little or no share / option holding. Survey questions 36 and 37 investigate whether corporate management owns share or options as part of an incentive program. The type and sector of the business impacts the firms' abilities to hedge. As an example, capital intensive businesses offer wider hedging opportunities due to the size of the hedges. In addition, the diversity with its associated diversification discount is often cited in previous research. The regression includes a determinant reflecting the diversity of the business. The financial performance is focussing on financial returns such as the return on equity (ROE). ROE is used as a determinant in the regression in section 7.

We have compiled where the determinants (independent variables) used in the regression model are described. The regression models for the use of derivatives and firm valuation are described in section 7.1 and section 7.2, respectively.

*Table 4: Determinants for the use derivatives and firm valuation*

| Determinant | Description |
|---|---|
| Company structure | Size (SIZE)<br>Tangible to total assets (TTTA) |
| Financial performance | Return on equity (ROE)<br>Free cash flow from operations to total assets (CFTA) |
| Business | Diversity (DIV)<br>Market to book (MB) |
| Management | Management ownership (MAN) |
| Shareholders | Ownership concentration (OWN20 and BLCK)<br>Institutional ownership (INST) |
| Capital structure | Long term (LTAS) |
| Market maturity and volatility | Volatility (VOL) |
| Bank | Complexity of derivatives (CPX) |

# 5 Methodology

The methodology is based on a research survey and a regression which is designed by combining the survey results with the publicly available financial data of the firms surveyed using Bloomberg.

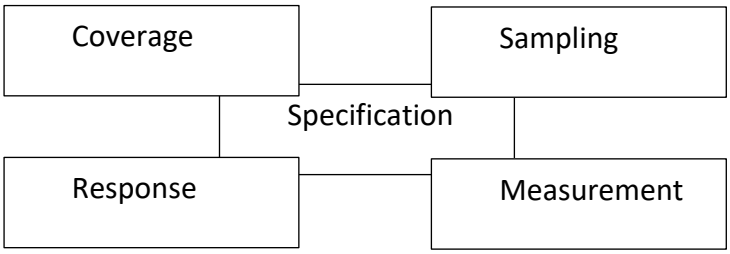
## 5.1 Survey design and post processing

The specification of the research question or topic and the drafting of the survey questions are conceptual. The survey design answers the following questions:

- How many people need to be surveyed in order to be able to describe fairly accurately the entire group? How should the people be selected?
- What questions should be asked and how should they be posed to respondents?
- What data collection methods should one consider using, and are some of those methods of collecting data better than others?
- Once one has collected the information, how should it be analysed and reported?

The design and implementation of a modern and efficient survey is crucial to the data collection and the associated data quality, integrity and completeness. The data quality refers to the reduction of the mean square error that differentiates between random error and systematic bias. The data integrity refers to sampling and non-sampling errors.[9] The International Handbook of Survey Methodology defines four cornerstones based on Salant and Dillman (1994).[10]

*Table 5: Four cornerstones of surveys*




The cornerstone 'coverage' refers to the population to be surveyed. In the context of our research the coverage refers to all non-financial AMNCs listed on the Johannesburg stock exchange. Coverage errors occur when some members of the population, i.e. when some AMNCs would have zero probability of being selected in the survey sample. This is not the case because our focus is on JSE listed companies. Typically, this error is also referred to as under- or overcoverage.[11] In our case we use nonprobability sampling. Nonprobability sampling doesn't use a random selection procedure. In our case we selected specific AMNCs that fulfilled specific requirements. Namely, listed on the JSE, detailed annual reports with indications on hedging instruments and operating in more than one country in sub-Saharan Africa.

According to Devore and Peck (2008) p.491 the sample size can be divided into two categories. The small sample size contains less than 30 samples and the large sample size contains more than 30 samples. The sample size determines the precision level. Assuming a normal distribution of the survey answers the simplified formula reads with 95% confidence:

$$\mathrm{n} = 0.25\left(1.96\frac{1}{B}\right)^2$$

- n = number of samples
- B = equal to the precision level, i.e. the specified bound on the error of estimation in %

[9] International Handbook of Survey Methodology by the European Association of Methodology
[10] International Handbook of Survey Methodology by the European Association of Methodology
[11] An example of overcoverage is a duplicated member under a different firm name in the sample. The cornerstone 'sampling' refers to the selection of participants of a population in a survey.

Once the sample size is known, the precision level B can be calculated. It's obvious that a small sample is better than no sample at all and time and budget influence the effort available to collect the responses. Various sample sizes have been proposed for surveys. Converse and Presser (1986) suggest 25 to 75, Fowler and Floyd (1995) propose 15 to 35, Sheatsley (1983) advises 10 to 25 whilst Sudman, Seymour and Bradburn (1983) propose 20 to 50 respondents.

The cornerstone 'response' error refers to the inability to obtain the data from all respondents on all questions. The non-response can be divided into survey nonresponse and question nonresponse. The survey nonresponse is the failure to obtain any information at all from a respondent. This means that the respondent doesn't fill in the survey. The question nonresponse refers to the failure to receive answers for one or more questions in the survey. The only time this is a serious problem when respondents and nonrespondents differ from each other when certain groups or industries are underrepresented. The cornerstone 'measurement' refers to accuracy of the respondents' answers. Hence the questions in the survey must be clear and all respondents must be able to understand the terms and definitions in the same way. Measurement errors occur when the respondent's answer departs from the 'true' answer. This is mitigated with precise answer options in the survey.

We have applied four fundamental design principles:

1. Respondent friendly by limiting the required computer skills and avoiding equipment limitations. The web-based survey software Surveymonkey was chosen,
2. Simplicity of the survey structure avoiding controlled routing. Controlled routing refers to the option of applying skipping and branching in the survey,
3. Use of numerical labels and scales in the questions and
4. Limit the length of the survey by limiting the number of questions.

The pre-testing of the survey is an important step and provides feedback whether the respondents understand the questions. Hence, we asked four respondents to review the survey.

The post processing method is based on the following five steps:

1. Editing of data points only where publicly available data supports the editing,
2. Transcribing from the web survey into Excel for further processing,
3. Coding where necessary by assigning alpha numeric values to responses,
4. No statistical adjustment by equally weighting the respondents and
5. Cleaning review for consistencies (out of range)

## 5.2 Research survey topics

A comprehensive survey with 38 questions subdivided in five clusters was developed in a logical structure. The 1st cluster with questions 1 to 4 gathered general information on the participating firms such industry sector, diversification and areas of operation etc. The 2nd cluster with questions 5 to 16 collected information around treasury concerns and hedging objectives. The 3rd cluster collected information around hedging strategies and type of derivatives used with questions 17 to 29. The 4th cluster covered alternative hedging instruments with questions 30 to 34. Finally, the last cluster investigated the firm structure and collected key financial metrics with questions 35 to 38.

## 5.3 Survey participants

The population essentially includes all Johannesburg Stock Exchange (JSE) listed companies. Currently there are 371 companies listed. The financial services companies provide the products and services to the SAMNCs and are therefore excluded. Non-financial firms are alternately known as industrial or services firms throughout the literature. In this study, financial firms are excluded from our analysis, because their business model, risk exposures and hedging strategies are very different from industrial or services firms. Banks as financial intermediaries specialize in risk transformation for industrial or services firms. Approximately 120 companies fulfil the criterion of being a South African Multinational Corporation excluding the financial services firms. The sample was further reduced to 48 firms when applying a minimum level of sophistication of the treasury function through web-based research using the search terms Head of Group Treasury or Head of Treasury. 26 firms received the survey invite through the Association of Corporate Treasurers Southern Africa (ACTSA). The remaining 22 firms received the survey through the survey software Surveymonkey.

The thesis does not allow to identify the participants although the individual responses were identifiable in most cases and hence could be matched with background information on financials and ownership.

The online survey was sent to all respondents via email with a link to the survey in the mail. All respondents were informed prior to the email with the link with the request to participate in the survey. Telephonic follow-up and further reminders were sent to the respondents to complete the survey to increase the response rate.

## 5.4 Research survey limitations

The survey method has of course some limitations which were discussed briefly in section 5.1. There are three additional limitations. Firstly, financial organisations are excluded from the survey because they act as intermediaries or advisors to the AMNCs surveyed. Secondly, the selection bias of the determinants in the regression remains as there might be unobserved or hidden variables that affect the decision to use

derivatives. Thirdly, as in any study that uses survey data, the potential impact of non-response bias must be assessed. If firms did not respond to the survey due to a lack of interest, which is most likely if they do not use derivatives, then non-response does not create a bias given that our sample consists only of derivatives users. The survey is about derivatives use, in general, which is not pejorative; it is not about speculation per se. Also, firms were given assurance that highly limited access would be granted to their responses. This assurance and the limited focus on speculation mitigates concerns that firms did not respond to the survey because they believed their use of derivatives would be viewed unfavourably. Prior research by Stulz (2003) has shown a correlation between firm size and derivatives use. Hence if the respondents using derivatives are significantly larger than the non-respondents using derivatives, then there could be a bias in the results towards firms using derivatives. Given that almost all surveyed firms are using derivatives, this bias is expected to be insignificant.

Lastly, this research seems to be the first one of this nature in South Africa by combing a survey with publicly available financial data. Hence, comparative research for South Africa could not be used and instead global research and models were used.

Most features of the ethics code of survey researchers are common the ethics of their professional organization and the regulations enforceable by government agencies. The email invite to the survey included the specific note that the survey is conducted anonymously according to the Protection of Personal Information Act (POPIA) and the rules and regulations of the Wits Business School, Johannesburg.[12]

### 5.5 Public financial data

The publicly available financial data was retrieved from Bloomberg. The details of the data set are explained in Appendix B, section 10.

## 6 Results of the survey

This chapter will detail the results of the survey and compare the SAMNCs' requirements with the products and solutions offered by the market. Three global surveys by leading consulting and financial firms and the survey by Lebata (2018) are also used to interpret our results, namely:

- Deloitte 2016 Global Foreign Exchange Survey,
- Deloitte 2017 Global Corporate Treasury Survey,
- Citi Treasury Diagnostics: Managing FX risk in turbulent times (2016) and
- Lebata (2018)

[12] https://www.gov.za/documents/protection-personal-information-act

The respondents were promised total anonymity, i.e. their names or the company cannot be identified from the study although the company and the corresponding response were identifiable and could thus be matched with background information on financials and ownership.

Fifty SAMNCs were selected based on the geographical presence in Africa and listed on the Johannesburg stock exchange (JSE). A total of 22 firms responded which corresponds to a response rate of approximately 35%. Typical response rates reached 35% for the survey by Loderer and Pichler (2000) and 21% for the renowned Wharton survey on the use of derivatives for non-financial U.S firms in 1998[13]. Twenty-two respondents are based in South Africa. The high response rate in South Africa could be interpreted as genuine interest of the respondent paired with solid and relevant knowledge of financial hedging instruments and mechanisms.

In the list of treasury policy sections below we have matched the questions in the survey.

*Table 6: Treasury policy sections*

| Treasury policy section | Question No | Question |
|---|---|---|
| 1. Introduction | Question 1: | What industry are you in? |
| | Question 2: | Do you consider yourself a single segment or a diversified firm? |
| | Question 3: | Please indicate the number of countries that you operate in Africa? |
| | Question 4: | Please indicate the number of countries that operate in outside Africa? |
| 2. Philosophy and objectives | Question 11: | Please rank the hedging objectives derived from your hedging policy? |
| | Question 12: | To what extent are you allowed to hedge your exposure, i.e. what is your maximum permitted hedge ratio? |
| 3. Treasury organisation | Question 7: | What does your treasury operating model look like? |
| | Question 8: | How many people are managing your treasury activities? |

[13] http://knowledge.wharton.upenn.edu/article/how-companies-use-derivatives/

| | | |
|---|---|---|
| 4. Risk model | Question 15: | What risk monitoring tools are you using |
| 5. Interest rate risk, foreign exchange risk and commodity price risk | Question 5: | Please rate your risk management tools / methods for the African markets? |
| | Question 17: | Please state your primary derivative hedging strategy |
| 6. Financial instruments | Question 19: | What policy permitted financial categories of financial instruments are you using? |
| | Question 20: | Please distribute your use of basic hedging instruments according to the table below? |
| | Question 21: | Do you know of and use any of the following hedging instruments? |
| 7. Accounting, compliance and reporting | Question 27: | Are you using the International Swaps and Derivatives association (ISDA) master agreements for the over-the-counter (OTC) derivatives? |
| | Question 28: | Is your firm applying hedge accounting according to IFRS 9 since it's optional? |
| | Question 29: | If you use hedge accounting, to what degree (%) are the following hedges covered by your hedge accounting? |

## 6.1 Overview of the survey response results

In this section we broadly outline the results of the survey responses. For more details, please refer to the Appendix A with the detailed results of the survey responses and the comparison with similar survey results from across the world.

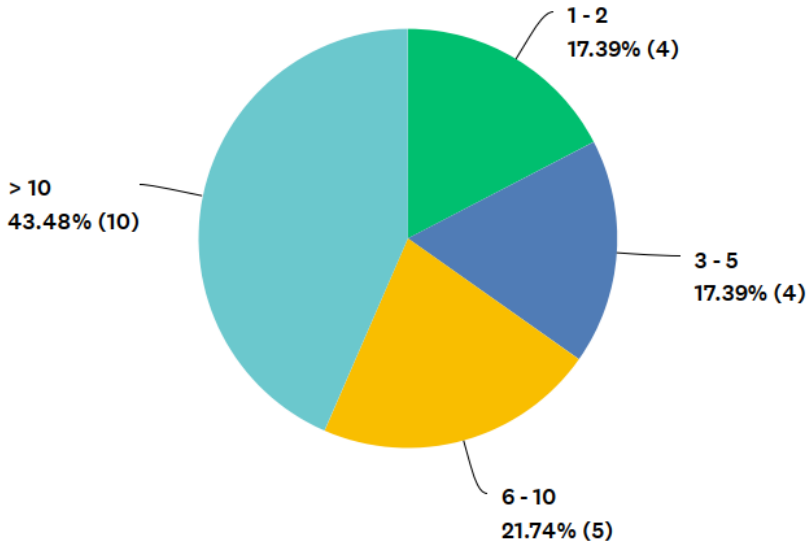
The comparison between my survey results, and global research shows that the SAMNCs' hedging strategies and operations are very similar to the global hedging strategies and experiences. Due to the lack of skills in local operations, the South African Multinational Corporations have concentrated the treasury functions at the headquarters and the policies are developed centrally. The main difference is that the SAMNCs are more risk-averse when evaluating and using derivative instruments. Mainly forwards with tenures up to 12 months are used. Only one surveyed SAMNC used

complex derivatives. But the firms adhere to the strict framework developed by the South African regulatory authorities and international standards.

Surprisingly, we found a mismatch between the product portfolio offered by South African financial institutions and the hedging requirements of the surveyed firms. The financial institutions offer spots, forward, futures, swaps and options. Generally, South African Multinational Corporations do not require or use options and futures for developing currencies. We conclude that there is a great potential to expand the use of the available products, but it requires substantial education of the treasury departments.

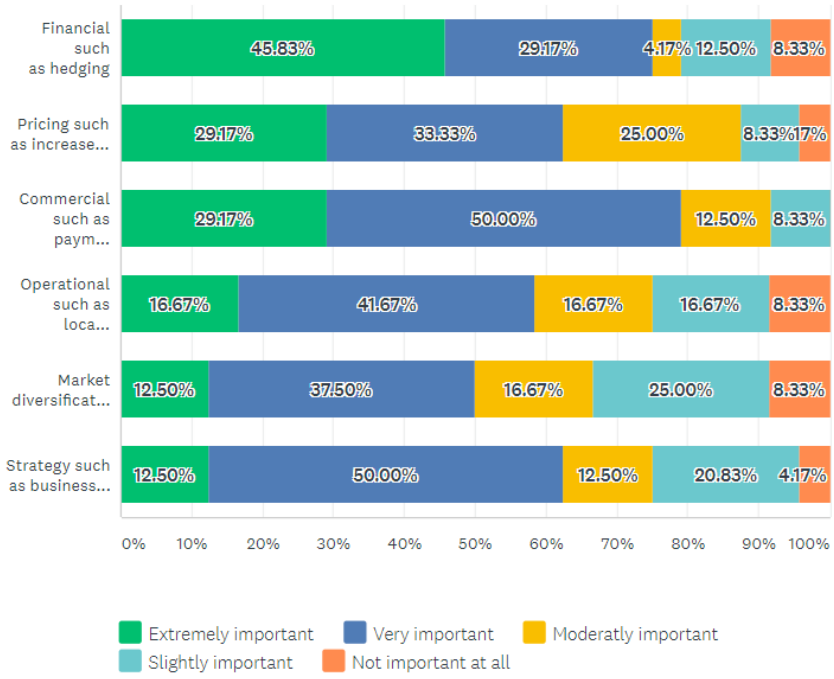
The majority of the firms operate in more than 2 two countries in Africa. Nevertheless, it appears that there is a home bias where many companies operate close to South Africa. The large South African Multinational Corporations such as retailers and mining house operate across the continent. The following table shows the presence of the firms across Africa.

*Table 7: Please indicate the number of countries that you operate in Africa?*




SAMNCs view hedging as an important risk management tool. The table below covers the risk management tools and indicates that 45.83% of the firms see hedging are extremely important for the African markets.

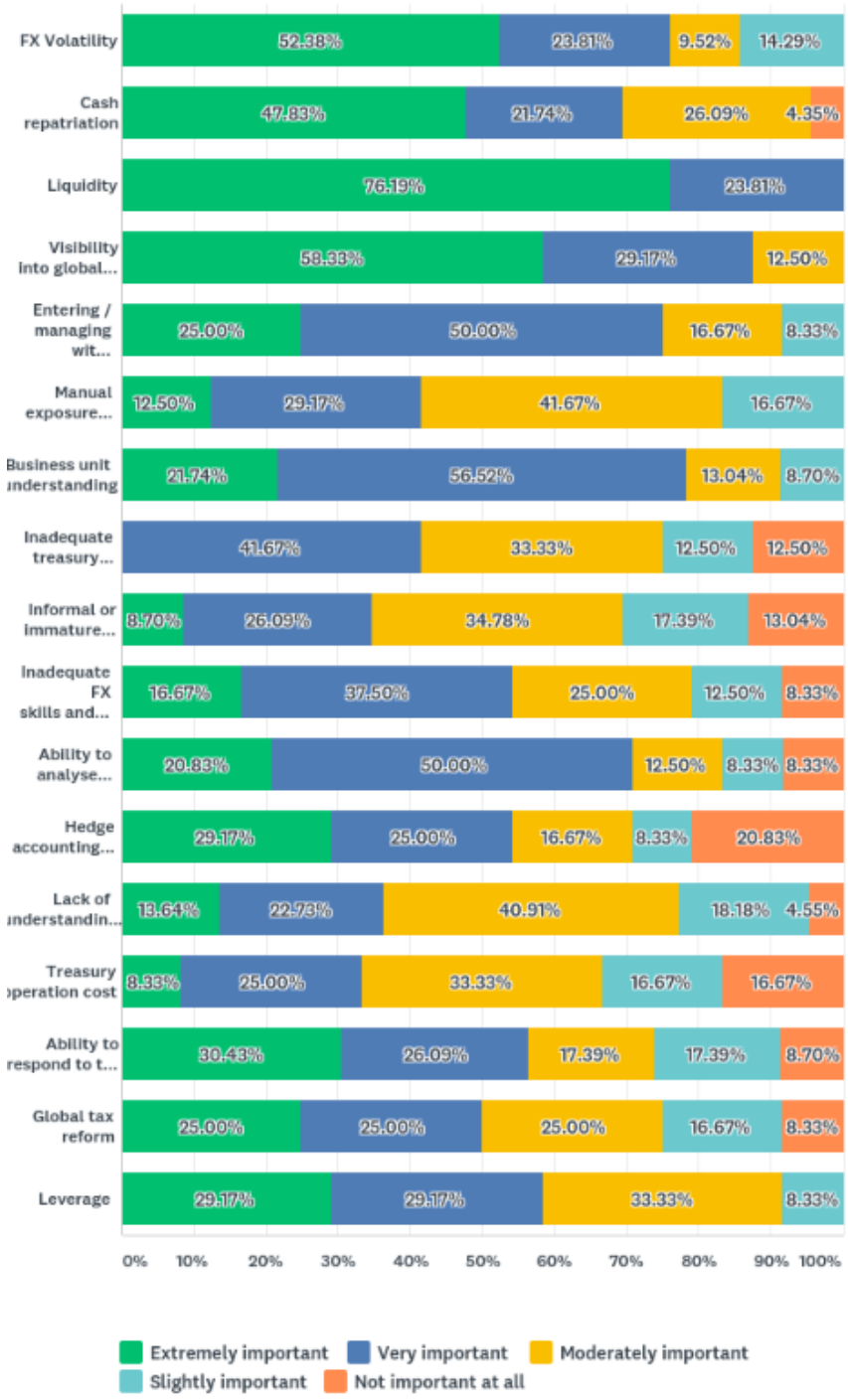
*Table 8: Please rate your risk management tools / methods for the African markets?*




The comparative analysis indicates that global firms attach even a more important emphasis on risk management than the South African counterparts.

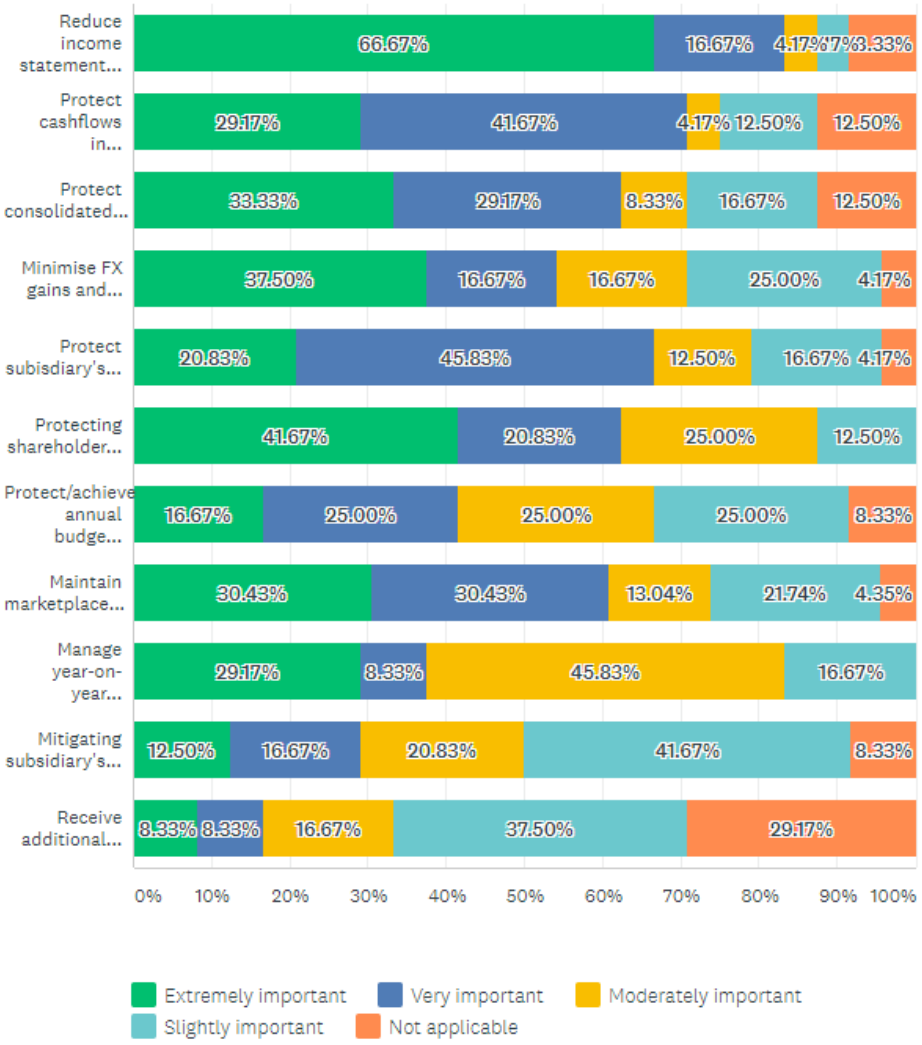
Liquidity and visibility into global operations, cash and financial risk exposure are the two most important treasury challenges. Interestingly, the foreign exchange volatility is only ranked third whilst global firms rank foreign exchange volatility as the most important treasury challenge. Consistent with global results, the survey results clearly show that currency risk is by far the highest perceived risk by the SAMNCs impacting the performance of the firm as outlined in the table below.

*Table 9: Please rank the hedging objectives derived from your hedging policy?*



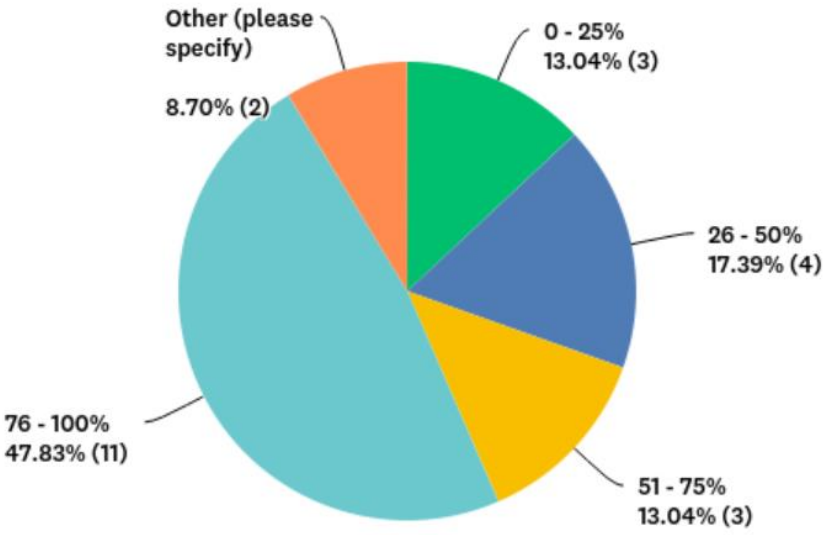

Natural hedges are the most popular mechanism used to mitigate risk for the SAMNCs. In comparison, international firms and SAMNCs used derivatives equally when mitigating risk. The top 3 hedging objectives are reducing income statement volatility, protect cashflows in group reporting currency and protect subsidiaries' local currency cashflows as shown in the table below. Deloitte confirmed the same in its 2016 Global Foreign Exchange Survey.

*Table 10: Please rank the hedging objectives derived from your hedging policy?*




However, SAMNCs seem to be quite risk averse because only 48%of the firms allow a hedge ratio of 75% to 100% of their exposure as defined the hedging policies.

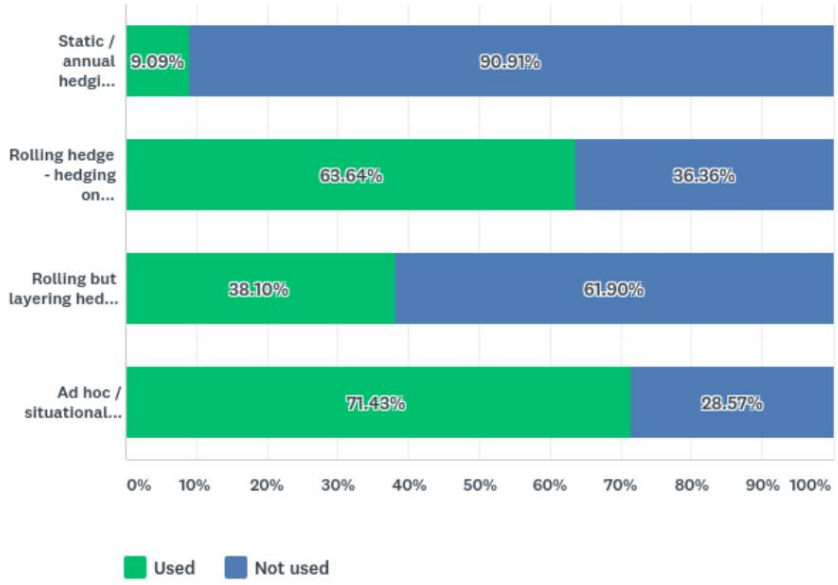
*Table 11: To what extent are you allowed to hedge your exposure, i.e. what is your maximum permitted hedge ratio?*



The actual corresponding hedging ratio during the last 12 months is even lower with 31%. Interestingly 18% of the firms have limited the hedge ratio to 0-25%. The exchange controls and regulations seem to hamper the business where all firms scored in the top half ranging from 1 (to a great extent) to 5 (somewhat). This result is line with the low ranking of South Africa in the World Economic Forum's criteria 'Burden of government regulation'. In terms of the use of risk monitoring tools the SAMNCs lag behind the firms surveyed in the Deloitte 2017 Global Corporate Treasury Survey.

