

**The applicability, purpose and impact of bond options:
the South African perspective**

by

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submitted in accordance with the requirements for
the degree of

MASTER OF COMMERCE

in the subject

BUSINESS MANAGEMENT

at the

University of South Africa

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(November 2014)

DECLARATION

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I declare that “The applicability, purpose and impact of bond options: the South African perspective” is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

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ACKNOWLEDGEMENT

SOLI DEO GLORIA

I acknowledge the contribution of the following people:

Profs. Johan Marx and Henry Mynhardt, for their guidance and support that enabled me to complete this research.

Dr. M. Pohl, for the statistical analysis of the collected data.

Ms. M. van Zyl, for assistance with a literature search on the library databases.

Ms. J. Viljoen, for the language editing of this dissertation.

ABSTRACT

In South Africa, over-the-counter (OTC) bond options may be used in order to either hedge or speculate. However, since 2001, this market deteriorated significantly. The current research assessed the role of the local bond option market, reasons for the deterioration of the South African OTC bond option market, and how this bond option market could possibly be restored as a primary hedging instrument. The opinions of individuals operating in this market were obtained using a questionnaire. In the opinion of the respondents, wide bid–offer spreads, regulatory interferences and poor participation within this market caused market deterioration. The market could be restored as a hedging instrument if effective market integration exists, interbank trading regularly takes place, liquidity was enhanced, transparency increased and investor knowledge improved. Future research could focus on regulatory transformation, the types of derivatives used for hedging, and an assessment of appropriate continuous professional development interventions for investors.

Keywords:

Bond option, bond, derivatives, deterioration, emerging market economy, improvement, Johannesburg Stock Exchange (JSE), opinions, over-the-counter, South Africa.

ACRONYMS AND ABBREVIATIONS

ASX	Australian Securities Exchange
BESA	Bond Exchange of South Africa
BIS	Bank of International Settlements
CBOE	Chicago Board Options Exchange
CBOT	Chicago Board of Trade
CEC	Commission of European Communities
CRAs	credit rating agencies
CSD	Central Securities Depository
DP	dynamic programming
EMEs	emerging market economies
EMU	European Monetary Union
ET	exchange-traded (adj.)
EU	European Union
Eurex	European Exchange
FDI	foreign direct investment
FESE	Federation of European Securities Exchanges
FPI	Financial Planning Institute of Southern Africa
FRAs	forward rate agreements
FSA	Financial Services Authority
FSB	Financial Services Board
GARCH	generalised autoregressive conditional heteroskedasticity
GDP	gross domestic product
IFRS	International Financial Reporting Standards
IMF	International Monetary Fund
IOSCO	International Organisation of Securities Commission
ISDA	International Swaps and Derivatives Association
JSE	Johannesburg Stock Exchange
NT	National Treasury
OTC	over-the-counter
PIMCO	Pacific Investment Management Company
S&P	Standard & Poor's
SARB	South African Reserve Bank

SEC	United States Securities and Exchange Commission
UK	United Kingdom
Unisa	University of South Africa
USA	United States of America
VaR	value at risk
WFE	World Federation of Exchanges

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

Portfolio managers have to perform according to individually prescribed fund mandates (Financial Services Board 2007). These mandates prescribe the required rate of return that the portfolio manager has to achieve within a specific fund. A portfolio manager could modify the risk-return of a portfolio by adding derivative instruments to the portfolio (Graf, Haertel, Kling & Ruß 2014; Johnson 2014). Option contracts are part of the derivative instruments that portfolio managers use. According to Graf *et al.* (2014), these option contracts are often used in portfolios to achieve higher returns.

The current research comprised an evaluation of the applicability, purpose and impact of over-the-counter (OTC) bond options from a South African perspective. This specific derivative instrument, a South African OTC bond option, was part of a flourishing financial market until 2011 (Johannesburg Stock Exchange [JSE] 2011). According to the JSE (2011), trading activity of these OTC bond options declined to such an extent between 2001 and 2011 that they might be considered insignificant. As option contracts could be used to generate higher returns or perform within fund mandates, the deterioration in the OTC bond option market should be evaluated.

A financial derivative is defined as a financial contract of which the value is derived from an underlying asset. The range of underlying assets includes bonds, equities, indices, mortgages, weather, earthquakes and exchange rates (Acharya, Brenner, Engle, Lynch & Richardson 2010). Contracts on the underlying assets may be in the form of forwards, futures, options or swaps (Chance 2003; Franke, Härdle & Hafner 2011; Marx 2013).

An option is but one of the derivative instruments. An option is the right but not the obligation to buy or sell an underlying asset at a predetermined price (Marx 2013). The value of these options is derived from an underlying asset.

An underlying asset can be defined according to the type of asset. In this research, an underlying asset is a bond (Bodie, Kane & Marcus 2009). A bond is defined as a fixed income security, which is issued by a borrower, who agrees to pay a stream of payments with different compounding terms for a predetermined number of years, to a bondholder. The initial investment is only repaid on the date of maturity (Bodie *et al.* 2009; Marx 2013). A bond as underlying asset has different derivatives.

The derivative instrument, which was evaluated in this research, is a bond option. Franke *et al.* (2011) define a bond option as an agreement which gives the bearer of the option the right but not the obligation to buy or sell a particular bond at a specified time in the future for a predetermined price. An option that is bought or sold is defined as a call¹ or put² option. Transactions in the option market can take place on a regulated exchange or OTC. Transactions that take place on the exchange are highly regulated, standardised, liquid and centrally cleared (Chance 2003). While transactions that take place OTC are unregulated, non-standardised transactions and investors have increased exposure to default risk³ in the financial market (Chance 2003). Bonds and their associated derivatives, options, trade in the OTC and exchange-traded (ET) market.

The derivatives market did however transform from its first use. The evolution of options in the derivative market is discussed below, followed by the background on the primary users and applications of bond options as well as information on the current levels of liquidity and pricing methods of these instruments.

1.1.1 History of option markets

Through the centuries, options have been in use by individuals who often exploited these instruments to derive additional profits from hedging and speculation (Poitras 2009). Swan (2000) is of the opinion that the history of derivatives is incomplete and that literature does not often refer to the specific events that led to financial

¹ A call option is the right but not the obligation to buy an asset at a predetermined price (Marx 2013).

² A put option is the right but not the obligation to sell an asset at a predetermined price (Bodie *et al.* 2009).

³ Default risk is the risk that the counterparty to an agreement may not perform as contractually agreed (Marx 2013).

innovations. However, Hafner and Zimmermann (2009), Shaffer (2010), Weber (2009) and Swan (2000) attempted to explore the history of options.

The first recorded use of options dates back to the years before Christ. According to Weber (2009), the first use of options could have been as early as the fourth millennium before Christ. Even though option contracts have been in existence since before Christ, option contracts that were similar to the contracts traded today only started trading in the 16th century (Swan 2000). The option contracts used today underwent a number of changes and caused several market collapses since their inception.

The first freestanding option contracts traded on the Antwerp exchange in Belgium during the 16th century and caused a market collapse at the time (Poitras 2009). Soon after the Antwerp exchange collapse in 1585, Holland became the leading option market (Poitras 2009). In Holland, option contracts on tulips were written during the early 17th century (Poitras 2009). This market evidently failed when the price of tulips collapsed and caused bankruptcies during the period of the 'tulip mania' (Shaffer 2010). The earlier option markets had all experienced failures that were followed by a collapse in the market. In a number of instances, the poor regulatory environment had a part in these failures.

Poor regulation often contributed to collapses in option markets. Weber (2009) remarks that early option markets were poorly regulated, and this resulted in option writers who defaulted on their obligations to deliver the underlying assets. Further, many investors and speculators were involved in wrongful practices when dealing in option contracts as there was a lack of regulation. In order to restore trust in the option markets, proper regulation became essential (Hull 2008).

According to Poitras (2009), England was the first country to pass legislation to improve market efficiency. The ensuing law was commonly referred to as "Barnard's Act" (Poitras 2009:499) and this act ensured that a broker could be held responsible in the event of a default on the option contract (Poitras 2009). During the early 1930s, the United States of America (USA) also had to adopt regulations to prevent irregular trading transactions in the option market (Sherman 2009). The Glass-

Steagall Act⁴ drove the market reform. The main objective of the Glass–Steagall Act was to force a bank to decide whether it would be a commercial or investment bank (Maues 2013). This was to limit the conflict of interest between the activities that were undertaken by a bank (Crawford 2011). The Glass–Steagall Act restored trust in the USA financial market and investors expected this standard of financial market regulation around the world (Crawford 2011).

Effective regulation made it possible for different exchanges to allow innovative new types of option contracts in the financial market (Arestis & Karakitsos 2009). In 1973, the Chicago Board Options Exchange (CBOE) introduced call options that traded on the USA exchanges instead of trading OTC (Hull 2008). According to Bodie *et al.* (2009), the introduction of ET options had a crowding-out effect on the OTC option market. Only a decade after the successful introduction of ET options in the USA did South Africa adopt OTC options into the financial market (Bullard 1987).

The Bond Exchange of South Africa (BESA) (BESA 2002) reported that a number of new financial instruments were incorporated into the financial market since the 1980s. Among these instruments were options which South Africa started to trade OTC. South Africa standardised the option contracts, similar to the CBOE, but the option contracts remained an OTC market (Bullard 1987). South Africa therefore introduced and traded standardised OTC option contracts (Bullard 1987).

The Eskom 168 bond was the first bond on which a standardised option contract traded in the South African financial market (Israelsohn & Firer 1991). This option contract formed part of the new financial instruments introduced in South African financial market (Israelsohn & Firer 1991). The South African financial market gained a number of new financial instruments that were introduced into the market during the late 1980s.

Future contracts were however not among the newly introduced instruments. This was a strange occurrence as future contracts play an important role to hedge against risk when trading in option contracts (Bullard 1987). However, this did not concern

⁴ Refers to the Banking Act of 1933 (USA). The 'Glass–Steagall Act' is the name by which this act is known within the investment management community (Maues 2013).

the market at that time as the market was considered bullish until January 1987 (Bullard 1987). Jiang and Fang (2015) describes a bull market as period of upswing in the financial market.

According to BESA (2002), the South African financial market expanded during the 1990s as more government and parastatal bonds were issued. At that stage, parastatal bonds were more liquid than government bonds. This was because the bid–offer⁵ spreads of parastatal bonds were better quoted than those of the government bonds (BESA 2002). The expanding underlying bond market consequently allowed more option contracts. These derivatives are beneficial to users if the derivatives are applied appropriately (Chui 2012).

1.1.2 Fundamentals of option users and applications

Investors who were introduced to option contracts soon realised the value of these instruments. Ritchken (1987) was one of the first researchers who identified the importance of options. Ritchken (1987) found that important applications of option contracts was to create new pay-off strategies and to insure pay-offs against adverse movements due to volatile interest rate changes. Institutions that were involved in this market soon also applied various strategies to benefit from these option contracts (Ritchken 1987).

The institutions that were involved in the option market were identified as issuers, market makers, intermediaries, participants and regulators. An issuer was defined as an institution that created a financial asset such as a bond (Wuite 2009). Market makers bought and sold assets in the financial market at the quoted bid–offer prices (Van Heerden & Van der Westhuizen 2008). Intermediaries in the financial market were purchasers of financial instruments on behalf of entities with surplus funds (Kalač, Bećirović & Plojović 2013). According to Adelegan (2009), participants acted in a similar capacity as an intermediary, with the exception that participants were retail investors or professional asset managers. However, participants did not buy on behalf of various entities but only for a specific entity (Adelegan 2009). Lastly,

⁵ Bid–offer spread is the price quoted at which an entity would buy (bid) or sell (offer) a financial asset (Marx 2013).

regulators imposed legislation to combat market inefficiencies in the financial environment (Wuite 2009).

The various institutions involved in the market focused on their objectives of hedging, speculating or arbitrage, as this is how institutions achieve their objectives in a financial market (Hull 2008). According to Dodd (2004), options were used for their hedging abilities. Hull (2008) describes hedging as the process of using options to reduce the risk of financial transactions. Hull (2008) also acknowledges that in some transactions, risk can be reduced to such an extent that the transaction can be structured to become entirely risk-free. Risk-free transactions are known as arbitrage opportunities in the financial markets (Chance 2003). More recently Chernenko and Faulkender (2011) found that the firms in their study did not only use options for risk management but also for speculation. Manera, Nicolini and Vignati (2013) define speculation as the process of buying financial instruments in order to derive profits. Institutions therefore make use of bond and bond option instruments to mitigate risk, incur riskless profits or achieve higher returns from speculative transactions (Chance 2003; Chernenko & Faulkender 2011; Dodd 2004).

The use of bonds and bond options for arbitrage, hedging or speculation does not only benefit the institutions that enter these transactions but is also beneficial for an economy. According to Herring and Chatusripitak (2000, cited in Bokpin 2010), the bond market is regarded as an essential component of any financial system. Without a bond market, an economy would experience increased levels of systematic risk and possible economic crisis (Herring & Chatusripitak 2000, cited in Bokpin 2010). Consequently, a country with a healthy bond market would consist of expertly analysed financial products, a transparent financial market, efficient credit rating agencies (CRAs) and an active financial analyst population. Since derivatives are based on an underlying asset, these instruments also prove to be beneficial in an economy.

Bond options offer a number of benefits in an economy. The benefits of bond options range from protection against economic crises to informational efficiency (Hakansson 1999; Maniar 2007). According to Almeida and Vicente (2009), investor preferences are communicated through options. Further, Cao and Ou-Yang (2009)

found that without options, investors would not be able to take a position in the market based on informational events. Therefore it is possible that market activity could be limited if the possible benefits that bond options offered are foregone (Cao & Ou-Yang 2009).

The literature identified that bond options have a number of applications and users in the financial markets. To determine the level of bond option usage, the level of bond option activity in the world financial markets should be evaluated. Option trading, pricing volumes and activity in the international and domestic financial market are discussed in the next section.

1.1.3 Option trading, pricing, volumes and liquidity

The price of an option has a bearing on the level of trading activity and liquidity in the market (Amihud, Mendelson & Pedersen 2005). Some authors (Câmara & Heston 2008; Yallup 2012) are however of the opinion that, since the development of the Black–Scholes (1973) option pricing model, investors only adapt the model to suit their current pricing needs in the option market. In the current research, pricing models, which incorporate different variables that influence the price of options, such as liquidity and trading activity, were studied in order to find an optimal option pricing model.

The different option pricing models make use of distinctive variables that primarily affect the price of an option. Chiang and Huang (2011) researched the use of the generalised auto-regression conditional heteroskedasticity (GARCH) option pricing model while others (Câmara & Heston 2008; Yallup 2012) suggest the use of the Black–Scholes model (Black & Scholes 1973), the Merton model (Merton 1976) or other models that incorporate the yield curve (see 2.4.5) and forward rates. According to Strong (2005), most newly introduced option pricing models are derivatives of the Black–Scholes option pricing model.

An increased number of mathematicians and scientists have been drawn to Wall Street in recent years to engineer financial instruments (Northcott 2008). The emphasis that quantitative analysts placed on pricing models introduced a new field

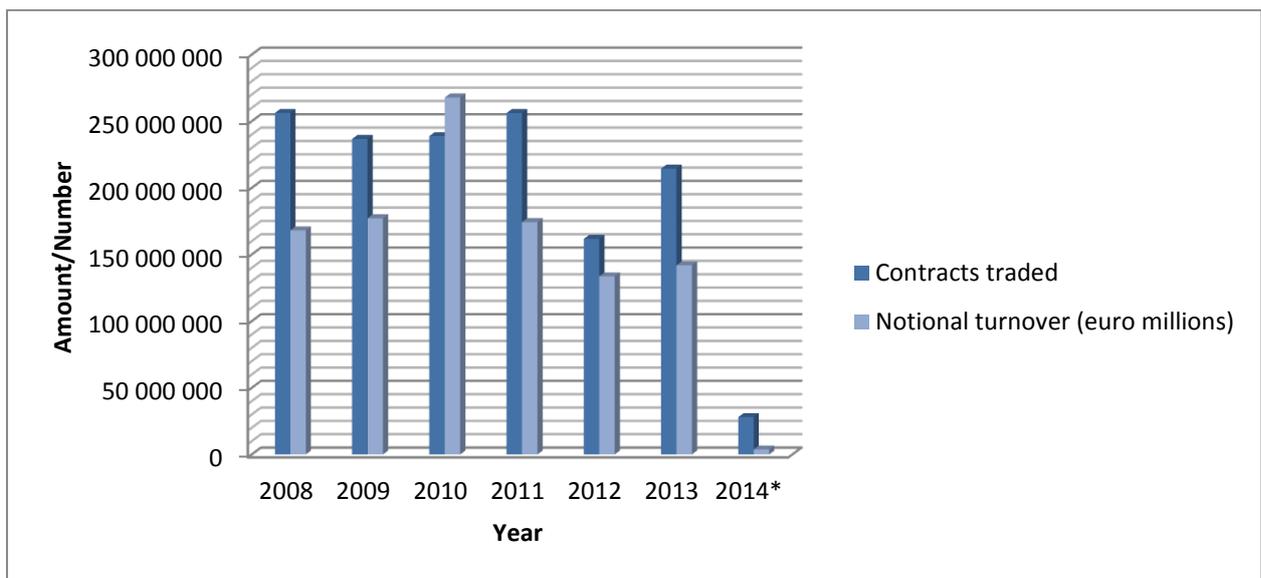
in finance, namely quantum finance. Quantum finance is the application of physics concepts on financial instruments (Haven 2002). Quantum finance introduced a set of new option pricing methods with certain assumptions. According to Zeqian (2004), mathematical adaptations were applied to the Cox–Ross–Rubinstein binomial model to reduce the model by applying Maxwell–Boltzmann statistics. The complexity in the pricing of options exponentially increased as new and innovative pricing models were introduced into the market. However, according to Deuskar, Gupta and Subrahmanyam (2011), accurate pricing of options can only take place if there is sufficient liquidity in the market irrespective of the level of mathematical engineering.

A number of authors⁶ researched the level of liquidity within financial markets and the measurement thereof. According to Hearn and Piesse (2012), four efficient liquidity measurement formulae exist. These formulae measured liquidity by evaluating the bid–offer spread, the volumes traded, the speed of transactions and price discovery. Amihud (2002) constructed a mathematical formula that measure liquidity more accurately by using absolute returns and volumes traded. Liquidity also forms part of research areas, as financial markets tend to grow daily.

The activity in the market and the turnover in the market changes constantly. Research (Aguenaou *et al.* 2011) however found that financial markets grow as technological advancements are made. As early as 1986, Block and Gallagher determined that the daily volume and total positions in the derivative markets can emphasise the popularity of a derivative. Block and Gallagher (1986) define popularity in this regard as the daily volume and total position exceeding the daily volume and total position of the underlying market. Therefore a comparison between the contract size and notional turnover could be an indication of increased market activity. Roll *et al.* (2009) report that option markets have grown exponentially during the past years, both in number of assets and in volume. An indication that the changing market activity and turnover in the bond option market is influenced by technological advancements suggests that markets grow constantly (Aguenaou *et al.* 2011).

⁶ The authors referred to are Aguenau, Gwilym and Rhodes (2011), Amihud (2002), Block and Gallagher (1986), Hearn and Piesse (2012) and Roll, Schwartz and Subrahmanyam (2009).

Even though the option market is positively impacted by advancements in technology the market remains susceptible to risk, an example of a negative impact on the market was the subprime crisis of 2007⁷ (Eichengreen, Mody, Nedeljkovic & Sarno 2012). European bond option market activity after the financial crisis of 2007 is illustrated in Figure 1.1. The figure shows the number of contracts traded and notional turnover in million euros. These indicators show the level of activity in the market.



*Figures from January to May 2014.

Figure 1.1: Contracts traded and notional turnover of European bond options

Source: Adapted from the Federation of European Securities Exchanges (FESE) (n.d.)

Figure 1.1 illustrates how the European bond option market performed over the period 2008 to 2014. The results show that notional turnover in euro millions remained almost constant during the years 2008 to 2013, with the exception of 2010, when the market experienced an above-average increase in notional turnover. There has been a decrease in the notional turnover since 2011. The number of bond option contracts traded remain within the boundaries of 200 000 000 and 250 000 000. In comparison to the European bond option market, the South African

⁷ Refers to the 2007–2009 subprime crisis. The crisis started in July 2007 and in September 2008, Lehman Brothers collapsed, followed by a global recession (Eichengreen *et al.* 2012). For reference purposes, this research report only refers to the subprime crisis of 2007.

bond option market activity in notional dollar amount outstanding is illustrated in Figure 1.2.

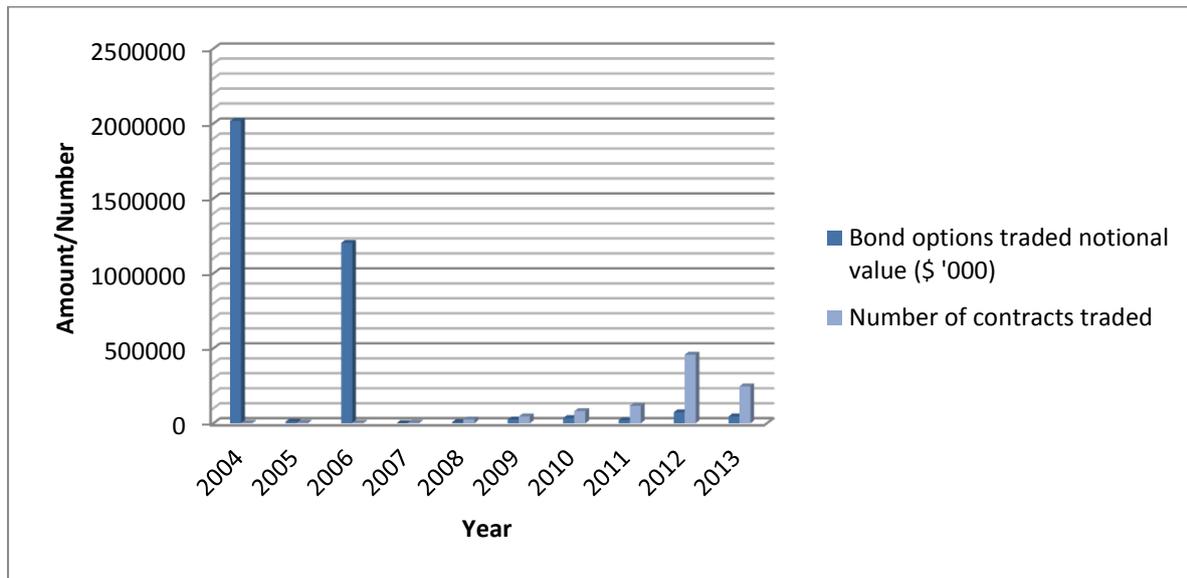


Figure 1.2: Bond option activity represented as the number of contracts traded and notional dollar value outstanding (\$'000)

Source: Adapted from World Federation of Exchanges (WFE) (n.d.)

Figure 1.2 illustrates the performance in the South African bond option market according to the data obtained from the WFE (n.d.). The notional dollar amount outstanding on bond options decreased from \$2 000 000 000 in 2004 to nearly \$11 000 000 in 2005. After 2006, the bond option market recovered in terms of notional dollar amount outstanding to around \$1 200 000 000. Ever since 2006, the notional dollar amount outstanding did not achieve an amount higher than \$7 400 000. Initially, the high dollar amounts outstanding traded on fewer than 5 000 contracts traded in bond options from 2004 to 2007. Since 2008, the number of contracts traded in the bond option market increased to a minimum of 25 000 contracts traded in 2008 and a maximum of 467 000 contracts traded in 2012. Even though the number of contracts traded increased significantly the dollar value of these transactions were at the maximum \$74 000 000 (WFE n.d.).

The South African financial market experienced volatility during 2008 and 2013. Figure 1.2 illustrates the number of contracts traded and the notional outstanding dollar amount in the bond option market. According to Hassan (2013), the South African OTC bond option market is not as transparent as the ET bond option market

as transactions take place between informed individuals. The market also carries a larger level of default risk than the ET market as the OTC market transactions are not centrally cleared (Hassan 2013). The Johannesburg Stock Exchange (JSE) (2011) reports that the OTC bond option market has deteriorated significantly between 2001 and 2011.

In 2010, the derivatives market in South Africa was among the 20 largest derivatives market in the world (Hassan 2013). The JSE (2011) emphasises that the focus should remain on the OTC bond option market and that the market should not be stimulated by introducing a new financial product that would replace the current bond option instruments. The 2001 to 2011 deterioration in the OTC bond option market was therefore an isolated occurrence and did not affect the remaining derivative instruments.

In conclusion, a bond option that trades OTC is one of the derivatives that may be used in order to hedge against market volatility, to speculate in order to derive additional profits or to derive risk-free arbitrage profits. According to Deuskar *et al.* (2011), a bond option is the product of choice in order to hedge against risk. However, in South Africa, the OTC bond option market experienced a significant downturn in 2001 to 2011, to such an extent that the market may be considered as insignificant (JSE 2011).

1.2 PROBLEM STATEMENT

The problem the current research wanted to investigate was whether OTC bond options still have any role to play in the South African financial market as a hedging instrument.

1.3 RESEARCH OBJECTIVES

The current research identified clear and concise research objectives in order to address the research problem statement. The research objectives also served as a guide for the research questions. The primary and secondary research objectives are listed next.