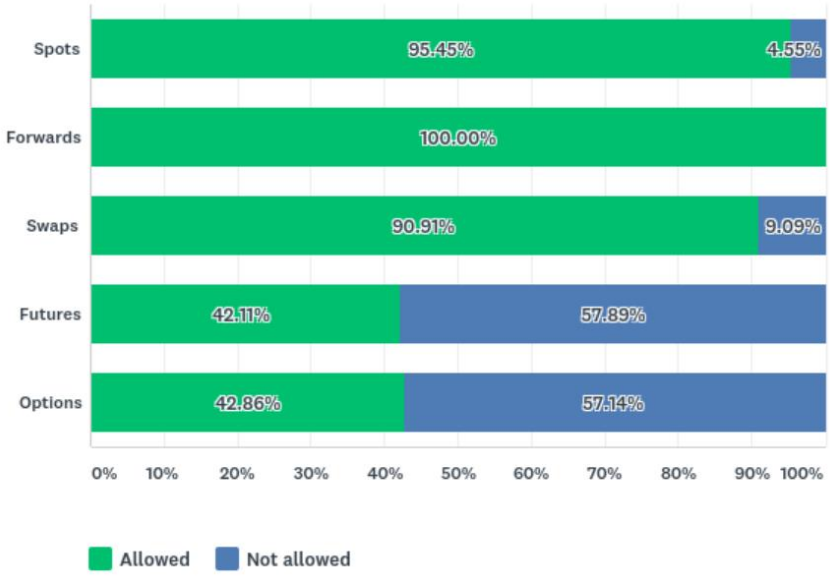
The primary derivative hedging strategy is based on rolling and ad-hoc hedges. In particular, the score of 71% for the use of ad-hoc hedges seems high. On a global level the Deloitte 2016 Global Foreign Exchange survey indicated that only 31% of the firms use ad-hoc hedges.

*Table 12: Please state your primary derivative hedging strategy*



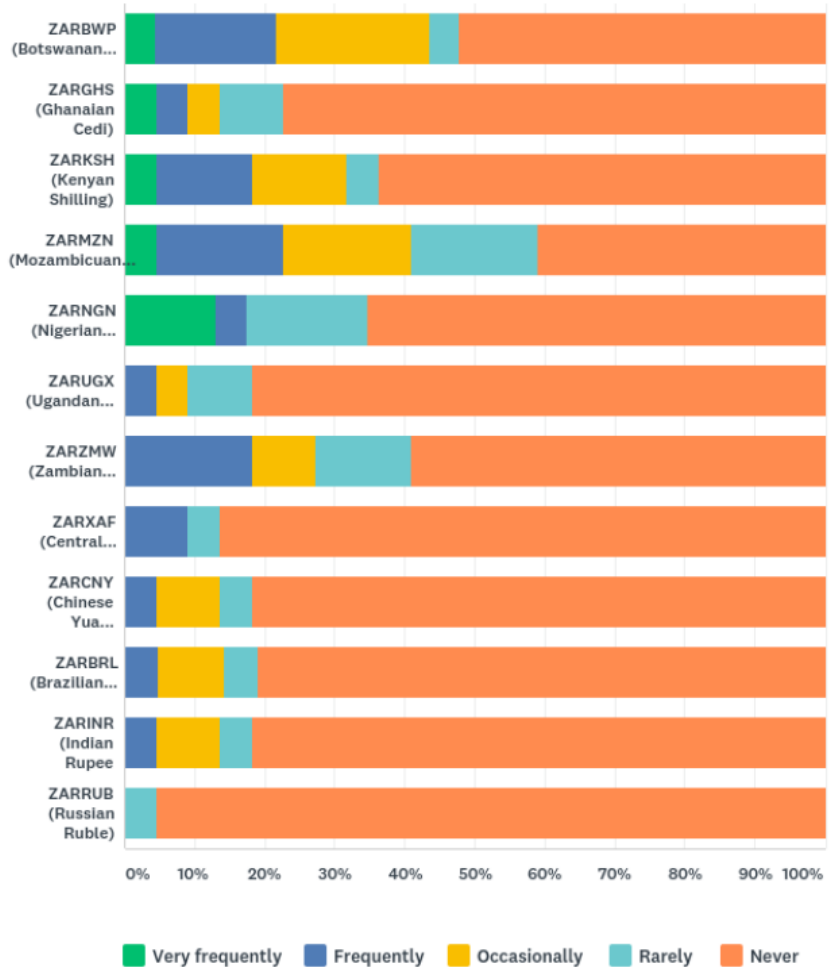

The hedge performance analysis is generally done on a monthly basis. The basic financial instruments for exchange rates (spots and forwards) and interest rates (swaps) are permitted in the hedging policies. All surveyed SAMNCs use spots and forwards. 80% of the SAMNCs use swaps and the use of futures drops down to 35%, the use of options is 45%. These results are in line with internationals surveys. However, the use of complex derivatives is very limited. Through our discussions with several treasury departments, it was mentioned that the cost and more importantly the lack of understanding on board level were the main reasons for not using more complex derivatives.

*Table 13: What policy permitted financial categories of financial instruments are you using?*



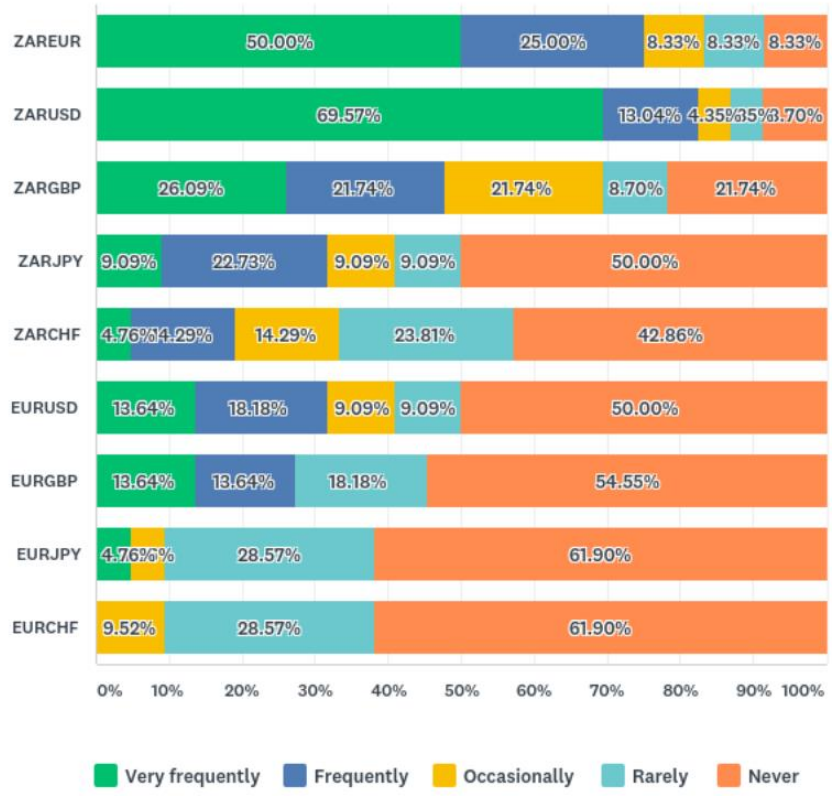

In terms of foreign exchange currency pairs, the pair South African Rand - Nigerian Naira is the pair that is most frequently used.

*Table 14: Please qualify the use of your most important 'developing' currency pairs that you use (frontier and BRICS markets)?*



When combining the scores for the answers ‘very frequently’, ‘frequently’ and ‘occasionally’, the pairs South African Rand – Botswana Pula and South Africa Rand – Zambian Kwacha score the highest but still at a low level. This very infrequent use of developing currency pairs from a South African perspective was one of the big surprises from our survey although Barclays stated in its African currency analysis in April 2016 that ’most corporate entities across Sub Saharan Africa may have a bias towards the use of spot transactions over any hedging solutions’. Unlike the infrequent use of developing currency pairs, some of the developed currency pairs show a far higher degree of use. Unsurprisingly, the currency pair South African Rand – US Dollar shows the highest combined score of very frequently and frequently use at 82.61%.

*Table 15: Please qualify the use of your most important ‘developed’ currency pairs that you use*




Whilst markets, prices, costs and regulations constantly change, 65% of SAMNCs have not diversified its use of developing and developed currency pairs during the last 5 years. This could be interpreted as a lack of ability to adapt. The derivative contract length and forecast range is limited to 6 months in most cases for spots, swaps, futures and options except for forwards where the tenures extend to 12 months. This is somewhat inconsistent with the layered hedging mechanism where the maximum effect is achieved when using 6-12 months tenures. SAMNCs are very cost conscious and the acceptable cost for derivatives is expected to hover between the Johannesburg Interbank Average Rate (JIBAR) of 7% and the discount rate used in financial models in South Africa of around 15%. SAMNCs are quite focussed on corporate governance where 78% are using the International Swaps and Derivatives association master agreements

and 65% apply hedge accounting according to IFRS 9 despite it being optional at this point in time. The cash-flow hedges show the highest degree of hedge accounting adoption where 42% of the SAMNCs responded that such hedges are covered between 76 to 100%.

Lastly, we looked into the topic of blockchain and cryptocurrencies. Almost 70% of the respondents seem to have a general to decent understanding of blockchain technology. This score is far higher than the score of 44% of the global firms from the Deloitte 2017 Global Corporate Treasury Survey. Cost reduction is the perceived most important benefit of the blockchain technology. The equivalent score of understanding bitcoin and/or other cryptocurrencies is even higher at 82.16%. Alternative hedging instrument such as cryptocurrencies, commodities or real estate are not appealing to SAMNCs.

In conclusion the SAMNCs are more risk averse than their global peers and they don't use the available derivative instruments and developing currency pairs offered by the financial institutions to the fullest extent possible due to cost considerations, lack of liquidity in financial markets and lack of understanding on board level.

The results of the 2nd cluster of questions (5 to 16) show that hedging is seen as an important risk management tool. Global firms attach even a higher importance to risk management than SAMNCs. Liquidity and visibility into global operations, cash and financial risk exposure are the two most important treasury challenges. Interestingly, the foreign exchange volatility is only ranked third whilst global firms rank foreign exchange volatility as the most important treasury challenge. Consistent with global results, the survey results clearly show that currency risk is by far the highest perceived risk by the SAMNCs impacting the performance of the firm. Natural hedges are the most popular mechanism used to mitigate risk for the SAMNCs. In comparison, international firms and SAMNCs used derivatives equally when mitigating risk. The top 3 hedging objectives are reducing income statement volatility, protect cashflows in group reporting currency and protect subsidiaries' local currency cashflows. Deloitte confirmed the same in its 2016 Global Foreign Exchange Survey. However, SAMNCs seem to be quite risk averse because only 48%of the firms allow a hedge ratio of 75% to 100% of their exposure as defined the hedging policies. The actual corresponding hedging ratio during the last 12 months is even lower with 31%. Interestingly 18% of the firms have limited the hedge ratio to 0-25%. The exchange controls and regulations seem to hamper the business where all firms scored in the top half ranging from 1 (to a great extent) to 5 (somewhat). This result is line with the low ranking of South Africa in the World Economic Forum's criteria 'Burden of government regulation'. In terms of the use of risk monitoring tools the SAMNCs lag behind the firms surveyed in the Deloitte 2017 Global Corporate Treasury Survey.

The results of the 3rd cluster of questions (17 to 29) covers the hedging strategies and the derivative instruments used by the SAMNCs. The primary derivative hedging strategy is based on rolling and ad-hoc hedges. In particular, the score of 71% for the use of ad-hoc hedges seems high. On a global level the Deloitte 2016 Global Foreign Exchange survey indicated that only 31% of the firms use ad-hoc hedges. The hedge performance analysis is generally done on a monthly basis. The basic financial instruments for exchange rates (spots and forwards) and interest rates (swaps) are permitted in the hedging policies. All surveyed SAMNCs use spots and forwards. 80% of the AMNCs use swaps and the use of futures drops down to 35%, the use of options is 45%. These results are in line with internationals surveys. However, the use of complex derivatives is very limited. Through our discussions with treasury departments it was mentioned that the cost and more importantly the lack of understanding on board level were the main reasons for not using more complex derivatives. In terms of foreign exchange currency pairs, the pair South African Rand - Nigerian Naira is the pair that is most frequently used. When combining the scores for the answers 'very frequently', 'frequently' and 'occasionally', the pairs South African Rand – Botswana Pula and South Africa Rand – Zambian Kwacha score the highest but still at a low level. This very infrequent use of developing currency pairs from a South African perspective was one of the big surprises from our survey although Barclays stated in its African currency analysis in April 2016 that 'most corporate entities across Sub Saharan Africa may have a bias towards the use of spot transactions over any hedging solutions'. Unlike the infrequent use of developing currency pairs, some of the developed currency pairs show a far higher degree of use. Unsurprisingly, the currency pair South African Rand – US Dollar shows the highest combined score of very frequently and frequently use at 82.61%. Whilst markets, prices, costs and regulations constantly change, 65% of SAMNCs have not diversified its use of developing and developed currency pairs during the last 5 years. This could be interpreted as a lack of ability to adapt. The derivative contract length and forecast range is limited to 6 months in most cases for spots, swaps, futures and options except for forwards where the tenures extend to 12 months. This is somewhat inconsistent with the layered hedging mechanism where the maximum effect is achieved when using 6-12 months tenures. SAMNCs are very cost conscious and the acceptable cost for derivatives is expected to hover between the Johannesburg Interbank Average Rate (JIBAR) of 7% and the discount rate used in financial models in South Africa of around 15%. SAMNCs are quite focussed on corporate governance where 78% are using the International Swaps and Derivatives association master agreements and 65% apply hedge accounting according to IFRS 9 despite it being optional at this point in time. The cash-flow hedges show the highest degree of hedge accounting adoption where 42% of the SAMNCs responded that such hedges are covered between 76 to 100%.

The results of the 4th cluster of questions (30 to 34) cover the alternative hedging instruments. Almost 70% of the respondents seem to have a general to decent

understanding of blockchain technology. This score is far higher than the score of 44% of the global firms from the Deloitte 2017 Global Corporate Treasury Survey. Cost reduction is the perceived most important benefit of the blockchain technology. The equivalent score of understanding bitcoin and/or other cryptocurrencies is even higher at 82.16%. Alternative hedging instrument such as cryptocurrencies, commodities or real estate are not appealing to SAMNCs.

In conclusion the SAMNCs are more risk averse than their global peers and they don't use the available derivative instruments and developing currency pairs offered by the financial institutions to the fullest extent possible due to cost considerations, lack of liquidity in financial markets and lack of understanding on board level.

# 7 Regression

We analyse the determinants of derivative use and the determinants of firm value for SAMNCs based on the model developed by Brunzell, Hansson, Liljeblom (2009) which examined cross sectional data from Nordic firms. Similar models have been used in many other emerging market studies such as Chaudhry et al. (2014) for Pakistan, Vural-Yavas (2016) in Turkey, Velasco (2014) in the Philippines, Gómez-González et al. (2009) in Colombia and Ali (2017) in Kenya.

The models for our study will adapted the existing Brunzell, Hansson, Liljeblom (2009) model following the six-step process to establish an econometric model as outlined in section 12 – Appendix B.

*Equation 1: Theoretical model for use of derivatives from Brunzell, Hansson, Liljeblom (2009)*

$$\boldsymbol{USE_i} = \alpha_1 + \beta_1 \boldsymbol{SIZE_i} + \beta_2 \boldsymbol{EUR_i} + \ +\beta_3 \boldsymbol{LT-DEBT_i} + \ \beta_4 \boldsymbol{MB_i} + \ \beta_{\mathrm{j}} \boldsymbol{RISK_i} + \ \beta_{\mathrm{k}} \boldsymbol{OWN_i} + \ \beta_{\mathrm{l}} \boldsymbol{SECTOR_i} + \ \boldsymbol{\varepsilon_i}$$

$USE_i$ is a dummy that takes the value of one if the firm has responded confirming on the derivatives use, $SIZE_i$ is the logarithm of turnover in euros, $EUR_i$ is a dummy for Finland which is part of the Eurozone, $LT\text{-}DEBT_i$ is a proxy for costs of financial distress, $MB_i$, i.e. the market-to-book ratio proxies for growth options, $RISK_i$ is a vector of j variables measuring firm risk (the degree of diversification, SIC, and stock return volatility, VOL), $OWN_i$ is a vector of k ownership variables (management ownership and blockholder ownership), $SECTOR_i$ is a vector of l sector dummies, and $\varepsilon_i$ is a cross-sectional error term. We also include interaction terms between a financial sector dummy and the variables LT-DEBT and firm diversification (SIC) to allow for a different relationship between derivatives use and these variables for the financial sector.

*Equation 2: Theoretical model for derivatives and firm valuation from Brunzell, Hansson, Liljeblom (2009)*

$$\boldsymbol{MB_i} = \alpha_1 + \beta_1 \boldsymbol{USE_i} + \beta_2 \boldsymbol{SIZE_i} + \beta_3 \boldsymbol{TANG\_TO\_TOT_i} + \beta_4 \boldsymbol{SIC_i} + \beta_j \boldsymbol{OWN_i} + \beta_k \boldsymbol{CONTROLS_i} + \beta_l \boldsymbol{SECTOR_i} + \boldsymbol{\varepsilon_i}$$

$MB_i$ is the market-to-book ratio, $USE_i$ is a dummy that takes the value of one if the firm has responded confirming on the derivatives use, $SIZE_i$ is the logarithm of turnover in euros, $TANG\_TO\_TOT_i$ to separate between value versus growth firms, $SIC_i$ is a measure for firm level diversification, $OWN_i$ is a vector of j ownership variables (management, institutional, and blockholder ownership), $CONTROLS_i$ is a vector of k financial control variables (long-term debt to assets, LT-DEBT, and return-on-equity, ROE), $SECTOR_i$ is a vector of l sector dummies, and $\varepsilon_i$ is a cross-sectional error term.

Our model for the use of derivatives is outlined in paragraph 7.1 and our model for firm valuation is outlined in paragraph 7.2. We have adapted both models slightly to suit the responses of the survey and the publicly available financial data from Bloomberg. The two models use an Ordinary Least Squares (OLS) linear regression.

As we indicated earlier the survey returned 17 responses. Literature indicates that a sample size of 30 is the minimum to run a cross-sectional study. The publicly available data from Bloomberg and the annual reports allow to increase the sample size to 30 and more. Our sample size includes the minimum of 30 SAMNCs listed on the JSE. The financial data for the additional 13 firms was collected from Bloomberg and the qualitative information for the use of derivatives was collected manually from the annual reports. Bartram et al. (2011) used an automated search using a list of search terms. The results of a random sample of 100 users and 100 nonusers led to an average reliability of 96.0%. In our case we only selected firms where the annual report stated the financial derivative positions, confirming the use of derivatives (100% reliability).

## 7.1 Use of derivatives

Prior research has focused on the determinants of derivative use. Our survey confirmed that all firms in our sample use derivatives which created a statistical challenge because the dependent dummy variable would have been constant (1). Hence, we modify the multivariate model to analyse the use of complex derivatives (UCD). According to Hair et al. (2010) the dichotomous nature of the dependent variable UCD requires a logistic regression. The logistic regression uses the maximum likelihood estimation method, instead of the ordinary least squares method of a multiple regression which minimizes the sum of the squares in the difference between the observed and predicted values.

UCD takes the value of one (1) if the firm responded positively to the use of complex derivatives with values 0.6 to 1 in the complexity Table 2 or zero (0) if the firm doesn't use complex derivatives with values 0 to 0.3 in the complexity Table 2. Most studies indicate that the firms' revenues are related to the use of derivatives. The firms' revenues are available on Bloomberg. We proxy SIZE by the natural logarithm of

turnover in South African Rand available on Bloomberg. In addition, Brunzell, Hansson, Liljeblom (2009) proposed the determinants of solidity, growth options, firm risk and ownership structure. Solidity is proxied by LTAS defining the ratio long term debt to total assets. Growth options proxied by MB defining the ratio market to book value. We included DIV, a dummy variable for diversity indicating whether the firm is a single (DIV = 0) or multi segment firm (DIV = 1). Diverse firms are naturally expected to assume less risk due to the benefits of diversification. The dummy variable DIV was determined through Question 2: in the survey and cross-referenced with the classification obtained from Edwards (2010). The firm risk is proxied by VOL indicating the trailing twelve months volatility. Finally, we proxy the ownership vector through MAN indicating the management ownership as a percentage of total equity and through BLCK as a proxy for ownership concentration indicating the block ownership of the largest shareholder in percent. Block ownership allows to engage in corporate governance and influence policies, i.e. hedging policies.

The complete model with all determinants and the dependent dummy variable UCD results in the following equation:

*Equation 3: Adjusted theoretical model for use of complex derivatives*

$$\boldsymbol{UCD_i} = \alpha_1 + \beta_1 \boldsymbol{SIZE_i} + \beta_2 \boldsymbol{LTAS_i} + \beta_3 \boldsymbol{MB_i} + \beta_4 \boldsymbol{DIV_i} + \beta_5 \boldsymbol{VOL_i} + \beta_6 \boldsymbol{MAN_i} + \beta_7 \boldsymbol{BLCK_i} + \boldsymbol{\varepsilon_i}$$

The descriptive statistics of the regression variables are shown in the Table 16 below.

*Table 16: Descriptive statistics of the UCD regression variables*

| | BLCK | DIV | LTAS | MAN | MB | SIZE | UCD | VOL |
|---|---|---|---|---|---|---|---|---|
| **Mean** | 0.2034 | 0.6667 | 18.1124 | 0.0311 | 2.9982 | 10.3930 | 0.4000 | 0.3424 |
| **Median** | 0.1368 | 1.0000 | 15.5434 | 0.0030 | 2.1167 | 10.6488 | 0.0000 | 0.2943 |
| **Maximum** | 0.6452 | 1.0000 | 42.6473 | 0.2000 | 8.7231 | 12.0763 | 1.0000 | 1.2918 |
| **Minimum** | 0.0120 | 0.0000 | 0.0085 | 0.0000 | 0.0174 | 7.2706 | 0.0000 | 0.1905 |
| **Std. Dev.** | 0.1525 | 0.4795 | 11.7030 | 0.0559 | 2.2735 | 1.2634 | 0.4983 | 0.1897 |
| **Skewness** | 1.4275 | -0.7071 | 0.2612 | 1.8350 | 1.0906 | -0.9406 | 0.4082 | 4.3571 |
| **Kurtosis** | 4.1536 | 1.5000 | 2.2726 | 5.1168 | 3.2812 | 3.2749 | 1.1667 | 22.4373 |
| | | | | | | | | |
| **Jarque-Bera** | 11.8522 | 5.3125 | 1.0024 | 22.4362 | 6.0461 | 4.5185 | 5.0347 | 567.1819 |
| **Probability** | 0.0027 | 0.0702 | 0.6058 | 0.0000 | 0.0487 | 0.1044 | 0.0807 | 0.0000 |
| | | | | | | | | |
| **Sum** | 6.1024 | 20.0000 | 543.3711 | 0.9327 | 89.9462 | 311.7900 | 12.0000 | 10.2720 |
| **Sum Sq. Dev.** | 0.6745 | 6.6667 | 3971.8700 | 0.0907 | 149.8926 | 46.2863 | 7.2000 | 1.0432 |
| | | | | | | | | |
| **Observations** | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 |

The Jarque-Berra null hypothesis assumes that the distribution is normal. The probabilities for BLCK, MAN, MB and VOL are statistically significant at the 5% significance level, i.e. we reject the null hypothesis. These independent variables are not normally distributed. The probabilities for LTAS and SIZE are above the 5% significance level and we cannot reject the null hypothesis. Hence these independent variables are

normally distributed. DIV and UCD are dummy variables and do not have a normal distribution. Table 17 below shows the results of the logistic regression.

*Table 17: Variables and coefficients of the UCD regression*

**Dependent Variable: UCD**
**Method: ML - Binary Logit (Newton-Raphson / Marquardt steps)**
**Sample: 1**
**Included observations: 30**
**Convergence achieved after 6 iterations**
**Coefficient covariance computed using observed Hessian**

| Variable | Coeff. | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| **C** | -13.3795 | 10.2554 | -1.3046 | 0.1920 |
| **SIZE** | 0.7973 | 0.7939 | 1.0043 | 0.3153 |
| **LTAS** | 0.2627 | 0.1216 | 2.1611 | 0.0307 |
| **MB** | -0.6282 | 0.5957 | -1.0547 | 0.2916 |
| **DIV** | 2.6862 | 2.1879 | 1.2278 | 0.2195 |
| **VOL** | 3.8281 | 3.8507 | 0.9941 | 0.3202 |
| **MAN** | -1.6268 | 11.4080 | -0.1426 | 0.8866 |
| **BLCK** | -12.2056 | 8.3120 | -1.4684 | 0.1420 |

| | | | |
|---|---|---|---|
| **McFadden R-squared** | 0.6077 | **Mean dependent var** | 0.4000 |
| **S.D. dependent var** | 0.4983 | **S.E. of regression** | 0.3378 |
| **Akaike info criterion** | 1.0613 | **Sum squared resid** | 2.5106 |
| **Schwarz criterion** | 1.4350 | **Log likelihood** | -7.9197 |
| **Hannan-Quinn criter.** | 1.1809 | **Deviance** | 15.8395 |
| **Restr. deviance** | 40.3807 | **Restr. log likelihood** | -20.1904 |
| **LR statistic** | 24.5412 | **Avg. log likelihood** | -0.2640 |
| **Prob(LR statistic)** | 0.0009 | | |
| **Obs with Dep=0** | **18** | **Total obs** | **30** |
| **Obs with Dep=1** | **12** | | |

The $R^2$ statistic of 0.6077 shows a relatively good fit of the model where 60.7% of the change of the dependent variable is explained by the independent variables. At twenty-two degrees of freedom the 5% and 10% significance level indicate a t-statistic of 2.0739 and 1.7171, respectively. LTAS is significant at the 5% level. This indicates that higher levels of debt (distress) are associated with the use of complex derivatives. SIZE is not significant but has a positive sign. Vural-Yavas (2016) also found a positive impact of the firm size on the likelihood of hedging in Turkey. Larger firms benefit from the economies of scale sufficiently and use financial derivatives more easily. MB is not significant with a negative sign. Chaudhry et al. (2014) also found a negative sign when studying non-financial firms in Pakistan. Normally growth firms take on more risk which in return would lead to higher levels of risk protection through derivatives. The signs for both risk variables DIV and VOL indicate that less risky firms use significantly more derivatives, but they are not significant. Brunzell, Hansson, Liljeblom (2009) found the same result for SIZE, the same sign for DIV and VOL but significant at the 10% percent level and insignificant opposite signs for MAN and BLCK.

To test the robustness of the UCD regression we use the complexity factor CPX from Table 2 as the dependent variable. The nature of the dependent variable CPX ranging from 0 to 1 allows the use of an OLS regression.

*Equation 4: Adjusted theoretical model using the complexity factor CPX*

$$\boldsymbol{CPX_i} = \alpha_1 + \beta_1 \boldsymbol{SIZE_i} + \beta_2 \boldsymbol{LTAS_i} + \beta_3 \boldsymbol{MB_i} + \beta_4 \boldsymbol{DIV_i} + \beta_5 \boldsymbol{VOL_i} + \beta_6 \boldsymbol{MAN_i} + \beta_7 \boldsymbol{BLCK_i} + \boldsymbol{\varepsilon_i}$$

The descriptive statistics of the regression variables are shown in the Table 18 below.

*Table 18: Descriptive statistics of the CPX regression variables*

| | BLCK | CPX | DIV | LTAS | MAN | MB | SIZE | VOL |
|---|---|---|---|---|---|---|---|---|
| **Mean** | 0.2034 | 0.4633 | 0.6667 | 18.1124 | 0.0311 | 2.9982 | 10.3930 | 0.3424 |
| **Median** | 0.1368 | 0.5000 | 1.0000 | 15.5434 | 0.0030 | 2.1167 | 10.6488 | 0.2943 |
| **Maximum** | 0.6452 | 1.0000 | 1.0000 | 42.6473 | 0.2000 | 8.7231 | 12.0763 | 1.2918 |
| **Minimum** | 0.0120 | 0.2000 | 0.0000 | 0.0085 | 0.0000 | 0.0174 | 7.2706 | 0.1905 |
| **Std. Dev.** | 0.1525 | 0.2125 | 0.4795 | 11.7030 | 0.0559 | 2.2735 | 1.2634 | 0.1897 |
| **Skewness** | 1.4275 | 0.4259 | -0.7071 | 0.2612 | 1.8350 | 1.0906 | -0.9406 | 4.3571 |
| **Kurtosis** | 4.1536 | 2.3433 | 1.5000 | 2.2726 | 5.1168 | 3.2812 | 3.2749 | 22.4373 |
| **Jarque-Bera** | 11.8522 | 1.4461 | 5.3125 | 1.0024 | 22.4362 | 6.0461 | 4.5185 | 567.1819 |
| **Probability** | 0.0027 | 0.4853 | 0.0702 | 0.6058 | 0.0000 | 0.0487 | 0.1044 | 0.0000 |
| **Sum** | 6.1024 | 13.9000 | 20.0000 | 543.3711 | 0.9327 | 89.9462 | 311.7900 | 10.2720 |
| **Sum Sq. Dev.** | 0.6745 | 1.3097 | 6.6667 | 3971.8700 | 0.0907 | 149.8926 | 46.2863 | 1.0432 |
| **Observations** | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 |

Only the descriptive statistics for CPX are different compared to the previous table.

*Table 19: Variables and coefficients of the CPX regression*

**Dependent Variable: CPX**
**Method: Least Squares**
**Sample: 1**
**Included observations: 30**

| Variable | Coeff. | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| **C** | -0.1128 | 0.3577 | -0.3155 | 0.7554 |
| **SIZE** | 0.0357 | 0.0294 | 1.2126 | 0.2381 |
| **LTAS** | 0.0095 | 0.0035 | 2.7531 | 0.0116 |
| **MB** | -0.0084 | 0.0176 | -0.4795 | 0.6363 |
| **DIV** | 0.0393 | 0.0860 | 0.4576 | 0.6517 |
| **VOL** | 0.2860 | 0.2041 | 1.4011 | 0.1751 |
| **MAN** | -0.2767 | 0.6587 | -0.4200 | 0.6786 |
| **BLCK** | -0.2832 | 0.2419 | -1.1710 | 0.2541 |

| | | | |
|---|---|---|---|
| **R-squared** | 0.40988 | **Mean dependent var** | 0.46333 |
| **Adjusted R-squared** | 0.22211 | **S.D. dependent var** | 0.21251 |
| **S.E. of regression** | 0.18743 | **Akaike info criterion** | -0.28763 |
| **Sum squared resid** | 0.77287 | **Schwarz criterion** | 0.08602 |
| **Log likelihood** | 12.31452 | **Hannan-Quinn criter.** | -0.16810 |
| **F-statistic** | 2.18289 | **Durbin-Watson stat** | 2.13779 |
| **Prob(F-statistic)** | 0.07653 | | |

The $R^2$ statistic of 0.4099 is lower than in the previous regression but still shows a relatively good fit. As expected, all the determinants keep the same signs. LTAS remains significant at the 5% level as the only significant determinant for the use of complex derivatives.

## 7.2 Derivatives and firm valuation

The selected dependent variable is the market to book ratio (MB). The market value is the current stock price of all outstanding shares. The book value equals the net assets of the company Allayannis and Weston (2001) found evidence consistent with the hypothesis that hedging increases firm value.

The following independent variables have shown to have an impact on firm valuation and have been included in the equation. We included the turnover in South African Rand (SIZE) to take small firm effects into account, tangible to total assets to differentiate between value and growth firms (TTTA), free cash flow from operations to total assets (CFTA) as a measure for potential agency problems, firm diversification (DIV) for a diversification discount, the complexity of the derivative instruments used (CPX) assuming that higher complexity does have a larger impact than simple derivative instruments, management ownership for reduced agency problems (MAN), block ownership for potential negative effects due to ownership concentration (BLCK), a dummy variable which takes the value of 1 if the largest blockholder in the firm owns more than 20% of total equity (OWN20), institutional ownership for value increasing governance (INST), long-term debt to total assets (LTAS) and return on equity (ROE).

*Equation 5: Adjusted theoretical model for derivatives and firm valuation*

$$\boldsymbol{MB_i} = \alpha_1 + \beta_1\boldsymbol{SIZE_i} + \beta_2\boldsymbol{TTTA_i} + \beta_3\boldsymbol{CFTTA_i} + \beta_4\boldsymbol{DIV_i} + \beta_5\boldsymbol{UCD_i} + \beta_6\boldsymbol{MAN_i} + \beta_7\boldsymbol{BLCK_i} + \beta_8\boldsymbol{OWN20_i} + \beta_9\boldsymbol{INST_i} + \beta_{10}\boldsymbol{LTAS_i} + \beta_{11}\boldsymbol{ROE_i} + \boldsymbol{\varepsilon_i}$$

SIZE, TTTA, CFTA, LTAS, MAN, BLCK, OWN20, INST and ROE were collected from Bloomberg and the 2018 integrated annual reports. As indicated earlier, the dummy variable DIV was measured through Question 2:. The values of the dummy variable UCD correspond to the values used in Table 2

The descriptive statistics of the regression variables are shown in the Table 20 below.

*Table 20: Descriptive statistics of the MB regression variables*

| | BLCK | CFTTA | DIV | INST | LTAS | MAN | MB | OWN20 | RESID | ROE | SIZE | TTTA | UCD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Mean** | 0.2034 | 0.0455 | 0.6667 | 0.6800 | 18.1124 | 0.0311 | 2.9982 | 0.4000 | 0.0000 | 0.1276 | 10.3930 | 0.8809 | 0.4000 |
| **Median** | 0.1368 | 0.0391 | 1.0000 | 0.7413 | 15.5434 | 0.0030 | 2.1167 | 0.0000 | -0.2186 | 0.1365 | 10.6488 | 0.9169 | 0.0000 |
| **Maximum** | 0.6452 | 0.3133 | 1.0000 | 1.2915 | 42.6473 | 0.2000 | 8.7231 | 1.0000 | 3.7729 | 0.5611 | 12.0763 | 0.9976 | 1.0000 |
| **Minimum** | 0.0120 | -0.0588 | 0.0000 | 0.2102 | 0.0085 | 0.0000 | 0.0174 | 0.0000 | -2.2428 | -0.7414 | 7.2706 | 0.4016 | 0.0000 |
| **Std. Dev.** | 0.1525 | 0.0659 | 0.4795 | 0.2432 | 11.7030 | 0.0559 | 2.2735 | 0.4983 | 1.5810 | 0.2211 | 1.2634 | 0.1344 | 0.4983 |
| **Skewness** | 1.4275 | 2.1929 | -0.7071 | -0.2557 | 0.2612 | 1.8350 | 1.0906 | 0.4082 | 0.7662 | -1.8297 | -0.9406 | -2.0461 | 0.4082 |
| **Kurtosis** | 4.1536 | 10.2693 | 1.5000 | 3.1965 | 2.2726 | 5.1168 | 3.2812 | 1.1667 | 3.1363 | 9.3821 | 3.2749 | 7.1940 | 1.1667 |
| **Jarque-Bera** | 11.8522 | 90.0983 | 5.3125 | 0.3752 | 1.0024 | 22.4362 | 6.0461 | 5.0347 | 2.9581 | 67.6540 | 4.5185 | 42.9198 | 5.0347 |
| **Probability** | 0.0027 | 0.0000 | 0.0702 | 0.8290 | 0.6058 | 0.0000 | 0.0487 | 0.0807 | 0.2278 | 0.0000 | 0.1044 | 0.0000 | 0.0807 |
| **Sum** | 6.1024 | 1.3642 | 20.0000 | 20.3995 | 543.3711 | 0.9327 | 89.9462 | 12.0000 | 0.0000 | 3.8286 | 311.7900 | 26.4259 | 12.0000 |
| **Sum Sq. Dev.** | 0.6745 | 0.1261 | 6.6667 | 1.7153 | 3971.8700 | 0.0907 | 149.8926 | 7.2000 | 72.4903 | 1.4170 | 46.2863 | 0.5241 | 7.2000 |
| **Observations** | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 |

The Jarque-Berra null hypothesis assumes that the distribution is normal. The probabilities for BLCK, CFTTA, MAN, MB, ROE, and TTTA are statistically significant at the 5% significance level, i.e. we reject the null hypothesis. These independent variables are

not normally distributed. The probabilities for INST, LTAS and SIZE are above the 5% significance level and we cannot reject the null hypothesis. Hence these independent variables are normally distributed. DIV, OWN20 and UCD are dummy variables and do not have a normal distribution.

Before we analyse the coefficients of the independent variables, we calculate the correlation matrix of the independent variables and the variance inflation factor to test the presence of multicollinearity. The variance inflation factor is a direct measure of how much the variance of the coefficient (i.e. its standard error) is being inflated due to multicollinearity. The correlation matrix and the variance inflation factors are shown below in Table 21. Pallant (2010) and Hair et al. (2010) indicate that a correlation coefficient of 0.90 and above indicates the presence of multicollinearity between the independent variables. Hair et al. (2011) recommend that multicollinearity is a concern if variance inflation factors are higher than 5.

*Table 21: Correlation matrix and variance inflation factor*

| | SIZE | TTTA | CFTTA | DIV | UCD | MAN | BLCK | OWN20 | INST | LTAS | ROE | VIF |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **SIZE** | 1.0000 | | | | | | | | | | | 1.6504 |
| **TTTA** | 0.0864 | 1.0000 | | | | | | | | | | 2.4405 |
| **CFTTA** | -0.2369 | -0.0790 | 1.0000 | | | | | | | | | 1.2418 |
| **DIV** | 0.2628 | -0.0468 | -0.0380 | 1.0000 | | | | | | | | 1.6010 |
| **UCD** | 0.2116 | 0.0361 | -0.2150 | 0.0000 | 1.0000 | | | | | | | 3.3416 |
| **MAN** | 0.0228 | -0.5129 | 0.0460 | -0.0484 | 0.0805 | 1.0000 | | | | | | 1.7460 |
| **BLCK** | -0.1562 | 0.1817 | 0.0741 | -0.1591 | -0.3829 | -0.2122 | 1.0000 | | | | | 3.1733 |
| **OWN20** | -0.1594 | 0.2416 | -0.0078 | -0.1443 | -0.2500 | -0.0757 | 0.7496 | 1.0000 | | | | 3.5361 |
| **INST** | 0.4883 | 0.0133 | -0.1904 | 0.3973 | 0.2630 | 0.0257 | -0.5589 | -0.5419 | 1.0000 | | | 2.4495 |
| **LTAS** | -0.1351 | -0.3387 | -0.1003 | -0.4111 | 0.5447 | 0.2029 | -0.0810 | -0.0934 | -0.1859 | 1.0000 | | 3.0438 |
| **ROE** | 0.1097 | 0.0874 | 0.2975 | -0.0274 | -0.4616 | 0.0870 | 0.1383 | -0.1217 | -0.0816 | -0.2237 | 1.0000 | 2.1449 |

In Table 21 above all correlation coefficients are below 0.9 and all variance inflation factors are below 5 indicating that multicollinearity is not a concern in this study.

Table 22 below shows the coefficients of the independent variables for the firm value regression.

*Table 22: Variables and coefficients of the independent variables for the firm value*

**Dependent Variable: MB**
**Method: Least Squares**
**Sample: 1**
**Included observations: 30**

| Variable | Coeff. | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| **C** | 7.2298 | 5.9298 | 1.2192 | 0.2385 |
| **SIZE** | -0.1967 | 0.3789 | -0.5192 | 0.6100 |
| **TTTA** | -5.1356 | 4.3306 | -1.1859 | 0.2511 |
| **CFTTA** | 12.5729 | 6.2982 | 1.9963 | 0.0613 |
| **DIV** | 0.5117 | 0.9834 | 0.5203 | 0.6092 |
| **UCD** | 0.5963 | 1.3671 | 0.4362 | 0.6679 |
| **MAN** | -3.7971 | 8.8069 | -0.4311 | 0.6715 |
| **BLCK** | -3.0046 | 4.3529 | -0.6903 | 0.4988 |
| **OWN20** | 1.3289 | 1.4064 | 0.9449 | 0.3572 |
| **INST** | 1.8669 | 2.3982 | 0.7785 | 0.4464 |
| **LTAS** | -0.0331 | 0.0556 | -0.5964 | 0.5583 |
| **ROE** | 5.5925 | 2.4690 | 2.2651 | 0.0361 |

| | | | |
|---|---|---|---|
| **R-squared** | 0.51639 | **Mean dependent var** | 2.99821 |
| **Adjusted R-squared** | 0.22084 | **S.D. dependent var** | 2.27348 |
| **S.E. of regression** | 2.00680 | **Akaike info criterion** | 4.52013 |
| **Sum squared resid** | 72.49028 | **Schwarz criterion** | 5.08061 |
| **Log likelihood** | -55.80198 | **Hannan-Quinn criter.** | 4.69943 |
| **F-statistic** | 1.74725 | **Durbin-Watson stat** | 2.47159 |
| **Prob(F-statistic)** | 0.14152 | | |

At nineteen degrees of freedom the 5% and 10% significance level indicate a t-statistic of 2.0930 and 1.7291, respectively. ROE is significant at the 5% level and CFTTA is significant at the 10% level. These coefficients confirm the understanding that strong cashflows and higher return on equity, i.e. profitable firms, improve the firm valuation. All other determinants are insignificant. The negative sign of SIZE, whilst insignificant, indicates that smaller “hedgers” trade at a premium compared to larger “hedgers”. This contradicts the common understanding that larger firms benefit from economies of scale and access to resources. Whilst not significant, the coefficient for UCD is positive indicating that the use of complex derivatives versus the use of simple, plain vanilla derivatives such as forwards might increase firm value. Walker, Kruger, Migrio and Sulaiman (2014) found no strong evidence for South African firms that ‘hedgers’ trade at a premium compared to ‘non-hedgers’. Actually, the results are in favour of ‘non-hedgers’. Interestingly, the sample was divided in 3 groups based on the type of derivatives used (foreign exchange rate, interest rate and commodity derivatives). Unfortunately, this classification did not match our dependent variable UCD. The other interesting observation is the negative sign of the coefficient for the management ownership (MAN) and for the largest shareholder (BLCK) whilst the institutional ownership (INST) and dummy variable for the largest shareholder above 20% shareholding (OWN20) are positive.

# 8 Conclusions

This chapter summarises the findings and provides suggestions for additional research. The comparison between our survey results, the survey results of South African firms by Lebata (2018) and the global survey results by Deloitte and Citi Bank shows that the SAMNCs’ hedging strategies and operations are very similar to the global hedging strategies and experiences. We present the key similarities and differences in the following paragraphs.

Foreign exchange volatility and lack of liquidity in the financial markets are the key challenges for treasury organisations for SAMNCS as well as firms around the globe (Question 6:). Hedging operations have been centralised during the past decade locally as well as internationally due to lack of local skills and experience (Question 7:). The currency risk was rated the most important one (Question 9:). Rather surprisingly, the use of netting as a hedging mechanism shows the lowest score (Question 10:). This indicates that there’s ample potential to increase the netting mechanism and possibly reduce the costly use of derivatives. Hedging is used for risk management purposes, i.e. reducing income statement volatility and not speculation, i.e. profit seeking (Question 11:). The cross-referencing with the integrated annual reports of the surveyed firms also confirms these results. The literature review also found the same hedging objectives.

The permitted hedge ratio is low in international comparison, i.e. South African firms take a rather conservative quantitative, i.e. risk-averse approach to hedging (Question

12:). The analysis between the hedge ratio permitted by the hedging policies and the actual hedge ratio shows that the firm hedge less than was the policies allow (Question 13:). The discussions with some of the SAMNCs indicate that the cost -benefit analysis of a higher hedge ratio is skewed to the cost side, i.e. cost is the main driver for the low actual hedge ratio. The more sophisticated risk monitoring tool Value at Risk (VaR) is used less extensively by the SAMNCs compared to the results from the global surveys which indicates a lower level of sophistication of the local firms (Question 15:). Rolling hedges are the primary derivative hedging strategy (Question 17:).

The survey results and the annual financial statements indicate the use of simple ungeared hedging instruments such as forward exchange contracts and interest swaps from variable to fixed interest rates (Question 19: and Question 20:). However, the percentage of firms that use these simple instruments is higher than the global average. The study by Bartram et al. (2011) indicates that South Africa has the highest percentage of firms that use forwards. There was only one SAMNC (aviation industry) that used complex derivatives resulting in the maximum score of one (1) in our complexity Table 2. The limited use of options and variants thereof is driven by the cost / premiums (Question 26:), the perceived lack of benefits and the lack of understanding and management of such instruments. In particular, the lack of understanding at board level was mentioned in several of our discussions with the SAMNC heads of treasury.

The most surprising fact is that derivatives were mainly used in conjunction with hard currencies such as US Dollar, Euro or British Pound indicating that revenue streams are not protected when reporting in the corporate functional currency or when repatriating funds (Question 22: and Question 23:). The most widely used developing currency pairs is the ZARNGN (Nigerian Naira). The tenure of the derivatives is also rather short and generally limited to 12 months (Question 25:). The local and regional banks pride themselves with a diversified product portfolio from a geographical, i.e. developing currencies, and type of instrument perspective. However, the SAMNCs do not use these available instruments to extract the maximum value. A major concern by the SAMNCs is of course the cost of the derivative instruments which is largely driven by the illiquid and volatile markets in sub-Saharan Africa (Question 26:). Our discussion with some of the larger regional financial institutions have confirmed that derivatives for most larger sub-Saharan economies have been developed but these derivatives are not used in a large scale by the SAMNCs. We conclude that there is a great potential to expand the use of the available products, but it requires substantial prior education of the treasury departments.

The framework established for the financial markets by the Financial Sector Regulation Act, the Financial Sector Conduct Authority, IFRS and the King Report (FSCA) requires strict adherence to rules and regulations. The SAMNCs follow these rules and regulations diligently (Question 27:, Question 28: and Question 29:). However, there also concerns about the over-regulation of the financial markets (Question 14:).

The second part of the thesis investigated the significance of the selected determinants for the extent of use of derivatives and the firm value. The results of the regression for the use of derivatives (USE) show a positive significance at the 5% level for the determinant SIZE (turnover). This indicates that the larger firms use derivatives more often than smaller ones which is line with the prior research as outlined in the literature review.

The results of the firm value regression show that the determinant CPX (use of complex derivatives) is not significant for the firm value, but the negative sign of CPX would indicate that the use of complex derivatives reduces the firm value which is the opposite from prior research except for Nguyen and Faff (2007) who found for Australian firms that the use of derivatives in general, and the use of interest rate derivatives in particular, are negatively related to firm value, whilst currency and commodities derivatives have no discernible impact on firm value. The two most recent sub-Saharan studies by Ali (2017) and Kiio and Ambrose (2017) also established a positive relationship between financial risk hedging practices and firm value for the firms listed on the Nairobi Stock Exchange.

## 8.1 Further research

The most evident improvement is the increase of the sample size for the survey and the regression. The sample size could be increased with firms operating in sub-Saharan Africa that are not listed on the Johannesburg Stock Exchange. Given that only the Johannesburg Stock Exchange and the firms listed on it, are liquid (regression) and mature (survey) enough, the study could be extended to Nigeria with the Nigerian Stock Exchange, Kenya with the Nairobi Stock Exchange and Ivory Coast with the Bourse Régionale des Valeurs Mobilières. Currently the challenge is that these stock exchanges do not offer currency, interest or commodity derivatives. The over-the-counter derivative offering is largely restricted to forward contracts.

Whilst using proven concepts and regressions, we can't rule out that the selection bias related to the choice of determinants influences our results. As an example, the thesis did not focus on country specific factors that could be important determinants. The size of the local derivatives market size as measured by daily turnover of exchanged traded and over-the-counter foreign exchange, interest rate and commodities derivatives could be such a determinant. The weekly JSE statistics[14] provide the relevant information. Bartram et al (2009) concluded that firms in less liquid financial markets are less likely to hedge.

[14] Johannesburg Stock Exchange market statistics https://www.jse.co.za/services/market-data/market-statistics

Hedging costs are a concern to the SAMNCs and the survey analysed the hedging cost as a function of hedging (transaction) tenure but not as a function of a currency. Hence an additional level of granularity could be added to the analysis.

Finally, we could use expand the regression across additional discrete periods (financial years) using a time series for the financial data. This would generate an additional level of robustness.

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# 10 Appendix A – Financial hedging instruments

Eun and Resnik (2015) divided the financial hedging instruments into the basic categories outlined in Table 23 below.

*Table 23: Basic categories of financial hedging instruments*

| Instrument | Description | Characteristic |
|---|---|---|
| Spots | Spot contracts are used to buy or sell a commodity, security or currency for immediate settlement (payment and delivery) on the spot date | Settlement is normally two to three days after the trade date |
| Forwards | Forward exchange contracts are used to secure a rate today for settlement at some time in future | Usually longer than two business days |
| Options | The holder of the option has the right but not the obligation to buy or sell a fixed amount of currency at a fixed rate of exchange at a predetermined date in the future | Time value explain of the option contract will diminish over the life of the option and at expiration will be zero |
| Futures | Futures are standardised contracts of a standard quantity of a specific underlying asset traded on a stock market | Expiry dates are March, June, September and December. |
| Swaps | Swaps are an exchange of cash flows between two parties at a predetermined rate in future periods | Fixed rate to fixed rate; floating rate to floating rate; or fixed rate to floating rate. |

Forward exchange contracts offer the following advantages:

- They cater for a diverse type of commercial and financial transactions and both importers and exporters can make use of it,
- The company is protected against unfavourable exchange rate fluctuations,
- The exact value of the export and import order can be calculated on the day it is processed and
- Budgeting and costing are accurate.

The forward exchange contracts offer the following disadvantages:

- Once a company has covered a transaction with a forward foreign exchange contract, it cannot take advantage of preferential exchange rate movements,
- If an order is cancelled or there is any surplus amount outstanding on a forward exchange, it must be surrendered at the prevailing spot exchange rate, which can result in a financial loss and
- Early deliveries, extensions, surrenders and cancellations during the fixed period of a forward exchange contract are done on a swap basis causing additional administration.

Options offer great flexibility in terms of achieving the risk management goals. The solution will always involve a risk vs. return trade off and the company itself will determine the degree of protection required in respect of the premium involved and the benefits (or upside potential) retained. Thus, the firm can set the strike rate and the maturity to suit particular and specific requirements. Options allow to combine long and short positions. Long and short positions can be combined on put and call options to create payoffs which specifically fit the underlying exposure.

Futures offer standardized features and high levels of leverage which makes them particularly useful for the risk-tolerant investors. The high leverage allows those investors to participate in markets to which they might not have had access otherwise. The margin requirements futures are generally well-known because they have been relatively unchanged for years. Unlike options, futures do not have any time decay. Time decay is a reduction in an option's price caused by the passage of time. Most futures markets are very deep and liquid, especially in the most commonly traded commodities, currencies and indexes.

Swaps offer the following advantages:

- Borrowing at lower cost by taking advantage of current or expected future market conditions. Also, swaps do not have upfront premiums,
- Access to additional financial markets outside the home markets,
- Hedge against currency and interest rate fluctuations,
- Correct mismatch between assets and liabilities and
- Additional income because swap spreads correlate closely with credit spreads. Spread is gap between the bid and the ask prices

The main disadvantage of swaps is the cost associated with swap agreements which often supersede the benefits in the short term. In the longer term the swap agreements are beneficial for both parties. The main challenge is often the lack of liquidity because two parties with matching needs are required. And finally, there is the risk of defaults by the buying or selling party.

Options are very popular nowadays and offer a far higher leverage compared to trading the underlying asset. The value of an option includes two components, namely the intrinsic value and the time value. The intrinsic value refers to the money that could be realised by exercising an option. The time value will diminish over the life of the option and at expiration will be zero. There's large variety of different option types. Broadly speaking the options can be grouped into 2 categories:

- Vanilla options and
- Exotic options

The vanilla option gives the holder the right to buy (call) or sell (put) an underlying asset at a predetermined price within a given time frame. A vanilla option has no special or unusual features. In contrast, exotic options contain complex criteria affecting valuation and payoff. In most cases these criteria are time sensitive and the holder can exercise specific preferences at various points prior to the expiry of the option. The exotic options can be sub-divided into the 3 categories:

- Volatility-dependent options,
- Path-dependent options and
- Binary options

Whilst all options are dependent on volatility, the volatility dependent options are particularly dependent on future volatility. Examples are Compound and Chooser options. The path-dependent options are based on average prices of the underlying asset during the lifetime of the option. There are two variants of path-dependent options. The soft path dependent option bases its value on a single price event of the underlying asset during the lifetime of the option, e.g. highest or lowest trading price of the underlying asset. Examples are Barrier options. The hard path dependent options take into account all trading prices of the underlying asset during the lifetime of the option. Option types include Asian options, also known as average options. The binary options do have an all-or-nothing character with large profit potential and 100% loss potential.

Two exercise types apply to options. The European option can be exercised only at the expiry date of the option. The American option can be exercised at any point in time prior to the expiry date of the option. Both types of options can be traded during the lifetime of the option.

Table 24 below describes the complex categories of financial hedging instruments.

*Table 24: Complex categories of financial hedging instruments*[15]

| Instrument | Characteristics | Other |
|---|---|---|
| Range forward (complex forward, no premium) | Provides protection against unfavourable exchange rate movements by setting a floor rate or ceiling Rate | Maturity spans generally from two days to several years. Like the standard forward the range forwards are available for a number of currencies in sub-Saharan Africa |
| Synthetic forward (complex forward) | Constructed through borrowing in one currency, lending in another currency, and offsetting these transactions in the spot exchange market or through call and put options with the same strike price and expiry date | Forward position can be maintained without the same types of requirements for counterparties |
| Participating forward (complex forward) | Similar to a standard forward contract but allows to benefit from any favourable exchange rate movements on a pre-determined percentage of the total contract | The protected rate will always be less favourable than a standard forward rate |
| Leveraged forward (complex forward) | Allows to benefit from a favourable hedge rate compared to the outright forward rate | Two variants: geared and discounted |

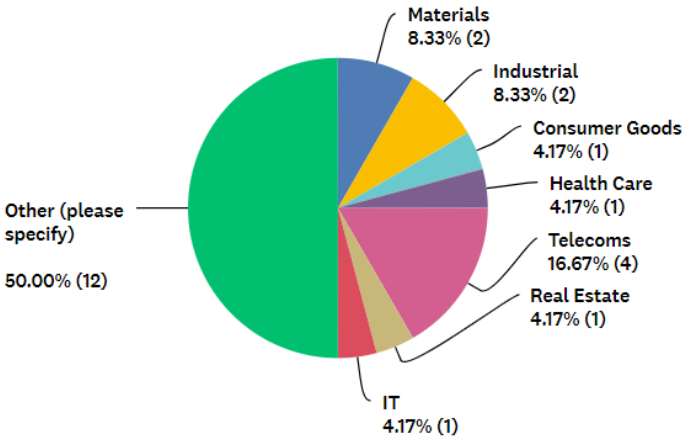
[15] The definitions have been collected from various online sources

| | | |
|---|---|---|
| Collar (zero cost option) | Construct with puts and calls of the underlying asset both having the same expiry date and number of contracts | Protection against downside risk but limited participation in favourable depreciation of the currency. Most of the time the options are out of the money |
| Cylinder (zero cost option) | Construct with put or call option and simultaneously selling a call or put option for the same amount and with the same expiry date | Protection against the risk that the underlying asset will fall or rise to a certain level in the future |
| Straddle (zero cost option) | Construct with a put and a call of the same underlying asset, strike price and expiry date | Significant movement of the underlying asset and options prices is required for this strategy to be profitable |
| Barrier options | Call or put is activated only if the underlying asset hits a certain barrier else the derivative expires worthlessly | Knock-out or knock-in variants. Normally loss of 100% of the investment. In some cases, a cash rebate may be paid out |
| Binary or digital options | Construct that pays out the asset or nothing at all at the expiry, independent whether the option is in the money or out of the money | Popular short-term trading instrument, profit or loss is known when the trade expires. Loss of 100% of the investment is possible. Similar to barrier options. There are three variants: discrete, double and sequential |

| | | |
|---|---|---|
| Asian option | Construct where the pay-off is linked to the average value of the underlying asset at pre-set dates during the life of the option | Two variants:<br><br>ARO = average rate option (fixed strike), based on the difference between the average price of the underlying asset during the life of the option and a fixed strike price<br><br>ASO = average strike option (floating strike), strike price is equal to the average price of the underlying asset during the life of the option |
| Chooser option | Allows the holder to decide whether it is a call or put prior to the expiration date | Equivalent to a straddle but comparably cheaper |
| Compound option | Construct where the underlying asset is another option with any combination of calls or puts | Allows for larger leverage and they are cheaper than vanilla options. Two strike prices and two expiry dates |
| Lookback option | Payoff depends on the optimal (max. or min.) underlying asset's price occurring over the lifetime of the option | Due to the choice of the most favourable exercise point, they are very expensive |
| Basket option | Underlying asset is a weighted group, or basket, of commodities, securities, or currencies | Same characteristics as a standard / vanilla option |

# 11 Appendix B – Detailed survey responses

Question 1: **What industry are you in?**




The Industry Classification Benchmark (ICB) used by the Johannesburg Stock Exchange (JSE) served as input to define the answer options. 10 options were given accordingly:[16]

- Oil & gas / energy,
- Materials,
- Industrial,
- Consumer Goods,
- Financials,
- Health Care,
- Telecoms,
- Real Estate,
- IT and
- Utilities,

The answer ‚Other' includes the following industry descriptions:

- Gaming, gaming & entertainment,
- Transport,
- Construction & engineering, mining, steel,
- Hospitality and leisure,
- Diversified portfolio, including agriculture, property, technology, pharmaceuticals and financial services,
- Manufacturing,
- Chemical industry,
- Logistics and Motor,

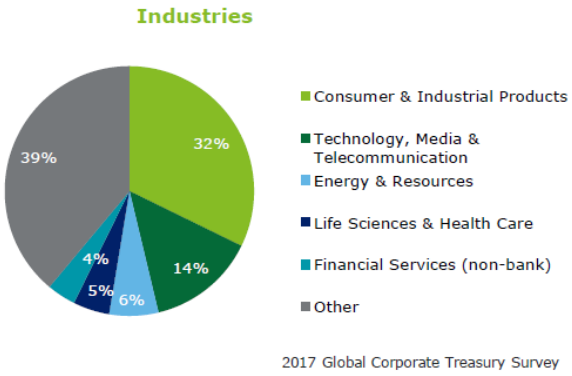
[16] https://www.jse.co.za/services/market-data/indices/ftse-jse-africa-index-series/icb-industry

- Mining,
- Mining, water, agriculture, food and manufacturing and
- Agro-processing.