1.3.1 Primary objective

The primary objective was to determine whether OTC bond options still have any role to play in the South African financial market as a hedging instrument.

1.3.2 Secondary objectives

In support of the primary objective, three secondary objectives were identified:

- firstly, to establish the importance of an effective bond option market in a financial market;
- secondly, to assess the apparent decline in the South African OTC bond option market and to determine the possible causes that contributed to the inactivity and deterioration of the OTC bond option market between 2001 and 2011; and
- thirdly, to suggest possible solutions to restore the OTC bond options as a viable hedging instrument in South Africa.

The research objectives were addressed according to the research structure designed and illustrated as Figure 1.3.

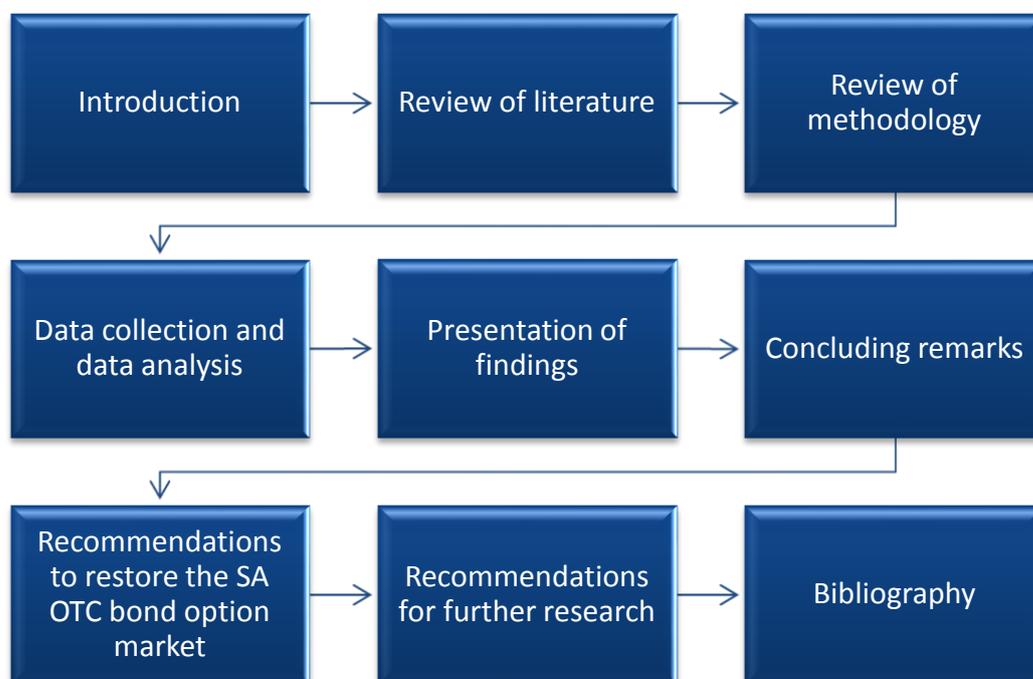


Figure 1.3: Research structure

Source: Own composition

An overview of bond options and the challenges facing the South African OTC bond option market was provided. Following that, the research problem and the associated research objectives were identified. Further, the method of investigation is illustrated in Figure 1.3, the research structure. The remainder of this chapter will concentrate on the research questions, the significance of the research, the method of investigation, the limitations and the proposed chapter outline.

1.4 RESEARCH QUESTIONS

Appropriate research questions are essential to ensure the validity and reliability of a research project (Bryman & Bell 2011). The research problem statement and the research objectives were used to construct the primary and secondary research questions. The research questions are listed below.

1.4.1 Primary research question

The primary objective was to determine whether OTC bond options still have any role to play in the South African financial market as a hedging instrument.

Do OTC bond options still have any role to play in the South African financial market as a hedging instrument?

1.4.2 Secondary research questions

From the primary research question, three secondary research questions were derived:

- Why is an effective bond option market essential in a country's financial markets?
- What caused the apparent deterioration of the South African OTC bond option market between 2001 and 2011?
- How can OTC bond options be restored as the primary hedging instrument in the South African financial market?

The primary and secondary research questions potentially had the ability to address the problem identified and the associated research objectives. The significance of successfully addressing the problem and the associated objectives is explained in the following section.

1.5 RESEARCH SIGNIFICANCE

The successes of different financial instruments are essential to any economy. In South Africa, OTC bond options used to be considered as an element that was part of a flourishing financial market. Until 2006, the notional bond option value outstanding was around \$1 200 000 000, after which the value decreased dramatically (WFE n.d.). The JSE (2011) is of the opinion that the OTC bond option market deteriorated to such an extent by 2011 that the market became insignificant. As financial instruments contribute to the economy, it is of importance to evaluate the OTC bond option market.

The significance of this research is supported by the proposed contributions that this research will make. The primary contribution that this research attempted to make was to conclude whether OTC bond options still have a role to play in the South African financial market as hedging instrument.

The secondary contributions that this research attempted to make comprised:

- to conclude why an effective bond option market is essential in an economy;
- to conclude on the causes of the apparent deterioration of the South African OTC bond option market between 2001 and 2011; and
- to recommend how the South African OTC bond option market could be restored as primary hedging instrument.

The research significance of the South African OTC bond option is further confirmed by the possible benefits that a successful bond and bond option market offers an economy. The potential benefits include reduced systematic risk, improved risk management, informational efficiency and speculation in the financial markets (Cao & Ou-Yang 2009; Maniar 2007). A financial market without bond options could

therefore suffer losses if an inadequate amount of information is disseminated into the financial market (Almeida & Vicente 2009; Hakansson 1999).

Research by Hakansson (1999) suggests that an economy could experience adverse effects if the bond market and its associated bond option market became insignificant. The significance of achieving the primary objective and secondary objectives was therefore essential. The research design and methodology that were implemented in order to achieve the research objectives and address the research questions are therefore introduced.

1.6 RESEARCH DESIGN AND METHODOLOGY

The approach to conduct research on the South African OTC bond option market had to be reliable, dependable and professional. According to Cooper and Schindler (2008), research conducted in a reliable, dependable and professional manner may be used for decision-making. Cooper and Schindler (2008) further claim that, in order to achieve the research objectives and to derive possible solutions to research questions, a research design should be constructed. Figure 1.4 represents such a research design.

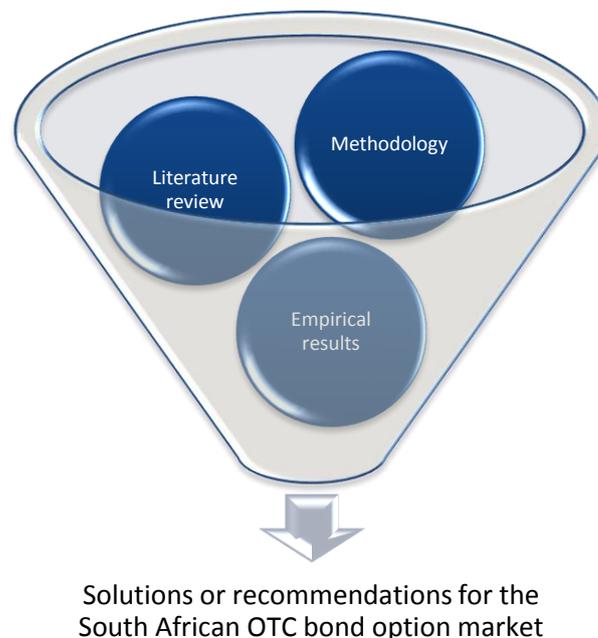


Figure 1.4: Research design

Source: Own composition

The research design suggested that the research would be conducted in two stages. Figure 1.4 illustrates this two-stage design. A methodological approach was used to establish that a literature review had to be conducted. It also specified the way the empirical results would be obtained in order to find a solution or recommendation for the research problem. The approach followed to conduct the literature review of the OTC bond option market in South Africa is described first.

1.6.1 Literature review

A literature review had to be constructed in order to establish what had already been researched and what had been concluded on international and domestic bond and bond option markets. The literature review was guided by the research problem and the associated research questions.

Bryman and Bell (2011) suggest that the literature review should enhance the importance of the primary and secondary research questions. The literature review is therefore part of the exploratory research. According to Bryman and Bell (2011), exploratory research contributes to the validity of the research questions.

Tranfield, Denyer and Smart (2003) proposes that a literature review is enhanced if the literature review follows a scientific research approach. The literature review would be reliable if it followed a scientific approach of a systematic review process (Tranfield, Denyer & Smart 2003). For a literature review to follow a systematic process, the review must be planned and performed and then report the findings. Bryman and Bell (2011) found that a literature review that follows a systematic process can easily conclude whether similar studies have been conducted.

The literature review therefore serves as the basis to support the research problems, which leads to conclusions on the research questions. Literature that supports the research questions guides the questions in the research instrument in order to ask valid questions and collect quality data that can be used to contribute to the academic body of knowledge. A literature review should therefore also support the empirical research.

1.6.2 Empirical research

Empirical research is aimed at collecting data that addresses the research problem and the associated research questions (Bryman & Bell 2011). In the current research, empirical research was conducted in order to quantify the opinions of individuals who were employed by institutions that were active in the South African OTC bond option market at the time of the research. The constructs of the research instrument were guided by the research questions. According to Bryman and Bell (2011), research that is of a quantitative nature follows a positivistic⁸ research approach. The current research aimed to report the findings of the quantitative data in order to recommend possible interventions to restore the OTC bond option market.

Based on literature of Bryman and Bell (2011), empirical research consists of different components that support the problem statement and research objectives.

The essential elements of the empirical research are:

- the data measurement;
- the research instrument;
- the research population;
- the research sample; and
- data analysis.

These research elements are discussed in the subsections that follow.

1.6.2.1 Data measurement

Empirical research consists of data that is measured in order to draw a conclusion and make future recommendations. According to Bryman and Bell (2011), data is measured for three reasons, namely delineation of differences, consistency and accurate estimations of correlations. Data can be measured in four possible data measurement scales, namely nominal, ordinal, interval and ratio scales (Bryman & Bell 2011; Cooper & Schindler 2008).

⁸ Vogt (2005) defines positivism as the ability to study a problem quantitatively compared to the disbelief that the specific problem cannot be studied in such a paradigm.

Measurement scales are ranked from least sophisticated to a most sophisticated level (Remenyi, Williams, Money & Swartz 1998). The nominal scale only allows data that can be used to identify different elements in a population or sample (Gill & Johnson 2010). An ordinal scale allows ranking of different elements of research variables (Gill & Johnson 2010). An interval scale allows some stronger statistical data sets but the general concern with this scale is that no actual zero exists (Gershkoff 2008). The ratio scale allows the highest level of statistical testing and analysis as this scale has a true zero and the scale can be used to compare results effectively. The objective of measurement should be to obtain quality data.

Quality data should be reliable, valid, measurable and generalisable (Cooper & Schindler 2008). The data measured can be described as reliable if the research can be replicated and if the results deliver similar findings at different times (Crowther & Lancaster 2009). According to Babbie (2008), data is valid if it has the ability to measure the significance of an empirical concept effectively and it can be viewed as an accurate measure. Cooper and Schindler (2008) conclude that the practicality or measurability of data refers to the economic viability of the research, administrative ease of completing the research, the level of standardisation of the research and how easy the research is to interpret. Lastly, Bryman and Bell (2011) suggest that data measured should be generalisable. This would make it possible to draw the same conclusion in different situations. The research instrument has a significant influence on the type and quality of data collected.

1.6.2.2 Research instrument

The current research used a questionnaire as research instrument in order to collect the data for the research. Remenyi *et al.* (1998) are of the opinion that a questionnaire supports positivistic research, and statistical techniques can easily be applied on the collected data. Crowther and Lancaster (2009) support the use of a questionnaire as valuable data can be collected if the questions are structured correctly. According to Crowther and Lancaster (2009), the questions in a questionnaire should be specific, structured appropriately, with correct wording and in a specific order to obtain the desired data.

1.6.2.3 Population

The population of the current research comprised individuals who were employed by institutions who formed part of the South African OTC bond option market at the time of the research. Gill and Johnson (2010) state it would be unrealistic to distribute the questionnaires to the entire population; therefore, sampling is used. As the South African OTC bond option market consisted of issuers, market makers, intermediaries, participants and market regulators at the time of the research, sampling was used in order to distribute the questionnaire to the individuals who were employed by the institutions that formed part of this market. The research instrument was therefore used to collect data from the sample for data analysis.

1.6.2.4 Data analysis

The data collected with the research instrument must be captured, stored and analysed (Bryman & Bell 2011). The data collected during the current research was stored electronically in a password-protected Adobe Acrobat Professional X document. The data was then exported into Microsoft Office Excel 2010. Thereafter, the Microsoft Office Excel 2010 data was imported into the Statistical Package for Social Sciences (SPSS) program for data analysis. Lastly, the statistical results were interpreted in order to draw reliable conclusions, make recommendations and identify possible areas for further research.

The methodology and research design proposed a suitable structure to conduct the research on the South African OTC bond option market. The structure addressed the two-stage method of collecting data, firstly from the literature review, and secondly from the empirical research. The empirical research was conducted in an ethical manner (see 1.7) as it involved human participants that had to supply data by completing a questionnaire. The ethical considerations are discussed in the following section.

1.7 ETHICAL CONSIDERATIONS

This research had to adhere to the ethics policy of the University of South Africa (Unisa) (2007). The researcher is currently an employee of Unisa and is employed in the Department of Finance, Risk Management and Banking. As the researcher is an employee of Unisa, financial support was provided in form of a tuition benefit. The researcher also holds a grant obtained in his capacity of a student at Unisa. The financial benefit received by the researcher did not affect the research in any manner. The researcher conducted all research within the bounds of Unisa's ethics policy.

The integrity of the research was neither influenced at the request of Unisa nor was it changed in any way. There was no conflict of interest at any time during the course of this research. The objective of the researcher was to draw conclusions, make recommendations and identify possible areas for further research on the South African OTC bond option market.

To promote the integrity of the research regularly transgressed ethical principles have been identified. The regularly transgressed principles were in the form of authorship and data collection. From an authorship perspective, ethical misconduct was plagiarism, and from a data collection perspective, ethical misconduct included harming respondents, inadequate informed consent, deception, breach of confidentiality and invasion of privacy (Diener & Crandall 1978). The ethical principles identified in 1978 by Diener and Crandall are still identified as ethical principles that could be violated. The regularly violated principles have also been defined in more recent literature (Babbie 2008; Bryman & Bell 2011). The possible ethical violations with regard to this research are listed next.

- Plagiarism

According to the Unisa plagiarism policy, plagiarism is the theft of another author's ideas or research. Plagiarism includes any dishonest practices with regard to copyright, unreferenced work or poorly referenced work (Unisa 2005).

- Informed consent

Informed consent was obtained from each of the individuals who participated in the research. Bryman and Bell (2011) recommend that data collected from respondents should only be stored for the required period, in other words for the duration of the research. Individuals were informed that the data collected would be published in the dissertation and that the results might also be published in an academic journal at a later stage. The data collected will be destroyed after publication of the dissertation and the relevant article or articles.

- Avoidance of harm

The researcher protected all information at all stages of the research to prevent harm to respondents. In this research, potential harm that could arise, as described by Babbie (2008), pertained to the possible harm to career prospects for future employment of the respondents. Data collected will be provided at the request of any individual, except where such data can be used to secure a potential advantage against institutions that are deemed as direct market competition.

- Deception

There was no incentive for the researcher to deceive the individuals who participated in the research. Babbie (2008) states that deception occurs when respondents in a study are not truthfully informed or if some information is withheld from the respondents. Cooper and Schindler (2008) suggest that some researchers deceive respondents to yield more accurate results or to protect confidential information. Deception could not yield any additional benefit in this research and therefore all respondents were adequately informed.

- Confidentiality

All responses obtained from the respondents were treated as confidential. Babbie (2008) suggests that the term anonymous should not be replaced by confidential, as these terms are not synonymous. All information that respondents provided will be kept confidential at all times. The financial data used to illustrate the market activity was only used if it had been published on a publicly available resource, limiting the probability of publishing confidential market data.

- Invasion of privacy

The research did not invade the privacy of any respondent in the sample. Invasion of privacy can occur when the contact details of the respondent are used improperly. If a respondent states that he or she does not wish to form part of the research being conducted, the privacy of such person should be respected and his or her contact details be removed from the sample contact details list. Cooper and Schindler (2008) found that the right to privacy included more than a guarantee of confidentiality; it also directly related to the validity of the study. In the case of the current research, the right to privacy also inherently allowed respondents the right to noncompliance when contacted to form part of the research.

All ethical considerations were meticulously adhered to during the current research. The research instrument included a letter to seek permission to use the data supplied by the respondent. The letter also included an agreement of confidentiality. To inform the respondents adequately, the objective of the research was stated. The respondents therefore did not have to fear risk of harm. They also knew they would not be deceived nor would their privacy be invaded at any stage during the research. Should a respondent have wished to withdraw from the research, he or she could do so by not submitting the questionnaire. After final submission of the questionnaire, withdrawal from the research was not possible as all data was submitted anonymously.

This research was however subject to certain limitations and was also specifically delimited to address the specific objectives of the research. The limitations and delimitations are discussed in the next section.

1.8 LIMITATIONS AND DELIMITATIONS

The current research was limited to a specific derivative instrument, namely options. Other derivatives contracts, namely forwards, futures and swaps were excluded from this research. According to Chui (2012), forward contracts and future contracts are agreements to long or short a predetermined number of an underlying asset at a specific price and time in the future. Chance (2003) defines a swap contract as an agreement between two parties to exchange cash payments for a predetermined

period. Swaps could also be considered as a series of forward contracts. The type of option that the current research evaluated was a European-style (see 2.3.1) bond option.

According to Lim, Lee and Kim (2014) as well as Marx (2013), the different option exercise styles that exist are American, Bermudan and European. An American option grants the holder the right to exercise the option at any stage during the life of the option, the Bermudan option grants the holder the right to exercise the option on specific dates during the life of the option, and the European style grants the holder to right to exercise the option at expiration of the option contract. Any derivative other than European-style bond options fell outside the ambit of the research.

It is difficult to determine the number of respondents in the financial market as institutions make use of analysts, legal advisors and other specialists who might not be included in the population (see 4.8). The sample (see 4.9) from the population of the current research consisted of individuals who were employed by institutions that were defined as issuers, market makers, intermediaries, participants or regulators. The respondents had to been actively involved in the South African OTC bond option market.

A sizable risk of the current research was the non-transparent nature of the OTC bond option market. The reliability of information may be questioned due to the nature of the market. Transactions in this market are often not standardised nor are they well recorded, as the general consensus regarding the OTC market is that transactions only take place between two well-informed parties (see 2.5.2.1). Some data may also be protected or private due to the sensitivity of information.

This study will not furnish foreign economies with any recommendations regarding the use of OTC bond options. The literature review on foreign economies was used for comparative purposes only.

1.9 RESEARCH: CHAPTER DESIGN

This research report consists of six chapters and a bibliography. The chapter design is diagrammatically illustrated in Figure 1.5 below.

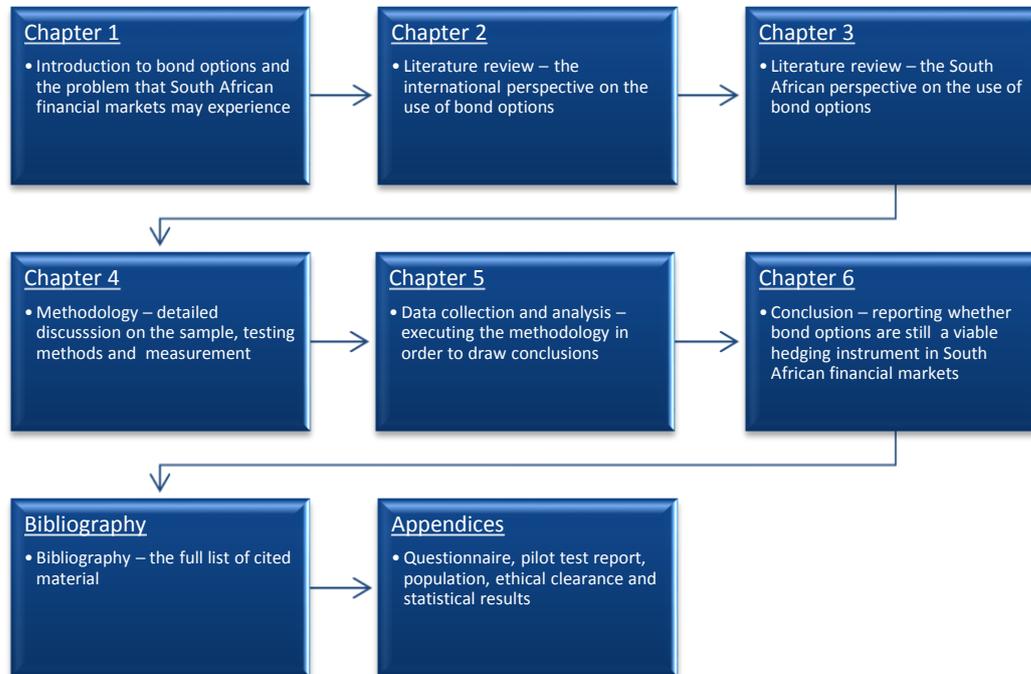


Figure 1.5: Chapter design

Source: Own composition

Figure 1.5 diagrammatically illustrates the structure of the research and the chapter design. The chapters of the research are an introduction, an international literature review, a domestic literature review, a methodology and findings, and a conclusion. The bibliography is followed by the appendices.

- Chapter 1

Chapter 1 introduced the reader to the problem identified in the South African financial market, namely that OTC bond options experienced a significant decline since the early 2000s. The chapter outlined the proposed research objectives for this research. The research objectives were supported by the research question, and a preliminary methodology was suggested. The limitations to this research were identified and a chapter outline for the research was suggested.

- Chapter 2

The first section of the literature review addresses the fundamental aspects of a bond and bond option market. The literature review then explores the international trends regarding bond and bond option markets. In support of the research questions, the benefits of a bond option market are provided in this chapter.

- Chapter 3

The literature review is continued in Chapter 3. This chapter considers the South African bond and bond option market. The chapter is again concluded with the benefits that bond options offer in a financial market but with the emphasis on these benefits in a developing economy such as South Africa.

- Chapter 4

The proposed methodology as mentioned briefly in the first chapter in the research is discussed in detail in Chapter 4. This chapter seeks to inform the reader of how the research on the South African OTC bond option market was conducted with reference to the research paradigm, type of data, scales of measurement, research instrument, type of questions and ethical considerations.

- Chapter 5

The methodological approach proposed in Chapter 4 was performed to collect data for the empirical results. This chapter relates how the data that was collected from the respondents of this research was captured and analysed and how it is presented. The statistical analysis of the data obtained from the respondents is discussed in order to draw valid conclusions, make recommendations and identify areas of further research in the final chapter.

- Chapter 6

The final chapter presents the literature and empirical results that supported the research objectives. The literature review and empirical results are used to draw a conclusion on the applicability, purpose and impact of OTC bond options in the South African financial market. This chapter also provides recommendations on how

to restore the OTC bond option market and identify possible areas for further research.

- Bibliography

The bibliography comprises of all the sources referenced in the research on the South African OTC bond option market. The referencing technique used in the research complies with the standards of the Harvard⁹ referencing technique.

- Appendices

Five appendices are attached to this research report on the South African OTC bond option market, namely the questionnaire, pilot test report, population, ethical clearance form and statistical results.

1.10 SUMMARY

This chapter introduced the reader to a financial instrument that allows investors to generate additional profits if it is incorporated into an investment portfolio. However, the market that offered this instrument declined significantly. This was described as a reason for concern as investors did not make use of the instrument and the need for the research was confirmed. This chapter essentially introduced the need to do research on the applicability, purpose and impact of OTC bond options from a South African perspective. The chapter continued by establishing how options originated and how this financial instrument was used currently.

By providing information on the history of option contracts, an opportunity was created to elaborate on why option contracts form part of a financial market. After the motivation for the use of option contracts was established, the users and the applications of option contracts were identified. Option contracts did not change over time, as option contracts are still valued today, based on the value of an underlying asset. Information on the current value and the number of contracts traded in the European and South African ET market was provided. Liquidity and turnover in these ET markets were shown. However, the South African OTC market

⁹ As per referencing guide provided by AOSIS OpenJournals (n.d.)

declined to such an extent that the South African OTC bond option market could be considered as insignificant.

The researcher identified appropriate research objectives in order to assess the identified problem in the OTC South African bond option market. Research questions were postulated in order to support the research objectives. The significance of evaluating this problem in the South African OTC bond option market was specified.

In order to evaluate the research problem, a methodological approach had to be followed. The research identified an appropriate methodological approach that would effectively evaluate the problem according to the postulated research questions. The methodological approach identified a two-stage design. This design would effectively evaluate the literature according to the research questions and interpret empirical results in order to draw a conclusion on the identified problem.

This research collected data from publicly available sources and human participants. As this research adhered to a policy of research ethics, the research did not violate any ethical principles. The research was done to obtain the most relevant results within the limitations that had been identified. The data showed limitations, and the research was delimited to address only the problem identified in this research on the South African OTC bond option market.

The research structure proposed in this chapter is followed throughout this research. The following chapter describes the fundamentals of bonds and bond options. Information of the international literature on bond and bond option markets is also provided.