Interestingly 50% of the respondents couldn't classify their business according to the ICB classification. Of course, this is also an example where the question was not explained detailed enough and led to measurement errors as described in section 5.1.

The Deloitte 2017 Global Corporate Treasury Survey with over 200 companies across all industries shows a different distribution, in particular because financial services companies (non-bank) were included.[17]

*Table 25: Deloitte 2017 Global Corporate Treasury Survey industry distribution*

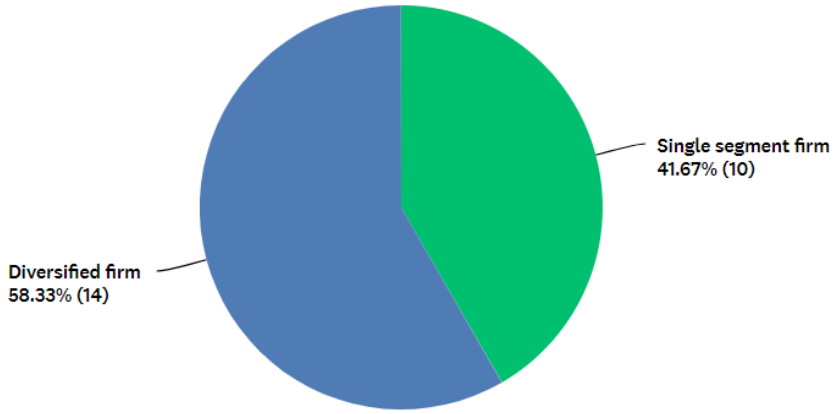



From the 1st of January 2019 the ICB structure has been enhanced and expanded and will include 11 Industries (previously 10), 20 Super sectors (previously 19), 45 Sectors (previously 41) and 171 Sub-sectors (previously 114). The industries are defined as follows:

- Technology,
- Telecommunications,
- Health Care,
- Financials,
- Real Estate,
- Consumer Discretionary,
- Consumer Staples,
- Industrials,
- Basic Materials,
- Energy and
- Utilities.

[17] The Deloitte 2017 Global Corporate Treasury Survey Report is a bi-annual global treasury survey. The results are published on Deloitte's global web site www.deloitte.com https://www2.deloitte.com/us/en/pages/risk/articles/global-corporate-treasury-survey-2017.html

Question 2: **Do you consider yourself a single segment or a diversified firm?**

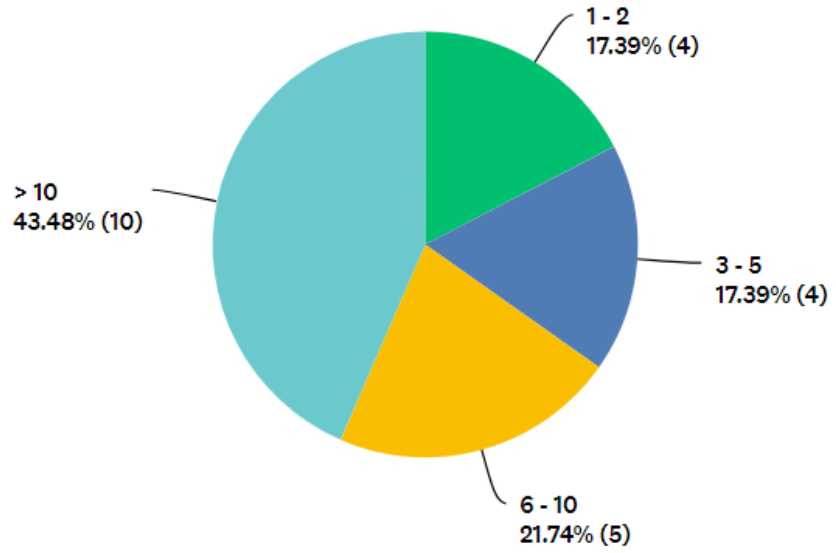



The results show that a slight majority (14 out of 24) of the firms consider themselves as diversified firms. The results were cross-checked against the classification from Edwards (2010) and the surveyed firms had all answered consistently.

Research has shown that firm diversification (number of industry segments) is related to derivative use. The regression is using the results as input for the control independent variable DIV in paragraph 7.1.

Generally financial markets value a diversified group of businesses and assets at less than the sum of its part.

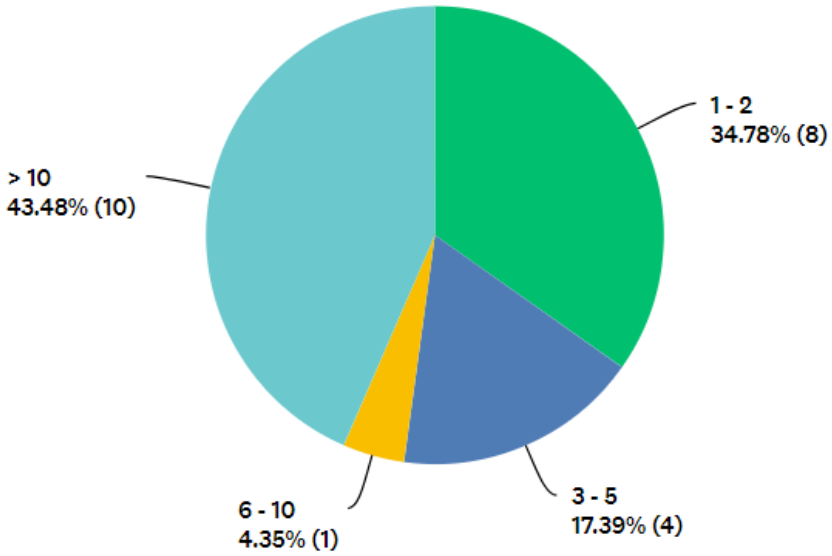
Question 3: **Please indicate the number of countries that you operate in Africa?**




The selection of the firms in the sample population focussed on African multi-nationals operating in Africa. The results show that only 17.39% operate in one or two African

countries (including South Africa). 82.61% of the firms operate in 3 and more African countries. The fact that 43.48% of firms operate in 10 or more countries indicates that once a business model works in one country it can be replicated in other countries and that South African firms are not risk averse.

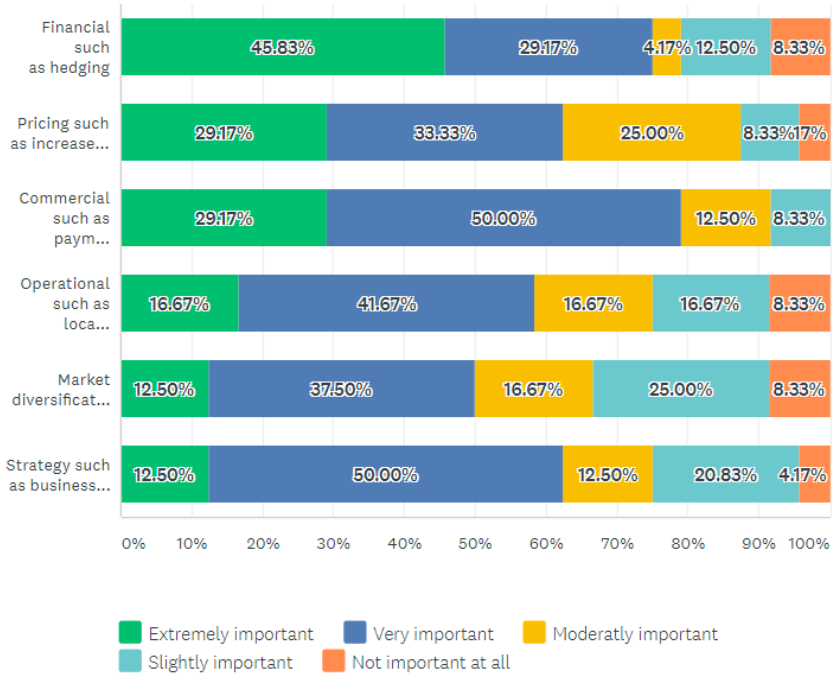
Question 4: **Please indicate the number of countries that operate in outside Africa?**




The results show that a far higher percentage of SAMNCs operate in a smaller number of countries outside Africa (34.78%). This could indicate some form of home bias, i.e. focus on operations in Africa instead of expanding beyond the African continent.

Interestingly the same number of SAMNCs (10) operate in more than 10 countries in Africa and in more than 10 countries outside Africa. Closer analysis reveals that in 80% of the cases it's the same firm that operates in more than 10 countries in and outside Africa. The remaining 20% of the firms are a combination of 6-10 and >10 countries. This leads to the conclusion that the largest SAMNCs, from a geographical perspective, have expanded far beyond the initial African borders and built a substantial footprint outside Africa.

Question 5: **Please rate your risk management tools / methods for the African markets?**

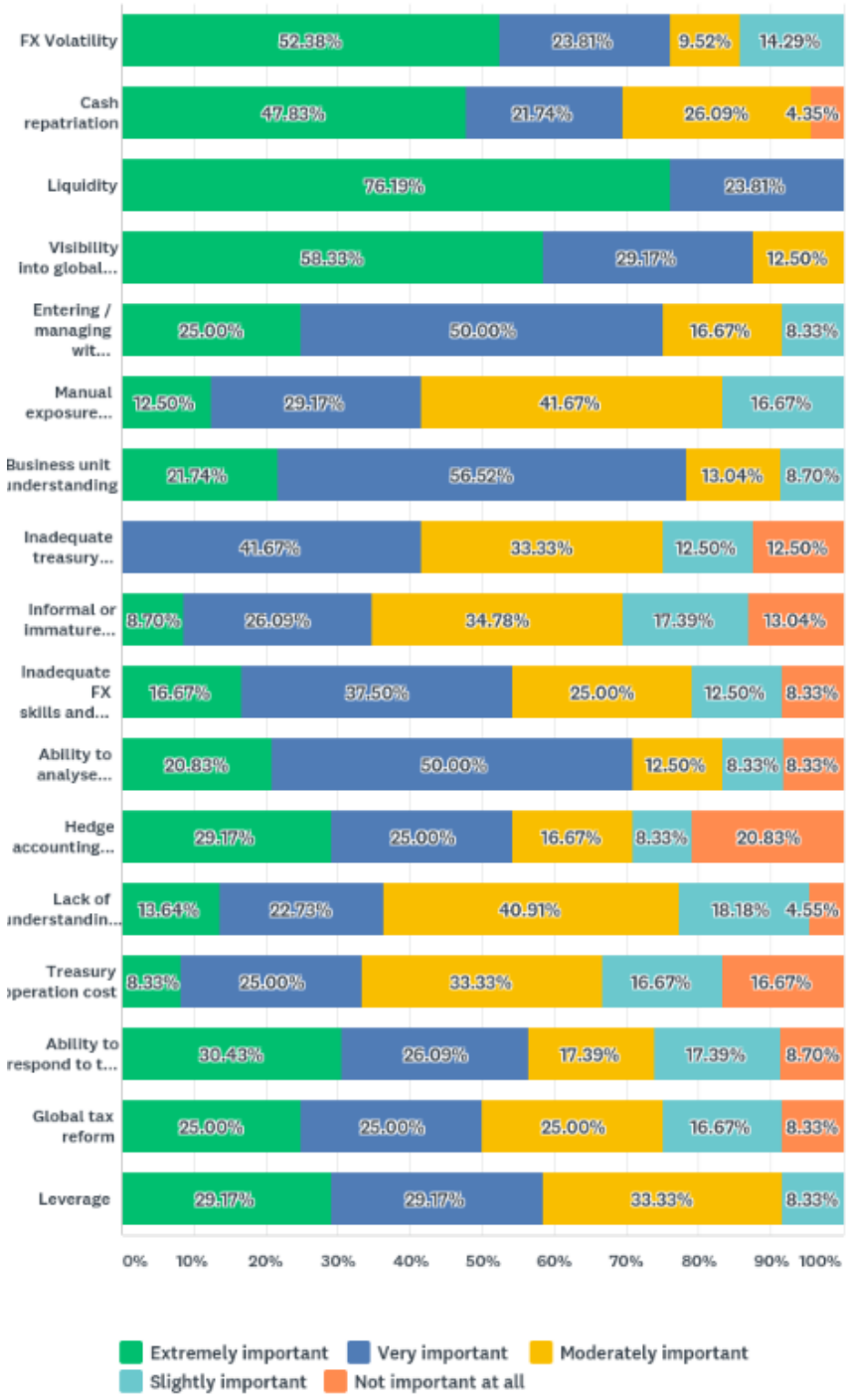



The following answer choices were given:

- Financial such as hedging,
- Pricing such as increase pricing to cover risk etc.,
- Commercial such as payment terms, payment guarantees etc.,
- Operational such as local production,
- Market diversification in terms of expanding to new geographies and
- Strategy such as business diversification in terms of products and services.

45.83% of the firms indicated that financial risk management tools such as hedging are extremely important for the African markets. Together with the score 'Very important' this percentage increases 75% which is the 2nd highest score of the risk management tools. Only the commercial risk management tools with a combined score of 79.17% ranks slightly higher. These results also indicate that this thesis covers an important risk management aspect for SAMNCs. However, the comparative analysis from Question 15: indicates that global firms put a more important emphasis on risk management than the SAMNCs.

Question 6: **Please qualify the importance of your treasury challenges?**




The combined score of ‘extremely important’ and ‘very important’ results in 5 main treasury challenges:

1. Liquidity with the highest score of 100%,
2. Visibility into global operations, cash and financial risk exposure with 87.50%,
3. FX volatility with 76.19% but with a much higher percentage of ‘extremely important’,

4. Business unit understanding with 78.26% and
5. Entering / managing within restricted markets with 75%.

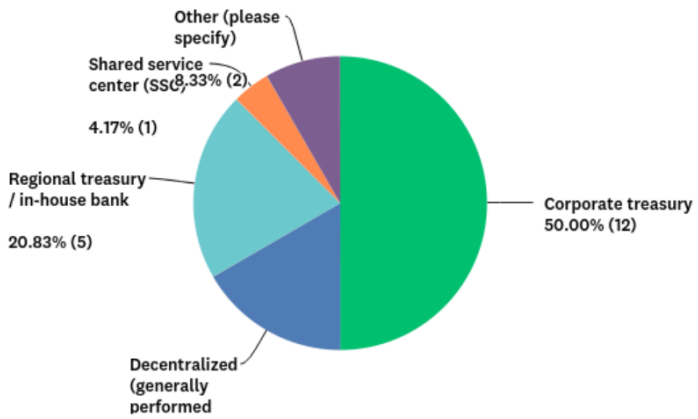
We noted that foreign exchange volatility is only ranked the 3rd most important treasury challenge. We then compared the results with the Deloitte 2017 Global Corporate Treasury Survey. The foreign exchange volatility ranked as the most important treasury challenge. However, 4 out of 5 treasury challenges were the same in the first 5 challenges which shows a high degree of correlation.

*Table 26: Deloitte 2017 Global Corporate Treasury Survey – strategic challenges for treasury organisations*


Liquidity is of course a generally challenging aspect of operating in Africa where most financial markets outside South Africa are illiquid. This explains the difference between our survey responses and the Deloitte survey.

At the other end of the scale we have got 'lack of understanding by board / exec management' and 'treasury operations cost'. Both challenges are ranked the same in both surveys.

## Question 7: **What does your treasury operating model look like?**

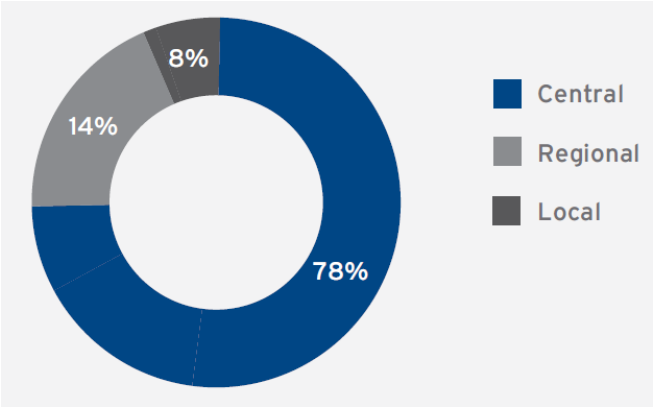



Half of the firms use a corporate treasury function. The shared service centre (SSC) and the regional treasury also fall into the category of centralised treasury organisations. Only 16.67% use a decentralised (in-country) treasury organisation. These results are consistent with Lebata (2018) where in South Africa only 17% of the firms use a

decentralised model and 83% of the firms use a centralised treasury model which goes hand in hand with the trend that has been developing for a number of years now. Lebata (2018) further states that 73% of Multinationals, 62% of his sample, have centralised operations. State-Owned Entities (SOEs) and SA based companies have responded with a 100% centralised model.

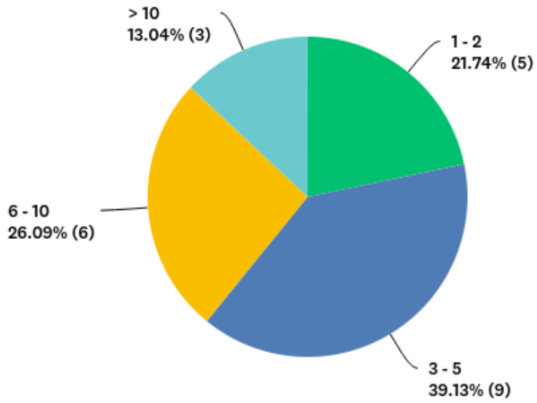
The Citi Treasury Diagnostics observations show that 78% of the firms manage the risk centrally which is in line with our results. The local and regional percentages are also in line with our results.

*Table 27: Citi Treasury Diagnostics: Managing FX risk in turbulent times (2017): Level of risk management*




The major contributing factors for the move towards centralised treasury models are lack of local treasury knowledge for multi-country operations, cash pooling, advanced regulations (Sarbanes-Oxley) and accounting standards (IFRS).

Question 8: **How many people are managing your treasury activities?**



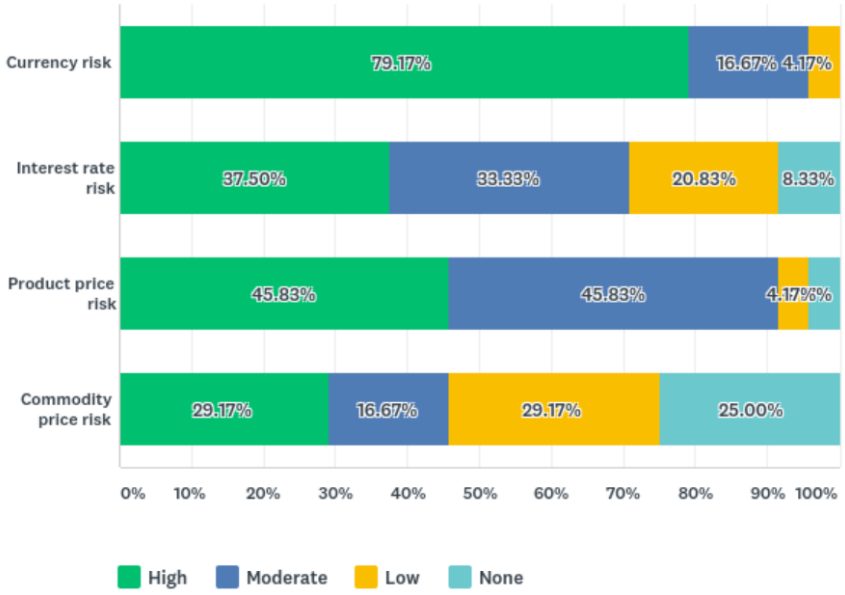

60% of the respondents indicate that their teams don't include more than 5 employees. 13% indicate that the treasury team includes more than 10 employees. The Deloitte 2016 Global Foreign Exchange Survey[18] indicates that the average number of employees

[18] https://www2.deloitte.com/bn/en/pages/financial-advisory/articles/global-foreign-exchange-survey.html

managing the foreign exchange is 6.3. The foreign exchange activities represent a sub-set of the treasury activities. This observation allows to conclude that the AMNCs treasury teams are smaller than the global average. During various conversations the heads of treasury indicated that it was very difficult to get headcount increases approved which in return might indicate a lack of understanding / focus by the top management.

*Table 28: Deloitte 2016 Global Foreign Exchange Survey: Number of people managing foreign exchange risk*

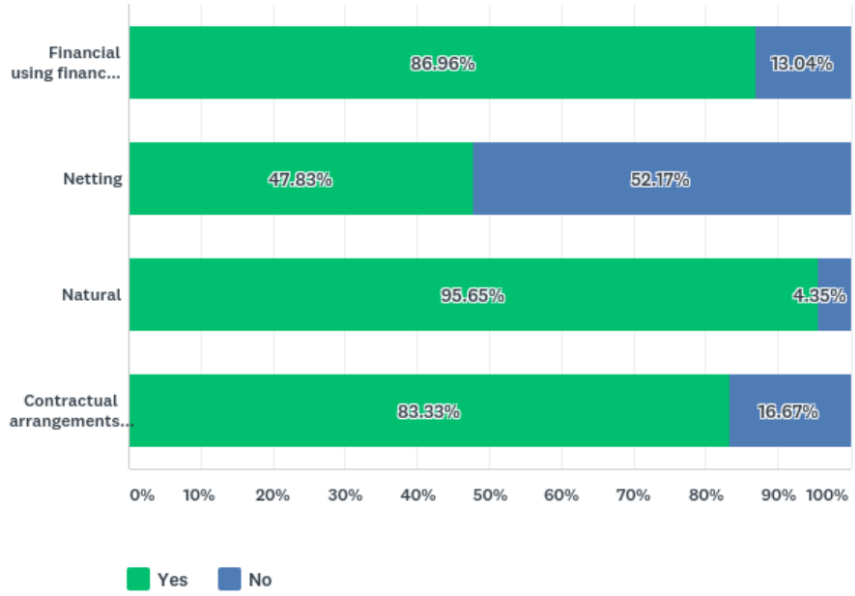

Question 9: **What is the intensity of the following types of financial risks on the performance of your company?**




The results clearly show that the currency risk is by far the highest perceived risk by the AMNCs impacting the performance of the firm. 96% of the firms consider the currency risk as high or moderate. This is in line with the responses of Question 6: where 52% of the respondents indicate that the foreign exchange volatility is a key strategic challenge for the firm. The product price risk with a combined high and moderate score of 92% follows on the second place. Only 46% of the firms view the commodity price risk as high or moderate. This score warrants a comment for the mining industry. The production

input represents the majority of the operating costs. The mining firms buy the production input in hard currency and sells the output minerals in hard currency. Hence there is literally no commodity price risk which impacts the performance of the mining firms. Minnitt et al. (2007) examined the hedged gold production in South Africa and presented the hedging cycles where gold in the ground was sold at predetermined prices from the beginning of the 1980ties until the end of the 1990ties before the demise started due to market shocks starting with the Washington Central Banks Agreement on Gold in 1999. Today the gold still in the ground is hardly ever hedged.

Question 10: **Please indicate which hedging mechanisms you are using?**



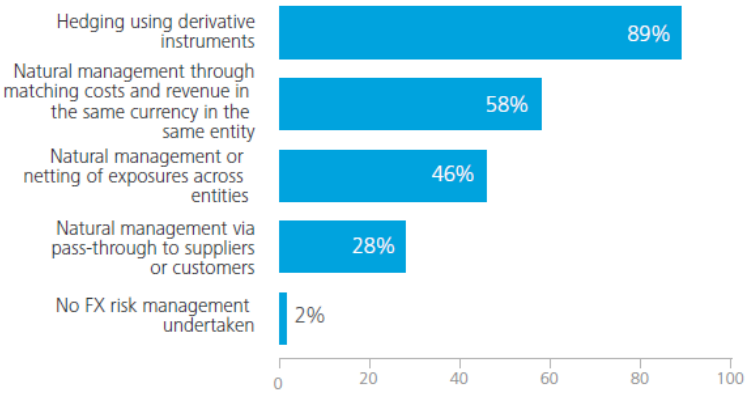

The scores show that 95.65% of the firms use natural hedging to protect itself against the four risks surveyed in Question 9: (currency, interest rate, product price and commodity price. The scores from Lebata (2018) confirm where 57% of the firms using natural hedging through matching of costs and revenues in the same currency. The second highest score results from the use of derivative instruments with 86.96%. Lebata (2018) confirms the results where 80% of the respondents indicated that they are always or mostly using derivative instruments. The 3rd highest score is the use of contractual agreements with 83.33%. This score is significantly different from the Lebata (2018) score where only 34% always or moderately use contractual agreements. This could be explained by the fact that Lebata (2018) surveyed a significant number of firms that are only operating in South Africa whilst my sample only includes AMNCs. Surprisingly, netting shows the lowest score with 47.83% of the firms using that mechanism. This indicates that there's ample potential to increase the netting mechanism and possibly reduce the costly use of derivatives.