CHAPTER 2

LITERATURE REVIEW:

THE BOND MARKET MECHANISM: AN INTERNATIONAL PERSPECTIVE

2.1 INTRODUCTION

As indicated in Chapter 1, the literature review of bonds and bond options comprises two independent sections. The two sections reports on the instrument and the derivative, bonds and bond options firstly, followed by the review of international literature on bonds and bond options. The second section reports on the domestic South African bond and bond option market.

Derivative instruments are normally based on an underlying asset or class of underlying assets (Acharya *et al.* 2010). Milne (2009) concludes that each of these assets or asset classes has unique characteristics, risks and pricing models. There is an interaction between these assets and their associated derivative contracts. A review of the bond market could therefore contribute the knowledge base on the associated derivative, bond options.

According to Arestis and Karakitsos (2009) different countries (Japan, UK & USA) implemented measures to improve the derivative markets, after the subprime crisis of 2007. These improvements focussed on prudential regulation (see 2.4.2), accounting rules and transparency in the derivatives markets. In addition to the improvements, it was recommended that a greater emphasis should be placed on the role of CRAs. As CRAs have an influence on the price of credit, the role of CRAs should also be reassessed (Arestis & Karakitsos 2009).

Abad, Chuliá and Gomez-Puig (2010) state that there is a substantial difference between the capitalisation of the international bond market compared to the capitalisation of the international equity market. Philips, Davis, Patterson and Thomas (2012) confirm that the international bond market is larger than the international equity market, with an estimated outstanding \$158 trillion dollars in bonds compared to \$54 trillion in equities (Roxburgh, Lund & Piotrowski 2011).

In view of the above, this chapter describes bonds and bond options. After the description of the underlying and the associated derivative, the chapter reflects a review of the international perspective of the bond and bond option market. The purpose of the chapter is to describe an effective bond and bond option market. A section on the benefits of the bond option market concludes the literature review of the international bond and bond option market.

2.2 BONDS

Debt financing is generally an inexpensive form of financing compared to short-term borrowing (Gitman ed. 2010). Ball, Hail and Vasvari (2011) found that corporate entities prefer to enter the bond market to raise capital for projects rather than the equity market. The definition of a bond and its characteristics is discussed in the next section.

2.2.1 Bonds defined

Killian, Garvey and Shaw (2012) state that all bonds have the same fundamental characteristics, namely a yield to maturity, coupon rate, principal (or par) value and a market value. Internationally, there are a number of terms which refer to bonds. Yankee bonds, Gilts, Eurobonds, Bunds, Samurai bonds and fixed-income debt all refer to the same type of asset, namely a bond (Zhu 2013). There are however financial instruments that are regularly confused with a bond, namely debentures and mortgage bonds.

Unlike bonds, a debenture is not a secured investment and does not guarantee the return of the principal value at maturity (Bodie *et al.* 2009). Bonds pay a coupon value and the principal to the bond holder. The coupon is paid over the life of the bond and the principal is only paid at maturity of the bond (Marx 2013). The other confusing instrument is a mortgage bond.

A mortgage bond has collateral attached to the contract. The collateral can be in the form of an asset or something of similar value. Instalments on mortgage bonds

include amortisation in order to reduce the outstanding balance and interest of the mortgage bond (Bodie *et al.* 2009).

According to the definition of Killian *et al.* (2012), debentures and mortgage bonds do not qualify as bonds. Both these instruments, debentures and mortgage bonds, fell outside the ambit of this research. This research only evaluated bonds and therefore this research report only makes use of the term bond to describe this type of financial instrument. A bond can best be identified by the following characteristics:

- Principal value

According to Reilly and Brown (2011), the principal value is also known as face value or par value of a bond. This value is the value that the issuer needs to borrow from the debt market. The buyer of the bond becomes the bondholder or lender, and receives the par value on the maturity date of the bond (Reilly & Brown 2011).

- Term to maturity

The maturity of a bond indicates when the bond par value will be paid to the bondholder. Maturity usually refers to the number of years that the bond will be active in the secondary market¹⁰ (Marx 2013). During the life of the bond before maturity, the market value changes as market conditions fluctuate (Reilly & Brown 2011).

- Market value

Marx (2013) describes the market value of a bond as the price at which the bond trades in the secondary market. This price is determined by finding the present value of the future cash flows when discounting by the current market interest rate. The market value and the interest rate have an inverse relationship – as the interest rate increases, the market value will decrease and vice versa. Bonds also make a fixed interest payment. This payment also affects the market value and is known as the coupon rate (Marx 2013).

¹⁰ The secondary market is the market where financial instruments trade after their first issue (Van Zyl, Botha & Skerritt 2006).

- Coupon rate

Marx (2013) defines the coupon rate as the interest amount that the bond issuer pays the bondholder. This interest amount paid to the bondholder is the bond coupon. The coupon rate is expressed as a percentage of the par value of the bond. Coupon rates differ among bonds ranging from zero per cent to percentages that are higher than the prevailing interest rate in a country (Marx 2013). All factors that affect the total return of a bond will affect the yield to maturity (Bodie *et al.* 2009).

- Yield to maturity

Van Zyl *et al.* (2006) states that the yield to maturity is the total rate of return over the term of the bond. This yield is a function of any returns from the bond, including payments from the bond, coupon payments and the potential capital gains or losses on the bond. If these returns were reinvested at the yield to maturity, the combined returns would form the total return of the bond (Van Zyl *et al.* 2006).

Bonds are essential financial instruments within a financial market. Bonds are complex financial instruments with a variety of factors that could cause bond price fluctuations. Risk management techniques should be implemented in order to hedge against negative fluctuations in market value. A derivative, such as a bond option, could be used to hedge against bond price fluctuations. Bond options are therefore used to limit the upside or downside risk of the bond.

2.3 OPTION CONTRACTS

Ben-Ameur, Breton, Karoui and L'Ecuyer (2007) argue that unlike equities, a bond option cannot exist without the underlying instrument, the bond. Bond options form a fundamental part of the financial market. The option market however developed considerably since the late 19th century (Van Zyl *et al.* 2006). The competition between the ET and OTC markets led to a number of these changes. Changes in the market included mergers, restructuring and electronic trading (Chance 2003).

2.3.1 Options defined

A derivative is a financial instrument that is valued according to the value of an underlying asset (Chance 2003). In this research, the underlying instrument was a bond. The four most common derivatives are forwards, futures, options and swaps (Dai, Wang, Lyuu & Liu 2010). The current research focused on bond options.

Options similar to any other asset or derivative within the financial market are bought (long¹¹) or sold (short¹²) (Bodie *et al.* 2009). In the option market, an option to buy is a call option, while an option to sell is a put option. In this research, a call option referred to the right but not the obligation to buy a bond at a certain point in time at a specified price, known as the strike price (Marx 2013). A put bond option is the right but not the obligation to sell a bond before the bond matures at the strike price (Ben-Ameur *et al.* 2007; Commission of the European Communities [CEC] 2009).

The right to exercise an option at a strike price may differ among options. This refers to the style of the option. An option can be styled as American, Bermudan or European. European options may only be exercised on the date of expiration (Marx 2013), while American options may be exercised at any stage during the life of an option (Reilly & Brown 2011). A Bermudan option, however, grants the holder the decision to exercise the right to buy or sell an option on specific dates during the life of an option (Lim *et al.* 2014). Due to the limitations of this research, only European options were evaluated. The style of an option has an influence of the payoff of an option, as the formulae to price the options are dependent on their associated style.

Each call and put bond option has a payoff at the expiry of the option. These payoffs differ between long and short call and put contracts. Payoff diagrams in Figure 2.1 individually illustrate the payoff a long call, long put, short call and a short put.

¹¹ The long position is the position of the buyer of an option contract (Marx 2013).

¹² The short position is the position of the seller of an option contract (Marx 2013).

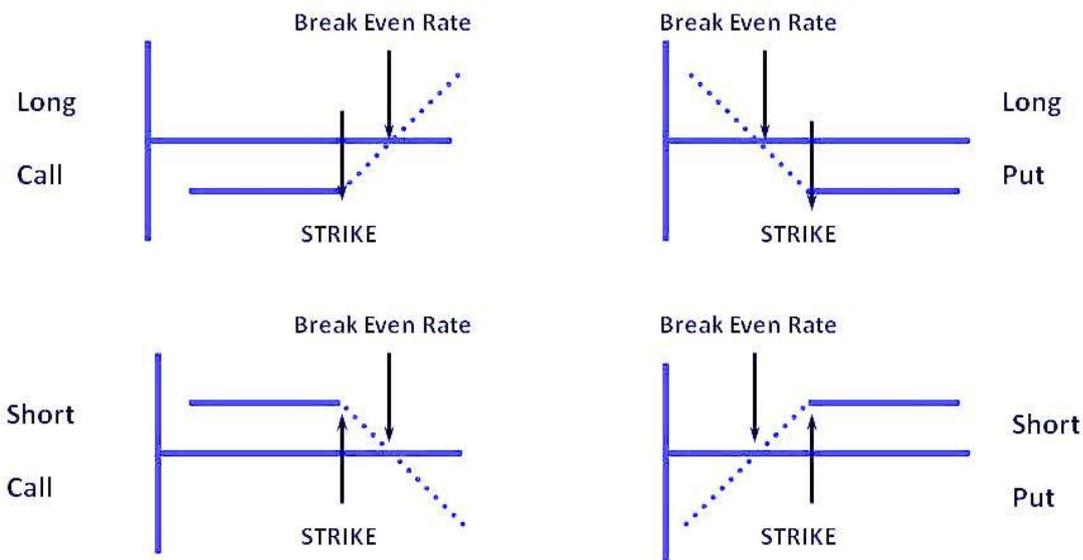


Figure 2.1: Payoff diagrams of a long and short call and put

Source: Banerjee (2008)

Figure 2.1 illustrates the payoff of the four different positions of an option contract. According to Ben-Ameur *et al.* (2007) an option is only exercised if the option expires in-the-money. An option is in-the-money if the strike price is lower than the present market price of a call. A put however is in-the-money when the strike price is higher than the prevailing market price (Ben-Ameur *et al.* 2007).

Investors use option strategies to hedge against risk. Option strategies attempt to derive profits without incurring unnecessary risks. An option trading strategy is constructed bullish, bearish, leveraged, volatile, neutral or arbitrarily (De Beer 2011). All strategies are a combination of an option and the underlying asset (De Beer 2011). Figure 2.2 gives an illustration of a combination of two options to create a long straddle spread (De Beer 2011).

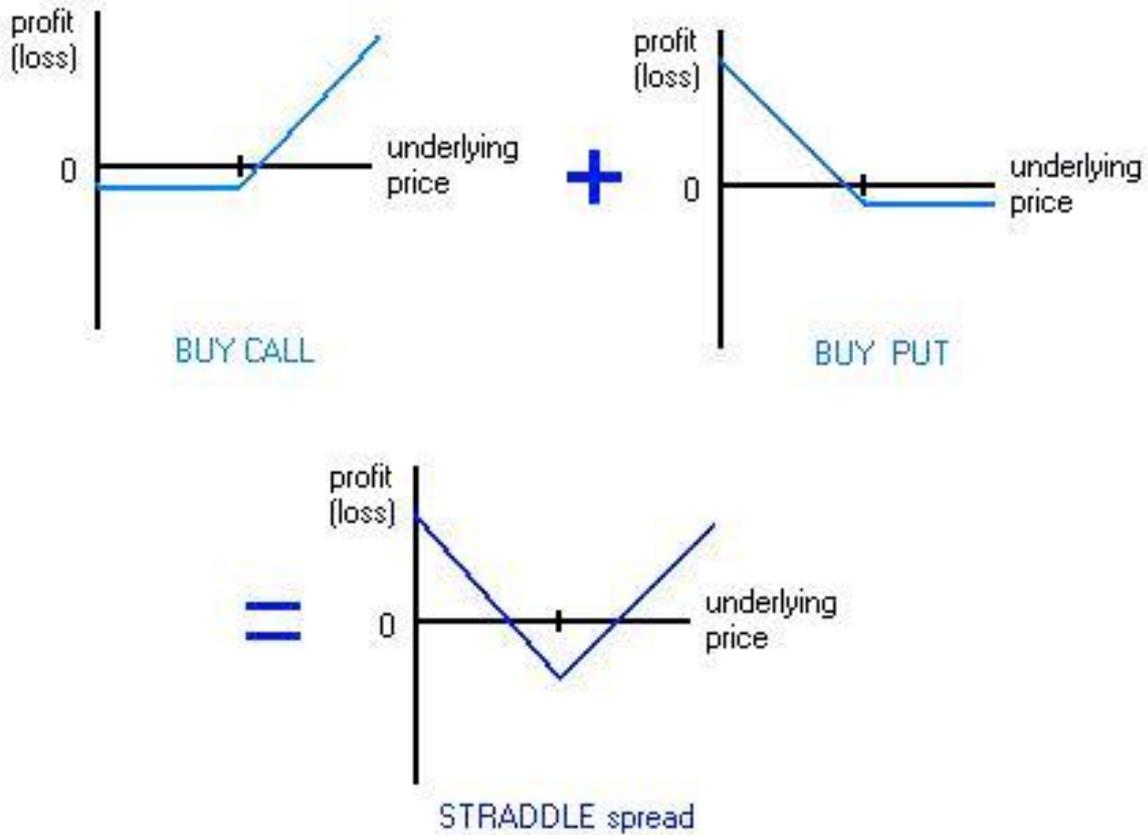


Figure 2.2: Straddle spread

Source: De Beer (2011)

Figure 2.2 gives an example of a straddle spread option strategy that is used to limit risk. An investor engaging in a long straddle would ultimately buy a call and also buy a put option with a similar strike price. Straddles have been a frequently used strategy ever since market volatility increased after 2007 until as recently as September 2014 as an investor would profit from market volatility when engaged a straddle (De Beer 2011). De Beer (2011) summarised the cost and profit of a straddle as indicated in Table 2.1.

Table 2.1: Attributes of a long straddle

Cost	$c + p \rightarrow \textit{Debit}$
Payoff	$\max(0; S_T - X) + \max(0; X - S_T)$
Profit	$\textit{Payoff} - \textit{Cost}$
Maximum profit	$(X - \textit{Cost}) \textit{ or Unlimited}$
Maximum loss	\textit{Cost}
Breakeven	$X \pm \textit{Cost}$

Source: De Beer (2011)

Table 2.1 shows the cost, payoff, profit, maximum profit, maximum loss and breakeven of a straddle spread option strategy. De Beer (2011) states that it is important to note that the strategy limits the loss to the cost of the strategy while the profit is either the difference between the strike price and the cost, or it could be unlimited. As option pricing is dependent on the underlying instrument it is important to understand the bond market. Based on the literature review, the international bond market is discussed in the next section.

2.4 INTERNATIONAL BOND MARKETS

The bond market is an effective market for companies to raise debt capital. Bonds are used as an alternative funding instrument to equity financing as bonds are a less expensive form of financing than equity financing (Gitman ed. 2010). Organisations therefore turn to the bond market when in need of additional financing (Van Zyl *et al.* 2006). This section will attempt to explain the fundamentals of the bond market. The discussion will include a review of the international bond market, bond regulation, bond liquidity, bond pricing and bond yields.

2.4.1 The international bond market

Hunter and Simon (2005) suggest that investors turn to the bond market when the equity market experiences a downturn. This is because a weak equity market increases the strength of the bond market as investors wanted to achieve better returns (Hunter & Simon 2005). The bond market of each country is unique and the

effect of the subprime crisis in 2007 had a different effect on the financial market of each of the countries. The bond market of some international financial markets is discussed next.

The Australian bond market is an example of a bond market within a developed financial market. According to the Pacific Investment Management Company (2011) there are different types of bonds currently available in the Australian market, namely corporate, securitised, semi-government and government bonds. A benefit of investing in Australian bonds is that Australia exports a large amount of commodities to China. The bond market as a whole has an excellent rating from Moody's¹³ and Standard & Poor's¹⁴ (S&P), boasting AAA and Aaa ratings respectively. These ratings suggest that the bonds are of an investment grade. This type of bond holds a small risk to the investor and has a stable issuer (PIMCO 2011).

Greenwood and Vayanos (2010) found that investors assess bonds based on their current investment need. The coupon, maturity and interest rate of a bond influence the view of an investor. These factors also influence the price of a bond as well as the inflation, supply and demand and other macroeconomic variables. Furthermore, Greenwood and Vayanos (2010) conclude that in the United Kingdom (UK), bond issues were fewer when the government reduced spending in 1999 because of budget surpluses.

The UK derives strips from coupon-bearing bonds to create an additional security effectively changing the coupon-bearing instrument into a zero-coupon bond (Lamoureux & Theocharides 2012). Results from Armitage, Chakravarty, Hodgkinson and Wells (2012) indicate that the UK strip market is not as liquid as the UK bond market. Armitage *et al.* (2012) also found that liquidity largely differs in these markets.

Abad *et al.* (2010) found that the EMU markets are less integrated with the USA market than non-EMU markets. Abad *et al.* (2010) particularly stated that, at the

¹³ Moody's is a CRA and offers the Aaa rating to bonds that are essentially free of default risk in the near future (Hull, Predescu & White 2004).

¹⁴ S&P is a CRA and offers the AAA rating to bonds that are essentially free of default risk in the near future (Hull *et al.* 2004).

time of their research, there were large differences in the integration between USA and German bond markets compared to the EMU and non-EMU countries. The bond returns of non-EMU countries are easily influenced by the global risk factors, while EMU countries were influenced by Eurozone risks (Abad *et al.* 2010).

Arestis and Karakitsos (2009) are of opinion that funding of innovative and profitable ideas of corporate entities is difficult in the USA, especially in the equity market after the subprime crisis of 2007. The USA central bank, also known as The Fed or The Federal reserve, lowered interest rates in 2007 to stimulate growth after the 2007 subprime crisis even though the financial crisis had a severe effect on the USA financial market (Arestis & Karakitsos 2009).

Ping and Qin (2011) state that, even as the American financial market was in a poor state after the 2007 financial crisis, they still regarded US Treasury Bonds as the safest investment, as these bonds have virtually no credit risk. Ping and Qin (2011) conclude that China became the largest institutional investor in US Treasury Bonds as China bought more than \$900 billion worth of US Treasury Bonds since the 2000s. The predictability and different combinations of maturity options allow investors to create their own basket of Treasury Bonds.

Emerging countries, such as the BRICS¹⁵ economies, have different challenges in their domestic bond market. An example of a BRICS country that experienced challenges is Brazil as the country went through various financial challenges, such as hyperinflation and introduction of a new currency, since the 1960s (Leal & Carvalhal-da-Silva 2006). Leal and Carvalhal-da-Silva (2006) researched the development of the Brazilian bond market. The research concluded that the Brazilian bond market is underdeveloped when compared to other emerging economies.

Leal and Carvalhal-da-Silva (2006) conclude that a number of factors could explain the weak development in the Brazilian bond market as other emerging economies experienced similar challenges. In Brazil, the large government bond market has a

¹⁵ BRICS is an acronym for a group of countries (Brazil, Russia, India, China and South Africa) in an association of emerging market economies (Pant 2013).

crowding out effect on corporate bonds (Walter 2011). According to Leal and Carvalho-da-Silva (2006) the Brazilian government bonds have an additional tax incentive. This tax incentive for government bonds decreased the appeal of the corporate debt market. Leal and Carvalho-da-Silva (2006) found that a number of emerging economies have an underdeveloped bond market due to liquidity constraints.

Leal and Carvalho-da-Silva (2006) states that the Brazilian yield curve was consolidated with the yield curve of the UK and USA to limit the liquidity constraints in the market. A large number of government bonds were introduced to prevent illiquidity in the bond market in Brazil between 1985 and 2005. These changes were of a regulatory nature and reduced overcrowding and enhanced liquidity in the market (Leal & Carvalho-da-Silva 2006). Regulation in a financial market should however not overregulate the financial market as overregulation could overburden the financial market.

2.4.2 Bond market regulation

Financial markets around the world have their own unique regulations. Ball *et al.* (2011) found that financial markets thrive when there is transparency, full disclosure, investor protection and effective monitoring in the financial market. Therefore, regulation in a country encourages market activity and thereby promotes economic growth.

Ball *et al.* (2011) conclude that regulation has an impact on the yield of a bond. Countries who have established regulation and enforcement policies tend to have lower bond yields. Bernanke (2011) found that the aftermath of the subprime crisis in 2007 led governments to improve regulation to reduce systemic risks in the financial markets. Kaufman (2000) describes systemic risk as the risk of collapse of an entire system.

Milne (2009) recommends that regulatory improvements should differentiate between micro and macro prudential regulation. Bank regulation and the capital adequacy requirements are micro prudential regulation, while macro prudential

regulation evaluates the interaction between trading services and the financial institutions, including banks. Milne (2009) furthermore says that a relationship could exist between micro prudential regulation and systemic risk in a financial system if micro prudential regulation internalises the external costs of systemic risk by financial institutions.

Arestis and Karakitsos (2009) researched the actions of the USA government after the Glass–Steagall Act had been repealed in 1999. This Act prohibited financial institutions to combine their loan origination and loan portfolio. The result was that American banks were allowed to hold commercial and residential property. The property was held instead of liquid traditional assets such as government bonds and Treasury Bonds. It is possible that such regulation could negatively affect bond market. The negative effect is possible because banks reduced liquid asset holdings in bonds and increased their holdings in commercial and residential property, reducing the activity and liquidity of the bond market (Arestis & Karakitsos 2009).

Governments regulate financial markets to reduce systematic risk in the financial environment. Regulation should address macro and micro prudential aspects. If governments do not regulate efficiently, economies could experience increased systematic risk.

2.4.3 Bond liquidity

Trading activity and liquidity have a fundamental role in financial markets (Van Zyl *et al.* 2006). However, little is known about liquidity and trading activity (Chordia, Roll & Subrahmanyam 2001). Deuskar *et al.* (2011) are of the opinion that there is a direct relationship between liquidity and the market price of an asset. Liquidity can be described as the time it takes to convert an asset into cash at a price close to the current fair market price (Reilly & Brown 2011). Ping and Qin (2011) redefine this definition. They call it financial liquidity, and simplify the definition as the ability to buy and sell with ease.

Goyenko, Subrahmanyam and Ukhov (2011) aver that liquidity in the bond market can be adversely influenced by the prevailing economic climate. Liquidity is

influenced by the price, maturity and principal amount of a bond. The bond bid–offer spread widens for differences between the long- and short-term bonds, as well as during periods of negative growth in the gross domestic product (GDP). Periods that have a negative GDP growth drive investors to seek alternative investments, such as bonds (Goyenko *et al.* 2011).

Macroeconomic shocks in the short-term bond market absorb some of the illiquidity before transmitting the illiquidity to the long-term bond market (Goyenko *et al.* 2011). Milne (2009) describes illiquidity as systemic risk of assets within a market. Bond markets experienced illiquidity when the bid–offer spread of some bond prices remains unchanged (Milne 2009). Ball *et al.* (2011) aver that illiquid bonds carry more risk than liquid bonds and investors demand a higher liquidity premium for these illiquid bonds compared to liquid bonds.

Ball *et al.* (2011) found that bonds associated with high risk traded actively on the bond markets. Deuskar *et al.* (2011) state that illiquidity has a negative effect on the price of a bond. This is because investors require a higher return on illiquid bonds compared to the required return on liquid bonds. Armitrage *et al.* (2012) agree that there is a positive relationship between the liquidity of a bond and the price of bond.

Deuskar *et al.* (2011) emphasise the importance of bond liquidity and the relationship it has with bond pricing. Chordia *et al.* (2001) found that liquidity could form part of a function of the prevailing interest rate in a country. Interest rate however is not the only externality that could influence liquidity. Ping and Qin (2011) present results that indicate that the size of a bond and the number of issued bonds also play a role in determining market liquidity. According to Ping and Qin (2011), the best example of liquid bonds are US Treasury bills, not to be confused with US Treasury Bonds. Treasury bills are non-interest bearing securities that mature in one year or less and sell at a discount of the par value (Hull 2008).

Goyenko *et al.* (2011) state that there are still critical areas of bond market liquidity that need to be researched as these areas hold practical and academic importance. Chordia *et al.* (2001) found that improved liquidity could also positively influence regulation and investment management. The effects that liquidity and regulation

have on bond pricing are factored into pricing models (see 2.4.4). Financial assets, such as bonds, are accurately priced when the bonds are liquid. Illiquidity in the bond market makes it difficult to price the asset (Milne 2009).

2.4.4 Bond pricing

Bonds are priced based on five variables, namely par value, spot price, interest rate, coupon rate and maturity (see 2.2.1). Milne (2009) concludes that financial institutions develop unique pricing models to price and analyse bonds. These models adjust for credit ratings disseminated by CRAs as regular marking-to-market is not constantly possible.

Grinblatt and Longstaff (2000, in Armitage *et al.* 2012) found that factors such as liquidity, maturity and taxation provide insight into the valuation differences between pricing models. Milne (2009) reasons that losses suffered by financial institutions could be the result of mispricing, unhedged transactions or incorrect information. The process of bond pricing consists of two dependent parts, firstly the valuation of the bond and secondly the bid–offer spread of the bond.

A bond can be valued by way of a number of models. As stated earlier (see 2.4.4), financial institutions create their own pricing models and incorporate quantitative as well as qualitative measures in these models. Bonds are generally priced according to Equation 2.1.

Equation 2.1: Price of a bond

$$Price = \sum_{i=1}^N \frac{C}{(1+k)^i} + \frac{Par}{(1+k)^N} \text{ and } C = k_c \times Par$$

Source: Arnold (2012)

Where:

- C = coupon;
- k = interest rate;
- Par = par value of the bond; and
- k_c = coupon rate of the bond.

The excess returns generated by government bonds can be determined as per Equation 2.2.

Equation 2.2: Excess returns

$$r_{i,t} = a_i + b_i^W Z_{i,t-1}^W + b_i^L Z_{i,t-1}^L + \varepsilon_{i,t}$$

Source: Abad *et al.* (2010)

Where:

r_t = government bond excess returns for country i ;

Z_i^W = world return variable;

Z_i^L = local return variable; and

$\varepsilon_{i,t}$ = error term for the country and period.

The second part of bond valuation, the bid–offer spread, can be determined as modelled by Roll (1984), and shown here in Equation 2.3.

Equation 2.3: Bid–offer spread

$$Bid - Offer = 2\sqrt{-cov}$$

Source: Roll (1984)

Where:

cov = first-order serial covariance of price changes.

Chordia *et al.* (2001) found that the spreads fluctuate in different market conditions. Shrinking markets widens the bid–offer spread considerably more compared to the relatively small changes occurring in growing markets. These expansions and contractions of an economy directly affect the bond market and its associated yield curve.

2.4.5 Bond yields

Seminal work by Fama and French (1989) incorporated the bond yield to evaluate the expected returns of equities and bonds in a market. According to Wilson (2012),

the bond yield is the amount of interest payable by the issuer of a bond. Bond yield has an inverse relationship with the bond price (Lawrence & Shankar 2007). The bond yield curve is a function of the changing yield and is determined by the bootstrapping method. Reilly and Brown (2011) defines bootstrapping as the process of determining interest rates by creating a theoretical spot rate from coupon bearing bond.

Van Zyl *et al.* (2006) describe a bond yield curve as a function of interest rates (yield) and maturity. A number of factors can influence the shape of the yield curve. Market expectations, liquidity, currency volatility and monetary policy influence the shape of the yield curve (Van Zyl *et al.* 2006). According to Van der Merwe (2004), central banks announce the repurchase (repo) rates regularly. Repo rates influence the discount or rediscount rates of financial instruments in the money market (Van der Merwe 2004) and have a direct influence on the yield curve and could shift the entire curve when future economic conditions change considerably (Chun 2011).

According to Ball *et al.* (2011), bond yields adjust for inflation as well as currency volatility. Therefore a country with higher inflation would have a higher interest rate. A higher interest rate is used to limit inflationary effects in the financial market. The World Bank (n.d. a) published the CPI for a number of countries indicated in Table 2.2.

Table 2.2: CPI figures for 2008–2013

Country	2008	2009	2010	2011	2012	2013
Australia	96	97	100	103	105	108
Brazil	91	95	100	107	112	119
China	98	97	100	103	107	109
Germany	99	99	100	102	104	106
India	81	89	100	109	119	132
United Kingdom	99	97	100	105	107	110
United States	88	98	100	103	105	107

*2010 = base year

Source: World Bank (n.d. a)

Table 2.2 provides the level of inflation for Australia, Brazil, China, Germany, India, the UK and the USA on a year-on-year basis for a six-year period (2008–2013). Inflation has a positive relationship with interest rates (Berument, Kilinc & Ozlale 2005). Ball *et al.* (2011) found that long-maturity bonds issued at a large par value have higher yields than short-maturity bonds due to increased risk. In comparison, short-maturity bonds have higher yields than long-maturity bonds. Grieves, Marcus and Woodhams (2010) conclude that the inverse relationship between yield and price implies a lower price conversion ratio for short-maturity bonds.

The yield curve of each country is unique as yields react differently amongst different countries because of factors such as liquidity, currency volatility and monetary policy as explained by Van Zyl *et al.* (2006). An example of a yield curve for a developed country is reflected in Figure 2.3, and for a developing country, in Figure 2.4. These yield curves represent the 10-year government bond yield curve for the UK and Brazil respectively (Bloomberg Terminal 2014).



Figure 2.3: Britain 10-year bond yield curve

Source: Bloomberg Terminal (2014)

Figure 2.3 gives an indication of the reaction to the 2007 subprime crisis from the perspective of a foreign developed economy. Figure 2.3, the UK bond yield curve, indicates that the long-term bond yields decreased after the subprime crisis and remained at the lower levels since 2007 to 2012. The yield of this bond only started changing in 2012. After that, it experienced a slight upswing. Figure 2.4 gives an indication of the reaction of the long-term bond yields of a foreign developing economy.



Figure 2.4: Brazil 10-year bond yield curve

Source: Bloomberg Terminal (2014)

Figure 2.4 shows how the Brazilian bond market reacted to the 2007 subprime crisis. After the subprime crisis, the yields decreased for a shorter period compared to the UK long-term bond yield curve, after which it experienced an upswing until 2011, when it experienced a significant decrease (Bloomberg Terminal 2014).

Greenwood and Vayanos (2010) state that most central banks had to enter into open-market transactions to inject funds into their country's financial market after the 2007 subprime crisis. The central banks all had a similar objective at that stage,

namely to alter the long-term bond yields (Greenwood & Vayanos 2010). If long-term bond yields increased, it could lead investors to move more funds from the bond market into the equities market (Chordia *et al.* 2001). Shortly after the subprime crisis, Abad *et al.* (2010) suggest that the 10-year yield curve of some European Monetary Union (EMU) countries are influenced by domestic risks rather than international risks. This is unlike the case with non-EMU countries where the risks that affect non-EMU countries are global risk factors (Abad *et al.* 2010).

The bond market is an essential part of financial markets. Governments and the private sector both use the bond market to raise additional capital to finance projects. Bonds, however, are dynamic and evolve considerably. A number of factors, such as pricing formulae, liquidity, yields and regulation, influence the market price of a bond. These same factors have an influence on the bond option market. The literature regarding the bond option market as seen from an international perspective is discussed in the next section.

2.5 BOND OPTION MARKET

Derivative instruments have an important role in a financial market of any global financial market (Deuskar *et al.* 2011). The three most common underlying assets on which derivatives trade are interest rates, currency exchanges rates and equities. The interest rate derivatives market flourished during the early 2000s and accounted for more than 70% of the entire global derivatives market (Baaquie 2010).

Bezzina and Grima (2012) found that derivatives led to large financial losses and institutional failures in recent years. Even though the failures occurred, the derivative market still expanded (Acharya *et al.* 2010). Derivatives must however be understood in case investors choose to use these financial instruments in their portfolios.

2.5.1 International bond option market

Prior to the 1970s, the derivative markets consisted mainly of agricultural products. Only in 1970 did the financial derivatives market start to expand as a result of advances in derivative pricing and economic conditions at the time (Stulz 2005). According to Bezzina and Grima (2012), volatility in the foreign exchange and interest rate market increased significantly during the 1970s. Due to the fluctuations in volatility and foreign exchange, institutional investors had to apply hedging techniques efficiently to reduce risk (Bezzina & Grima 2012).

Stulz (2005) concludes that derivatives play an important role in modern economies. Bond options could add a substantial amount of value to the financial market in a country. Australia has a flourishing underlying bond market and boasts with an effective bond derivatives market (PIMCO 2011). According to PIMCO (2011), the successful Australian bond option market owes its successes to the flourishing underlying bond market.

In an emerging market, the bond market and its associated derivative market may be different from a developed market such as Australia. Brazil, one of the emerging economies in the BRICS group, experienced some challenges in its financial market but has made major progress up to 2012 (Park 2012). The Brazilian bond market offers government bonds with an average maturity of fewer than three years (Park 2012). Park (2012) found that the liquidity in the Brazilian secondary bond market was very low with financial institutions holding corporate bonds until maturity. Dodd and Griffith-Jones (2007) found that the Brazilian OTC market is excellent in reporting transactions but they questioned the viability of an OTC bond option market in an emerging economy, such as Brazil, as OTC bond option market could negatively impact the financial market.

Arestis and Karakitsos (2009) state that financial innovation is associated with the relationship between securities and derivatives. The CEC (2009) found that financial instruments in the derivatives market have established infrastructures and risk management structures. However, these structures could still improve to become more effective. In a time of financial innovation, information should be well

distributed as a lack of information could lead investors to experience risk if they are not properly informed of the changing environment (Dodd 2009).

Bezzina and Grima (2012) are of the opinion that derivatives are not fully utilised in the international financial markets. This lack of utilisation is due to investors who do not have the expertise to incorporate these instruments into their portfolios (Bezzina & Grima 2012).

2.5.2 Bond option markets

Bond option transactions take place in a regulated ET market or in an over-the-counter (OTC) market. The differences between the OTC and ET markets is summarised below.

2.5.2.1 Over-the-counter market

According to Stulz (2005) contracts in the OTC market are unregulated. These contracts can be private with a custom maturity, size, settlement and price (Stulz 2005). Regulators are of the opinion that investors who perform transactions in the OTC market are informed and aware of the systemic risks of the specific financial instrument (Dodd 2012).

The CEC (2009) reports that compared to the ET market, the OTC derivative market carries some additional risk. Some derivatives in the OTC market experience higher volatility due to the volatility in the underlying market. The liquidity of the underlying markets also tends to be different for the ET and OTC market, as the ET market is liquid compared to the OTC market (CEC 2009).

Deuskar *et al.* (2011) question whether illiquidity results in lower-priced option contracts. The question was raised as underlying assets trade at lower prices when the market is illiquid. Deuskar *et al.* (2011) found that the OTC bond option market is competitive but tends to be illiquid.

In the OTC market, bond options tend to be illiquid as the instruments are generally not standardised. OTC market contracts are often customised to suit the needs of a particular investor (Choudhry 2001; Stulz 2005). Standardisation is a method to prevent illiquidity in the OTC market (Bernanke 2011).

2.5.2.2 Exchange-traded (ET) market

Regulation in the standardised ET market is set to protect uninformed investors (Dodd 2012). The regulation offers the added incentive of reducing the systemic risks in the financial market when dealing with ET contracts. Standardised contracts make it easy for investors to enter and understand the terms of a transaction (Dodd 2012; Stulz 2005).

Regulation supports the suitability requirement of an investor. Dodd (2009) reports that suitability is a fundamental requirement for an investor and investors should be able to adhere to the terms of the contracts engaged in. ET options are standardised and thus suitable for investors without any specific requirements (Choudhry 2001; Stulz 2005).

The main difference between the OTC and ET market is standardisation (Choudhry 2001). Dodd (2012) is of the opinion that the differences between these markets are narrowing as technology progresses. Ball *et al.* (2011) however conclude that the only rationale left for differentiation between OTC and ET is to make a distinction between the regulatory consequences.

There are a number of different regulated or unregulated and standardised or non-standardised markets available. Table 2.3 gives a representation of the different market types as identified by Nystedt (2004).

Table 2.3: Definition of different derivatives markets

	Standardised	Non-standardised
Cleared, regulated	Organised derivatives exchange markets, such as the Chicago Board of Exchange (CBOE), the Chicago Board of Trade (CBOT) and the European Exchange (Eurex)	Tailor-made clearing
Not cleared, self-regulated	International currency and swap market	Pure OTC derivatives

Source: Nystedt (2004)

Table 2.3 reflects OTC and ET markets. In organised derivatives exchanges, such as the CBOE, CBOT and Eurex, transaction are easily recorded. However, the OTC market is not as transparent.

The Bank of International Settlements (BIS) (n.d. a) and BIS (n.d. c) record the notional dollar amount outstanding in the derivatives markets. Figure 2.5 shows a comparison between the ET and OTC derivatives markets expressed as a percentage of the dollar amount outstanding.

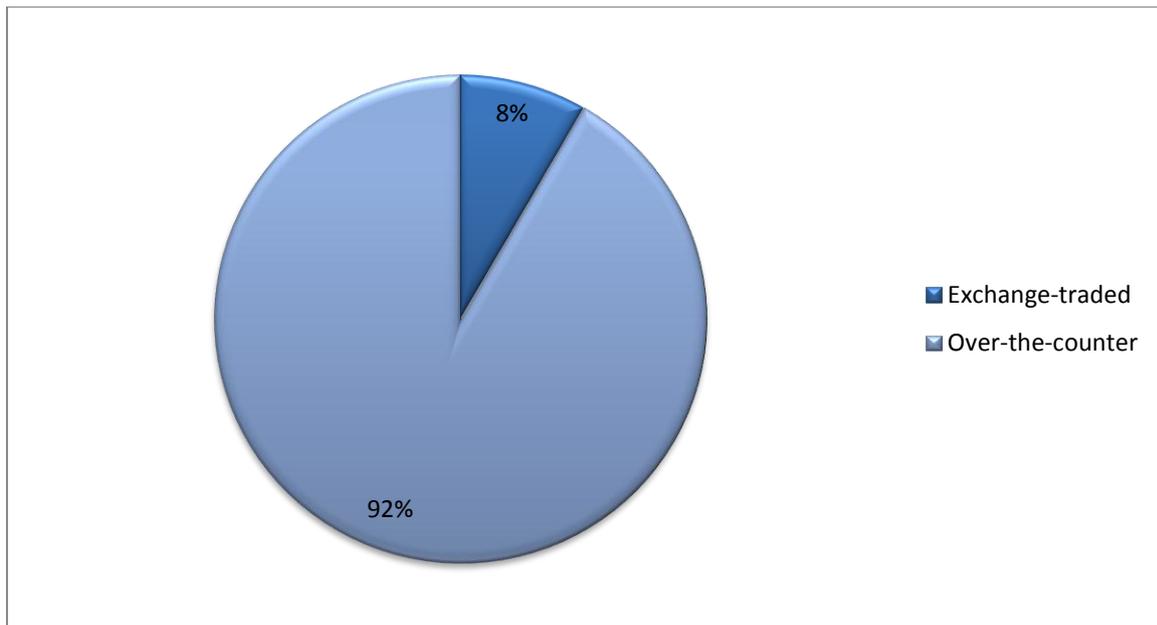


Figure 2.5: Derivatives notional percentage outstanding

Source: BIS (n.d. a) and BIS (n.d. c)

Figure 2.5 comprises a comparative representation of the notional percentage outstanding derivatives between the OTC and ET markets. The figure shows that 92% of all the outstanding notional \$ billions is part of the OTC market. Figure 2.5 further indicates that only 8% of the transactions formed part of the ET market.

The OTC market is unregulated as it is assumed that the investors are sufficiently informed and would not add inherent systemic risk to the market (Dodd 2012; Stulz 2005). However, this unregulated market changed considerably since the 2007 financial crisis because of reforms in the derivatives market (Adelegan 2009; Hull 2014).

2.5.3 Derivatives regulation internationally

The financial markets are regulated to prohibit transactions that could add risk to the financial system (Dodd 2009). Financial engineers create financing products that are structured around the regulations to derive profits by using barely legal financial products (Arestis & Karakitsos 2009). Sherman (2009) and Dodd (2009) are of the opinion that uncertainty and non-transparent markets are disruptive to the financial

system and lead to increased systemic risk in the financial markets. Regulation is the most effective tool to combat the inefficiencies in the market.

Bernanke (2011) aver that regulators had started to discuss initiatives to limit the inefficiencies in the financial markets prior to the 2007 financial crisis. Standardisation and clearinghouses were proposed to limit credit risk in the OTC markets (Bernanke 2011). Bezzina and Grima (2012) reported that the initiatives to regulate the derivatives market are part of the Basel Accords. The latest version of Basel, Basel III, has three distinct pillars. Pillar 1 addresses capital, risk coverage and leverage, Pillar 2 deals with risk management and supervision, while Pillar 3 addresses market discipline and disclosure requirements (BIS n.d. b). Although Basel III introduced derivative regulations, it is still up to each country to create legislation to enforce the Basel III requirements (BIS n.d. b). The regulation of the UK, USA, EU and emerging economies is discussed in the next section.

2.5.3.1 United Kingdom – Turner review

The Turner review was sanctioned by the Financial Services Authority (FSA) in 2009 (Turner 2009). Turner (2009) assessed the financial markets and the condition of the market after the 2007 financial crisis. The review raised concerns about derivatives regulation and reiterated that interest rate derivatives have a substantial role in the UK and that interest rate derivatives played a significant role in the market. The review found that credit derivatives constituted the primary source of increased systemic risk in the UK financial market. Regulation was consequently introduced to limit the derivatives risk. This regulation enforced initial margins and minimum risk levels in the OTC market (Turner 2009).

2.5.3.2 European Union (EU) – De Larosière report (2009)

The De Larosière report (2009) is the EU equivalent of the UK Turner review. De Larosière (2009) is of the opinion that certain derivatives increased the risk in the financial market instead of mitigating the risk as intended. The Basel I and Basel II frameworks were inadequate to deal with the derivative markets. Basel III, however, addressed derivatives in the third pillar of the Basel accord (De Larosière 2009).

The EU called for a simplification and standardisation of the OTC derivatives in order to enhance risk mitigation and transparency in the financial markets. The report recommended that a central clearinghouse with a substantial capital base be established to limit credit risk among investors (De Larosière 2009).

2.5.3.3 United States of America – Dodd–Frank Act (2010)

Ball *et al.* (2011) are of the opinion that the US regulatory environment offers superb investor protection, efficiently monitors the financial markets and encourages transparency. The regulation that improved the transparency, investor protection and financial strength of the market is known as the Dodd–Frank Act (2010).

The Dodd–Frank Act (2010) contains additional regulatory requirements and was not solely written to address the failures caused by derivatives. Morrison and Foerster (2010) reports that CRAs are included in this act and that the CRAs must register with the Securities and Exchange Commission (SEC). This allows regulatory bodies to ensure that the agencies adhere to due diligence procedures. As in the case of the EMU and the UK, the USA proposed mandatory clearinghouses that enforced margin requirements. Another initiative was to reward whistle-blowers since whistle-blowers contribute to investor protection reforms (Morrison & Foerster 2010).

2.5.3.4 Derivatives regulation in emerging markets

Emerging financial markets are not exempt from experiencing above normal losses similar to the losses of the developed financial markets (Dodd 2009). Dodd (2009) refers to Brazil, which is known for transparent reporting of OTC derivative transactions. After the 2007 subprime crisis, the country experienced significant losses (Dodd 2009).

During 2010, the International Organisation of Securities Commissions (IOSCO) surveyed markets in emerging countries, and achieved a 76% response rate among those countries regarding EMEs derivatives regulation (IOSCO 2010). IOSCO (2010) reported on some regulatory issues in these financial markets. Countries that took part were Brazil, China, India, South Africa and 15 other emerging economies.

IOSCO (2010) made 15 recommendations that focused on improving the regulatory framework within the trading environment in these emerging financial markets.

The IOSCO (2010) recommendations to emerging financial markets were to address market entry of intermediaries, investor protection, standardisation, clearinghouses, transparency, financial reporting, risk management and valuations. However, in the emerging financial markets, derivative trading did not lead to company failures. This was a result of the less-integrated emerging financial markets which protected the financial markets against the 2007 subprime crisis (IOSCO 2010).

After the subprime crisis, regulation was introduced into financial markets to limit the systemic risk derivative instruments add to financial markets. The effects of derivative trading differed amongst financial markets. This left each country with the obligation to enforce its own regulations from the guiding principles of the Basel Accords. The objective of the regulation was to improve financial market efficiency and to protect the investors within the financial markets. Efficient financial markets make it possible for investors to participate in hedging, speculation and arbitrage transactions.

2.5.4 Hedging, speculation and arbitrage

Hedgers, speculators and arbitrageurs are investors with certain investment objectives (Hull 2008). A hedger aims to protect profits by engaging in a position that would limit potential losses of a transaction (Hull 2008). An arbitrageur attempts to make a riskless profit when markets do not comply with the law of one price (Bodie *et al.* 2009). A speculator is an investor who forms a perception about the market and invests in order to derive profits (Hull 2008). The speculator often enters into riskier positions to achieve abnormal returns, unlike a hedger or arbitrageur who seeks to either lock in a price or obtain a riskless profit (Marx 2013).

Hedgers often attempt to construct a perfect hedge. However, perfect hedges cannot be achieved, since hedging only reduces risks against market variables, such as exchange rates, interest rates, share prices, commodity prices and credit risks (CEC 2009). In theory, a perfect hedge would not have any price influence on the

underlying asset or derivative and the hedging would be continuous. However, due to transaction costs, replication costs, contract sizes and volatility, perfect hedges cannot be achieved (Deuskar *et al.* 2011).

Dodd (2009) researched the technical attributes of a transaction to be considered a hedge. According to the International Financial Reporting Standards (IFRS) (International Accounting Standards Board 2010), a transaction is described as a hedge if the price falls between 85 and 105 per cent of the asset price. Even if the technical requirements are met, the suitability of the transaction to protect an investor against large adverse movements in the market should be determined (Dodd 2009).

Armitrage *et al.* (2012) found that market inefficiencies often lead to adverse movements in market prices. These inefficiencies are opportunities for arbitrage transactions. Arbitrage transactions are not necessarily cost-free as taxes are levied on arbitrage gains and commission is paid on the transactions (Armitrage *et al.* 2012). Armitrage *et al.* (2012) also found that arbitrage opportunities in the UK bond market are not fully exploited as investors lack the ability to utilise the market inefficiencies.

Arbitrageurs seek riskless profits. Short-term interest rate changes are considered a fundamental source of risk. Greenwood and Vayanos (2010) explored the effects¹⁶ on assets when interest rate shocks occur. Findings indicated that bonds have the highest sensitivity to interest rate changes. Arbitrageurs can benefit from the changes in interest rates when rates increase or decrease as their objective is to lock in a riskless profit (Greenwood & Vayanos 2010).

Speculators have an opposite outlook on risk, as they primarily take risks in order to profit by their outlook on the market (Marx 2013). Arestis and Karakitsos (2009) conclude that, when financial bubbles burst, speculators often require funds from central banks. This funding need indicates that speculators could potentially add risk to a financial market. In cases where a bubble burst, the central banks offered a

¹⁶ Effects refer to the inverse relationship between price and interest rates (see 2.2.1 and 3.2.5).

bailout to prevent a ripple effect of default risk disseminating into a financial market (Arestis & Karakitsos 2009).

Lawton (2012) however highlights the importance of speculation in a market as speculation increases liquidity in the financial markets. Speculators add liquidity in the financial markets by transacting when arbitrage differences exist. Bond option liquidity is the focus of the next section.

2.5.5 Bond option liquidity

Seminal work on liquidity by Amihud and Mendelson (1988) identified that one of the most important components of a financial instrument is liquidity. Lawton (2012) defines liquidity as the number of active buyers and sellers in a market, and adds that a liquid asset is an asset that can be transferred swiftly at a low cost.

Liquidity is essentially the ease of buying and selling (Dodd 2012). Measuring the ease with which investors buy or sell assets can be determined by four methods (Hearn & Piesse 2012), namely:

- bid–offer spread method;
- volume-based method;
- trading speed indicator method; and
- price discovery method.

The price of a bond option is related to the type of underlying instrument, in the current research, a bond. An underlying instrument that is liquid is priced higher than an illiquid underlying instrument but yields a lower return and is priced higher, while an illiquid underlying instrument is priced lower than a liquid underlying instrument but offers a higher return (Deuskar *et al.* 2011). The bond option market displays a positive relationship between liquidity and asset prices (Deuskar *et al.* 2011).

Risk has an effect on liquidity and pricing of a derivative. Improved liquidity can reduce the cost and risk exposure of a derivative (Bernanke 2011). Lawton (2012)

reports that the Group of 20 countries¹⁷ have a number of initiatives to reduce risk, one being organised exchanges for the OTC markets to improve liquidity. Standardisation could increase liquidity and reduce risk.

Longstaff (2009) and Amihud *et al.* (2005) conducted research on the price effect of liquidity. Longstaff (2009) found that assets with identical cash flows could vary by more than 10% in value depending on their level of liquidity. Amihud *et al.* (2005) confirm that liquidity has a definite positive influence on the price of an asset.

Financial instruments react differently to illiquidity. Deuskar *et al.* (2011) found that illiquid derivatives could be priced higher than similar derivatives with lower liquidity. The liquidity of bond options could have a potential price effect on the financial instrument. The level of bond option liquidity is different between the OTC and ET markets. These markets are discussed in the next paragraph.

2.5.6 Bond option market notional dollar amount outstanding: ET vs. OTC

Bond options form part of the global financial markets. Bond options accounted for almost 15% of the notional value of derivative contracts traded in 2010 (Baaquie 2010). The BIS (n.d. d) and BIS (n.d. e) recorded the notional dollar amount outstanding on bond options. Figure 2.6 represents the global ET and OTC bond option dollar amount outstanding.

¹⁷ The Group of 20 countries (also known as the G20) are twenty countries that is represented by governors of central banks and ministers of finance of the twenty different countries (Duca & Stracca 2014).