*Table 29: Answer to FX risk management approach by Lebata (2018)*

| # | Answer Options | Rarely | Sometimes | Mostly | Always | Total |
|---|---|---|---|---|---|---|
| 1 | Hedging using derivative instruments | 9% | 11% | 41% | 39% | 100% |
| 2 | Natural management through matching costs and revenue in the same currency in same entity | 15% | 28% | 44% | 13% | 100% |
| 3 | Natural management via pass-through to suppliers or customers | 38% | 28% | 28% | 6% | 100% |
| 4 | No FX risk management undertaken | 61% | 22% | 11% | 6% | 100% |

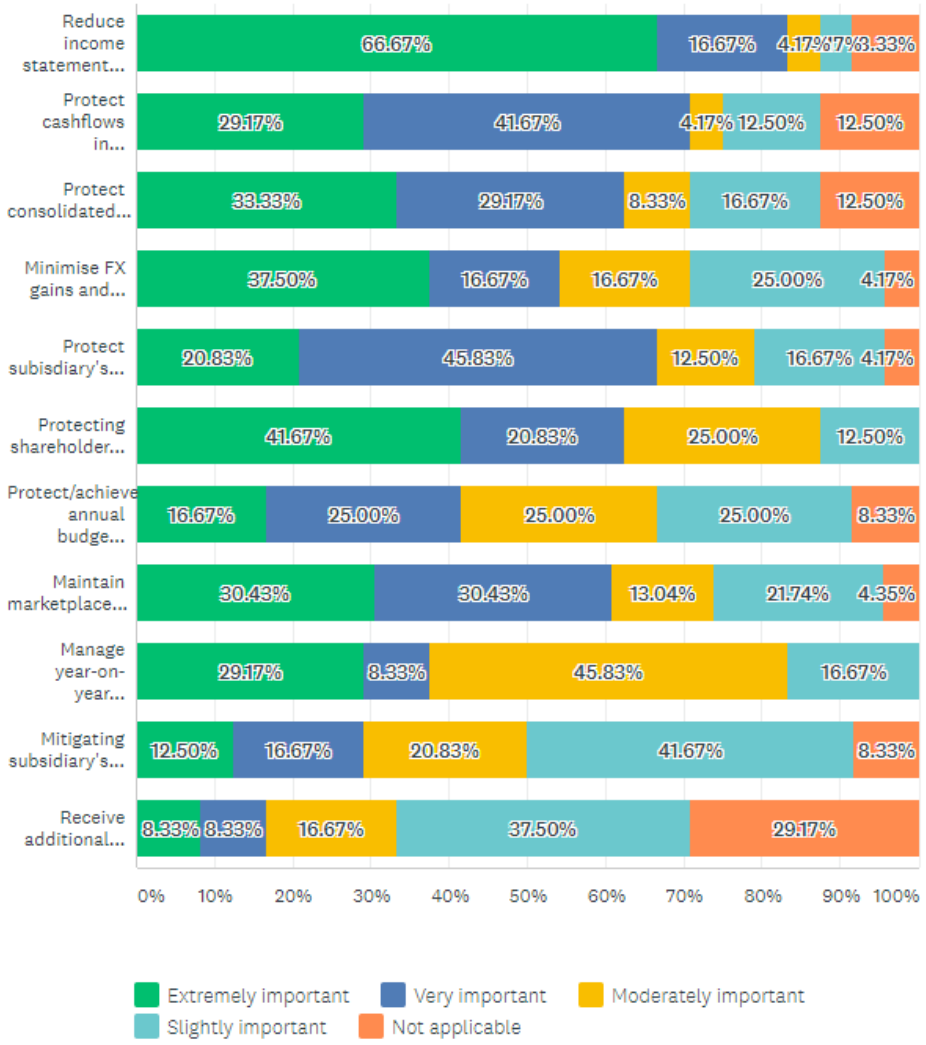
The results from the Deloitte 2016 Global Foreign Exchange Survey confirm our findings where 89% of the global respondents use derivative instruments (vs. 86.96% in our survey). The natural hedging score of 58% through matching costs and revenues is lower than our score but in line with Lebata (2018). The netting score of 58% is in line with our score of 47.83% confirming the ample potential to increase the use of the netting mechanism.

*Table 30: Deloitte 2016 Global Foreign Exchange Survey: Risk management approaches used*




Finally, the Citi Treasury Diagnostics observations in the report - Managing FX risk in turbulent times (2016) show that netting, which aggregates intercompany treasury and commercial flows and increases oversight of FX exposures globally, is only used by 47% of firms to improve currency risk management. This result corresponds to our findings where netting is used by 47.83% of the firms.

Question 11: **Please rank the hedging objectives derived from your hedging policy?**




The top 3 objectives are reducing income statement volatility with a combined score (extremely and very important) of 83.33%, protect cashflows in group reporting currency (translation risk) at 70.84% and protect subsidiary's local currency cashflows at 66.66%. Lebata (2018) confirms the most important objective to reduce income statement volatility with combined (strongly agree and agree) of 79%. There are slight nuances when it comes to the 2nd and 3rd most important objective. The protection of cashflows ranks 3rd with 66%, just slight below our score of 70.84%.

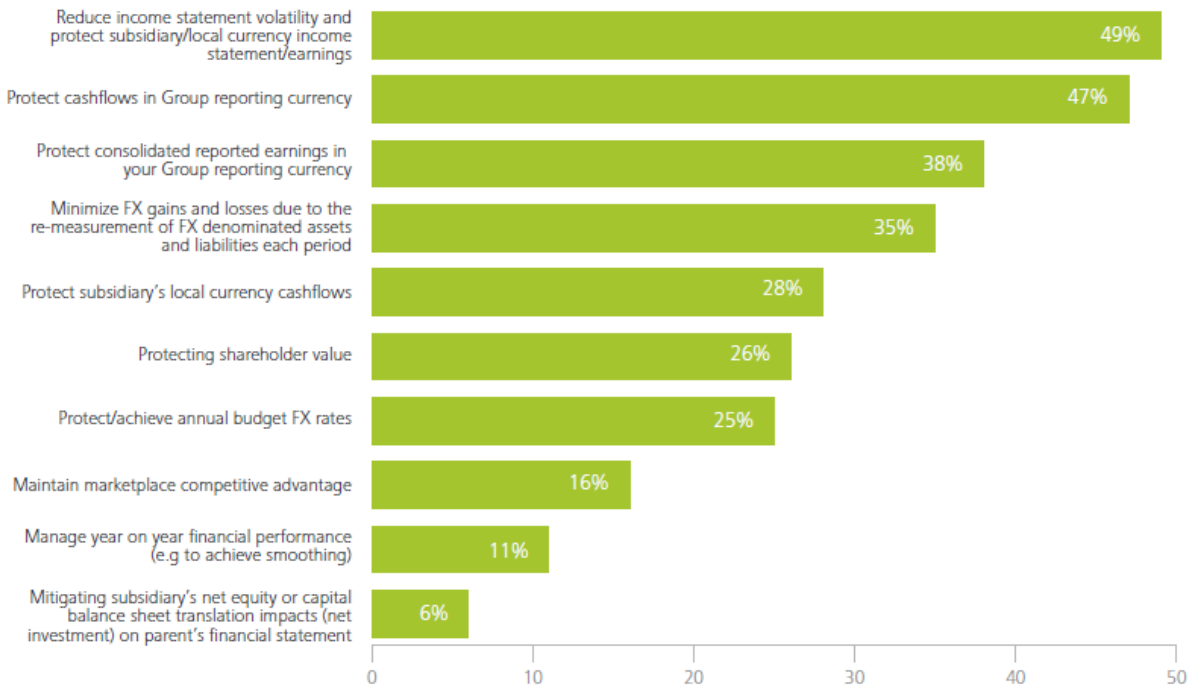
Comfortingly the objective to receive additional income shows the lowest score with a combined 16.66%. This confirms that the sampled firms do not speculate but rather manage risk. Rossi (2013) found that even during a financial crisis the motivation to speculate to generate additional revenue in Brazil was low.

*Table 31: Answer to primary FX Hedging objectives by Lebata (2018)*

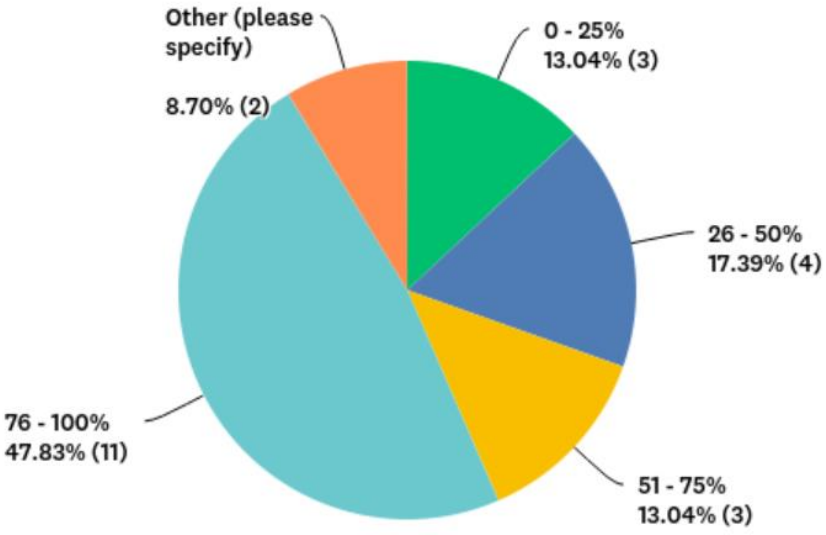
| # | Answer Options | Strongly Agree | Agree | Strongly Disagree | Disagree | N/A - No hedging done | Total |
|---|---|---|---|---|---|---|---|
| 1 | Reduce income statement volatility | 49% | 30% | 0% | 4% | 17% | 100% |
| 2 | Protect cash flows in group reporting currency | 30% | 36% | 2% | 15% | 17% | 100% |
| 3 | Protect consolidated reported earnings in your Group reporting currency | 26% | 23% | 6% | 28% | 17% | 100% |
| 4 | Minimize FX gains and losses due to re-measurement of FX denominated assets and liabilities in each period | 36% | 36% | 4% | 7% | 17% | 100% |
| 5 | Protect subsidiaries local currency cash flows | 15% | 42% | 4% | 23% | 17% | 100% |
| 6 | Protecting shareholder value | 26% | 36% | 4% | 17% | 17% | 100% |
| 7 | Protect/achieve annual budget FX rates | 11% | 30% | 17% | 25% | 17% | 100% |
| 8 | Maintain marketplace competitive advantage | 37% | 32% | 5% | 9% | 17% | 100% |
| 9 | Manage year on year financial performance | 22% | 33% | 4% | 24% | 17% | 100% |
| 10 | Mitigating sub's net equity/capital balance sheet translation impacts on parent's AFS | 11% | 26% | 9% | 37% | 17% | 100% |

The Deloitte 2016 Global Foreign Exchange Survey also found that the reduction of the income statement volatility is the most important hedging objective. 49% The 2nd most important objective is the protection of cashflow at 47% which is also in line with our survey results. The conclusion that by Deloitte that the hedging objectives focus on discrete periods (quarterly and annual) which seems to contradict the fact that the majority of companies use rolling hedging programmes as indicated in Question 17: Our survey results indicate that only 37.40% of the firms focus on managing year-on-year financial performance.

*Table 32: Deloitte 2016 Global Foreign Exchange Survey: Primary hedging objectives*



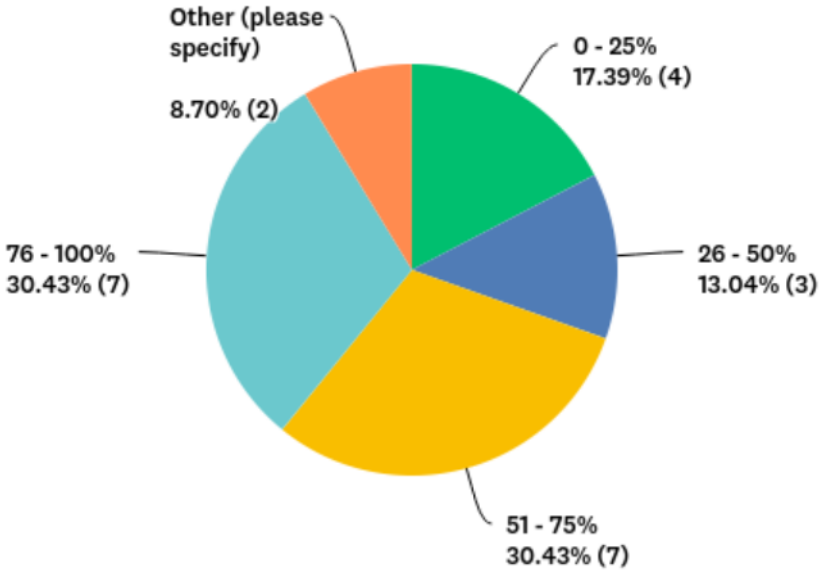

Question 12: **To what extent are you allowed to hedge your exposure, i.e. what is your maximum permitted hedge ratio?**




Only 60% of the firms can hedge 51% to 100% of their exposure. This is a relatively low hedge ratio in international comparison. My interpretation is that South African multi-nationals take a conservative view on hedging as a risk management tool.

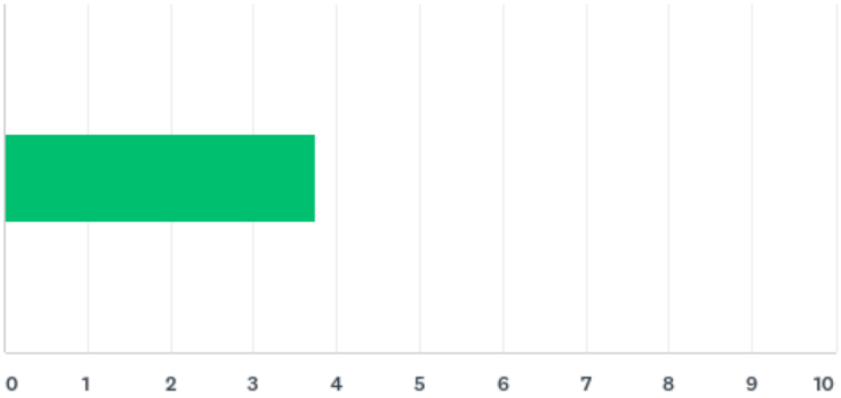
Mc Nally & Murray (2010) compared the optimal hedge ratios for based on the assumption of a zero return. The results show that the optimal hedge ratio for emerging markets is 100%. If these results serve as a basis for comparison, then these results confirm my interpretation.

Question 13: **What was your hedge ratio during the last 12 months?**




The results show that only 60% of the firms hedge between 51% and 100% of their exposure which is in line with the permitted hedge ratio in the previous question. Combining the low use of netting as indicate in Question 10: and the low hedge ratio suggests again that netting could be used more frequently.

Question 14: **Do the Reserve Bank or other regulations restrict you from executing your hedging strategy?**

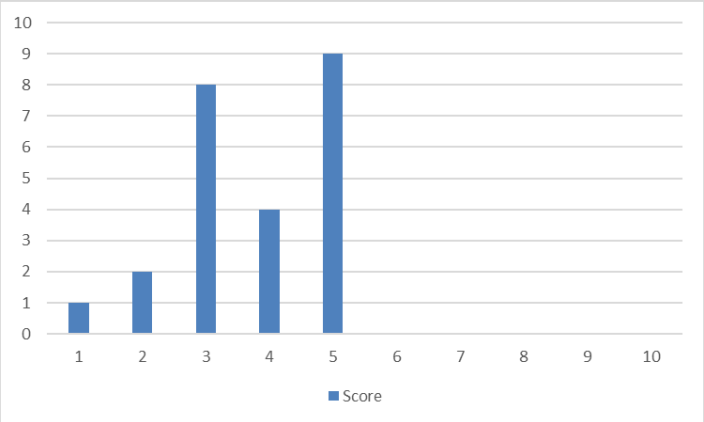



Exchange control regulations pose a significant problem for businesses in sub-Saharan Africa, which emanates from the various exchange control regimes and which hampers the flow of currency across African borders. South Africa, Malawi, Ethiopia, Mozambique, Namibia, Swaziland and Lesotho are examples of sub-Saharan African

countries that have exchange control requirements in place; some of these more restrictive than others.[19]

The survey offered answers ranging 1 (= to a great extent), 5 (= somewhat) to 10 (= not at all). The answers range from 2 to 5 with an average of 3.9.

*Table 33: Distribution of the exchange control and regulations scores*

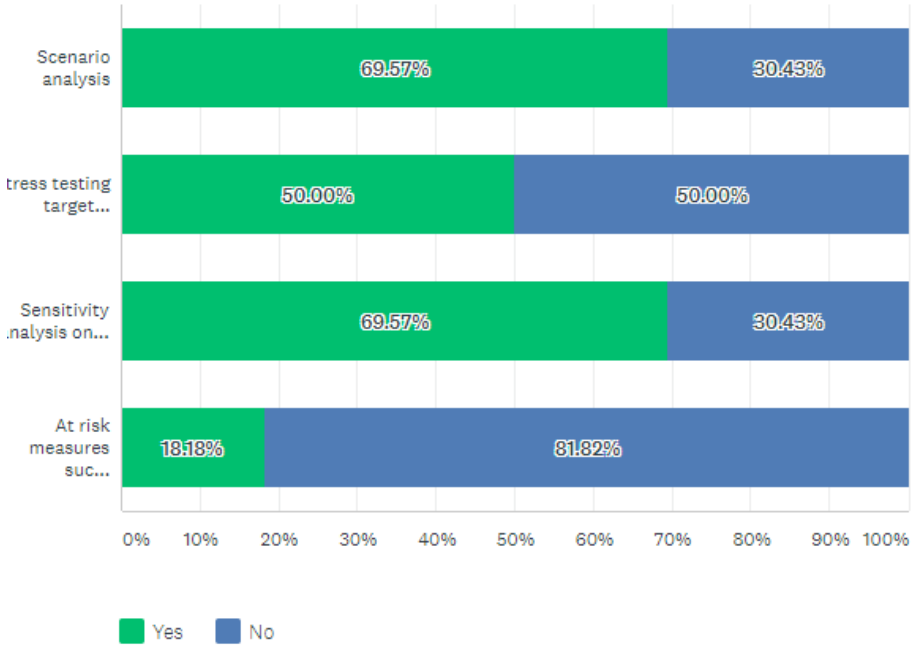



The distribution of the scores shows that all firms feel that exchange controls and regulations hamper the business. The highest number of firms scored 5. A sign of concern is the absence of scores from 6 to 10. The World Economic Forum world competitiveness report ranks South Africa 84th out of 140 in regard to 'Burden of government regulation'. [20] This ranking is consistent with the results from this question. Also, the Deloitte 2017 Global Corporate Treasury Survey indicates that 52% of the firms feel a general increase in hedging (and funding) costs due to regulatory reforms which is in line with the view of the AMNCs.

[19] Deloitte Corporate Risk Management: Challenges in sub-Saharan Africa 2013 by Michael Ketz, Lex Kriel and Paul Verhoef

[20] www3.weforum.org/docs/.../05FullReport/TheGlobalCompetitivenessReport2018.pdf

Question 15: **What risk monitoring tools are you using?**

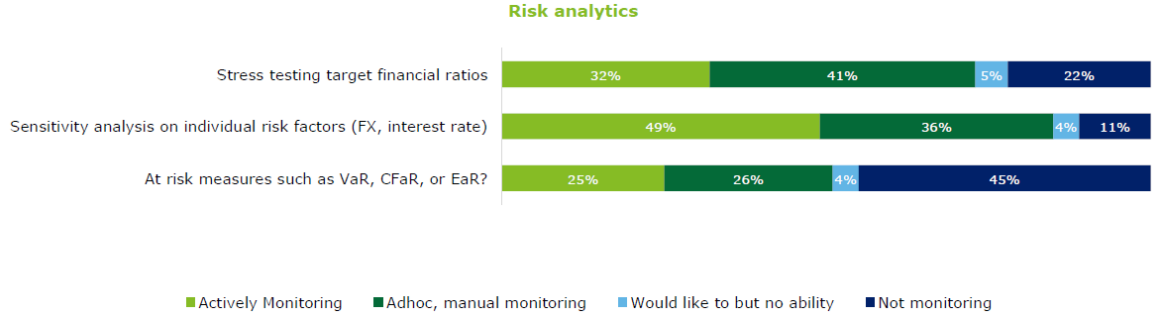



The survey results show that 69.57% of the firms use scenario analysis and sensitivity analysis on individual for risk management purposes. Both risk montioring tools are related and hence we compare this percentage against the percentage from the Deloitte 2017 Global Corporate Treasury Survey Report which shows 85%. 50% of the firms surveyed use the stress testing whilst the Deloitte 2017 Global Corporate Treasury Survey Report shows 73% is also above the survey score. The value at risk measures score of 18.18% is also lower than the score from the Deloitte 2017 Global Corporate Treasury Survey Report which shows 51%.

The comparison of these scores indicates that the global sample is using the risk monitoring tools more frequently than the survey sample of firms which leads to the conclusion that risk management is more important on a global level than on the local South African level.

The table below shows the results from the Deloitte 2017 Global Corporate Treasury Survey.

*Table 34: Deloitte 2017 Global Corporate Treasury Survey: Distribution of the exchange control and regulations scores*



Question 16: **How many financial institutions are you dealing with on a regular basis in regards to your hedging needs?**


A tier 1 financial institution is defined as a core relationship bank which can also be part of syndicated facilities. A tier 2 financial institution is engaged for occasional dealings but is not part of syndicated facilities.

95.83% of the firms use two or more relationships. 83.83% of the firms use more than 4 relationships. These results are consistent with Lebata (2018) where 68% of the firms use 3 or more banking partners. He reported that 84% of the mult-national firms use more than 3 banking partners.

*Table 35: Lebata (2018): Number of banking partners concluding foreign exchange deal*

| # | Answer Options | % |
|---|---|---|
| 1 | 1 | 12% |
| 2 | 2 | 14% |
| 3 | 3 | 6% |
| 4 | more than 3 | 68% |
| | Total | 100% |

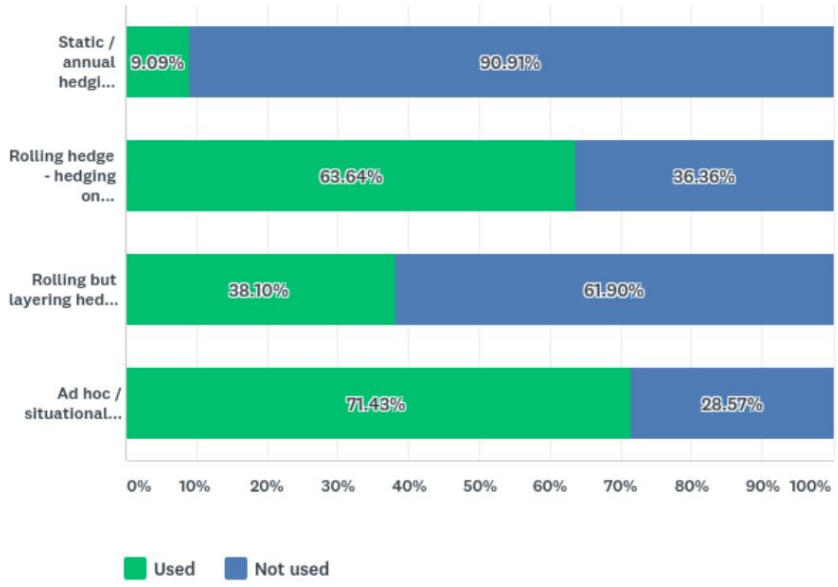
The results suggest that the firms are using multiple financial institutions for comparative purposes or in a bidding process to achieve the best prices for the various financial instruments.

Lebata (2018) also investigated how many banks are providing liquidity to the firms throug multi-bank trading platfroms. The results are consistent with the responses for the number of banking partners.

*Table 36: Lebata (2018): Number of banks providing liquidity to firms over a multibank trading firm*

| # | Answer Options | % |
|---|---|---|
| 1 | 1 - 2 providers | 34% |
| 2 | 3 - 5 providers | 39% |
| 3 | More than five providers | 27% |
| | Total | 100% |

## Question 17: **Please state your primary derivative hedging strategy**

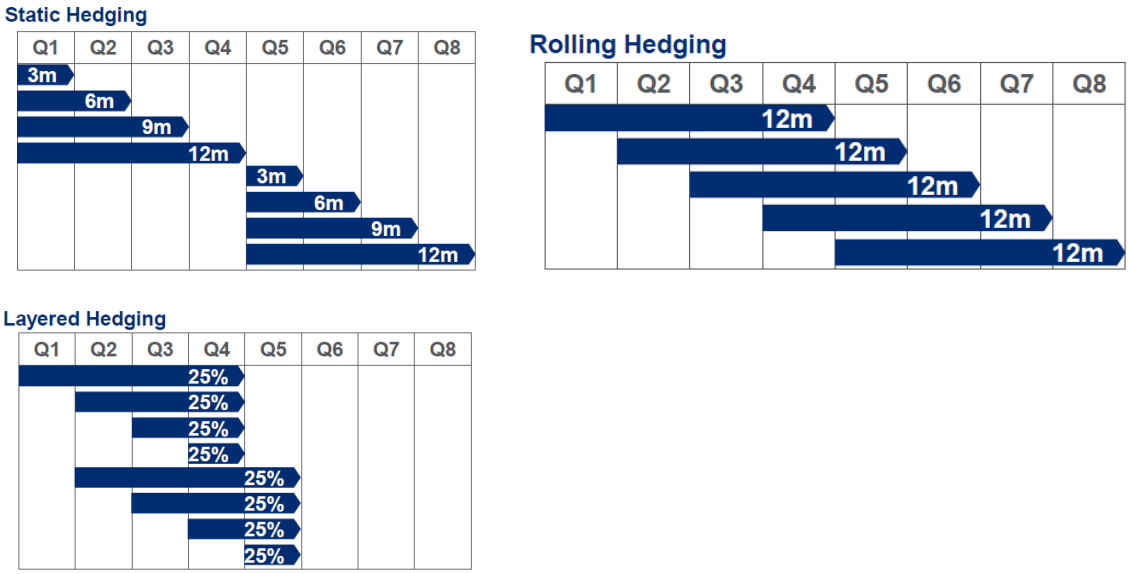



The two most common hedging strategies are 'rolling hedges' and 'Ad hoc / situational with 63.64% and 71.43%, respectively.

The static hedging protects the annual budet by implementing at hedge at one single point in time.The rolling program implements hedges throughout the year as new information and forecasts available. It provides predictability for the future transactions. Finally, the layered hedging mechanism is similar to the rolling hedge but with the difference that the hedge ratio is built-up over time. The graphs below have been extraced from a Citi Bank breakfast event in 2016.[21]

[21] Citi RAM Network Breakfast - Outlook for South Africa in 2016

*Table 37: Citi RAM Network Breakfast: Types of hedging strategy*




The Citi Bank USDZAR back-testing for cash-flow purposes using the dataset from Sep 2000 to Sep 2015 shows the best performance for layered hedging. The two graphs below show the 3- and 6-months programs, respectively. In both cases the layered program performs best in regard to the worst case 'effective rate' and the 'Value at Risk'.

*Table 38: Citi RAM Network Breakfast: 3 months hedging program*

| 9/2000 to 9/2015 | Unhedged | 3m Rolling | 3m Layered | 3m EWS Layered | 3m EWS Forward Layered |
|---|---|---|---|---|---|
| Avg. Effective Rate | 8.2493 | 8.2902 | 8.2776 | 8.2655 | 8.2764 |
| Best Case | 12.7% | 13.5% | 9.1% | 9.9% | 9.9% |
| Worst Case | (19.1%) | (19.4%) | (10.7%) | (21.3%) | (21.2%) |
| VaR (95%) | (9.6%) | (9.7%) | (5.1%) | (6.3%) | (6.8%) |
| St. dev. (1m) | 5.0% | 5.0% | 2.9% | 4.1% | 4.0% |

*Table 39: Citi RAM Network Breakfast: 6 months hedging program*

| 9/2000 to 9/2015 | Unhedged | 6m Rolling | 6m Layered | 6m EWS Layered | 6m EWS Forward Layered |
|---|---|---|---|---|---|
| Avg. Effective Rate | 8.2493 | 8.3502 | 8.3136 | 8.2770 | 8.2980 |
| Best Case | 12.7% | 13.6% | 5.4% | 9.0% | 7.5% |
| Worst Case | (19.1%) | (19.7%) | (8.1%) | (10.7%) | (15.0%) |
| VaR (95%) | (9.6%) | (9.7%) | (3.5%) | (6.2%) | (7.1%) |
| St. dev. (1m) | 5.0% | 5.1% | 2.1% | 3.6% | 3.7% |

We compare the results with Lebata (2018) who asked the same question to a larger sample of firms including firm that are not listed on the Johannesburg Stock Exchange.

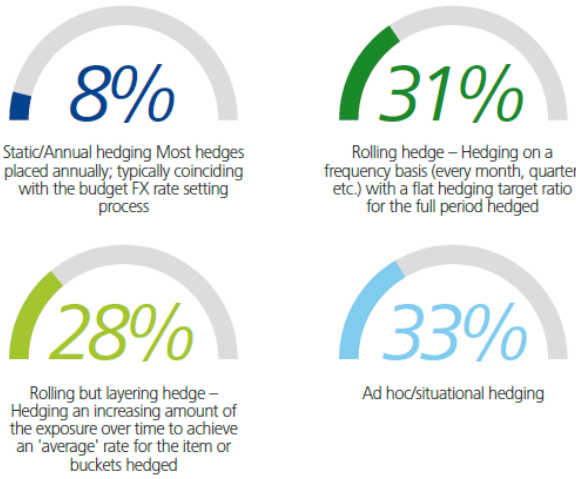
The answer 'Used' in our survey is compared with the scores of 'Mostly' and 'Always' and the answers are relatively consistent. Only the Ad hoc / situational hedging shows a far higher 'Used' percentage in our survey compared to Lebata (2018).