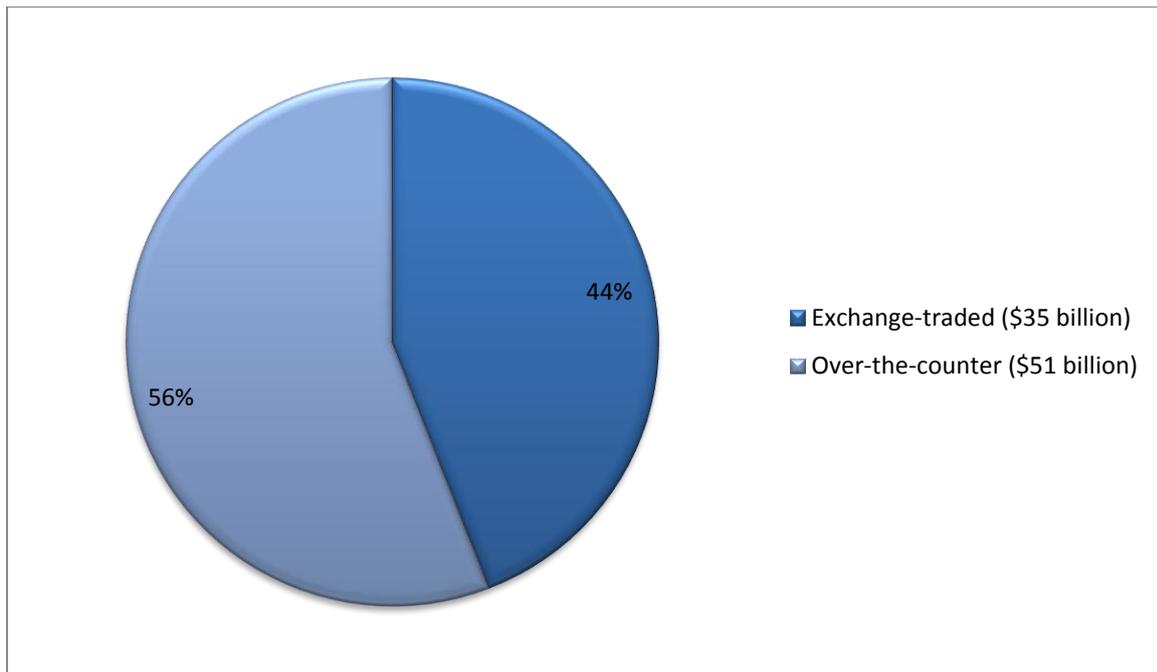


Figure 2.6: Global notional dollar amount outstanding on bond options

Source: BIS (n.d. d) and BIS (n.d. e)

Figure 2.6 shows that 44% of the bond options traded on regulated exchanges. From the recorded OTC bond option transactions, 56% traded in the OTC market. The BIS (n.d. d) and BIS (n.d. e) data suggests that the OTC market is larger than the ET market. The pricing of OTC and ET bond option contracts is discussed in the next paragraph.

2.5.7 Bond option pricing

As early as the 1990s, financial institutions had models to price several default-free bond options. Milne (2009) concludes that Merton (1973) developed a bond option pricing model that financial institutions used to value corporate bond options. Soon after Merton (1973), Brennan and Schwartz (1977) developed a model to price bonds with embedded options. Pricing models developed to such an extent that models that are more recent even include the bond ratings provided by the CRAs (Milne, 2009).

Bermin (2012), Jamshidian (2010), Milne (2009) and Becherer and Davis (2010) researched bond option pricing models. Bond option pricing models developed

earlier include the Vasicek (1977) model, the Cox–Ingersoll–Ross (1985) model, the Brennan–Schwartz (1977) model and the Dothan (1978) model. None of these models incorporated an initial yield curve, thus the pricing was inconsistent (Jamshidian 2010). The Ho–Lee (1986) model was the first model that created a pricing model by incorporating a yield curve (Jamshidian 2010).

Modern pricing models make use of dynamic programming (DP). DP is the process of determining a value with modelling variables in separate functions (Ben-Ameur *et al.* 2006). Modern pricing models include generalised autoregressive conditional heteroskedasticity (GARCH) analysis or value-at-risk (VaR) testing. Ben-Ameur *et al.* (2006) explored stochastic DP to value embedded options. The stochastic DP function was formed by incorporating the current time and interest rate to value the embedded option of a bond. Ben-Ameur *et al.* (2007) however found that American options cannot be valued by using analytical formulae as the values for American options are derived by using numerical methods, decision trees and finite differences.

Milne (2009) concludes that the use of some pricing models may lead to a number of discrepancies. Dai *et al.* (2010) are of the opinion that the Black–Scholes (1973) model probably gave rise to one of the most popular option pricing formulae. Bond option contracts do however have different variables than the Black–Scholes (1973) model and therefore bond option contracts require an adapted Black–Scholes (1973) model. This adapted model, as illustrated by Munk (2011), is discussed in the following paragraph.

2.5.7.1 Bond option pricing model

The European call option payoff as presented in the Black–Scholes (1973) model was adapted by Munk (2011) to create the European bond call option payoff, and is illustrated by Equation 2.4.

Equation 2.4: European bond call option payoff

$$C_T^{K,T,cpn} = \max(B_T - K, 0) = \max\left(\sum_{T_i > T} Y_i B_t^{T_i} - K, 0\right)$$

Source: Munk (2011)

Where:

$C_T^{K,T,cpn}$ = the European bond call option, expiring at time T with an exercise price of K , coupon cpn ; and

$B_t = \sum_{T_i > T} Y_i B_t^{T_i} = Y_i$ the bond payments, $B_t^{T_i}$ the bond price and time T_i .

The European put option payoff as presented in the Black–Scholes (1973) model was adapted by Munk (2011) to create the European bond put option payoff, and is illustrated by Equation 2.5.

Equation 2.5: European bond put option payoff

$$P_T^{K,T,cpn} = \max(K - B_T, 0) = \max\left(K - \sum_{T_i > T} Y_i B_t^{T_i}, 0\right)$$

Source: Munk (2011)

Where:

$P_T^{K,T,cpn}$ = the European bond put option, expiring at time T with an exercise price of K , coupon cpn ; and

$B_t = \sum_{T_i > T} Y_i B_t^{T_i} = Y_i$ the bond payments, $B_t^{T_i}$ the bond price and time T_i .

The put–call parity, according to Munk (2011), for the European bond option is illustrated in Equation 2.6.

Equation 2.6: Put–call parity for a European option on a coupon bond

$$C_T^{K,T,cpn} + KB_t^T = P_T^{K,T,cpn} - B_t - \sum_{t < T_i < T} Y_i B_t^{T_i}$$

Source: Munk (2011)

Where:

$C_T^{K,T,cpn}$ = the European call option, expiring at time T with an exercise price of K , coupon cpn ;

$P_T^{K,T,cpn}$ = the European put option, expiring at time T with an exercise price of K , coupon cpn ; and

$B_t = \sum_{T_i > T} Y_i B_t^{T_i}$ = Y_i bond payments, $B_t^{T_i}$ bond price and time T_i .

2.5.7.2 Black's (1976) European bond option pricing model

Dai *et al.* (2010) suggest that the Black–Scholes (1973) model is frequently used and adapted by investors to value bond options. Black (1976) created a variant of the Black–Scholes (1973) model to price a European call option on a coupon-bearing bond. The Black (1976) model is illustrated in Equation 2.7.

Equation 2.7: Black's (1976) European bond call option payoff

$$C_T^{K,T,cpn} = \left(B_t - \sum_{t < T_i < T} Y_i B_t^{T_i} \right) N(d_1(F_t^{T,cpn}, t)) - K B_t^T N(d_2(F_t^{T,cpn}, t))$$

Source: Munk (2011)

Where:

$C_T^{K,T,cpn}$ = European bond call option, expiring at time T with an exercise price of K , the coupon cpn ;

$B_t = \sum_{T_i > T} Y_i B_t^{T_i}$ = Y_i bond payments, $B_t^{T_i}$ bond price and time T_i .

$F_t^{T,cpn}$ = forward price of the bond;

$d_1(F, t) = \frac{\ln(F/K)}{\sigma\sqrt{T-t}} + \frac{1}{2}\sigma\sqrt{T-t}$;

$d_2(F, t) = d_1(F, t) - \sigma\sqrt{T-t}$; and

N = Probability.

Munk (2011) states that the Black (1976) bond option pricing model may lead to arbitrage pricing opportunities. Munk (2011) argues that these opportunities may arise as the entire yield curve is not incorporated in the pricing formula.

Vasicek (1977), Longstaff and Schwartz (1993) and Hull and White (1996) adapted the Black–Scholes (1973) model to create option pricing models. These models are illustrated in Equations 2.8 and 2.9.

Equation 2.8: Vasicek model

$$dr_t = \alpha (\gamma - r_t)dt + \rho dz_t$$

Source: Vasicek (1977)

Where:

α = classic random walk;

γ = long-term mean;

ρ = instantaneous variance; and

r_t = current spot rate.

The Vasicek (1977) model requires κ , θ and β to be positive constants. It assumes the short rate follows a mean-reverting Ornstein–Uhlenbeck process and returns satisfactory results for zero-coupon bonds and some European bond options (Vasicek 1977).

Equation 2.9: Longstaff–Schwartz call option pricing model

$$C_t^{K,T,cpn} = B_t^S \chi_1^2 - K B_t^T \chi_2^2$$

Source: Longstaff and Schwartz (1993)

Where:

- B_t^S = bond spot price at time t;
- B_t^T = bond price at time T;
- K = strike price; and
- χ^2 = chi-square.

The Longstaff–Schwartz (1993) model is a duration-based model. The model is two-dimensional and makes use of a non-central χ^2 -distribution (Longstaff & Schwartz 1993). However, this formula was not derived for coupon-bearing bond options.

The current research acknowledges the existence of other bond option pricing models such as the Hull–White model (Hull & White 1996) and the Ho–Lee model (Ho & Lee 1986). These models are however not discussed here as they are only further extensions of the Vasicek and Merton models respectively.

Bond option pricing models could have an influence on the liquidity of the market. According to Milne (2009), financial institutions adapt, change or create pricing models to suit their specific needs. Bond options hold a number of benefits for institutions and investors.

2.6 BENEFITS OF BOND OPTIONS IN A MARKET

Bond options hold benefits to financial markets. The benefits held by bond options are the management of risks, the creation of financial products, improved

speculation and price discovery¹⁸ within the financial market (Acharya *et al.* 2010). The 2007 subprime crisis encouraged financial institutions to improve risk management techniques (Milne 2009). Adelegan (2009) reports that options can be used to manage financial risk as investors can use bond options to limit risk. Investors will always be in a long or a short position (see 2.3.1), depending on their risk management requirements (Deuskar *et al.* 2011).

Financial innovation is one of the benefits that bond options add to the financial market. Dodd (2009) concludes that a combination of call and put contracts could form a new contract that would be similar to a future or forward contract (see 1.8).

Dodd (2012) determined that price discovery is yet another benefit of bond options in a financial market. Price discovery was defined by Bezzina and Grima (2012) as the process of determining spot prices of a financial asset. The CEC (2009) found that option trading not only assists the price discovery of an asset but also predicts the view of investors in the financial market through the price fluctuations.

Investors often have a different outlook on the market among themselves, especially investors who speculate because speculators aim to achieve profits by taking a position in the financial market (Van Zyl *et al.* 2006). Dai *et al.* (2010) conclude that speculation is essential for risk management, and options allow investors to speculate at a reasonable cost.

The cost principle plays a role in both hedging and in speculation. The benefits when trading in bond options range from reduced trading costs to risk management. Risk management can be stimulated by means of financial innovation. Investors and institutions can benefit from the depth bond options add to the financial markets.

2.7 SUMMARY

This chapter provided the theoretical background and the international perspective of bonds as an asset class, and the associated underlying derivative market, bond

¹⁸ Price discovery is the process of accurately reporting the monetary value of an asset (Van Zyl *et al.* 2006).

options. Milne (2009) concludes that each financial asset has a unique set of characteristics. These unique characteristics are evaluated from an international perspective to allow the reader to understand the mechanics of efficient bond and bond option markets.

The international bond market was reviewed by taking into account literature dealing with important factors that have an influence on the bond market. The important factors identified were the interaction in the bond markets of different countries and the way countries regulate the bond market (see 2.4.2). Other factors that have an influence on the bond market include the bond liquidity (2.4.3), bond pricing (2.4.4) and bond yields (2.4.5). A conclusion was drawn that internationally bonds are acknowledged as important financial assets as bonds are used to obtain public funding for institutions and governments who wish to raise capital at a lower rate than other sources of funding (see 2.2).

The focus of this research was however on the associated derivative market, namely bond option contracts. This chapter evaluated the international perspective by considering the international literature. Market factors that have an influence on bonds also influence bond options. The literature review emphasised the interaction within countries and between countries who actively participate in the bond option market. It was found (see 2.5.3) that there was an international call from various developed and developing countries to improve the regulatory framework within which bond option transaction takes place as this derivative could potentially lead to large financial losses when traded by uninformed investors.

The international perspective continues to provide insights into the trading methods and the practices of investors in the international bond option market. It was found that investors have different objectives within the bond option market. Investors may have the objective of hedging, speculation or performing arbitrage transactions (see 2.5.4). These transactions are executed on regulated exchanges or OTC. The type of exchange, whether ET or OTC, has an effect on the liquidity and the pricing of bond options. It was found (see 2.5.7) that a number of pricing methods exist to price the bond options and that a number of the pricing models might not be publicly available as some institutions consider their models as proprietary information. This

chapter concluded by establishing that bond option markets could offer a number of benefits to add to a financial market.

The mechanics and efficiency of the bond and bond option market from an international perspective provide insight into the significance of bond options in foreign economies. The bond market and its associated derivative bond options were evaluated to establish the importance of bond options in a financial market. Additionally, this international perspective aims to find possible factors that could influence the efficiency of the bond option market and the way these factors could be manipulated to improve the bond option market efficiency. These factors serve as an introduction to the domestic literature review on the South African bond and bond option market addressed in Chapter 3.

CHAPTER 3

LITERATURE REVIEW:

THE BOND MARKET MECHANISM: A SOUTH AFRICAN PERSPECTIVE

3.1 INTRODUCTION

Chapter 2 addressed the fundamental principles of bonds and bond option contracts. The fundamental principles served as an introduction to the literature review on the international bond and the bond option market. The aspects that were addressed in the bond market were the different bond regulations, bond liquidity, bond pricing and bond yields. The review of the international bond option market addressed similar components, namely bond option regulations, bond option liquidity and bond option pricing. Chapter 3 employs a similar approach to review the South African bond and bond option market.

The South African literature review is a reflection of the South African bond and bond option market. Moss, Ramachandran and Stanley (2007) aver that investors consider South Africa as one of the larger emerging market economies (EMEs) among the sub-Saharan countries. South Africa enjoys a high level of funding from international investors and could compete with financial markets of some developed economies (Moss *et al.* 2007).

The literature review of the domestic market is structured in two parts. The first section addresses the South African bond market and the developments in the bond market. The second section reflects a review of the domestic bond option market. To conclude the chapter, the benefits of a successful bond option market are listed, which is followed by a summary of the domestic market literature review. The review of the South African bond market is discussed in the next section.

3.2 SOUTH AFRICAN BOND MARKET

In the search for bond markets that offer above average returns, investors have started to invest increasingly more in EMEs. During 2006, South Africa attracted the

fourth largest contribution of funds among the EMEs (Moss *et al.* 2007), the first three being Korea, Taiwan and Brazil in that order. According to Durbin and Ng (2005), this investment into EMEs fund only a few large companies as EMEs rely on these companies for contributions to their GDP.

3.2.1 Bond market

The South African bond market grew from an informal market into the bond market today after its transition to a formal market in 1987 (Adelegan 2009). The emerging market corporate entities realised the value of selling bonds since 2003 (Hassan 2013). The companies in the EMEs, such as South Africa, realised that issuing bonds was a less expensive source of funding than selling additional shares (Durbin & Ng 2005).

The size of EME bond markets is often a reason for concern as illiquidity is a deterrent of investment, especially in EMEs (Zinna 2014). From an EME perspective, South Africa is considered one of the largest bond markets among the EMEs (Aling & Hassan 2012). Aling and Hassan (2012) however argue that South African government bonds are considered as some of the most liquid bonds across the world. However, the illiquidity of the corporate and parastatal bond market in South Africa remains a concern (Hassan 2013).

The South African bond market often experiences risk in terms of interest rate risk, inflation risk, political risk and exchange rate risk. International investors are often wary of risk and therefore tend to invest in their domestic financial market, even though portfolio theory motivates international investment for diversification (Burger & Warnock 2007). However, Burger, Warnock and Warnock (2012) found that financial markets that have efficient regulatory systems, liquidity and low taxes attract more investment from the USA investors than from other developed economies.

Investors tend to be risk-averse when investing in EMEs except if such investors are convinced that a country can protect the invested funds while offering a return (Brandão, Gelos, Melgar 2013). Adelegan (2009) found that South Africa has

efficient regulation to enforce contracts and reports that South Africa has a higher ranking in the World Bank's (n.d. b) ease of doing business report compared to other sub-Saharan African countries.

According to Reid (2009) the South African bond market still has risks but also growth potential. Burger *et al.* (2012) are of the opinion that the growth in the bond market may be hindered due to consistently increasing inflation rates. However, the South African bond market has not yet reached its full potential as some bond products, such as inflation-linked bonds, are not abundantly used (Reid 2009).

According to the literature, the South African bond market can be considered one of the more successful bond markets amongst the EMEs (Moss *et al.* 2007). The successes of the South African bond market can be ascribed to the liquid government bond market and efficient market regulation in the financial markets (National Treasury n.d.).

3.2.2 South African regulation

Goodhart, Hartmann, Llewellyn, Rojas-Suarez and Weisbrod (1998) recommends that financial regulation should protect investors, promote fairness, efficiency and transparency in the securities markets and promote a stable financial system. The South African financial sector changed over the years and so did the financial regulation.

Botha and Makina (2011) researched the South African financial regulation and supervisory framework and provided the following insights into this market. Since the 1960s, South Africa saw many financial market regulation changes. Financial controls were strictly enforced between 1965 and 1980. The strict financial control regulations led to the first review of the regulation by the De Kock Commission. The De Kock Commission in 1987 found that the South African financial regulation at the time (1965–1980) was restrictive and reduced market competitiveness. Soon after the first financial reforms in 1987, another commission was established called the Melamet Commission. The recommendations by this commission were for South

Africa to adopt regulations similar to that of Europe in order to promote efficiency (Botha & Makina 2011).

According to Erasmus and Makina (2014), the conservative South African financial regulations limited the devastating effects of the 2007 subprime crisis since the regulation reduced the market exposure to foreign market risk. In 2008, the International Monetary Fund (IMF) found that South African financial regulations were efficient and of a similar calibre as that of some developed financial markets. However, the IMF suggested that South African financial market should improve the prudential regulation and regulatory enforcements (IMF 2008).

Adelegan (2009) is of the opinion that South Africa does not have the capacity and skills to regulate and supervise the financial markets effectively. Botha and Makina (2011) conclude that South Africa has two regulatory authorities, the South African Reserve Bank (SARB) and the Financial Services Board (FSB). South Africa also has self-regulatory authorities, namely the JSE and the central securities depository (CSD), Strate CSD. These authorities all form part of the innovations in the South African regulatory environment. The latest suggested regulatory framework is the Twin Peaks model (Goodspeed 2013a). Figure 3.1 is an illustration of this regulatory model.

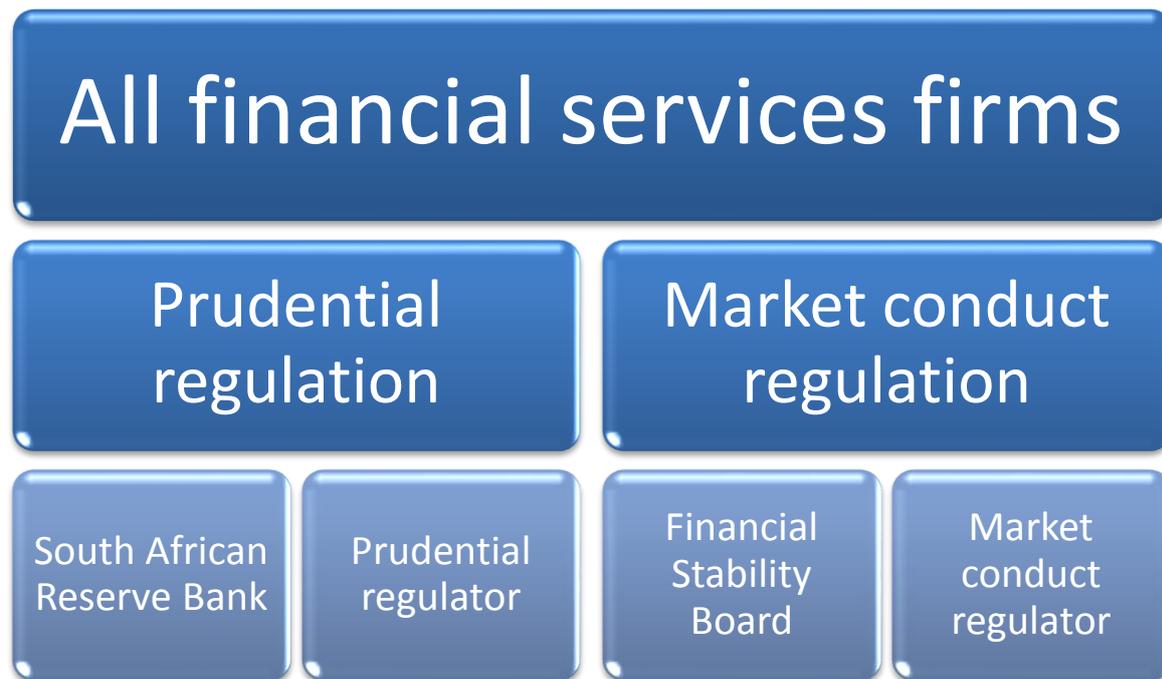


Figure 3.1: Twin Peaks financial regulatory framework

Source: Goodspeed (2013a)

Figure 3.1 reflects a graphic model of the Twin Peaks model. This model is focused on coordination, prudential regulation and market conduct (Goodspeed 2013a). According to Goodspeed (2013b), a market conduct regulator is responsible to oversee the market conduct of participants, i.e. consumer protection, while the prudential regulator is responsible for both macro and micro prudential regulation and supervision (see 2.4.2). The SARB and FSB jointly serve as an oversight commission, while National Treasury (NT) mitigates risk and ensures financial stability (Botha & Makina 2011). All financial services are regulated under this model from a prudential and market conduct perspective (Goodspeed 2013b).

The South African financial environment changed over the decades. These changes and improvements had served to protect the country against some of the effects of the 2007 subprime financial crisis, even though the ripple effect of the crisis made it through to EMEs such as South Africa as well (Aloa & Raimi 2011). This crisis essentially reduced the liquidity in the global markets which affected the EMEs.

3.2.3 Bond liquidity

The financial regulation in a country can influence the level of liquidity as regulation often restricts the flow of funds (Botha & Makina 2011). Liquidity fulfils an important role in the financial market, especially the bond market, as low liquidity reduces investment from foreign and domestic investors (Milne 2009).

The South African bond market is considered to be liquid by some (Lui 2013; Mu, Phelps & Stotsky 2013; National Treasury n.d.) or illiquid by others (Hearn, Piesse & Strange 2010; Moss *et al.* 2007) because authors do not share the same opinion on this market. The South African bond market consists of government, parastatals and corporate bonds. The government and parastatal bond market has dominated the South African bond market since inception in the 1970s (National Treasury n.d.). The corporate bond market developed in the early 1990s but was limited at first. Later, the corporate bond listings increased to such an extent during the 2000s that the corporate bond market capitalisation was at almost 20 per cent of the South African GDP (Lui 2013; Mu *et al.* 2013).

Research by Lui (2013), Moss *et al.* (2007) and National Treasury (n.d.) found that generally, if an African country has a high level of liquidity the country attracts more foreign direct investment (FDI) from developed markets. South Africa has a liquid bond market compared to those markets of other African countries. Investment in the South African bond market from developed markets is also due to the fact that other African countries such as Namibia and Botswana have cross-listing arrangements with the JSE, improving their level of liquidity (Lui 2013; Moss *et al.* 2007; National Treasury n.d.).

National Treasury (n.d.) reports on the status of the South African bond market and indicates that South Africa has a balanced market consisting of different types of bonds. However, the South African bond market contracted during the period after 1994 until 2000 (National Treasury n.d.). This was due to low numbers of listed corporate bonds and a possible crowding-out effect that government and parastatal bonds had. This led to distorted bond yields and irregular bond supply and demand

factors (Brambila-Macias & Massa 2010; Hearn *et al.* 2010; Mu *et al.* 2013; Reid 2009).

The size and liquidity of a bond market remain a concern when corporate bonds are listed in a market (Moss *et al.* 2007). South Africa has a leading bond market in an African context and could contribute valuable information on bond markets to other EMEs (Lui 2013). Over the years, South Africa experienced extreme volatility in the levels of liquidity, and other EMEs could benefit from the methods used in South Africa for pricing bonds during liquid and illiquid market conditions (Deuskar *et al.* 2011; Durbin & Ng 2005).

3.2.4 Bond pricing

Listed South African bonds have similar characteristics as bonds in developed financial markets and pricing responds similarly to market fluctuations (see 2.4.4). However, the pricing of bonds in the South African bond market is sensitive to other risks that are associated with developing financial markets.

According to Milne (2009), the incorrect pricing of a bond could have devastating effects on a financial market. Incorrect pricing disseminates incorrect information into the market resulting in unexpected losses (Milne 2009). Except for the risk of incorrectly priced assets, the South African bond market is subject to monetary policy, fiscal policy, country risk and exchange rate risk. CRAs evaluate the different risks and categorise different countries according to the level of risk that an investor incurs when investing in a country (Durbin & Ng 2005; White 2009).

Erdem and Varli (2014) define a credit rating as a rating of the economic, financial and political outlook of a country. This rating influences the rate at which a country borrows funds (White 2009). The credit rating of a country is a sovereign ceiling for bonds issued in a country as no corporate bond should have a higher rating than the country in which the bond is listed (Durbin & Ng 2005). According to Erdem and Varli (2014), CRAs place a substantial weight on the inflation rate of a country when modelling the credit rating.

The prevailing inflation rate has a direct impact on the price of South African government bonds (Reid 2009). The South African Reserve Bank (SARB) has a mandate to curb inflation by using an interest rate targeting method to realise a 3 to 6 per cent inflation rate (Van der Merwe 2004). The South African year-on-year inflation rate is presented in Table 3.1.

Table 3.1: Inflation figures for 2008–2013

Country	2008	2009	2010	2011	2012	2013
South Africa	88.6	95.7	100	105.0	110.6	116.3

*2010 base year

Source: Statistics SA (n.d.)

Table 3.1 gives an indication of the South African inflation rate between 2008 and 2013 on a December year-on-year basis. The basket of goods that determined the rate of inflation was revised during 2007 and had a substantial effect on the year-on-year inflation rate from the 2007 to 2008 calendar year (Statistics SA n.d.).

The SARB has a mandate to keep the inflation within the targeted range and increases or decreases open market operations to manipulate the inflation rate (Van Zyl *et al.* 2006). The open market transactions are influenced by the prevailing repurchase rate of the SARB. According to Aling and Hassan (2012), the 91-day Treasury bill is most commonly used as the domestic risk-free rate. The factors that influence bond prices in South Africa were discussed (see 2.2.1). The pricing method is discussed next.

The JSE uses two approaches to determine the price of a listed bond in the South African financial market. The two methods used to price the bonds are dependent on the time to maturity of the bond (BESA 2005). For bonds that have more than six months to expiry the pricing formula can be derived with Equation 3.1:

Equation 3.1: Original bond clearinghouse formula

$$\text{Unrounded all in price} = V_i^{\frac{d_1}{d_2}} \left[\frac{1}{2} g (a_n^i + e) + 100V_i^n \right]$$

Source: BESA (2005)

Where:

d_1 = number of days from settlement date to next interest date;

d_2 = number of days from last to next interest date or from settlement date to next interest date if settlement falls on an interest date;

i = yield at which bond trades, as percentage;

$V_1 = \frac{1}{1 + I/200}$ (present value of 1 payable in 6 months' time);

g = coupon as percentage;

n = number of complete six-month periods from next interest date to redemption date; and

$a_n^i = \frac{(1 - V_i^n)}{(I/200)}$; (present value of an annuity of one per six months, payable in arrears).

Equation 3.2: Accrued interest formula

$$\text{Accrued interest} = \frac{d_2 e - d_1}{365} \times g$$

Source: BESA (2005)

Where:

d_1 = number of days from settlement date to next interest date;

d_2 = number of days from last to next interest date or from settlement date to next interest date if settlement falls on an interest date; and

g = coupon as percentage.

Bonds with a maturity of fewer than six months may be priced with Equation 3.3:

Equation 3.3: Six months or fewer redemption bond pricing formula

$$\text{Unrounded All in price} = \frac{100 + e \times \frac{g}{2}}{1 + \frac{d_1}{365} \times \frac{i}{100}}$$

Source: BESA (2005)

Where:

d_1 = number of days from settlement date to next interest date;

i = yield at which bond trades, as percentage; and

g = coupon as percentage.

Equation 3.1 and Equation 3.2 represent the pricing model for a bond with more than six months to expiry. Equation 3.1 is used to calculate the unrounded all-in price while Equation 3.2 is used to calculate the accrued interest on the bond. Equation 3.3 is used to calculate the all-in price for a bond that has fewer than six months to expiry. Adelegan (2009) encourages other sub-Saharan African countries to develop models similar to that of South Africa in their domestic bond markets. The South African yield curve also serves as a benchmark for other sub-Saharan African countries (Adelegan 2009).

3.2.5 Bond yield curve

Bonds display an inverse relationship between their price and the interest rate (Semmler 2006). According to Aling and Hassan (2012), the bond yield curve is an essential component in the pricing of bonds and bond options. This yield curve is a weighted average of short-term interest rates (Reid 2009).

The yield curve is a source of information in the financial market. Reid (2009) concludes that the market expectations of the yield curve include the expected path of future inflation and real interest rates. This could deliver information on the risk premium of a bond.

The yield curve also exhibits information on the skewness and volatility of bonds in the financial market. Burger and Warnock (2007) found that bonds in emerging

economies are often more volatile than bonds of developed economies and exhibits negative skewness in bond returns based on the bond yield curves. Gabriel and Lau (2014) are of the opinion that negative skewness implies that there is a potential of poor investment returns on a long-term bond. The South African R186 government bond is an example of a long-term bond (Bloomberg Terminal 2014).



Figure 3.2: R186 Government bond yield curve

Source: Bloomberg Terminal (2014)

The R186 government bond has shown changes since the 2007 subprime crisis. Since 2011, the yield increased but remained almost constant at the increased level. The most recent trend in the yield was an increase in the yield as inflation was pressuring rates upward (Bloomberg Terminal 2014).

Aling and Hassan (2012) suggest that the bond yield curve not only influences the pricing of bonds but also the pricing of the associated derivative, namely bond options. The remainder of this chapter comprises a discussing of literature relevant to the South African bond option market.

3.3 SOUTH AFRICAN BOND OPTION MARKET

The derivative instrument trading activity in EMEs increased in volume and turnover in recent years (Mihaljek & Packer 2010). The derivatives that are traded on bonds in South Africa consist of bond futures, bond forward rate agreements, vanilla swaps on bonds and standard bond options (Adelegan 2009) (also see 1.8).

According to Adelegan (2009), the objective of the South African derivative market is to improve liquidity, promote risk management and to be competitive in the international field of derivatives. As with other developing financial markets, the South African derivatives market also changed since the inception of bond option trading.

3.3.1 Bond option trading platforms

The South African bond option market continuously developed since the first bond options were introduced. Bullard (1987) remarks that the first bond option was traded in 1983 on an Eskom bond that traded OTC. Since then, a number of developments took place and new structures to trade bond options on have been introduced. Since 2003, investors can choose whether they would trade bond options OTC or on a regulated standardised exchange, as BESA offers both platforms (Adelegan 2009).

Adelegan (2009) aver that the requirements of an investor determines on which platform the investor would prefer to participate in the bond option market. The introduction of Intersec, the electronic exchange platform for bond market derivatives, promotes the expansion in the bond derivatives market (Adelegan 2009). However, the recorded transactions on bond options only indicate option contracts on the R153, R157, R186, R201, R203, R204, R206, R208, R209, TRTI, ES33, EL28 and R213 bonds (Seele 2014). The OTC bond option market is less transparent than the ET bond option market and transactions are often only subject to agreements between investors who are aware of the effect of trading OTC bond option contracts (Dodd 2009).

Initially, only OTC bond options were traded in the South African financial market (Bullard 1987). According to Adelegan (2009), the South African bond option market grew at a significant pace until the 2000s. However, the JSE (2011) found that the level of activity in the OTC bond option market declined to such an extent that the market might be considered as insignificant. Adelegan (2009) reports that the South African bond option market primarily trade bond options OTC which implies that the decline in the OTC bond option market should be a concerning factor.

Dodd (2009) maintains a positive outlook on the derivatives market of emerging economies. However, Dodd (2009) recommends that countries should be able to absorb losses that occur due to derivative instruments and that the derivative used should be suitable for an investor. OTC transactions can easily lead to substantial losses for countries and companies who do not comprehend the extent of the risk incurred in the OTC market (Dodd 2009). Regulation is one of the primary tools in a financial market to protect consumers from inefficiencies in the financial market (Goodhart *et al.* 1998).

3.3.2 Derivatives regulation in South Africa

The South African regulatory environment has achieved many successes over the years. According to Erasmus and Makina (2014), the South African prudential regulation reduced the exposure of the financial market to foreign risk, limiting the exposure of the country to the global financial turmoil of 2007. The regulatory environment cultivates an environment that ensures that derivatives are suitable for the investors who wish to transact in this market, emphasising the importance of product suitability for investors (Dodd 2009).

The JSE was identified as the largest and most developed exchange in Africa that offered the best regulation (Andrews 2012; Hearn *et al.* 2010). However, the need for increased derivatives regulation still exists. Efficient derivatives regulation has the potential to increase market activity and manage the associated risks in the market effectively (Adelegan 2009).

According to Milne (2009), regulators should play a prominent role in the derivatives market. The presence of the regulators should lead to improved risk management and efficient use of derivatives. Adelegan (2009) found that proper regulation is a key element of a stable and liquid derivative market. Botha and Makina (2011) conclude that South African entities do not take excessive risk, and that the objective of South African regulation is to prevent financial transactions that could adversely affect the financial markets.

South Africa depends on a self-regulatory approach in the financial markets (Botha & Makina 2011). Adelegan (2009) describes self-regulation as a superior regulatory approach, as public regulation in the derivative market may lead to a situation where the derivatives experts avoid regulation, as they may be more knowledgeable than the regulators. However, Dodd (2009) is of the opinion that even if the regulatory environment is effective, investors must do a suitability analysis before entering the derivatives market.

Investors who enter the OTC bond option market are considered to be knowledgeable about the risks associated with the transaction entered into. However, Adelegan (2009) suggests that a *caveat emptor* or 'let the buyer beware' clause be incorporated into South African derivatives transactions as these transactions often carry additional risks to investors who make use of these instruments.

3.3.3 Hedging in the South African bond option market

OTC bond options have the potential to improve risk management of transactions and to hedge against possible adverse effects in the market. Investors often do not use bond options for the intended purpose of hedging but rather for arbitrage and speculation (Aling & Hassan 2012).

Derivatives have a number of applications, such as hedging, speculation and arbitrage (Hull 2008). Dodd (2009) is of the opinion that investors should only use derivatives for the purposes that were identified in a portfolio. Should investors use derivatives for purposes other than those identified, the derivatives should be not

used at all (Dodd 2009). If a hedge is ineffective or subject to large price fluctuations, derivatives should be excluded from a portfolio, as ineffective hedges lead to earnings losses (Dodd 2009; Zhang 2009). Price fluctuations are often reason for concern as such fluctuations could lead to substantial losses and increased risk for an investor, especially when derivatives are incorrectly used (Dodd 2009).

The South African financial market is susceptible to fluctuations in the exchange rate, short-term interest rate and market price of commodities (Chinzara 2010). These factors influence the price of the underlying bond and could have an influence on the price of bond options. Bonds have an indirect relationship with short-term interest rates (Semmler 2006). Chinzara (2010) states that short-term interest rates are a source of risk and adverse movements of this rate should be managed with hedging transactions. Constant hedging and adapting the hedge for maximum effectiveness could possibly improve liquidity in a financial market.

3.3.4 Bond option liquidity

Liquidity has an important role in a financial market as illiquid assets cannot be bought or sold with ease (see 2.5.5). Milne (2009) found that illiquidity prohibits effective hedging against adverse price movements. According to Adelegan (2009), South African investors make efficient use of bond options. However, recently the JSE (2011) found that the bond option market became illiquid and declined to such an extent that it may be considered insignificant.

Investors who self-insure the risks associated with their portfolios increase liquidity in the bond option market (Adelegan 2009). The level of liquidity can be manipulated by means of regulation. The CEC (2009) concludes that regulation could improve liquidity if investors would comply with the prescribed legislation. However, legislation could also become too restrictive in a financial market and reduce the level of activity significantly (Schwarcz 2011).

If regulation or a mandate of a fund manager prescribes certain minimum requirements towards hedging, financial markets could experience increased

liquidity. Deuskar *et al.* (2011) conclude that bond options are a preferred product when hedging against risk exposure. As a hedge is rarely perfect, rebalancing often occurs thus increasing the liquidity in the bond option market (Deuskar *et al.* 2011).

Liquidity has a significant effect on the price and the participation in the bond option market. It is often difficult to determine whether regulation would improve or worsen the level of liquidity in the market as investors determine the level of impact regulation has. Investors transact in the market to achieve their highest level of efficiency without wanting to bear additional burdens such as restrictive regulation.

3.3.5 Bond option activity

The liquidity of bond options in the South African market serves as an indication of the bond option activity in the financial market. Adelegan (2009) argues that a larger base of investors would automatically increase the market activity and liquidity. The activity and the notional dollar turnover are illustrated in Figure 3.3.

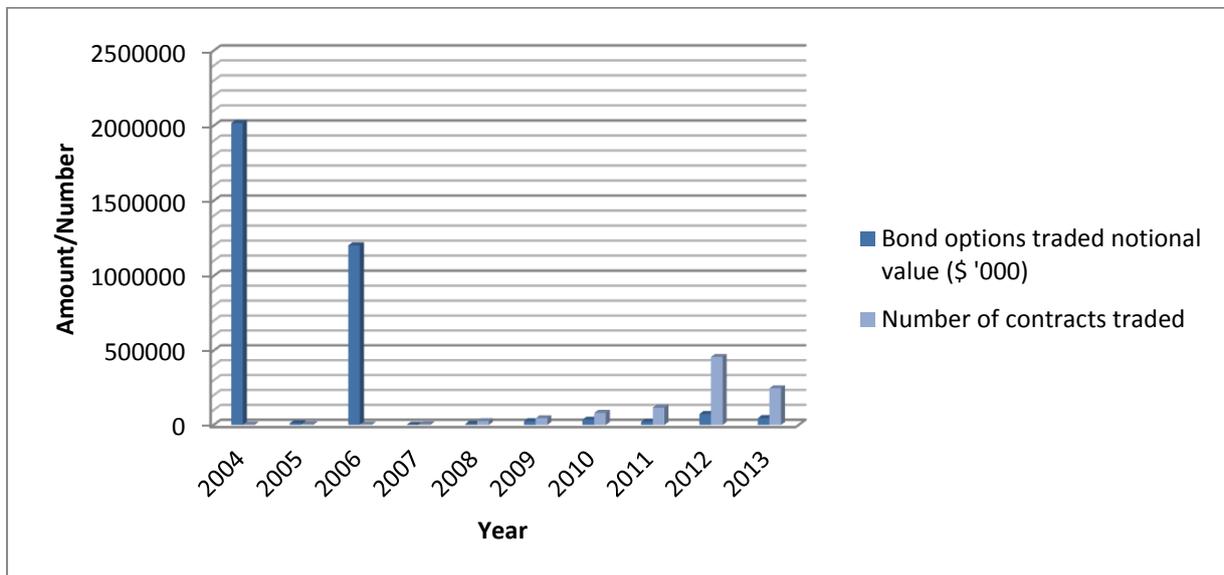


Figure 3.3: Bond option activity represented as the number of contracts traded and notional dollar value outstanding (\$ '000)

Source: Adapted from World Federation of Exchanges (WFE) (n.d.)

Figure 3.3 illustrates the notional dollar value outstanding and the number of contracts traded on bond options based on data from the WFE (n.d.) for the period

2004 to 2013. The notional dollar value outstanding decreased since 2004. Data suggests a dramatic decline in the outstanding amount in 2005. In 2006, the value was higher than in 2005 but still lower than in 2004. These large denominations of dollars outstanding were based on low levels of activity as a minimal number of bond options contracts were traded in 2004, 2005 and 2006. There has been an increase in the number of contracts traded between 2007 and 2013. The dollar value outstanding has however not made any significant progress to recover to values at even a tenth of the dollar amount outstanding in 2004 (WFE n.d.).

The decline in the South African bond option market is disappointing as bond options offer a number of benefits to a country.

3.4 BENEFITS OF BOND OPTIONS IN THE SOUTH AFRICAN MARKET

The 2007 subprime crisis highlighted some of the current weaknesses within the global derivatives market (Bernanke 2011). Irrespective of the flaws in the derivatives market, derivatives still offers significant benefits in a financial market (Adelegan 2009). The derivative, namely bond options, has several benefits in an EME, such as South Africa, and is discussed in this section.

The benefits of incorporating bond options into a portfolio range from individual portfolio benefits to macroeconomic benefits. Macroeconomic benefits are benefits that potentially have an effect on macroeconomic variables, such as the GDP, exchange rate, interest rate or budget deficit (Marx 2013). Individual portfolio benefits are benefits that fund managers and investors obtain (Reilly & Brown 2011).

Adelegan (2009), Acaravci, Ozturk and Acaravci (2009) and Moss *et al.* (2007) identify three macroeconomic benefits for a country. According to Acaravci *et al.* (2009), bond options have the potential to increase the growth in an economy due to increased financial activity. Secondly, Moss *et al.* (2007) found that an efficient bond option market attracts FDI into a country. Additional investment has the potential to increase the liquidity and notional turnover in a financial market. Lastly, Adelegan (2009) concludes that bond options could improve the level of domestic savings in a

country. The gross savings in South Africa forms part of the financing of gross capital formation (Mohr 2008).

Adelegan (2009) identifies the individual portfolio benefits that bond options offered and is discussed in this paragraph. The use of bond options reduces the exposure to risk that an investor would experience in volatile markets. The bond option therefore serves as a self-insurance product. Investors also use a bond option contract as an alternative source of financing. The premiums that an investor receives allow the investor to develop alternative cost structures. Finally, the use of bond options brings speculators, hedgers and arbitrageurs together in the market as each investor has the potential to gain additional profits by using a bond option. The collective of speculators, hedgers and arbitrageurs also adds liquidity to the financial market (Adelegan 2009).

The literature suggests that bond options offer a range of benefits in an EME. A country would benefit from the use of bond options, not only at a macroeconomic level but also from an individual portfolio manager's perspective.

3.5 SUMMARY

The literature review on the South African bond and bond option market was conducted in two sections. The first section addressed the South African bond market while the second section considered the bond option market. This second section was concluded with the potential benefits that bond options offer in an EME.

The review of the South African bond market covered principles that relate to the history of the bond market, the regulations governing the South African financial market, bond liquidity, bond pricing and the bond yield curve. The literature suggests that the South African bond market obtains most liquidity from government bonds and to some extent from parastatal bonds. The regulatory environment also changed in recent years, placing emphasis on prudential regulation by introducing the Twin Peaks model. A primary concern in the market is still the effect that interest rates have on bonds. The SARB uses an inflation-targeting approach, which increases the interest rate risk in periods of high inflation (see 3.2.4). Since a

derivative is based on an underlying asset, bond options are subject to similar risks than those experienced by the bond market.

The literature review suggested that the South African bond option market reacts to risks similar to those of international bond option markets. However, it was concluded that South African regulations reduce foreign risks experienced in the country. Reduced foreign risk decreased the international turmoil of the 2007 subprime crisis. The largest risk in the bond option market is the low level of liquidity. Data suggests that the notional dollar turnover declined significantly in 2005 and remained low from 2007 onwards. The number of contracts that trade on bond options increased from 2008 to 2013 but the funds channelled into the market were limited (see 3.3.5).

It is notable that the bond option market declined to such an extent that it is considered as insignificant. Research suggests that bond options offer a number of benefits in an economy (see 3.4). The benefits that an EME may experience are:

- accelerated economic growth;
- increased FDI;
- self-insurance and a reduction of risk to adverse effects of market volatility;
- an alternative source of credit and an improvement in domestic savings; and
- improved liquidity as hedgers, speculators and arbitrageurs actively participate in the market.

The literature suggests that the South African bond market and bond option market have an important function in the financial market. These instruments could potentially benefit the domestic economy. The decline of this market could potentially reduce the benefits that it offers the domestic economy. Chapter 4 describes the methodology used to determine the role of OTC bond options in the South African financial market. The methodology addressed the various factors that form part of the measurement and interpretation of data from the identified population.

CHAPTER 4

RESEARCH METHODOLOGY

4.1 INTRODUCTION

The research methodology comprises a map of the method of conducting the proposed research. According to Quinton and Smallbone (2006), research should follow multiple approaches and include multiple data sources to address the research questions. Triangulation is a method of building a strong research argument within the paradigm of positivism in empirical research (Bryman & Bell 2011; Crowther & Lancaster 2009; Quinton & Smallbone 2006).

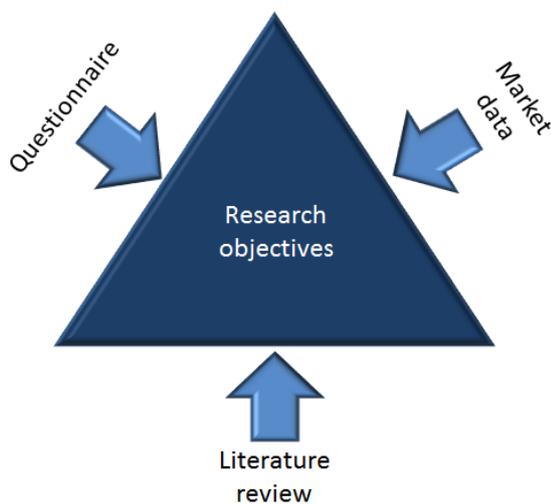


Figure 4.1: Triangulation approach to research

Source: Quinton and Smallbone (2006)

Figure 4.1 illustrates the three different sources of data and information that formed part of this research to reach the research objectives. Initially, the research explored literature of other authors to introduce and describe the problem. This was supported by market data obtained from reliable sources, and motivated the significance of the research. In this research, the market data substantiated the decline in bond option market activity. The third part of triangulation implied using a research instrument. In this research, a questionnaire was used to obtain the opinions of respondents in the South African OTC bond option market.

According to Quinton and Smallbone (2006), an action plan indicates how research will be conducted to obtain the results that will be used to achieve the research objectives. The methodology is an explanation of the different variables that form part of the research process used to collect and interpret data to draw valid conclusions (Bryman & Bell 2011). The methodology will address the research design, types of data, research instrument, measurement levels, characteristics of measurement, statistical methods, population, sampling and the ethical considerations. The research design serves as the introduction to the variables addressed in this methodology section.

4.2 RESEARCH DESIGN

This study followed a structured approach to conduct the research. This structure approach was based on the foundation of a well-formulated research design. A research design is the approach that a researcher uses to collect the data and interpret the findings (Cooper & Schindler 2008). The objective of the research design is to illustrate how the researcher will collect data, interpret the data and present the results to address the primary and secondary research questions (see 1.4) as identified in the first chapter.

In the current research, the primary research question was:

- Do OTC bond options still have any role to play in the South African financial market as a hedging instrument?

The secondary research questions were:

- Why is an effective bond option market essential in a country's financial markets?
- What caused the apparent deterioration of the South African OTC bond option market between 2001 and 2011?
- How can OTC bond options be restored as the primary hedging instrument in the South African financial market?

Figure 4.2 illustrates the steps required in a research design to collect data and interpret results.

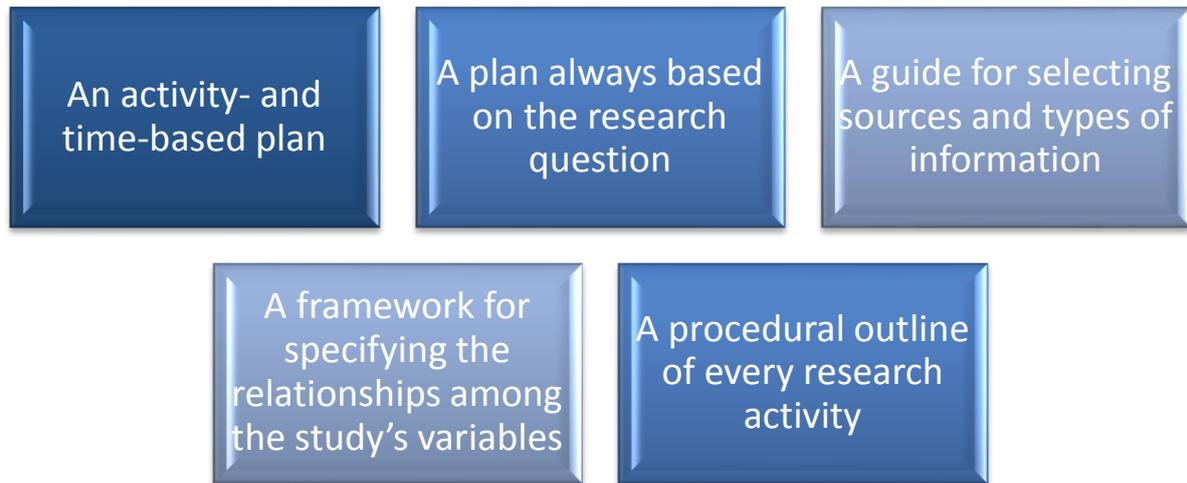


Figure 4.2: Essential steps of a research design

Source: Cooper and Schindler (2008)

Figure 4.2 illustrates the essential steps of a research design. According to Cooper and Schindler (2008), a research design is based on an activity- and time-based plan. The plan should use the research questions as foundation for the design. The data sources should be selected according to the type of information that needs to be obtained. Variables should be identified and the relationships among the variables in the research must be described. This should be the procedure for each research activity (Cooper & Schindler 2008).

The essentials of a research design remain unchanged irrespective of the type of research design (Crowther & Lancaster 2009). Research designs could be of qualitative (see 4.2.1) or quantitative (see 4.2.2) nature. The difference between qualitative and quantitative research has become relatively opaque because of similarities in research designs (Blaxter, Hughes & Tight 2001).