*Table 40: Lebata (2018): Survey scores on hedging mechanisms*

| # | Answer Options | Rarely | Sometimes | Mostly | Always | Total |
|---|---|---|---|---|---|---|
| 1 | Static/annual hedging (most hedges placed annually; typically coinciding with the budget FX rate-setting process) | 73% | 13% | 7% | 7% | 100% |
| 2 | Rolling Hedge – hedging on a frequency basis (per week, month, quarter, etc.) | 24% | 11% | 35% | 30% | 100% |
| 3 | Rolling but layering hedge – hedging an increasing amount of exposure over time to achieve an 'average' rate for item or buckets hedged | 32% | 25% | 32% | 11% | 100% |
| 4 | Ad hoc/situational hedging | 16% | 36% | 21% | 27% | 100% |

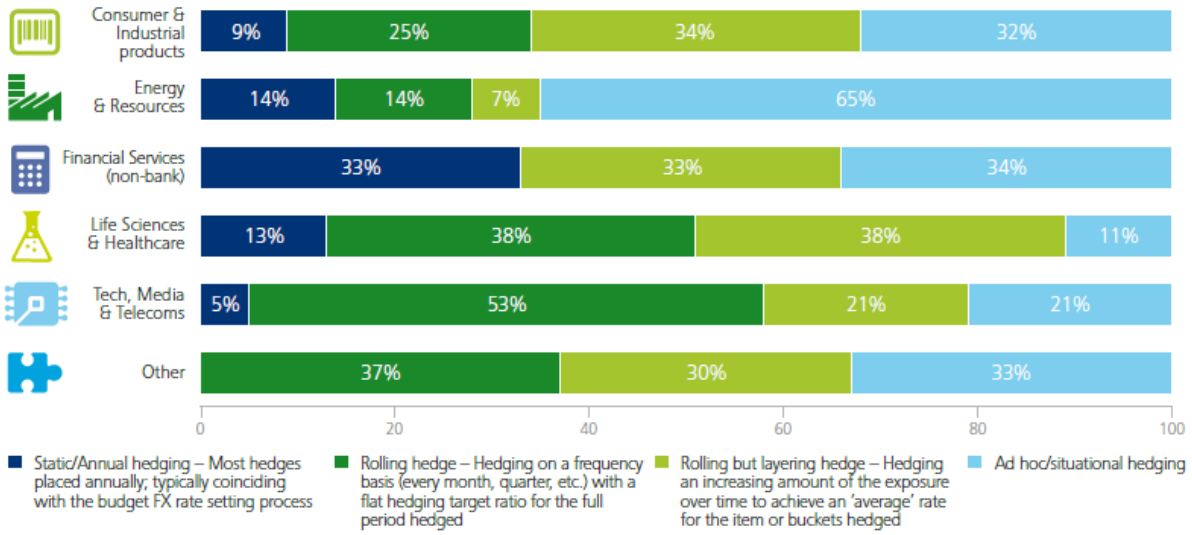
The Deloitte 2016 Global Foreign Exchange survey indicates that 59% of the firms use a rolling hedging as the primary derivative hedging strategy. 31% use a flat hedge ratio whilst 28% use some form of layering. The advantages of rolling hedges are reduced volatility between the periods, i.e. most often quarters, and the continuous, i.e. rolling, visibility of the hedges. The static hedging does not offer these advantages.

*Table 41: Deloitte 2016 Global Foreign Exchange Survey – primary derivative hedging strategy*

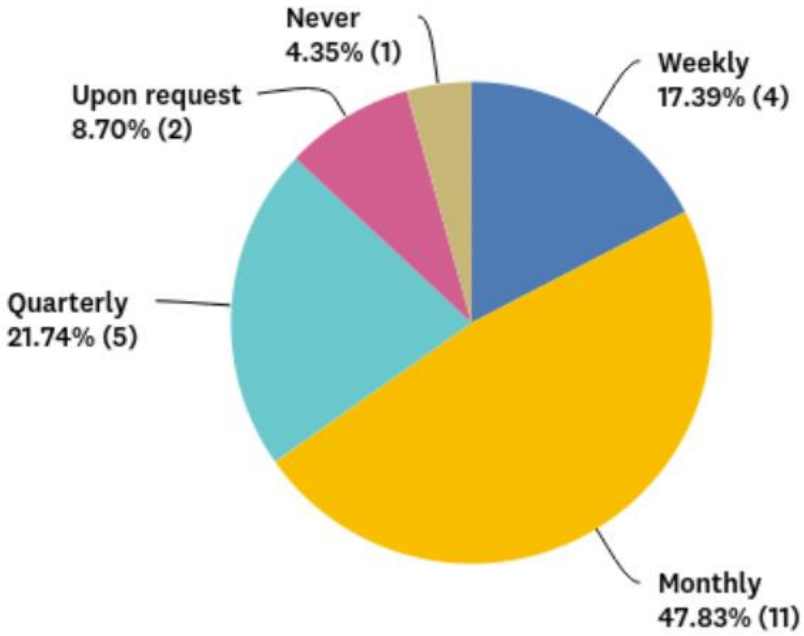



In addition, the Deloitte 2016 Global Foreign Exchange survey provides more detailed insights per industry. Excluding the Financial Services (non-bank) the static / annual hedging is rarely used by global firms. The rolling hedge is the most frequently used primary derivate hedging strategy. The ad-hoc score varies from 11% to 65%. All these results confirm our findings from the survey.

*Table 42: Deloitte 2016 Global Foreign Exchange Survey – Primary hedging*

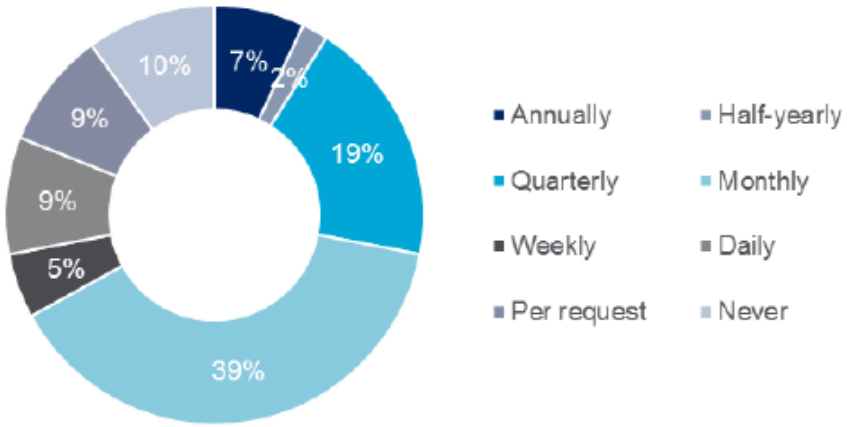



Question 18: **What is the frequency of hedge performance analysis?**

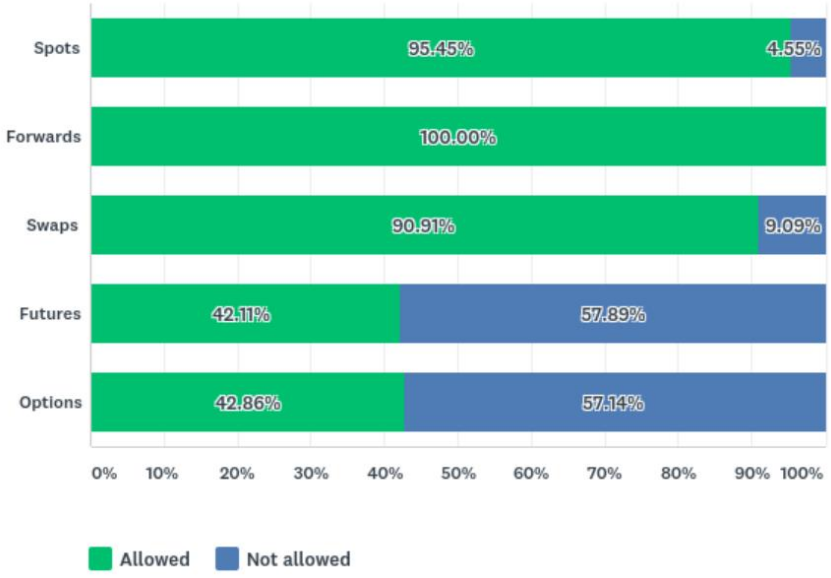



65.22% of the firms analyse the hedging performance on a weekly or monthly basis. Unsurprisingly only 13.15% perform the analysis upon request (2 firms) or never (1 firm). The Citi Treasury Diagnostics observations show that 58% of the firms analyse the hedging performance on a weekly or monthly basis which is relatively close to our results. Similar to our results, 19% perform the analysis upon request or never.

*Table 43: Citi Treasury Diagnostics: Managing FX risk in turbulent times (2017): Frequency of assessment*



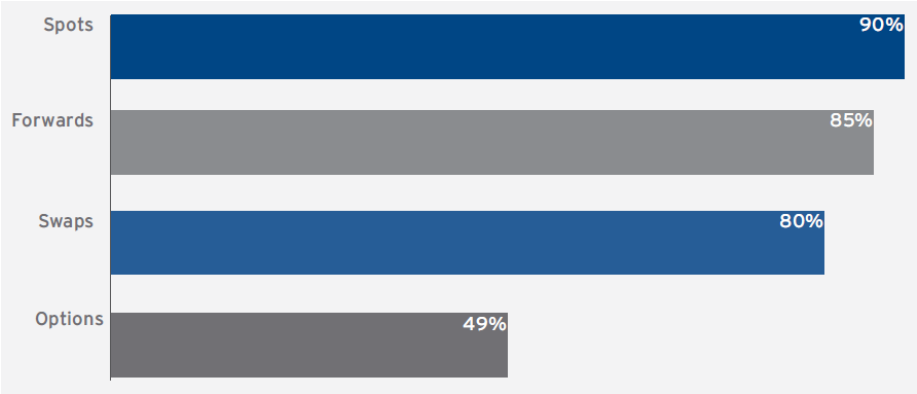

Question 19: **What policy permitted financial categories of financial instruments are you using?**



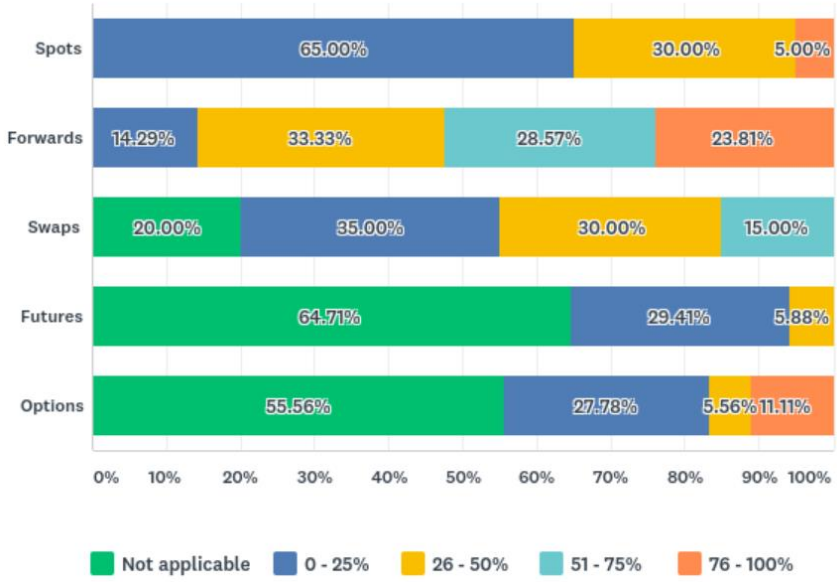

The responses show that the basic financial instruments for exchange rates (spots and forwards) and interest rates (swaps) are permitted. The characteristic of these basic financial instruments is that they are not geared. Only around 40% of the firms allow geared and therefore higher risk financial instruments (futures and options). This is consistent with the use of derivatives as shown in the responses for the following question.

The Citi Treasury Diagnostics observations in the 2016 report – Managing FX risk in turbulent times show slightly lower percentage of permitted financial instruments. However, the Citi observations confirm our survey results.

*Table 44: Citi Treasury Diagnostics: Managing FX risk in turbulent times (2016) – Policy permitted financial instruments*




Question 20: **Please distribute your use of basic hedging instruments according to the table below**




The results show that all firms use spots and forwards. 100% of the firms use spots and forwards. 80% of the firms use swaps and the use of futures drops down to 35%, the use of options is 45%. These results are higher than what Bartram et al (2011) registered. Their results show that across all 47 countries, 60.5% of the firms in the sample use at least one type of derivative. Exchange rate derivatives are the most common with 45.5%, followed by interest rate derivatives with 33.1% and commodity price derivatives 9.8%. Forward contracts are the most frequently used exchange rate derivatives, whereas swaps are the instrument of choice for interest rate derivatives. The specific result for South Africa shows 89.1% use of derivatives, e.g. forwards. This is the 3rd highest use of derivatives amongst the 47 countries and is consistent with my survey results. Lebata (2018) indicates that 80% of the firms surveyed use foreign exchange forwards. Swaps are the 2nd most used instrument at 59%. Only 33% of the firms use complex derivatives such as options and variants of options. These results are in line with our responses.

*Table 45: Lebata (2018): Foreign exchange instruments used*

| # | Answer Options | Yes | No | N/A - No FX hedging done | Total |
|---|---|---|---|---|---|
| 1 | FX forwards | 80% | 3% | 17% | 100% |
| 2 | FX options (vanilla, collars, straddles, etc.) | 33% | 50% | 17% | 100% |
| 3 | FX swaps | 59% | 24% | 17% | 100% |

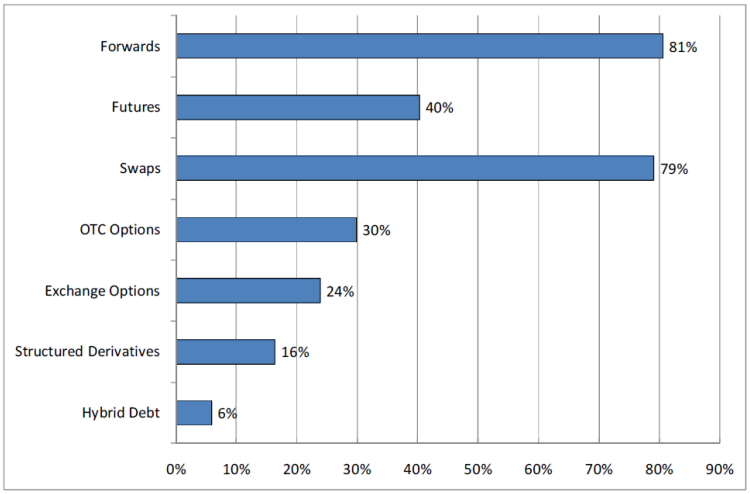
The survey by Loderer and Pichler (2000) shows that 81% of the Swiss firms surveyed do use forwards on a regular basis. Generally, the Swiss firms are less active users of derivative products.

*Table 46: Frequency of derivatives use by Swiss firms*

| | Frequency of use | $\chi^2$ – comparison test (confidence level) |
|---|---|---|
| Forwards | 81% | – |
| Swaps | 45% | > 0.99 |
| Options | 28% | > 0.99 |
| Futures | 15% | > 0.99 |

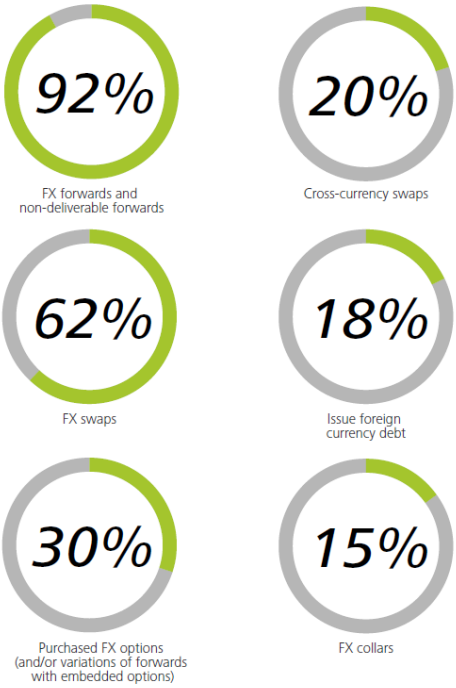
The survey by Brunzell, Hansson, Liljeblom (2009) shows that 81% of the Nordic firms surveyed do use forwards on a regular basis. This is exactly the same number as for the Swiss firms but lower than the result from my survey. The use of swaps is very similar to the results from my survey. The use of futures is slightly higher. However, the use of options is lower than what I found from our survey. The use of structured derivatives, i.e. complex derivatives is lower than in the case of our survey.

*Table 47: Frequency of derivatives use by Nordic firms*

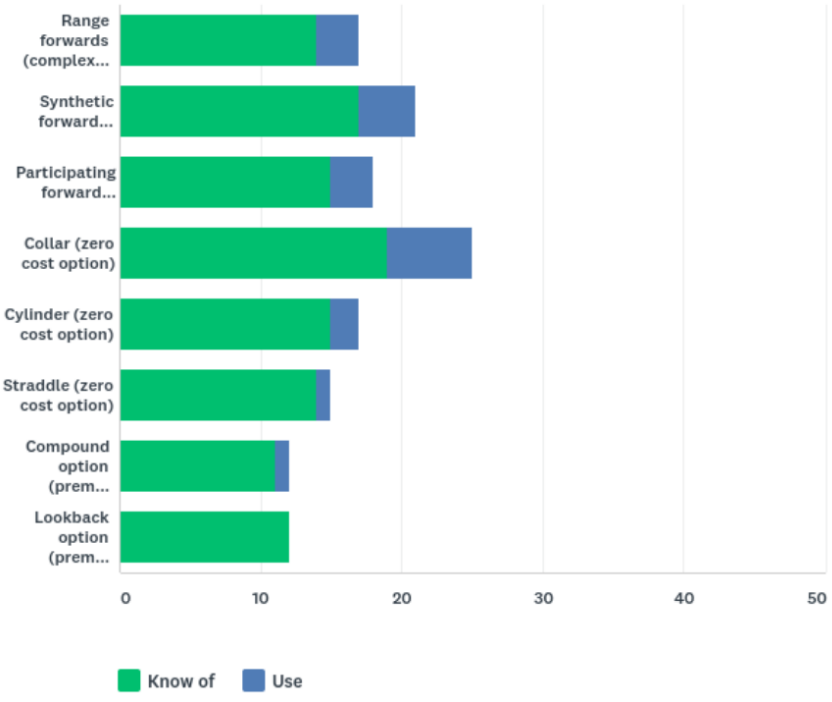



The Deloitte 2016 Global Foreign Exchange survey shows that the vast majority of products used are forwards and swaps. Only 33% use options. These results are also in line with our findings.

*Table 48: Deloitte 2016 Global Foreign Exchange survey: Foreign exchange instruments used in hedging programmes*



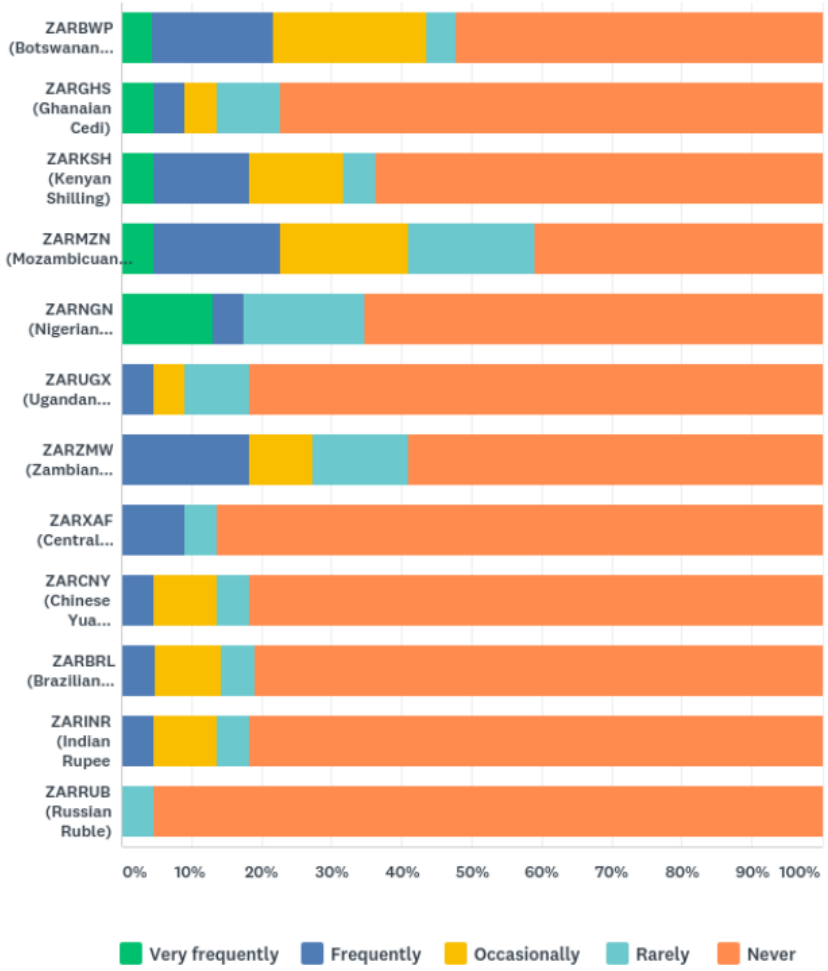

Question 21: **Do you know of and use any of the following hedging instruments?**




50% of the respondents know of all complex derivatives listed in the question. However, there is very little use of such complex derivatives. Through our discussions with treasury departments is was mentioned that the cost and more importantly the lack of understanding on board level were the main reasons for not using more complex

derivatives. The most popular complex derivative is the collar option. Only one SAMNC used compound options related to purchasing fuel.

Question 22: **Please qualify the use of your most important 'developing' currency pairs that you use (frontier and BRICS markets)?**




The firms' use of developing and BRICS[22] currency pairs reach a maximum 22.73% for the Mozambican Metical when using a combined score of 'Very frequently' and 'Frequently'. The table below shows the percentages from the table above.

[22] BRICS stands for Brazil, Russia, India, China and South Africa

*Table 49: African currency pairs used when hedging the foreign exchange risk*

| | VERY FREQUENTLY | FREQUENTLY | OCCASIONALLY | RARELY | NEVER |
|---|---|---|---|---|---|
| ZARBWP (Botswanan Pula) | 4.55% | 18.18% | 22.73% | 4.55% | 50.00% |
| ZARGHS (Ghanaian Cedi) | 4.76% | 4.76% | 4.76% | 9.52% | 76.19% |
| ZARKSH (Kenyan Shilling) | 4.76% | 14.29% | 14.29% | 4.76% | 61.90% |
| ZARMZN (Mozambicuan Metical) | 4.76% | 19.05% | 19.05% | 19.05% | 38.10% |
| ZARNGN (Nigerian Naira) | 13.64% | 4.55% | 0.00% | 18.18% | 63.64% |
| ZARUGX (Ugandan Shilling) | 0.00% | 4.76% | 4.76% | 9.52% | 80.95% |
| ZARZMW (Zambian Kwacha) | 0.00% | 19.05% | 9.52% | 14.29% | 57.14% |
| ZARXAF (Central African Franc) | 0.00% | 9.52% | 0.00% | 4.76% | 85.71% |
| ZARCNY (Chinese Yuan Renminbi) | 0.00% | 4.76% | 9.52% | 4.76% | 80.95% |
| ZARBRL (Brazilian Real) | 0.00% | 5.00% | 10.00% | 5.00% | 80.00% |
| ZARINR (Indian Rupee | 0.00% | 4.76% | 9.52% | 4.76% | 80.95% |
| ZARRUB (Russian Ruble) | 0.00% | 0.00% | 0.00% | 4.76% | 95.24% |

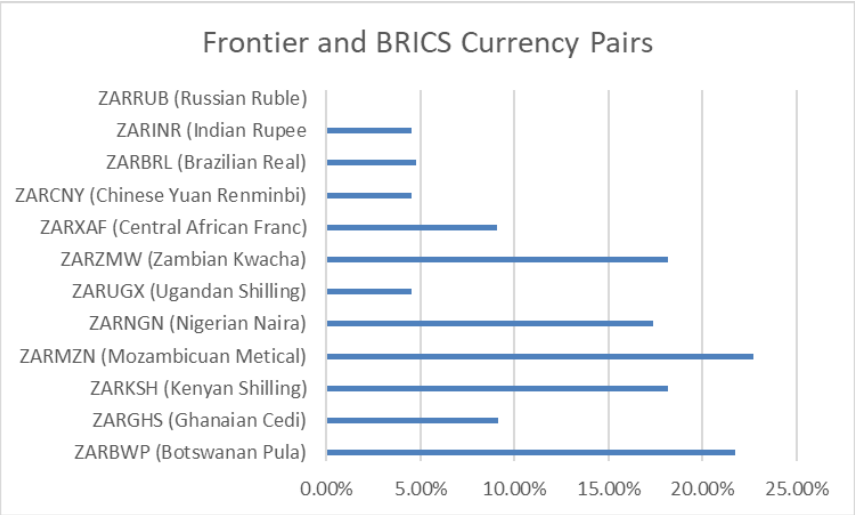
Unsurprisingly the Nigerian Naira is the currency with the highest score in the category ‘very frequently’. Nigeria is the largest economy in sub-Saharan Africa and South Africa is the second largest economy in sub-Saharan Africa.

The very infrequent use of developing currency pairs from a South African perspective was one of the big surprises from our survey although Barclays stated in its African currency analysis[23] in April 2016 that ’most corporate entities across Sub Saharan Africa may have a bias towards the use of spot transactions over any hedging solutions’. The survey included eight African currency pairs with the South Africa Rand being the base currency and the four Brazil-Russia-India-China (BRICS) currency pairs with the South African Rand being the base currency. The hedging g gg against the volatility of sub-Saharan currencies presents an excellent risk management tool. The explanation for the infrequent use lies probably with the high cost of derivative instruments and the fact that the South African Rand is also very volatile.

The South African based financial institutions are trying to develop risk management solutions for the African currencies listed in the table. However, there seems to a major gap between what the financial markets offer and what the African multinationals require. The African multinationals do not require the breadth and depth of instruments that the financial institutions offer or the instruments available do not fit the requirements of the African multinationals. These responses contradict the rather sophisticated risk management mechanisms applied.

[23] Barclays Presentation to AbInBev in Johannesburg in April 2016

*Table 50: Combined score of 'Very frequently'' and 'Frequently'*




China is South Africa's largest trading partner as per the table below from the Worldbank. However, the currency pair South African Rand (ZAR) – Chinese Yuan Renminbi (CNY) is only 'Frequently' used by one company. Two firms use it 'Occasionally' and one firm 'Rarely'. This leads to the conclusion that either the firms surveyed do not import or export from and to China or that the available financial instruments do not fit the firms' requirements. Of course, the selection of survey participants focussed on the AMNCs operating in Africa.

*Table 51: South Africa's top export and import partners in 2016*[24]

South Africa top 5 Export and Import partners

| Market | Trade (US$ Mil) | Partner share(%) |
|---|---|---|
| China | 6,812 | 9.19 |
| United States | 5,474 | 7.39 |
| Germany | 5,260 | 7.10 |
| Unspecified | 4,149 | 5.60 |
| Botswana | 3,712 | 5.01 |

| Exporter | Trade (US$ Mil) | Partner share(%) |
|---|---|---|
| China | 13,537 | 18.11 |
| Germany | 8,817 | 11.80 |
| United States | 4,978 | 6.66 |
| India | 3,104 | 4.15 |
| Saudi Arabia | 2,836 | 3.79 |

We collected the available derivative products from the financial institutions in South Africa and created the table below. The products include over-the-counter products (forwards, options and swaps) issued by commercial banks and exchanged traded products (spots and futures) on the Johannesburg Stock Exchange. Today the Johannesburg Stock Exchange is the only stock market in sub-Saharan Africa that offers currency derivative products (futures). The Nairobi Stock Exchange (NSE) plans the introduction of currency derivatives during the course of 2019.