4.2.1 Quantitative research design

A quantitative research design is a design that allows the researcher to measure data to a definite degree of certainty (Crowther & Lancaster 2009). Quantitative data is generally more exact compared to qualitative data as numerical data is described with standard statistical techniques (Crowther & Lancaster 2009; Remenyi *et al.* 1998). According to Remenyi *et al.* (1998), a survey is a quantitative tool that is used to collect data based on a respondent's knowledge, opinion or attitude. Surveys allow knowledge, opinions and attitudes to be reduced to numerical responses that are easily analysed by using statistics (Cooper & Schindler 2008).

A quantitative research design is of experimental nature or non-experimental nature. An experimental design often uses a test and control sample from a population while non-experimental designs do not include a control sample in the research design (Muijs 2011). Muijs (2011) is of the opinion that survey research is a well-known non-experimental design used in social sciences.

Non-experimental or descriptive research designs are used to research relationships, current conditions or factor identification from a quantitative research design approach (Kalaian 2008). The current research made use of a non-experimental quantitative research design. This design enabled the researcher to quantify the opinions of each respondent, as recommended by Crowther and Lancaster (2009). Descriptive statistics was used to interpret the collected data. Qualitative data was often used to enforce the findings of a quantitative research design.

4.2.2 Qualitative research design

A qualitative research design refers to research focused on feelings, emotions, motivations and individual behaviour (Langer 2001). The objective of qualitative data is to interpret events, situations and interactions, whether it be visual, verbal or textual (Cooper & Schindler 2008). A qualitative research design has the benefit of measuring non-quantifiable data that cannot be interpreted by numerical analysis (Crowther & Lancaster 2009). However, the differences between qualitative and

quantitative data have become vague because of similarities in the research designs (Blaxter *et al.* 2001).

Blaxter *et al.* (2001) identified four similarities between qualitative and quantitative research designs. These similarities suggested that, even though research adheres to the principles of a quantitative design, the research may use a qualitative design or vice versa. These similarities are:

- Quantitative research could be used to explore an area of study to create a hypothesis even though quantitative research is commonly used only to test theory.
- Qualitative research is commonly used to explore an area of study to create a hypothesis; however, qualitative research could be used to test theory.
- Qualitative research is concerned with how much, more than, less than, most and least, all of which can be quantified.
- Quantitative research includes an open-ended question in a survey to include non-numerical responses.

Blaxter *et al.* (2001) is of the opinion that the underlying philosophical positions in qualitative and quantitative research may not be that different from one another. The similarities between a quantitative and qualitative design suggest that the research design is dependent on the type of data collected or the measurement of the data collected.

4.3 DATA TYPE

Empirical research is of a deductive nature (Bryman & Bell 2011). Deductive research is empirical research that is founded on recorded observations (Crowther & Lancaster 2009). The process of capturing an observation or answering a question in the research environment is known as data collection. The collected data can be identified as primary or secondary data sources (Cooper & Schindler 2008).

4.3.1 Primary data

Primary data is defined as data that has not yet been subject to any manipulation. Therefore primary data cannot be interpreted as information (Cooper & Schindler 2008; Crowther & Lancaster 2009). The current research depended on the collection of primary data from the identified data sources. According to McDaniel, Lamb and Hair (2008), the advantage of creating primary data is that a specific research question can be answered, which secondary data often cannot achieve.

4.3.2 Secondary data

Secondary data is described as data that was generated by previous research or data that has been interpreted at least once before (Cooper & Schindler 2008; Remenyi *et al.* 1998). Secondary data could be published information, annual reports or data interpreted previously as a primary data source (Crowther & Lancaster 2009). According to Crowther and Lancaster (2009), secondary data has a supportive function in research as it is used to identify a problem, develop a research approach, formulate a research design, answer research questions and confirm the interpretations of the primary data.

It is important that secondary data only has a supportive role in research. Quinton and Smallbone (2006) are of the opinion that research would be unnecessary if the secondary data substantiates the findings of the primary data. The objectives of incorporating the different types of data should therefore be described thoroughly.

The current research used both primary and secondary data. The secondary data was obtained from Seele (2014) and the WFE (n.d.). These data sources provided market information that was necessary to illustrate the market activity for a predetermined period of time. The primary data was collected from the respondents to describe the possible reasons for the South African OTC bond option market events. This data was statistically processed, changing it into information ready for interpretation. According to Crowther and Lancaster (2009), information is defined as accurate, meaningful, relevant, timely data in a format that is possible to explain as it is in a logical format.

4.4 RESEARCH INSTRUMENT: QUESTIONNAIRE

A survey design promotes positivistic research (Bryman & Bell 2011). The survey design allows the application of statistical techniques and does not infuse any bias towards subjectivity of the respondents' opinions (Muijs 2011). In the current research, the survey approach comprised a regular business and management research technique. This approach favours a questionnaire as the research instrument (Remenyi *et al.* 1998). According to Crowther and Lancaster (2009), questionnaires have the potential to obtain a wide range of data if the questionnaire is structured correctly. Table 4.1 lists some of the advantages and disadvantages of a questionnaire.

Table 4.1: Advantages and disadvantages of questionnaires

Advantages of questioning	Disadvantages of questioning
Allows collection of complex data	Respondent mistrust of the researcher
Flexible questioning	Unstructured data collection
Potentially simplistic design	Respondents fear questioning
Allows questioning data collection from large numbers	Uncontrollable circumstances or respondents
Motivational to respondents	Limitations of questioning instruments
Good feedback improving validity	
Quick method of data collection	

Source: Crowther and Lancaster (2009)

The ability of a respondent to answer questions accurately and objectively remains a concern when obtaining data using a questionnaire (Bezzina & Grima 2012). According to Remenyi *et al.* (1998), a well-designed questionnaire that accurately addresses the research questions could improve the accuracy of the data collection. To ensure that a questionnaire is accurate the researcher should carefully consider the type of question asked, the order in which the questions are asked, the question wording, the method of collecting the data, the measurement of the data, the testing of the instrument and the structure of the questionnaire (Crowther & Lancaster 2009).

4.4.1 Types of question

For the current research, a questionnaire was designed based on two types of questions, namely open-ended or close-ended questions. Remenyi *et al.* (1998) concluded that open-ended questions are typical in exploratory research as the researcher cannot specify the response for this question, while close-ended questions are associated with quantitative research as the researcher has knowledge on the research problem and can therefore specify a response. As both types of questions were used, the respondents had the ability to motivate the close-ended questions by responding on an open-ended question.

4.4.2 Order of questions

The order in which questions are asked has the potential to affect the responses obtained by way of a questionnaire. Questions should be ordered according to a topic and should be clustered from a general construct to a more specific construct with demographic questions asked at the end of the questionnaire (Grover & Vriens 2006). A logical order is maintained throughout the questionnaire as this captivates the attention of the respondents (Oishi 2003).

The questionnaire designed to collect data from respondents during the current research was designed to address the research questions. The questionnaire first had to establish the perspectives of the individuals who were active in the South African OTC bond option market at the time of the research. It then went on to a more specific construct where respondents had to describe their perspective on the apparent deterioration of the OTC bond option market in South Africa between 2001 and 2011 (see Appendix 1).

4.4.3 Wording of questions

The wording of questions is important as this could improve the reliability of answers in the questionnaire (Fowler 2009). The example provided by Fowler (2009:89) is that of a poorly worded question such as “Age?” compared to a formulated question such as “Your current age is ...?” As the wording increases the reliability of the

answers, this research worded each question carefully in order to obtain reliable data from the respondents.

4.4.4 Method of collection

Collecting data with a questionnaire can vary from internet distribution to face-to-face conversations (Bryman & Bell 2011). The current research used self-completion questionnaires. A questionnaire that is self-completed does not require interviews or direct contact between the researcher and the respondent (Fowler 2009). The questionnaire was standardised to such an extent that the researcher only needed to send the questionnaire to a potential respondent. The respondent completed the questionnaire if he or she was willing to participate in the research.

According to Sapsford (2007), a standardised questionnaire reduces the interaction between the researcher and the respondent. In the current research, this reduced interaction was beneficial as all questions were asked in the same way without an interviewer or researcher rewording questions when collecting data from each respondent.

4.4.5 Choice of measuring scale

The researcher selected the most appropriate scale to collect data. According to Gill and Johnson (2010), the four measuring levels are nominal, ordinal, interval and ratio scale. Each type of scale has its own characteristics, and these are explained in section 4.5. The current research made use of the ratio scale as ratios can be described with descriptive statistics (see 4.5.4). Descriptive statistics were therefore used to interpret and explain the results of the information obtained from the data collection (Cooper & Schindler 2008; Gershkoff 2008; Gill & Johnson 2010; Remenyi *et al.* 1998).

4.4.6 Pre-testing

According to Remenyi *et al.* (1998), pre-testing of a questionnaire can be formal or informal. Informal pre-testing involves friends, colleagues, experts or individuals with

their own opinion about the subject. Formal pre-testing involves a pilot test that represents the sample before conducting the formal research (Remenyi *et al.* 1998).

The current research made use of an informal pilot test. Colleagues who had knowledge of the derivatives market in South Africa were approached to comment on the proposed questionnaire. The individuals who formed part of this pilot test filled out a pilot test report (see Appendix 2). According to Grover and Vriens (2006), pilot testing allows the researcher to assess the quality of the questionnaire. This enables the researcher to improve the questionnaire to enhance the validity of the questionnaire.

4.4.7 Proposed areas of research and related questions

The proposed questions supported the primary and secondary research questions. According to Crowther and Lancaster (2009), questions must be structured correctly to collect reliable data. Table 4.2, which was used to confirm the internal validity of the research instrument, briefly identifies each topic and associated rationale for a proposed question in the questionnaire. Internal validity was achieved as the proposed questions were supported by reviewed literature. Internal validity is addressed in section 4.6.1.

Table 4.2: Question topics, rationale and motivation from academic sources

Topic	Rationale
The need for an OTC bond option market	<ul style="list-style-type: none"> • Determine whether OTC bond options are essential for risk management. • Determine whether OTC bond options can be used to create an innovative funding structure. • Determine whether OTC bond options can deliver additional profits from speculation. • Determine whether OTC bond options can be used to derive a riskless profit.

Sources	Adelegan (2009), Arestis and Karakitsos (2009), Dai <i>et al.</i> (2010), Deuskar <i>et al.</i> (2011), Dodd (2009), Greenwood and Vayanos (2010), Lawton (2012)
The significance of OTC bond options in South Africa	<ul style="list-style-type: none"> • Determine whether OTC bond options could attract participants to the bond option market. • Determine whether OTC bond options could reduce risk in volatile markets. • Determine whether OTC bond options could improve liquidity in the bond market. • Determine whether OTC bond options could attract international investors.
Sources	Adelegan (2009), Chordia <i>et al.</i> (2001), Dodd (2009), Mihaljek and Packer (2010), Milne (2009)
Deterioration of the South African OTC bond option market.	<ul style="list-style-type: none"> • Confirm the deterioration of the OTC bond option market. • Determine whether bond issuers had a role in the deterioration of the OTC bond option market. • Determine whether the decline in the short-term interest rates since 2004 affected the OTC bond option activity. • Determine whether the OTC bond option pricing method that incorporated the volatility in the modified Black formula (1976) is effective. • Determine whether wide bid–offer spreads have a deteriorating effect on the OTC bond option market. • Determine whether the OTC bond option market is efficiently regulated and overseen. • Determine whether International Swaps & Derivatives Association (ISDA) agreements are sufficient to regulate the OTC bond option market. • Determine whether the ET bond option market crowded out the OTC bond option market.

	<ul style="list-style-type: none"> • Determine whether intermediaries are active in the OTC bond option market. • Determine whether all institutional investors have access to the OTC bond option market.
Sources	Adelegan (2009), Ball <i>et al.</i> (2011), Chinzara (2010), Chordia <i>et al.</i> (2001), De Larosière (2009), Durbin and Ng (2005), Goyenko <i>et al.</i> (2011), Greenwood and Vayanos (2010), Hearn and Piesse (2012), IOSCO (2010), JSE (2011), Milne (2009)
Enhancing OTC bond options in South Africa as a primary hedging instrument.	<ul style="list-style-type: none"> • Determine whether investors fully understand the OTC bond option market. • Determine whether the OTC bond option market is effectively integrated into the financial market. • Determine whether shorter-maturity OTC bond options could stimulate the OTC bond option market. • Determine whether there is regular interbank trading of OTC bond options. • Determine whether exotic options crowd out OTC bond options. • Determine whether the secondary bond market is liquid and active. • Determine whether the OTC bond option market is transparent.
Sources	Ameer, binti Mohd Isa and bin Abdullah (2011), Arestis and Karakitsos (2009), Bezzina and Grima (2012), Choudhry (2001), Cummins, Phillips and Smith (2001), Dodd (2012), Dodd (2009), Dodd and Griffith-Jones (2007), IOSCO (2010), PIMCO (2011), Stulz (2005).
OTC bond options as a hedging instrument.	<ul style="list-style-type: none"> • Determine whether OTC bond options should be considered a hedging instrument.
Sources	Adelegan (2009), Deuskar <i>et al.</i> (2011)

Regulating and standardisation OTC bond options.	<ul style="list-style-type: none"> • Determine whether OTC bond options should be regulated and traded on an exchange only.
Sources	Arestis and Karakitsos (2009), Ball <i>et al.</i> (2011)
The role of the respondent in the South African OTC bond option market.	<ul style="list-style-type: none"> • Collect demographic information to establish the type of investors and their objective in the market.

Source: Own composition

The topics identified in Table 4.2 are similar to the primary and secondary research questions (see 1.4). The rationale provided in Table 4.2 also served as an introduction for each of the questions in the questionnaire. The questionnaire was founded on literature, and the sources are cited in Table 4.2. The validity of the questions in the questionnaire was enhanced by citing these sources which reflected research on the specific constructs of the questionnaire. The proposed questionnaire was unique in that no previous questionnaire made use of the literature in Table 4.2 to construct a questionnaire. Each answer in the questionnaire was measured according to a specific type of measurement.

4.5 MEASUREMENT SCALES

The objective of descriptive research is to explain by means of statistical analysis (Crowther & Lancaster 2009). To apply statistical tests correctly, data measurement must be accurate. The four different measurement scales as defined by Gill and Johnson (2010), namely nominal, ordinal, interval and ratio scale are discussed in the next section.

4.5.1 Nominal scale

The authors (Cooper & Schindler 2008; Gill & Johnson 2010; Remenyi *et al.* 1998) explained the nominal scale as a basic form of measurement. Their view of nominal scale data is that this scale does not hold strong statistical properties and is often used to differentiate between different industries in an economy or in demographic

survey questions. Even though the scale is a weak statistical measure, it has value, especially when the research is of an exploratory nature (Cooper & Schindler 2008; Gill & Johnson 2010; Remenyi *et al.* 1998).

In the current research, the nominal scale was applied to collect data on the type of employer and the objective of the employee in the financial market. Two opinionated questions, which both had a yes and no answer to obtain the opinions of the respondents also formed part of the questionnaire.

4.5.2 Ordinal scale

According to Cooper and Schindler (2008) ordinal measurements have increased complexity when compared with the nominal scale. An ordinal measure as a nominal measure that can be ranked. The words “more than”, “the same” or “less than” are associated with an ordinal scale (Cooper & Schindler 2008).

The ordinal scale measurement allows some statistical analysis, namely mode and median calculations (see 4.7.2). Gershkoff (2008) is of the opinion that, although statistical analysis is possible, it does not contribute at a large scale, as the rank associated with the various measurements does not have a meaningful numerical distance between them.

4.5.3 Interval scale

The interval scale combines ordinal and nominal scales and has an additional capability, namely the measurement of distance between different points in the data set (Gershkoff 2008). Gill & Johnson (2010) states that intervals introduce a concept of equality as equal distances between measurements exist, e.g. the distance between 10 and 15 degrees Celsius is 5 degrees Celsius. The interval scale however lacks a true zero value (Gershkoff 2008). This entails that multiplication and division are not possible, as it cannot be twice as hot in Centigrade if it is 2 degrees Celsius compared to 0 degrees Celsius (Gill & Johnson 2010).

4.5.4 Ratio scale

The ratio scale is the top level of measurement scales, incorporating the abilities of all the lower-level measurements, namely the nominal, ordinal and interval scale. In addition to the interval scale abilities, the ratio scale has a definite zero (Gershkoff 2008). Therefore, there exists an exact difference between \$100 and \$150. The ratio scale can be converted into any other measurement scale. Additionally, a full range of statistical analysis techniques and mathematical tests is valid when data is measured with a ratio scale (Cooper & Schindler 2008; Gill & Johnson 2010; Remenyi *et al.* 1998).

The current research primarily used ratio scale data. Each respondent identified his or her extent of agreement with certain statements by selecting a percentage out of 100. This scale was used for all the questions in the first four constructs of the research instrument. The data collected using the research instrument was measured according to a nominal and ratio scale. The data measurements adhered to certain prescribed characteristics, namely validity, reliability and practicality.

4.6 CHARACTERISTICS OF MEASUREMENTS

Data measurements should adhere to specific characteristics, namely validity, reliability and practicality (Cooper & Schindler 2008). Practicality is not included as a characteristic by some authors (Crowther & Lancaster 2009; Gill & Johnson 2010) but it is important as practicality referred to the ease of constructing, measuring, administering and interpreting research (Cooper & Schindler 2008). Validity is divided into internal and external validity. These are described in the next section, followed by a description of reliability and the application of each of these characteristics during the current research.

4.6.1 Internal validity

The degree to which an instrument measures that which it intends to measure and the accuracy thereof is referred to as internal validity (Crowther & Lancaster 2009; Gill & Johnson 2010). According to Cooper and Schindler (2008) and Quinton and

Smallbone (2006), internal validity consists of face validity, construct validity, criterion validity and content validity.

- Face validity

Face validity refers to the accuracy of a measurement. A measurement is considered accurate when the independent variable is not measured as a dependent variable. The most suitable test for face validity is to determine the causality of each variable (Gill & Johnson 2010; Quinton & Smallbone 2006).

- Criterion validity

Criterion validity is judged by the relevance, bias, reliability and availability of the measure. Criterion validity measures the expected behaviour of a variable and the level of the accuracy of this expected behaviour (Cooper & Schindler 2008).

- Construct validity

Construct validity is the extent to which a research instrument tests theoretical accuracy. The researcher is responsible for evaluating the theoretical validity of the research instrument (Quinton & Smallbone 2006).

- Content validity

Content validity is the degree to which the level of measurement within the research instrument answers the research questions (Quinton & Smallbone 2006). If the research questions are adequately addressed by the research instrument, the measurement should be content-valid, in other words the research questions were adequately addressed by the questionnaire (Cooper & Schindler 2008).

To evaluate criterion validity, Table 4.2 showed each construct of the research instrument. Each construct was used to address a research question or part thereof. The questions that supported each construct were set according to recommendations from the literature review. As the questions were based on academic work by authors in the financial markets environment, the researcher was satisfied with the content and construct validity of the research instrument. To

enhance the internal validity, the research instrument was pre-tested with a pilot study among researchers in the field of finance, risk management and banking.

4.6.2 External validity

External validity is also known as the generalisability of research (Bryman & Bell 2011). External validity is the degree to which the findings from a sample are extrapolated to the population of the sample (Cooper & Schindler 2008; Crowther & Lancaster 2009; Quinton & Smallbone 2006).

Gill and Johnson (2010) identify two types of external validity, namely population validity and ecological validity. Population validity is the extent to which it is possible to extrapolate data from the sample to the population. Ecological validity, on the other hand, is the extent to which a social context can be generalised into other social contexts or scenarios.

The South African OTC bond option market is an exclusive market and only a limited number of entities participate in this market. As there are only a limited number of individuals who are active in this market, this research used purposive sampling (see 4.9). Purposive sampling is used to collect data from a field of experts and to gain a deeper understanding of a specific problem (Neuman 2009). The current research aimed to add to the theoretical knowledge and did not need to generalise within the population.

4.6.3 Reliability

A researcher that replicates a research project of another researcher and reaches similar findings as the first researcher confirms the reliability of the research project. If research is considered to be reliable, data collections from one point in time to a next should yield similar results (Crowther & Lancaster 2009; Gill & Johnson 2010; Quinton & Smallbone 2006).

According to Quinton and Smallbone (2006), it is often difficult to achieve reliability in business research as this type of research is commonly of a non-experimental

nature. As early as 1982 LeCompte and Goetz (1982) questioned the reliability of business research. These researchers were especially concerned about the reliability of business research when people were involved, as they found that it was not possible to replicate results without changing any of the initial parameters of the research.

Cooper and Schindler (2008) conclude that, if research measurements are free from random errors, it satisfies the reliability of a measurement. However, Quinton and Smallbone (2006) suggest that there are three methods to determine the reliability of a measurement, namely the test–retest method, the parallel test method and split-in-half method.

- The test–retest method comprises a replication of the initial research. This replication must be identical to the initial research but should occur at a future time, whether it be a day, month or year later (Quinton & Smallbone 2006; Vogt 2005).
- The parallel test method requires that the researcher identify two sample groups and collects the data concurrently with an identical research instrument. The results from the two samples should deliver similar findings if the research was considered to be reliable (Quinton & Smallbone 2006).
- The split-in-half method incorporates statistical measures to calculate the reliability of the research. This method measures the consistency between the first and second half of a respondent's answers. The statistical measure used is the Cronbach's alpha. This statistic calculates the correlation and measures the consistency of respondents' answers (Cooper & Schindler 2008; Quinton & Smallbone 2006).

The research on the perspectives of individuals who were active in the South African OTC bond option market at the time of the research was considered business research. According to Quinton and Smallbone (2006) as well as LeCompte and Goetz (1982), it is difficult to determine the reliability of business research when human participants are involved. The current research therefore did not attempt to use any of the reliability testing methods. The financial market conditions

consistently change and therefore replication of the research in identical circumstances cannot be achieved.

The data measurements were subject to descriptive statistical analysis in order to analyse and interpret the collected data (Black 2002). Statistical analysis allows a researcher to interpret findings from the data collected with the research instrument to reach a conclusion (Cooper & Schindler 2008).

4.7 STATISTICAL ANALYSIS

Statistical analysis is the analysis of any form of data that is measured at a specific level (Heiman 2011). According to Crowther and Lancaster (2009), the two types of statistical methods regularly used in research are inferential statistics and descriptive statistics.

4.7.1 Inferential statistics

Inferential statistics are used to determine the relationship between two or more variables (Boslaugh 2013; Curwin & Slater 1990; Heiman 2011). The current research did not use inferential statistical methods as the objective of the research was to describe the perspectives of individuals who were involved in the South African OTC bond option market at the time of the research.

4.7.2 Descriptive statistics

Descriptive statistics comprise a summary of the data collected according to a specific level of measurement (Heiman 2011). Descriptive statistics describe the characteristics of a population or sample, predicting outputs based on prior inputs. Descriptive statistics are presented graphically or numerically. A graphic representation of descriptive statistics is in the form of bar charts, box plots (also known as a “box and whiskers plot” [Rodriguez 2007]), histograms, pie charts and other graphic representations. The numerical representation describes the collected data according to measures of central tendency or measures of dispersion (Heiman 2011; Moore 2001).

- Measures of central tendency

The measures of central tendency are the mean, mode and median of a data set (Boslaugh 2013). The mean is the average value returned from collected data. The value that occurs most frequently in a data set is the mode. The median is the middle value when a data set is ranked from the minimum value returned to the maximum value returned from the data set (Boslaugh 2013).

- Measures of dispersion

The measures of dispersion describe the level of variability in a data set (Fielding & Gilbert 2006). This level of variability is a description of the extent to which the distributions differ from one another (Heiman 2011). According to Fielding and Gilbert (2006) the range, variance, standard deviation and coefficient of variation are associated with measures of dispersion. The range is the difference between the minimum and maximum values returned in a data set. The variance and standard deviation are measures of the distance of the collected data away from the mean. The coefficient of variation is a standardisation of the variation and allows a researcher to compare the standard deviations of different data sets (Boslaugh 2013; Heiman 2011).

The current research made use of descriptive statistics to interpret and present findings from the collected data. The presentation and interpretation of the collected data were in a numerical and graphical form (see e.g. 5.5.1, 5.5.2 and Figure 5.9). Microsoft Excel 2010 and the Statistics Package for the Social Sciences (SPSS) version 22 (SPSS 2014) were used to calculate the descriptive statistical measures and illustrate the results graphically. The numerical descriptive statistics that were used were the minimum, maximum, range, variation, standard deviation, median, mode, kurtosis and skewness. The graphical representations that describe the data collected are pie charts (see Figure 5.1), histograms (see Figure 5.3) and box plots (see Figure 5.9). The statistical analysis of the data was conducted on data obtained from the respondents.

4.8 POPULATION

The population is the group of subjects or objects used to collect data from (Salkind 2012; Williams, Sweeney & Anderson 2006). In the current research, the population comprised the active users of OTC bond options in South Africa. Bezzina and Grima (2012) describe active users in this regard as analysts, treasurers, auditors, compliance officers, brokers, investment bankers and managers. The population for the current research consisted of issuers, market makers, intermediaries, participants and market regulators. Each element identified as part of the population is described below.

- Issuer

An issuer is an entity that creates financial assets and releases the assets into the primary financial market (Nasdaq n.d.; Wuite 2009).

- Market maker

A market maker is an entity or individual that provides bid and offer prices on a specific financial asset. Market makers are willing to buy or sell a financial asset from or to a participant (Nasdaq n.d.; Wuite 2009).