The table shows a relatively broad range of derivative instruments, mainly forwards though, across the sub-Saharan markets. There is a clear mismatch between what the financial institutions offer and what the AMNCs require. Generally, AMNCs do not

[24] The statistics were retrieved from the World bank's World Integrated Trade Solution https://wits.worldbank.org

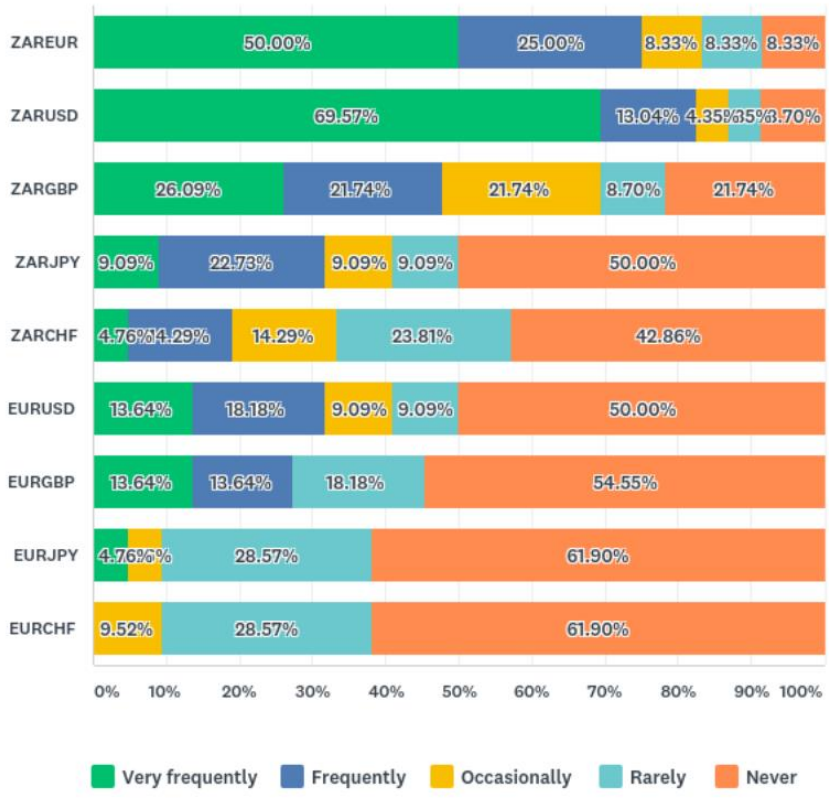
require options and futures for developing currencies. Forwards are only used for short tenures. We conclude that there's a great potential to expand the use of the available products, but it requires substantial prior education of the treasury departments.

*Table 52: Derivative products offer by South African financial institutions*

| Country | Spots | Forwards | Options | Futures | Swaps |
|---|---|---|---|---|---|
| Angola | | | | | |
| Botswana | | | | | |
| DRC | | | | | |
| Ghana | | | | | |
| Ivory Coast | | | | | |
| Kenya | | | | | |
| Lesotho | | | | | |
| Malawi | | | | | |
| Mauritius | | | | | |
| Mozambique | | | | | |
| Namibia | | | | | |
| Nigeria | | | | | |
| South Africa | | | | | |
| Swaziland | | | | | |
| Tanzania | | | | | |
| Uganda | | | | | |
| Zambia | | | | | |
| Zimbabwe | | | | | |

Available
Subject to liquidity
Not available

Question 23: **Please qualify the use of your most important 'developed' currency pairs that you use**

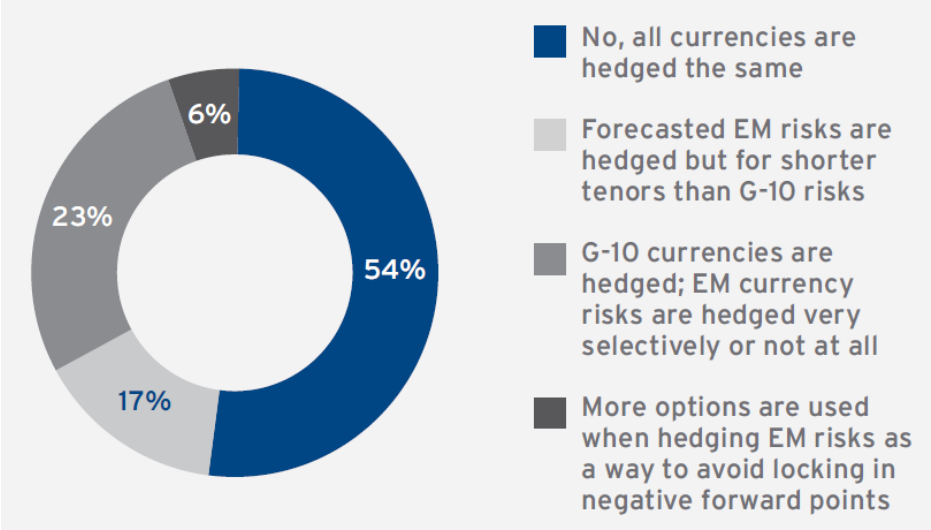



Unlike the infrequent use of developing currency pairs, some of the developed currency pairs show a far higher degree of use. Unsurprisingly the currency pair ZARUSD shows

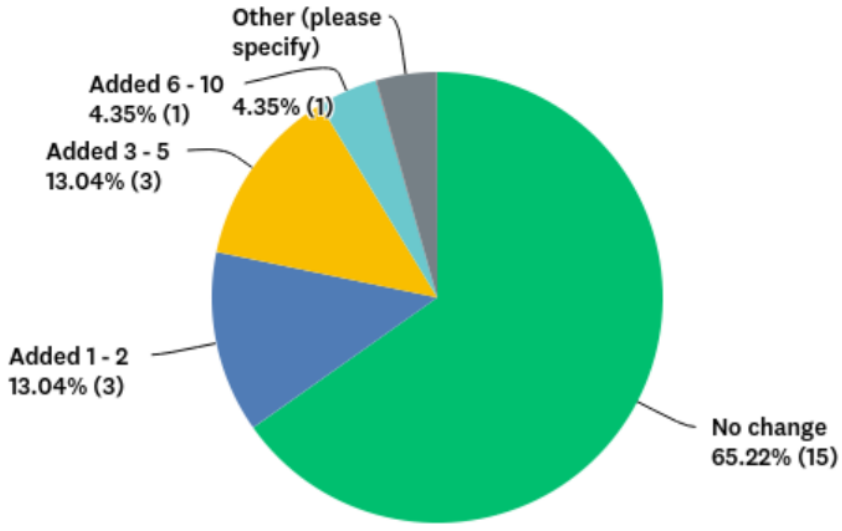
the highest combined score of very frequently and frequently use at 82.61%. The USD is still the most frequently used developed currency in sub-Saharan Africa. The currency pair ZAREUR is the second most used currency pair. The Euro is used in particular in West Africa. The European Union is the largest trading partner of South Africa.

The Citi Treasury Diagnostics observations show that more than half (54%) of the global firms treat emerging (developing) currencies in the same way as developed (G-10) currencies. Interestingly only 6% of the firms use a different strategy for emerging currencies.

*Table 53: Citi Treasury Diagnostics: Managing FX risk in turbulent times (2016): Managing EMs differently than G-10 currency risks*




Question 24: **By how many currency pairs have increased (+) or reduced (-) your hedges during the last 5 years**

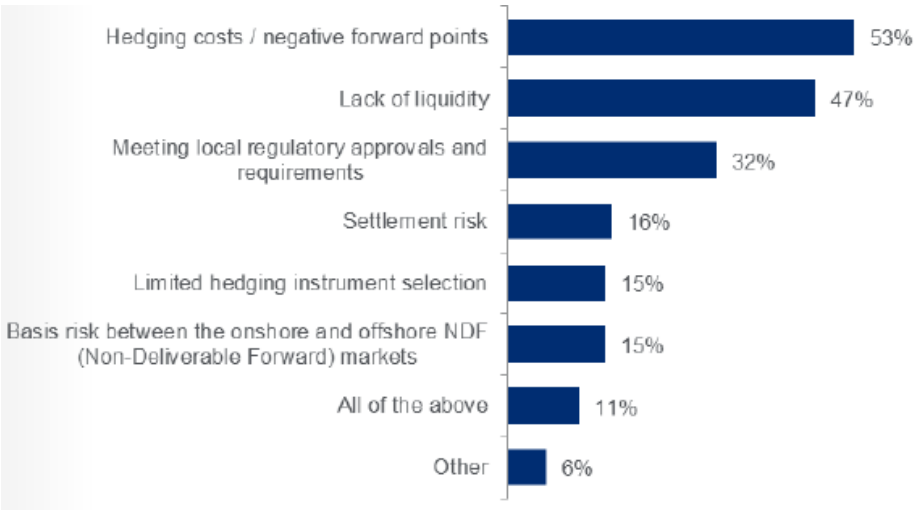



Approximately 65% of the firms have not diversified the hedged currency pairs. The question refers to developing and developed currencies. This indicates that the overall

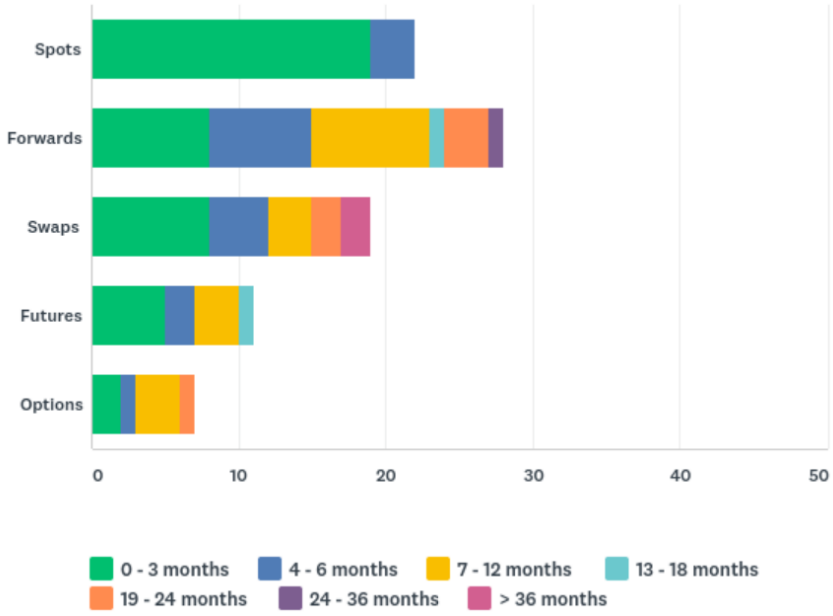
hedging approach for many firms has remained largely during the last 5 years. We understood from our interactions with the heads of treasury that the hedging cost, illiquid markets, lack of skills in treasury and lack of understanding on board level are contributing factors to the status-quo.

The Citi Treasury Diagnostics observations confirm our belief mentioned above. The observations list the key concerns related to the management of currency risks in emerging markets. The top two risks are the hedging costs at 53% and the lack of liquidity at 47%.

*Table 54: Citi Treasury Diagnostics: Managing FX risk in turbulent times (2016): Emerging markets currency risk management concerns*




Question 25: **What is the contract length or forecast range used for the basic hedging instruments (in months)?**



The results show that 0-3 months is the preferred tenure for hedging instruments. Only forwards show significant longer tenures between 4 and 12 months. We conclude that shorter transactions are hedged more often indicated by the absolute length of the 0-3 months tenure. However, this is somewhat inconsistent with the layered hedging mechanism where the maximum effect is achieved when using 6-12 months tenures.

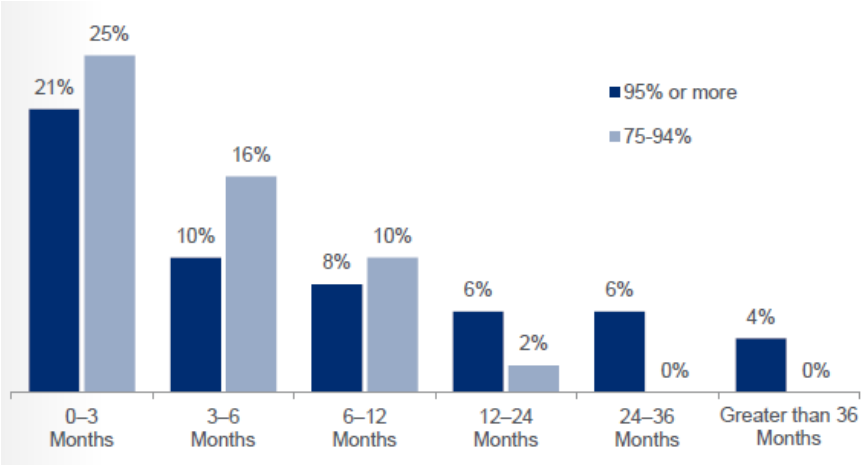
Deloitte 2016 Global Foreign Exchange survey found that firms tend to hedge shorter transactions. 83% of the firms hedge 0-3 months transactions. The table below also shows that the hedge ratio decreases with the hedge tenure.

*Table 55: Deloitte 2016 Global Foreign Exchange survey: Hedging transaction exposure*

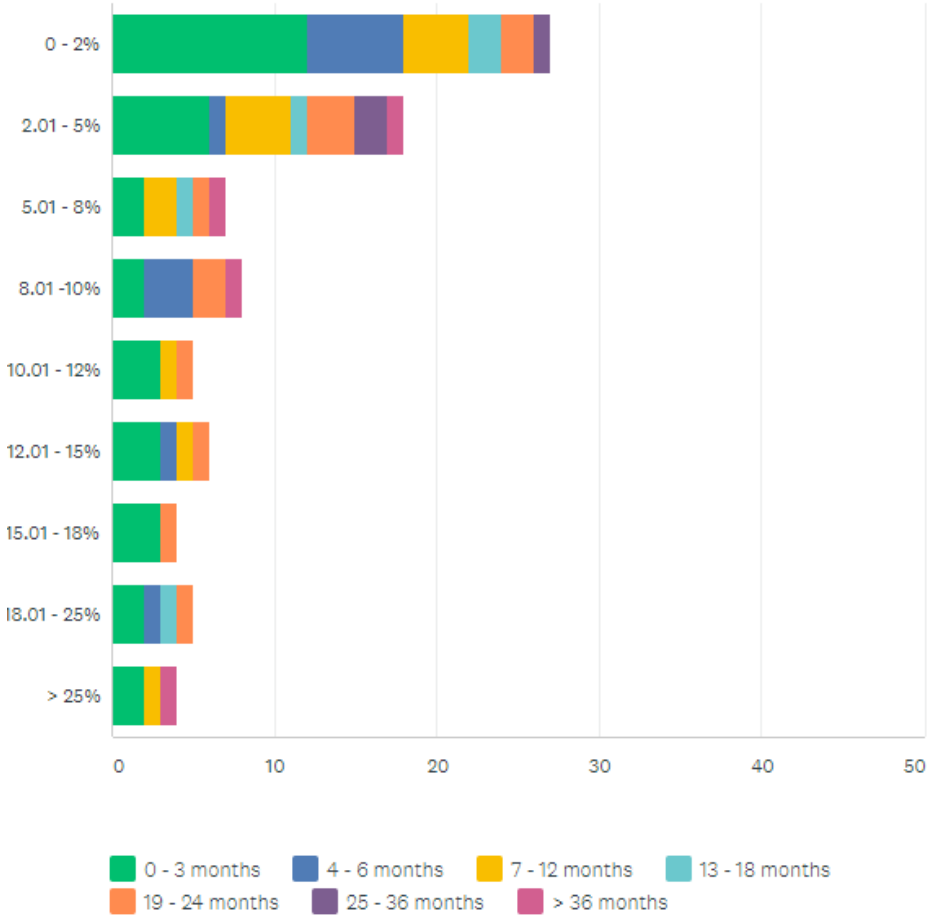
| Exposure type | Firms that hedge (%) | Avg. hedge ratio |
|---|---|---|
| Transaction exposures | | |
| Balance sheet | 80% | – |
| Forecast transactions | | |
| 0-3 Months | 83% | 68% |
| 3-6 Months | 83% | 59% |
| 6-12 Months | 77% | 50% |
| 12-18 Months | 50% | 32% |
| 18-24 Months | 37% | 22% |
| Beyond 24 Months | 29% | 18% |
| Translation consolidation exposures | | |
| Net Investment | 11% | – |
| Foreign Earnings | 8% | – |

The Citi Treasury Diagnostics observations confirm our and the Deloitte findings where the hedge ratio decreases with the forecasted transaction length.

*Table 56: Citi Treasury Diagnostics: Managing FX risk in turbulent times (2016): Proportion of forecasted exposures hedged*



Question 26: **What is the acceptable annualised hedging cost for your exposure in the function of contract length / forecast range as a percentage of the hedged amount?**




The chart clearly indicates the cost concerns where the largest number of firms expect the annualised cost for a 3 months instrument to be only slightly more expensive than the South Africa Three Month Interbank Rate (JIBAR). A cost of 2% for a 3-months hedging tenure equates to an annualised cost of 8%. Since mid-2017 the JIBAR was hovering between 7 and 7.5%. The graph below shows the JIBAR development over the past 10 years.

*Table 57: South Africa Three Month Interbank Rate, accessed on www.tradingeconomics.com on the 27th of March 2019*


The next 2.01 to 5% bracket for a 3-months hedge tenure results in an annualised range from 8 to 20% of the hedged amount. As a comparison the current discount rate used in financial models in South Africa is about 15%.

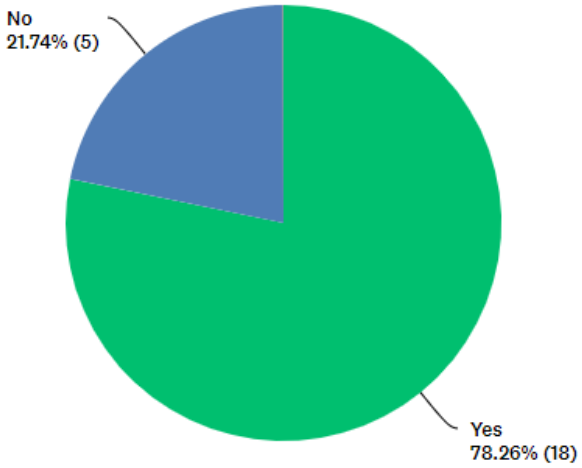
Financial institutions compare the historic currency depreciation to implied forward depreciation. The Barclays African currency analysis in April 2016 illustrates value in hedging the 3-months BWP, 12-months KES and MZN across all tenors.

*Table 58: Barclays Africa currency analysis: historic currency depreciation vs. implied forward depreciation*

| | Horizon Period | BWP | GHS | KES | MUR | MZN | NGN NDFs | TZS | UGX | ZMW |
|---|---|---|---|---|---|---|---|---|---|---|
| Historic Currency Depreciation | 3m | -9.71% | -0.53% | 1.15% | 2.83% | -18.31% | 0.05% | -0.34% | 4.60% | 17.05% |
| | 6m | 3.30% | 1.67% | 0.84% | 0.76% | -22.97% | -0.32% | 0.93% | 8.54% | 23.33% |
| | 12m | 6.57% | -0.07% | -8.12% | 2.76% | -49.99% | -0.64% | -14.30% | -10.43% | -25.23% |
| Implied Forward Depreciation (forward looking) | 3m | -0.65% | -6.49% | -1.13% | -0.43% | -3.00% | -16.32% | -2.52% | -3.57% | -8.43% |
| | 6m | -1.35% | -12.63% | -3.08% | -0.68% | -5.98% | -27.84% | -5.90% | -7.17% | -16.55% |
| | 12m | -3.38% | -24.77% | -7.10% | -1.18% | -11.92% | -47.42% | -21.18% | -13.91% | -33.26% |

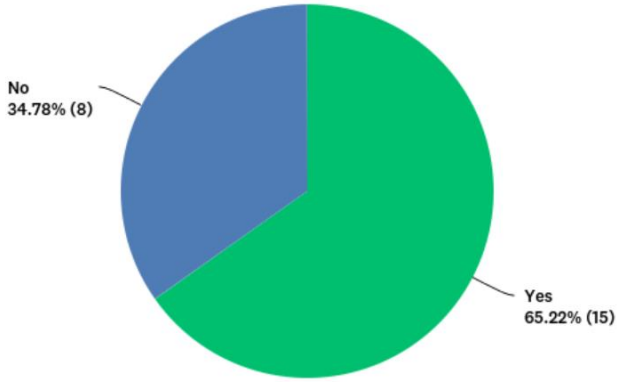
Any data on past performance, modelling, scenario analysis or back-testing contained herein is no indication as to future performance.

Question 27: **Are you using the International Swaps and Derivatives association (ISDA) master agreements for the over-the-counter (OTC) derivatives?**




Standardisation matters and discussions on board levels are much easier when standard contracts are used. The International Swaps and Derivatives association (ISDA) master agreement is a comprehensive document that can be adjusted for almost any over-the-counter derivative.

Question 28: **Is your firm applying hedge accounting according to IFRS 9 since it's optional?**



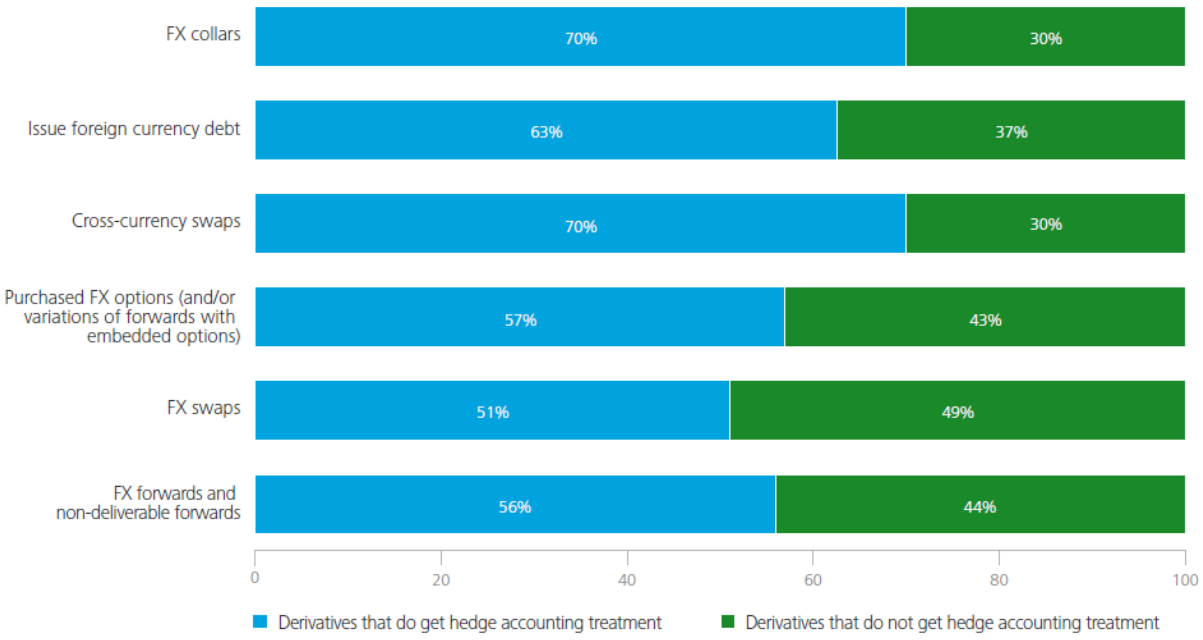

The results show that almost 65.22% of the firms apply hedge accounting. The adoption rate seems rather elevated at first glance. But, due to the recent release of IFRS 9 in January 2018 no significant studies or surveys have been concluded and the results released.

Hedge accounting is a technique that modifies the normal basis for recognizing gains and losses on associated hedging instruments or hedged items so that both are recognized in profit and loss (P&L) or other comprehensive income (OCI) in the same accounting period. The notion of 'in the same period' is of utmost importance because it

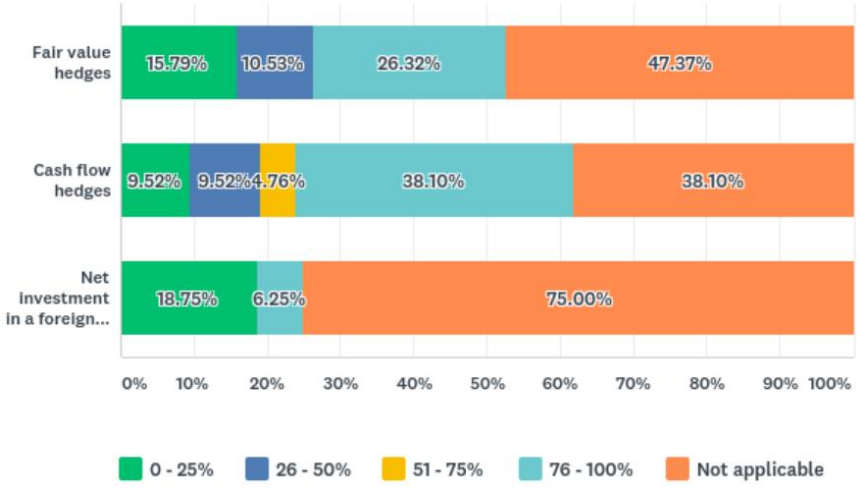
reduces or eliminates the volatility of the income statement that would arise if both, the associated hedging instrument and hedged item, were recognized separately under IFRS. IFRS distinguishes between fair value hedges, cash-flow hedges and net investment hedges. It is still necessary to determine whether the hedging relationship qualifies for hedge accounting. The firms are only allowed to apply hedge accounting if the specified qualifying criteria are met. The hedge accounting qualification is a science in itself and hence we will not delve further into the matter. The other important aspect of hedge accounting is that it's optional at this point in time. Finally, in the context of my thesis the question arises whether a parent company using the South African Rand as the functional currency can use the cash-flow hedge accounting when hedging the foreign currency revenues of its African subsidiaries on a group or holding level. The answer is no because the subsidiary's revenues are consolidated into the parent functional currency as part of a deferred cumulative translation adjustment in equity.

Deloitte 2016 Global Foreign Exchange survey examined the hedge account on a foreign exchange financial instrument level. The average of 61.16% across all instruments reflects our results of 65.22%. It's somewhat surprising that the adoption rate for forwards is lower than for foreign exchange collar or swaps because forwards are the most widely used and least complex hedging instrument.

*Table 59: Deloitte 2016 Global Foreign Exchange survey: Adoption of hedge accounting for different foreign exchange hedging instruments*



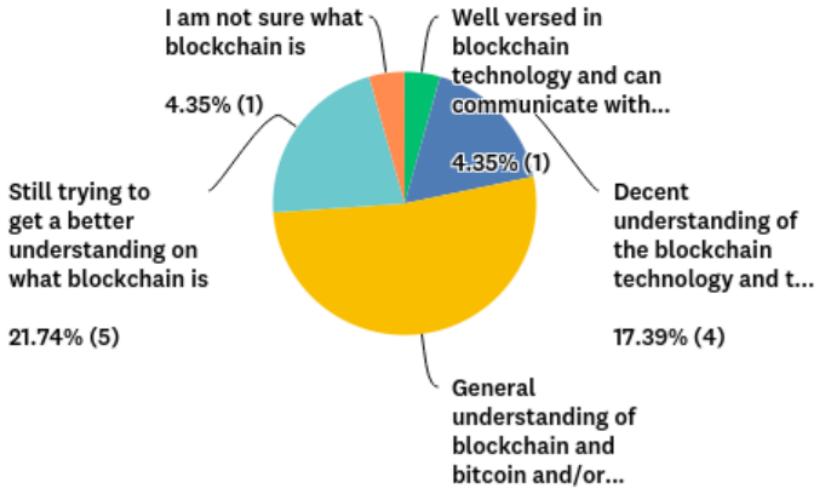
Question 29: **If you use hedge accounting, to what degree (%) are the following hedges covered by your hedge accounting?**




As mentioned above IFRS distinguishes between fair value hedges, cash-flow hedges and net investment hedges. The results show a differentiation compared to the previous question. The previous question only asked whether hedge accounting was implemented but not to what degree. Remembering that the surveyed firms indicated that the second most important objective is the de-risking of cash-flow volatility. The results show that the highest hedge accounting adoption is for cash-flow hedges. The second highest adoption is for fair value hedges which relates to the translation risk in the balance sheet.

AMNCs invest significantly in their foreign operations. Hence it's somewhat surprising, that 75% of the net investments in a foreign operation hedges are not covered by hedge accounting. But again, hedge accounting is optional at this point in time.

Question 30: **Please indicate your understanding of blockchain?**

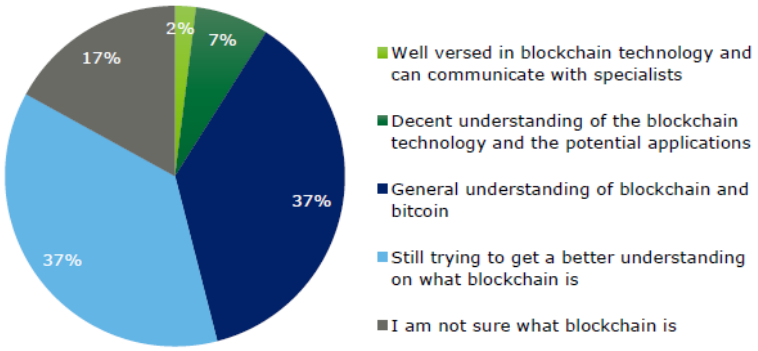


This question was reused from The Deloitte 2017 Global Corporate Treasury Survey report to get a global comparison. The results show that 52.17% of the respondents have a 'General understanding' of blockchain. Combined with the 'Decent understanding' the score reaches 69.56% which is lower than the combined score from Question 19: on the understanding of cryptocurrencies.

The table below shows the results from the Deloitte 2017 Global Corporate Treasury Survey. The combined score 'General understanding' and 'Decent understanding' reaches 44% which is far below the score of 69% from the South African firms.

This difference can be explained by a genuine better understanding of the South African respondents or some form of cognitive bias. Cognitive biases are systematic patterns of deviation from norm or rationality in judgment.

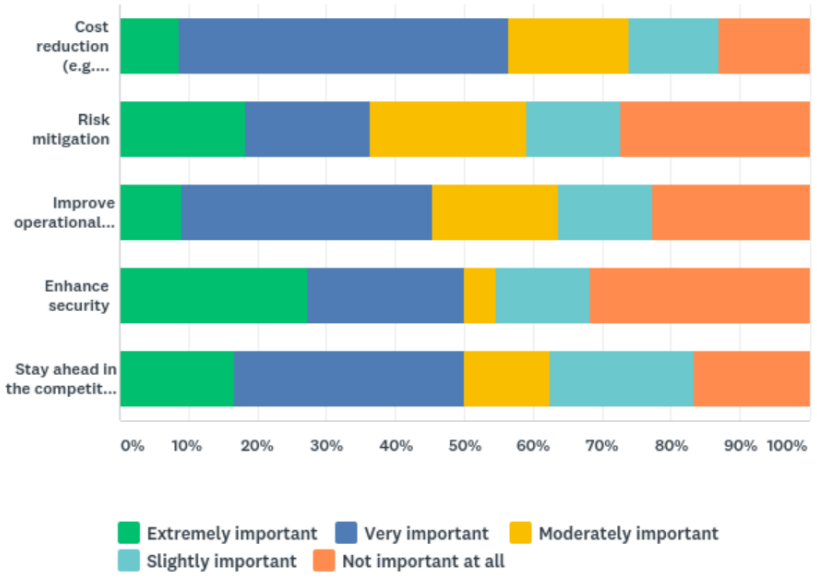
*Table 60: Deloitte 2017 Global Corporate Treasury Survey: Blockchain understanding*




Most treasurers are still firmly in the education phase when it comes to understanding Blockchain and how it will work for them. This need for a better understanding is reflected in the large number of recipients that don't see a benefit to their organisation-Treasury is a function that can immediately benefit from Blockchain technology.

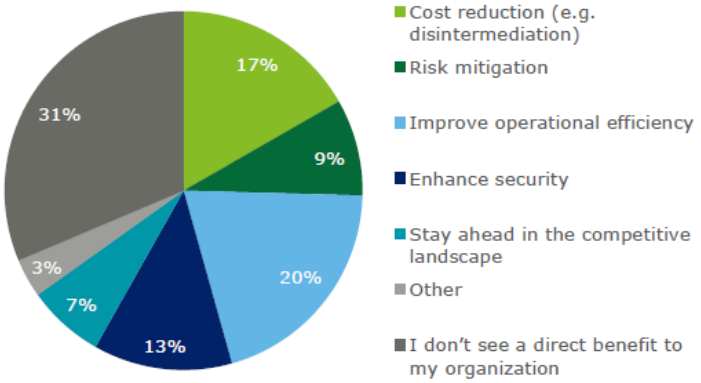
It is encouraging to see that respondents who do see a value, recognise cost reduction, operational efficiency and security as being high on the list of potential benefits. Risk mitigation is another potential benefit. However, the lower recognition could be due to the need for further education on the topic.

Question 31: **Please rank your perceived blockchain benefits (1 = most important, 6 = least important, one answer per column)?**

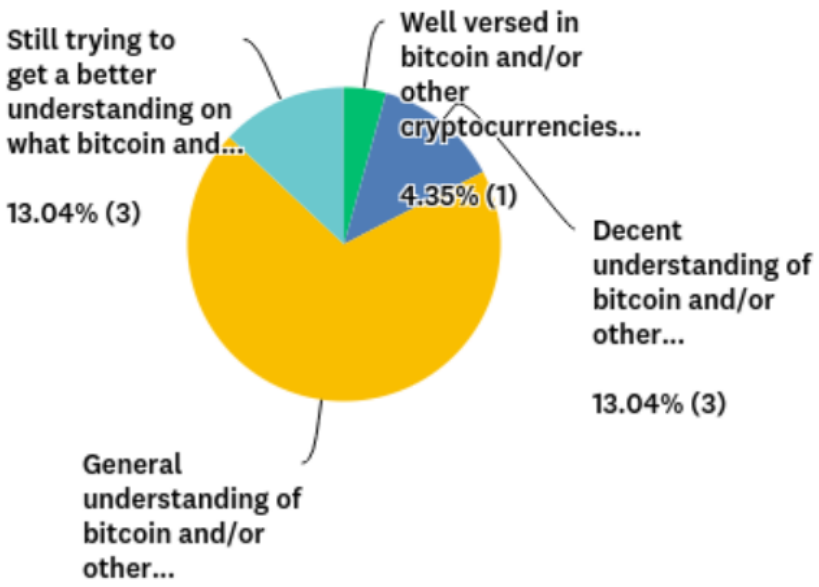



The results show that the firms perceive the cost reduction as the most important benefit with a combined score 'extremely important' and 'very important' 55%. The Deloitte 2017 Global Corporate Treasury Survey shows the second highest score. Improving operational performance is perceived to be less important unlike for the global respondents. Enhance security is equally important for the South African and global respondents. Risk mitigation scored the lowest percentage in both surveys. This is not surprising because the blockchain technology does not reduce the financial risk.

*Table 61: Deloitte 2017 Global Corporate Treasury Survey: Blockchain benefits*

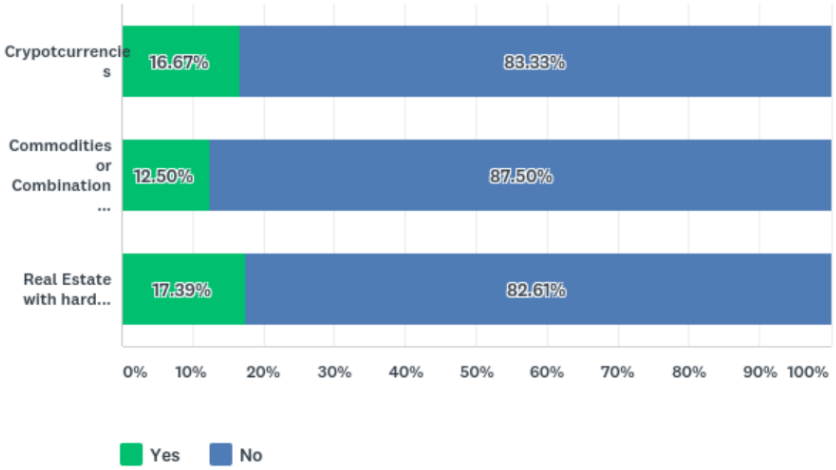


Question 32: **How good is your understanding of cryptocurrencies?**




69.57% of the respondents answer that they have a general understanding of bitcoin and/or other cryptocurrencies. The combined score of 'General understanding' and 'Decent understanding' increases to 82.16%. Whilst it's certainly encouraging that such a high percentage of respondents is familiar with cryptocurrencies, the question arises why the 'General understanding' and 'Decent understanding' of blockchain, which is the underlying technology for cryptocurrencies, only equates to 69.56%. A possible answer could be that blockchain is a technology concept and cryptocurrencies are a financial instrument. Financial instruments are obviously much closer to the heart of treasurers than technology.

Question 33: **Would you consider the following alternative instruments with a satisfactory correlation if they are readily available?**

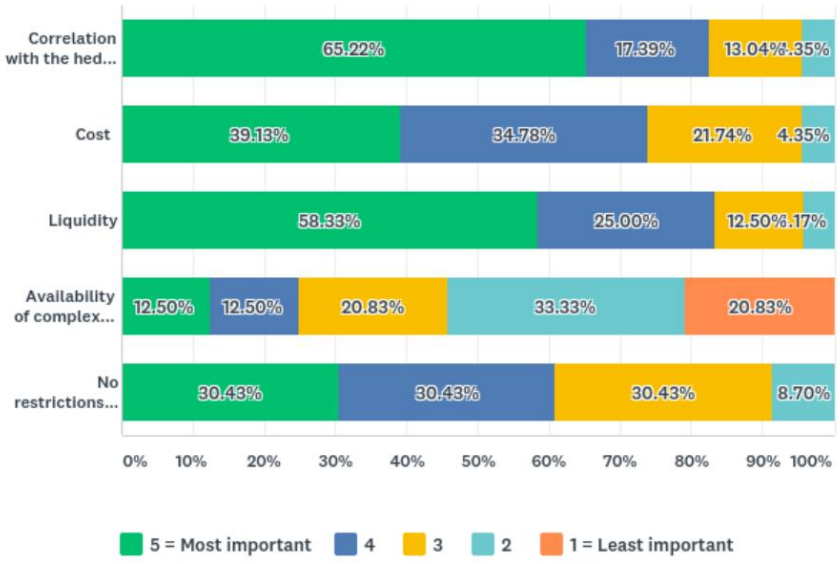


The following answer choices were given:

- Cryptocurrencies or
- Commodities or combination of currencies with a high correlation to commodities or
- Real Estate with hard currency rental contracts.

The question was more of speculative nature because all 3 answer options are outside the core business of the firms surveyed. The recent volatility in cryptocurrencies and its current performance limitations, cryptocurrencies offer very little appeal as an asset class. The option to use commodities or a combination of currencies with high a correlation to commodities is not attractive at all. Commodities are largely traded and the AMNCs would need to build up that specific competence which is rather a distraction than a focus area. Finally, real estate is not viewed favourably either. Real estate is an illiquid asset class and requires continuous management and maintenance. In addition, the ownership rights are not well protected in Africa. In conclusion the results reflect the firms' focus on the core business.

Question 34: **If you could design a novel hedging product, rank the product characteristics (5 = most important, 1 = least important, one answer per column)**




The following answer choices were given:

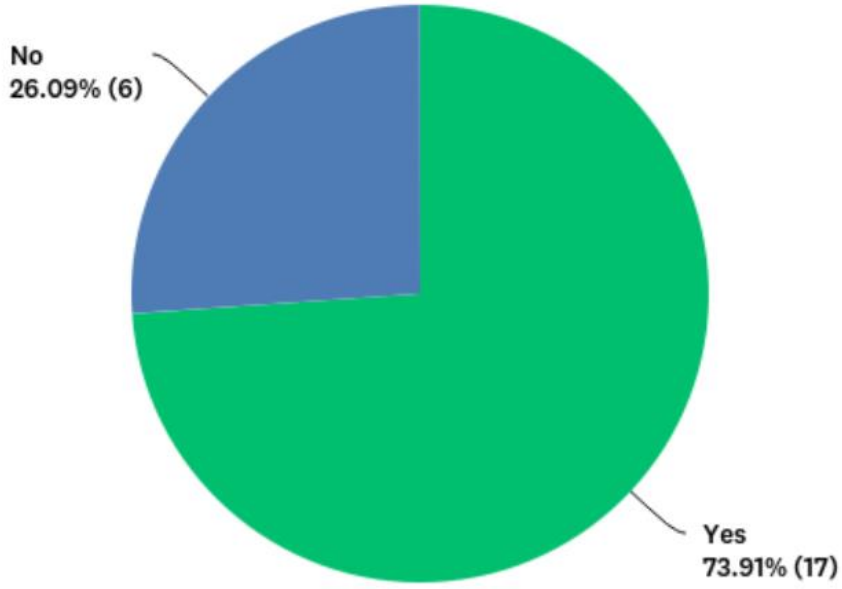
- Correlation with the hedged item or
- Cost or
- Liquidity or
- Availability of complex derivatives of the underlying product or
- No restrictions / limitations due to local and international rules and regulations.

Unsurprisingly the correlation between the hedged item / transaction and the hedging instrument and sufficient liquidity are the two most important characteristics with a combined score 5 and 4 at 83.33% and 82.61%, respectively. The availability of complex derivatives shows the lowest score at 25% which is consistent with the answers from Question 19: and Question 20: The answers to both questions indicate a moderate use of derivatives for hedging purposes.

## Question 35: **What is your firm's name or JSE ticker?**

Due to the anonymity of the survey the results are not shared.

## Question 36: **Does your management own stocks, options, warrants or convertibles issued by the firm as part of the remuneration structures?**




Stocks, options, warrants or convertibles form part of the long-term incentives (LTI). The King IV™ proposes a new LTI disclosure format comprising of the single-figure reporting table, the table of unvested LTIs and settled LTIs. Upon further analysis of the six companies which do not have LTIs in the pay mix it transpired:

- Three companies were not listed on the JSE. However, two companies were subsidiaries of multinationals. The multinationals pay LTIs on group level
- Three answers were incorrect when cross-checking the integrated annual reports

This short analysis confirms that all JSE listed companies surveyed to pay LTIs. This is in line with international practices.

## Question 37: **Please indicate the estimated share ownership for the following groups**

The accurate information was retrieved from Bloomberg based on the information from Question 35:.

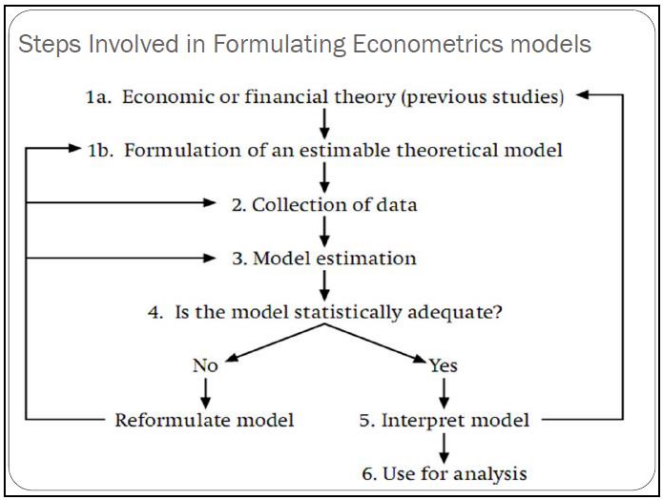
## Question 38: **Please provide the following financial information and ratios at this point in time**

The accurate information was retrieved from Bloomberg based on the information from Question 35:.

# 12 Appendix C – Steps involved in formulating an econometrics model

The six steps to formulate an econometrics model by Chris Brooks, Introductory Econometrics for Finance (2nd edition, page 9) were used to adapt existing econometrics models.

*Table 62: 6 steps involved in formulating an econometrics model*




Step 1a – Economic or financial theory is summarised in the section 2 Literature review. The literature review indeed provided a very sound basis with the study of Brunzell, Hansson, Liljeblom (2009) where the determinants for the use of derivatives, for derivatives for hedging or additional income and firm valuation were examined.

Step 1b – Theoretical model is based on the existing model from Brunzell, Hansson, Liljeblom (2009) which is outlined in the model below. The model examines cross sectional data from Nordic firms. The model for sub-Saharan Africa will be adapted accordingly.

Step 2 – Collection of data is based on our survey. The additional financial information is collected from Bloomberg.

Step 3 – Choice of estimation model

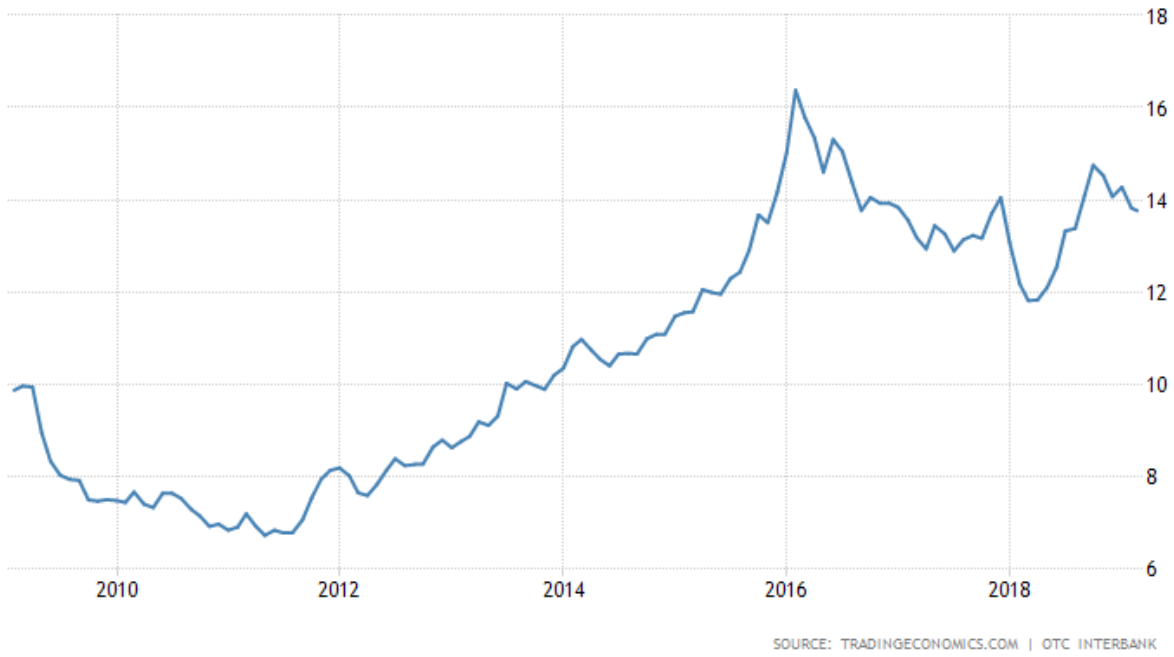
Step 4 – Statistical adequacy in based on the comparison between the results from Brunzell, Hansson, Liljeblom (2009) and the results of the regressions.

Step 5 – Evaluation of the model from a theoretical perspective

Step 6 – Use of the model for this study

# 13 Appendix D – Currency charts

USD- ZAR, accessed on www.tradingeconomics.com on the 19th of February 2019




USD – NGN, accessed on www.tradingeconomics.com on the 19th of February 2019


USD – KSH, accessed on www.tradingeconomics.com on the 19th of February 2019


110
105
100
95
90
85
80
75
70
2010
2012
2014
2016
2018
SOURCE: TRADINGECONOMICS.COM | OTC INTERBANK

# 14 Appendix E – Bloomberg definitions

The least square regressions have used the following publicly available data from Bloomberg. The definitions are given below for the use of derivatives regression.

*Table 63: Description of the variables for the regression for the use of derivatives*

| Independent variable | Description | Bloomberg terminal definition | Other data source |
|---|---|---|---|
| USE | Use of derivative instrument (yes or no) | | Survey and hedging policy described in the annual reports |
| SIZE | Logarithm natural (LN) of turnover in MZAR | LN of RR800 - TRAIL_12M_NET_SALES (Trailing 12M Net Sales) | |
| LTAS | Long term debt to total assets | RR147 – LT_DEBT_TO_TOT_ASSET | |
| MB | Market value of equity / book value of equity | Bloomberg web page | |
| DIV | Diversity | | Survey response |
| VOL | Volatility | RK610 – VOLATILITY | |
| MAN | Insider % of shares held | Bloomberg terminal security ownership | |
| BLCK | Institutional % of shares held | Bloomberg terminal security ownership | |

RR800 - TRAIL_12M_NET_SALES (Trailing 12M Net Sales)

Calculated by adding Sales/Revenue/Turnover (IS010, SALES_REV_TURN) for the last four quarters, two semi annuals, or annual. Figure is reported in millions; the Scaling Format Override (DY339, SCALING_FORMAT) can be used to change the display units for the field.

RR147 – LT_DEBT_TO_TOT_ASSET (LT Debt to Total Asset)

Measures the percentage of long-term debt to total assets. Unit: Actual.

INDUSTRIALS, BANKS, FINANCIALS, INSURANCE, UTILITIES, REITS, MUNICIPAL REVENUE

Calculated as: (Long Term Borrowings / Total Assets) * 100

Where:

- Long Term Borrowings is BS051, BS_LT_BORROW
- Total Assets is BS035, BS_TOT_ASSET

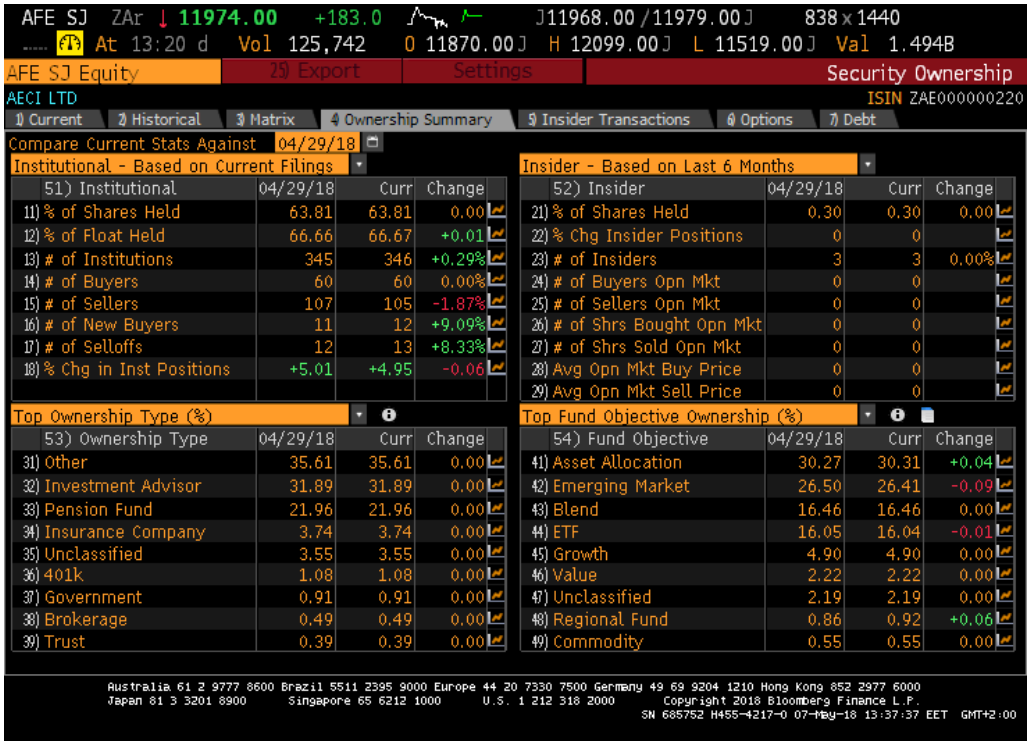
RK610 – VOLATILITY (Volatility)

Measure of risk of price moves for a security calculated from the standard deviation of day to day logarithmic historical price changes. Determined by the period set and the number of data points returned within the interval or within the start-date / end-date range.

MAN and BLCK

The data was accessed with the Bloomberg terminal for each firm and the data was exported using screenshots.

*Table 64: Bloomberg terminal screenshot security ownership*




The definitions are given below for the firm valuation regression.

*Table 65: Description of the variables for the regression for the firm valuation*

| Independent variable | Description | Bloomberg terminal definition | Other data source |
|---|---|---|---|
| MB | Market value of equity / book value of equity | | |
| SIZE | Logarithm natural (LN) of turnover in MZAR | LN of RR800 - TRAIL_12M_NET_SALES (Trailing 12M Net Sales) | |
| TTTA | Tangible to total assets | RR879 - TANGIBLE_ASSETS / BS035 - BS_TOT_ASSET | |
| CFTTA | Free cashflow to total assets | RR843 – TRAIL_12_FREE_CASH_FLOW / BS035 - BS_TOT_ASSET | FCF T12M |
| DIV | Diversity | | Survey response |
| MAN | Insider % of shares held | Bloomberg terminal security ownership | |
| BLCK | % of total equity owned by the largest shareholder of the firm | Bloomberg terminal security ownership | |
| OWN20 | Dummy variable which takes the value of 1 if the largest blockholder in the firm owns more | Bloomberg terminal security ownership | |

| | | | |
|---|---|---|---|
| | than 20% of total equity | | |
| INST | Institutional % of shares outstanding held | DS211 – EQY_INST_PCT_SH_OUT | |
| LTAS | Long term debt to total assets | RR147 – LT_DEBT_TO_TOT_ASSET | |
| ROE | Return on equity | RR029 - RETURN_COM_EQY | |

RR879 - TANGIBLE_ASSETS (Tangible Assets)

Total assets minus intangible assets. Figure is reported in million; the Scaling Format Override (DY339, SCALING_FORMAT) can be used to change the display units for the field. Calculated as:

Total Assets - Intangible Assets

Where:

- Total Assets is BS035, BS_TOT_ASSET
- Intangible Assets (Disclosed Intangibles) is BS138, BS_DISCLOSED_INTANGIBLES

Note: The ratio is not meaningful and will not calculate if the difference is negative number.

BS035 - BS_TOT_ASSET (Total Assets)

INDUSTRIALS

Total Assets:

The total of all short and long-term assets as reported on the Balance Sheet.

BANKS

Total Assets:

This is the sum of Cash & bank balances, Fed funds sold & resale agreements, Investments for Trade and Sale, Net loans, Investments held to maturity, Net fixed assets,

Other assets, Customers' Acceptances and Liabilities.

Canada:

This is the sum of Cash & Bank Balances, Short Term Investments, Interbank Assets, Securities Purchased with Resale Agreements, Net loans, Investments Held to Maturity, Net fixed assets, Other assets, Customers' Acceptances and Liabilities.

FINANCIALS

Total Assets:

Total assets is equal to the sum of Cash & near cash items, Short-term investments & securities inventory, Net receivables, Total Long-Term Investments, Net fixed assets, and Other assets.

INSURANCES

Total Assets:

Total assets is the sum of Cash & Near Cash Items, Net Receivables, Total Investments, Net Fixed Assets, Deferred Policy Acquisition Costs, and Other Assets

UTILITIES

Total Assets:

This account will generally equal Total Assets in the annual report, except when Utility plant is net of deferred income taxes. Deferred income taxes is presented on the credit or liability side of the balance sheet.

This item is balancing both the debit (assets) and credit (liabilities and shareholders' equity) sides.

REITS

Total Assets:

Total Assets is the sum of Net Real Estate Investments, Cash and Equivalents, Other Investments, Receivables, Other Assets and Restricted Assets.

MUNICIPAL ISSUERS:

For general obligation (G.O.) issuers (general fund), this is the total of all short-term, restricted, capital and long-term assets as reported on the statement of net assets.

For all other issuers, this is the total of all short-term, restricted, unrestricted, capital and long-term assets as reported on the balance sheet.

RR843 – TRAIL_12_FREE_CASH_FLOW (Trailing 12m Free Cash Flow)

Calculated by adding Free Cash Flow (RR008, CF_FREE_CASH_FLOW) for the last four quarters, two semi-annuals, or annual. Figure is reported in millions; the Scaling Format Override (DY339, SCALING_FORMAT) can be used to change the display units for the field.

DS211 – EQY_INST_PCT_SH_OUT (Inst. Owner % Shares Out)

Percentage of Shares Outstanding held by institutions. Institutions include 13Fs, US and International Mutual Funds, Schedule Ds (US Insurance Companies) and Institutional stake holdings that appear on the aggregate level. Based on holdings data collected by Bloomberg.

Data is available historically on a weekly basis beginning from March 2010 and is accessible on the Sunday date of each week.

RR029 - RETURN_COM_EQY (Return on Common Equity)

Measure of a corporation's profitability by revealing how much profit a company generates with the money shareholders have invested, in percentage. Calculated as:

(T12 Net Income Available for Common Shareholders / Average Total Common Equity) * 100

Where:

- T12 Net Income Available for Common Shareholders is T0089, TRAIL_12M_NET_INC_AVAI_COM_SHARE
- Average Total Common Equity is the average of the beginning balance and ending balance of RR010, TOT_COMMON_EQY

If either the beginning or ending total common equity is negative, Return on Equity will not be calculated.

Please reference Return on Common Equity Adjusted (F1169, RETURN_ON_COMMON_EQUITY_ADJUSTED) for the adjusted value that excludes the impact of abnormal items.