- Participants

A participant is considered any contributor of funds. Participants are retail investors, professional traders, asset managers or short-term traders (Adelegan 2009; Nasdaq n.d.; Wuite 2009).

- Intermediaries

An intermediary is an entity brings together a party in the financial market and a counterparty who is willing to transact in the market (Gorton & Winton 2002).

- Market regulators

A market regulator is an entity who has the ability to regulate the financial market in a country (Wuite 2009). Goodspeed (2013b) reports that South Africa uses a Twin

Peaks model where the SARB acts as the market conduct regulator while the Financial Services Board (FSB) is responsible for the prudential regulation.

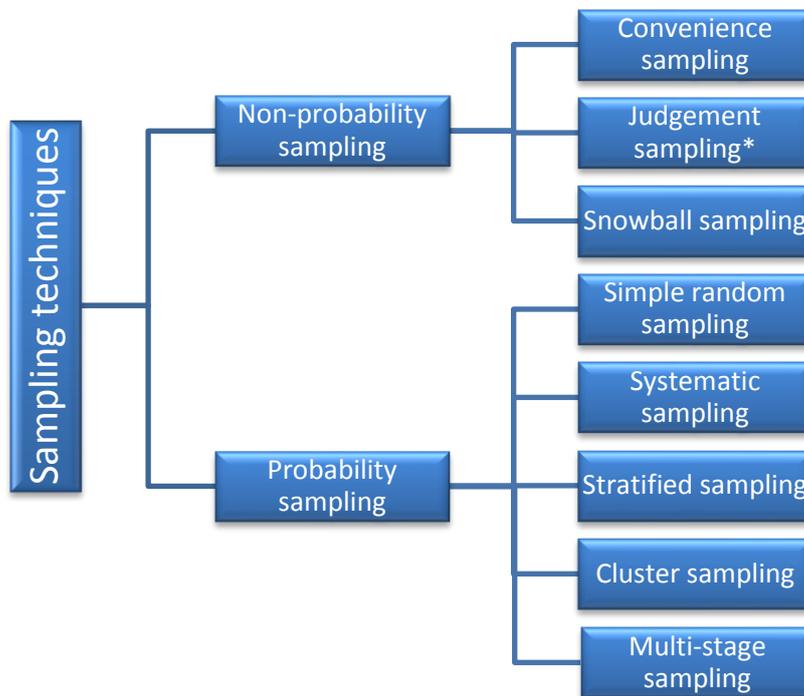
The population for the current research was identified from data collected by the Profile Group (n.d.). The Profile Group regularly publishes a directory of the South African financial market. This directory includes all major financial institutions in South Africa. The population identified comprised all companies that were listed in the Profile's Financial Market category of interest rate market members at the JSE. The full list of members is attached as Appendix 3. The members were arranged according to their classification as issuer, intermediary, market maker, market regulator or participant.

Each of the companies was contacted telephonically requesting possible participation in the research. If the company was active in the bond option market and the individual or individuals at the company were willing to participate a questionnaire was e-mailed to the specific individual or individuals. He or she could then submit the completed questionnaire anonymously through Adobe Acrobat Reader or Professional. If the institution that was contacted agreed to participate, a purposive sampling method was followed (see 4.9). Since this research aimed to obtain data from experts in the field of OTC bond options within this population, purposive sampling was the most appropriate, as indicated by Ishak and Bakar (2014). The different sampling methods are discussed briefly in the next section, while only purposive sampling is discussed in greater detail.

4.9 SAMPLING

Sampling is the identification of a subset of elements of the population (Salkind 2012). Most positivistic empirical research makes use of sampling, comprising probability and non-probability sampling methods (Bryman & Bell 2011). Sampling is used where it is impractical or inefficient to survey a population (Salkind 2012). If sampling is conducted correctly, it may be possible to generalise the results and apply the findings to the population (Gill & Johnson 2010; Remenyi *et al.* 1998). However, it is not always necessary to generalise results as some research aims to

find a deeper understanding of a specific problem (Neuman 2009). Figure 4.3 illustrates the various non-probability and probability sampling techniques.



*Judgement sampling is also known as purposive sampling (Bondmass 2014).

Figure 4.3: Sampling techniques

Sources: Gill and Johnson (2010) and Remenyi *et al.* (1998)

Figure 4.3 illustrates the non-probability and probability sampling techniques used by researchers to identify a subset of elements in a population.

The probability sampling methods are:

- simple random sampling (Salkind 2012);
- systematic sampling (Remenyi *et al.* 1998);
- stratified sampling (Salkind 2012);
- cluster sampling (Gill & Johnson 2010); and
- multi-stage sampling (Bryman & Bell 2011).

The non-probability sampling techniques are:

- convenience sampling (Salkind 2012);
- judgement sampling (Bondmass 2014); and
- snowball sampling (Gill & Johnson 2010).

A non-probability sampling technique, namely judgement or purposive sampling was used in the current research.

The non-probability purposive sampling technique is a superior non-probability sampling technique (Daniel 2012). According to Ishak and Bakar (2014), purposive sampling has three unique benefits:

- the researcher can sample only the experts in a specific field;
- the sampling method allows the researcher to access a specialised population; and
- purposive sampling allows for an in-depth evaluation of the research problem.

Purposive sampling was therefore regarded the most appropriate sampling method for the current research as it allowed the researcher to sample only the most knowledgeable individuals in the South African OTC bond option market.

The population identified the group of entities who were active within the South African OTC bond option market at the time of the research. This population was sampled purposively to identify the experts within the market. The data obtained from this sample allowed the researcher to report on the knowledge that the experts shared by completing the questionnaire. Since purposive sampling was used it was important that the data collected adhered to ethical considerations of Unisa. These ethical considerations are discussed in the next section.

4.10 ETHICAL CONSIDERATIONS

Research is subject to certain ethical guidelines. Ethics have various dimensions, and researchers often found that they transgress some of the ethical principles. Ethical principles can be transgressed from a data collection perspective or an authorship perspective. From an authorship perspective, authors should comply by

accrediting the work of other authors referenced in the research, as the possibility of plagiarism exist (Coats 2008; Eriksson & Kovalainen 2008; Israel & Hay 2006). From a data collection perspective, confidentiality should exist between the researcher and respondent, the respondents should consent to the research conducted, privacy of the respondents should be respected, deception should be excluded and potential harm should be addressed. (Diener & Crandall 1978; Israel & Hay 2006; Pimple 2002; Walliman 2006). The transgressions as mentioned are described briefly below.

- Plagiarism

Plagiarism is essentially the unauthorised use of another author's ideas or research (Eriksson & Kovalainen 2008; Israel & Hay 2006). It includes the failure to acknowledge another author for referenced work and dishonest practices with regard to copyright (Unisa 2005).

- Confidentiality

A close relationship exists between the confidentiality and anonymity of respondents in research (Eriksson & Kovalainen 2008). Respondents have an expectation of anonymity and confidentiality if there is an agreement of confidentiality between the researcher and the respondent in a research project. Confidentiality is the assurance that the data collected will not be identified with a specific research respondent (Eriksson & Kovalainen 2008; Gillbert 2006).

- Consent

Consent has two distinct requirements. It should be voluntary and informed (Faden & Beauchamp 1986). Voluntary participation refers to the decision of the respondent to partake in a research project without being forced or coerced into participation (Israel & Hay 2006). Respondents who voluntarily participate in research should be adequately informed. A respondent is informed when the researcher provides a motivation for the research, identifies the risks of participation and provides accurate information on the time burden of the questionnaire (Gillbert 2006).

- Privacy

Privacy and confidentiality are often confused. Confidentiality is the confirmation that data cannot be identified with a specific respondent (Eriksson & Kovalainen 2008). Privacy, unlike confidentiality, allows respondents who form part of a population or sample the right of noncompliance and researchers should thereby not invade the privacy of a respondent (Cooper & Schindler 2008; Walliman 2006).

- Deception

Respondents are deceived when the researcher does not adequately or accurately supply them with the correct information (Gilbert 2006). Some conflicting opinions exist on deception with some researchers such as Israel and Hay (2006) as well as Eriksson and Kovalainen (2008) arguing that deception could yield more accurate results. Deception may be acceptable when it insures that deception will reduce any form of harm to a respondent (Babbie 2008; Cooper & Schindler 2008). But, Gilbert (2006) suggests that respondents should be informed of the deception when the objective of the research was achieved.

- Potential harm

Ethically speaking, no respondent should be harmed intentionally nor should a respondent experience any risk of discomfort or prosecution as a result of participation in research (Gilbert 2006). Researchers should not only seek to limit any potential harm but should also attempt to improve the conditions of respondents as research should essentially benefit the population or society (Israel & Hay 2006).

The current research was bound by the ethical guidelines proposed by Unisa. Based on the information provided to Unisa, the researcher obtained ethical clearance to conduct research and to uphold the ethical expectations of Unisa. The clearance was issued based on the promise of the researcher to uphold ethics in data collection and in authorship. The ethical clearance certificate is attached as Appendix 4.

The researcher did not intentionally infringe on any copyright or plagiarise the work of other researchers. Secondary data or the work of others was not misinterpreted

or manipulated in any form to benefit this research. All information is presented accurately according to the referenced literature.

The respondents who participated in the research were adequately informed of the ethical principles that this research adhered to. All respondents in the sample had the right to privacy. After the respondents had been contacted, they had the opportunity to be excluded from the sample. Those who participated and wished to withdraw also had the opportunity to withdraw at any stage before receiving the questionnaire or even while completing the questionnaire. Appendix 1, the research instrument, included the informed consent form illustrating the agreement of confidentiality between the respondent and the researcher. The respondents were not deceived in any way nor were they subjected to any possible harm. All respondents took part in the research of their own free will without being coerced or incentivised into participating in this research (see Appendix 1).

4.11 SUMMARY

The methodology section introduced the triangulation approach adopted in this research. The triangulation approach suggests that postgraduate research pursues the research objectives from three angles. The researcher first conducted a literature review to obtain information relevant to the current research. The researcher then used secondary data to confirm the research problem. Lastly, a research instrument was used to obtain primary data from the respondents. The triangulation approach allowed the researcher to deliver findings that achieved the identified research objectives.

The objective of this methodology chapter was to establish how to construct an approach that would allow the researcher to reach valid conclusions. In order to construct a methodology, the different aspects that influenced the data and the data analysis and interpretation were evaluated. Aspects that played a role in data collection and analysis were the research design, the types of data, the research instrument, the measurement levels, the characteristics of measurement, the statistical analysis, the population, the sample and the ethical considerations that the research needed to abide by.

In this research, a quantitative research design was identified as the most suitable approach for data collection. An appropriate population was identified from a database of entities who were active within the South African OTC bond option market. The population comprised market makers, issuers, intermediaries, participants and market regulators. Purposive sampling was used to obtain data from the experts in the specialised field of the South African OTC bond option market.

The research instrument supported the practicality of the data collection (see 4.6). A self-administered questionnaire was used as the research instrument to collect ordinal and ratio scale data from the respondents. The data measurement adhered to the suggested content and construct validity. As human participants were involved reliability is difficult to test (LeCompte & Goetz 1982; Quinton & Smallbone 2006). The sample excluded the need to determine external validity as the objective of the research was to contribute to the theory on OTC bond options from a South African perspective in the opinion of the experts in this market.

The validity of the research was strengthened by the ethical guidelines followed by the research. The researcher ensured that no ethical considerations were transgressed as the validity of research could be jeopardised by unethical practices. The data obtained from the individuals who participated in the research was therefore their true opinions.

The quantitative design made it possible to evaluate the data by interpreting the data that was analysed with statistical methods. Descriptive statistical methods were used to interpret the data and to report on the findings of the research. The findings are addressed in the next chapter of this research.

CHAPTER 5

FINDINGS

5.1 INTRODUCTION

The methodology used to collect data for this empirical research delivered comprehensive results as the responses collected from the respondents were sufficient to achieve the research objectives. The results were used to address the primary and secondary research objectives. The primary and secondary objectives were constructed from the research objectives (see 1.3) in order to achieve results that would explain the apparent inefficiencies in the South African bond option market. A questionnaire was constructed, based on the research questions that were supported by the literature review. The questionnaire was divided into subsections to collect data on each research objective. The final questions related to the demographic profile of the respondents. The data collected on the research objectives is discussed by using numerical and graphical descriptive statistical techniques.

The use of descriptive statistics only rather than inferential statistics was motivated by the limitation on the size of the sample of the South African bond option market. The size of the sample indicated that the second objective of this research might be valid, namely to establish whether the market had deteriorated, and the descriptive statistics made adequate provision for statistical analysis of the small sample.

The descriptive statistical techniques that was used in this research included the standard deviation, minimum, maximum, average, mode, median, skewness and kurtosis. Each question in the questionnaire was analysed by means of descriptive statistics and will be discussed in section 5.2 to 5.9. The most appropriate descriptive statistical techniques were used to interpret the data. The results are presented in the form of a histogram, box and whiskers plot or a pie chart where appropriate.

The results obtained from the questionnaire are discussed in the remainder of this chapter. Each question will be discussed according to the following structure:

- the respondents' representation of the OTC bond option market is discussed before each question in the questionnaire is addressed;
- each question in the questionnaire is stated, followed by a brief introduction;
- the descriptive statistics of the results follow the introduction; and
- a concluding remark is made on each question before introducing the next question or section of the questionnaire.

5.2 THE ROLE OF THE RESPONDENTS IN THE SOUTH AFRICAN BOND OPTION MARKET

According to Marx (2013), investors have different objectives in the financial markets. The questionnaire (see Appendix 1) was used to identify how the respondents represented the OTC bond option market. Representation was established by determining the role of the respondents when entering into transactions in this market, as well as their objective in the market.

5.2.1 Question 8.1: I primarily transact in the market as a(n) ...

Marx (2013) defines a hedger as an investor who profits by engaging in a position that would not result in a significant potential loss. An arbitrageur is defined as an investor who has an objective of profiting without taking on any additional risk (Hull 2008), while a speculator enters into riskier positions in order to derive additional profits (Marx 2013). Figure 5.1 indicates the percentage speculators, hedgers and arbitrageurs between the respondents.

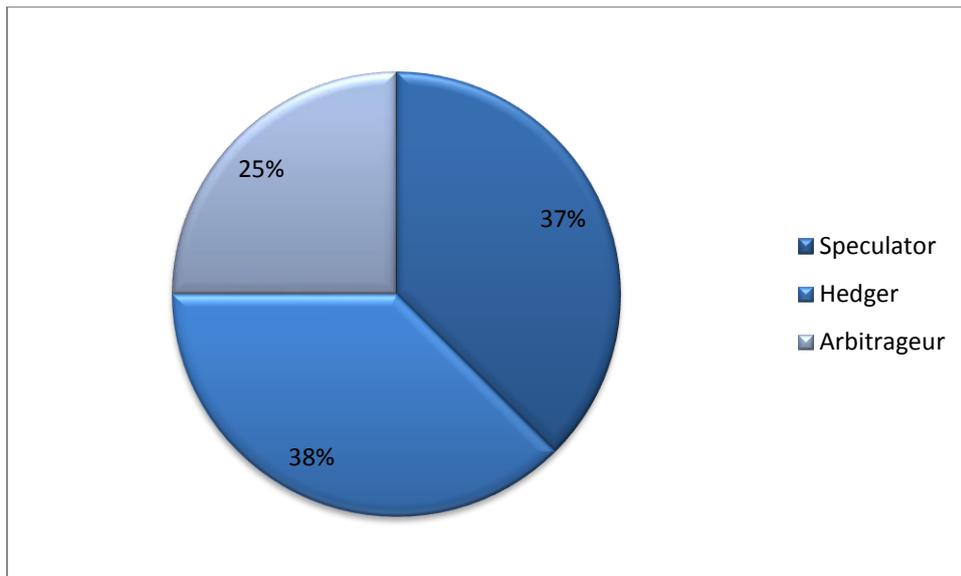


Figure 5.1: The role of the respondents in the OTC bond option market

Source: Own composition

Figure 5.1 shows that 25% of respondents acted as arbitrageurs, 37% respondents acted as speculators and the remaining 38% acted as hedgers within the OTC bond option market, and were employed by an institution that had a certain role in the market.

5.2.2 Question 8.2: The institution I am employed by can best be described as a(n) ...

The population consisted of institutions that were active in the OTC bond option market that can be classified as issuers, market makers, participants, intermediaries or regulators. The latter formed part of the other group of the questionnaire in this research. Issuers are entities that release assets into the primary market (Wuite 2009). Market makers sell the assets that are issued into the market to the various market participants (Wuite 2009). An intermediary acts as a negotiator who brings together a party who enters the market and a counterparty willing to transact (Gorton & Winton 2002). A participant is described as the smallest contributor of funds, for example retail investors, asset managers, short-term traders or professional traders (Adelegan 2009; Wuite 2009). The last group, market regulators, comprise an institution that contributes to financial regulation. In South Africa, the FSB and SARB

are market regulators. Figure 5.2 classifies the percentage of respondents employed by the different types of institutions.

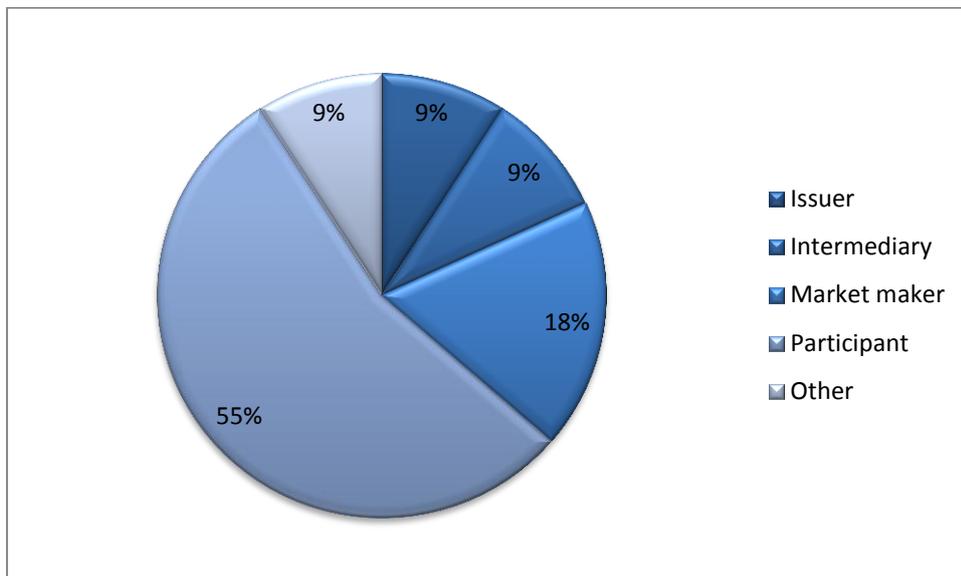


Figure 5.2: Respondents employed by type of institutions

Source: Own composition

Figure 5.2 shows that the respondents represented all the sectors of the institutions that employed individuals in the OTC bond option market. Figure 5.2 indicates that 9% of respondents were issuers, 9% were intermediaries, 9% were others (regulators, according to responses obtained), 18% were market makers and 55% were participants in the OTC bond option market.

This section reflects the demographic data of the respondents. Demographic data of the respondents were considered in terms of the purpose that the respondent had in the OTC bond option market and the type of institution where the respondent was employed. The results of the demographic profile of the respondents revealed that the OTC bond option market was indeed represented. The opinions of the respondents regarding the questions in the questionnaire are discussed in the next section.

5.3 SECTION 1: THE NEED FOR AN OTC BOND OPTION MARKET

The first research question, “Is an effective bond option market essential in a country’s financial markets?” consisted of four statements. The objective was to determine the need of the OTC bond option market in a country. As all respondents were part of the South African financial market, their responses were considered representative of a South African perspective.

5.3.1 Question 1.1: It is essential to use OTC bond options to manage risk associated with bonds

Adelegan (2009) found that financial risks can be managed by institutions if they make use of options to limit their exposure to an open position in the underlying market. The risks that investors take on by entering into long or short positions in the bond market can be hedged, but due to the high costs of hedging, investors often do not experience the maximum benefit (Deuskar *et al.* 2011). Figure 5.3 reflects a collective of the responses obtained on question 1.1.

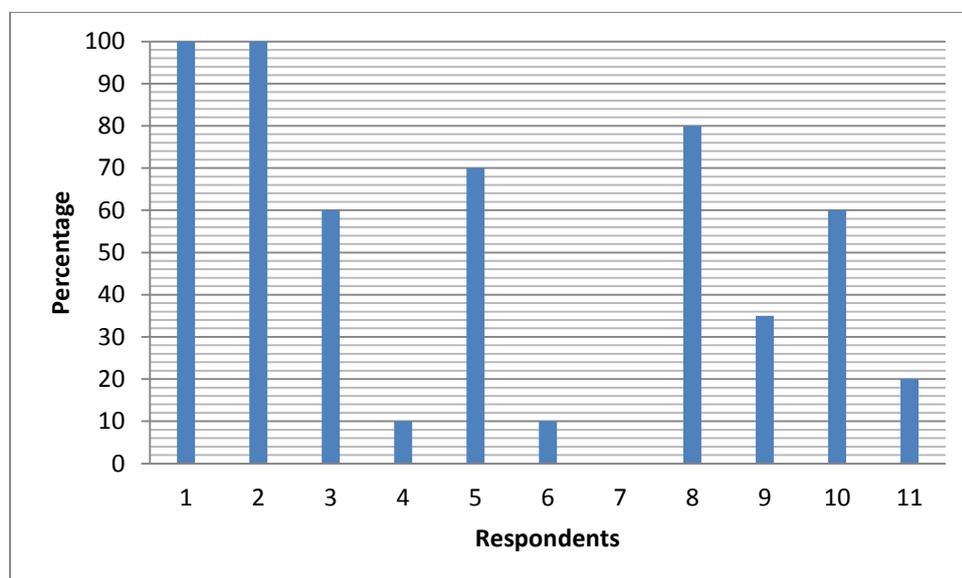


Figure 5.3: Essentiality of bond options to manage risk

Source: Own composition

Figure 5.3 shows that respondents had divergent opinions when asked whether bond options were essential for risk management. The average of the responses

was 49.55% with a median of 60%. The collected responses were skewed positively at 0.55 indicating that the graph is right-tailed. The kurtosis for the question was -1.508, which suggested that most responses were away from the mean. This was supported by the standard deviation that was calculated at 36.5%.

The results suggested that some respondents were of the opinion that bond options are not the only instrument that can be used to mitigate risk. It might also have indicated that they were of the opinion that it is not necessary to mitigate this risk in the bond market.

5.3.2 Question 1.2: The use of OTC bond options is a method of creating innovative funding structures

Different combinations of derivatives used to create new funding structures were considered innovative financial structures (Arestis & Karakitsos 2009). An example of such a structure could be the combination of put and call contracts creating a product similar to a future or forward contract (Dodd 2009). Figure 5.4 gives a graphic representation of the responses captured from the questionnaire.

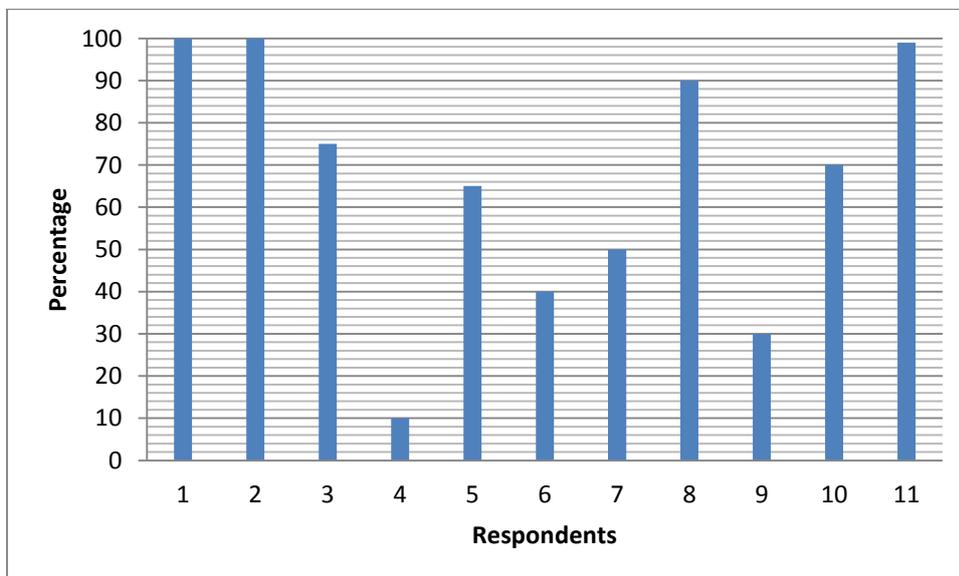


Figure 5.4: OTC bond options can be used to create funding structures

Source: Own composition

Figure 5.4 indicates that most respondents were of the opinion that innovative funding structures can be created with OTC bond options. The mean was 66.27% with a median of 70%. The standard deviation was 30.72%, which showed that values were however far from the mean.

The respondents agreed to some extent with Arestis and Karakitsos (2009), namely that OTC bond options could be used to create new funding structures. The question however remains whether these new funding structures were necessary.

5.3.3 Question 1.3: The use of OTC bond options to speculate could derive additional profits

According to Lawton (2012) and Dai *et al.* (2010), there is a need for speculative traders in an option market. Speculation in option markets has to be cost-effective for traders as speculation is essential to improve risk management and add liquidity to the financial market (Lawton 2012). Figure 5.5 illustrates the responses captured from the questionnaire.

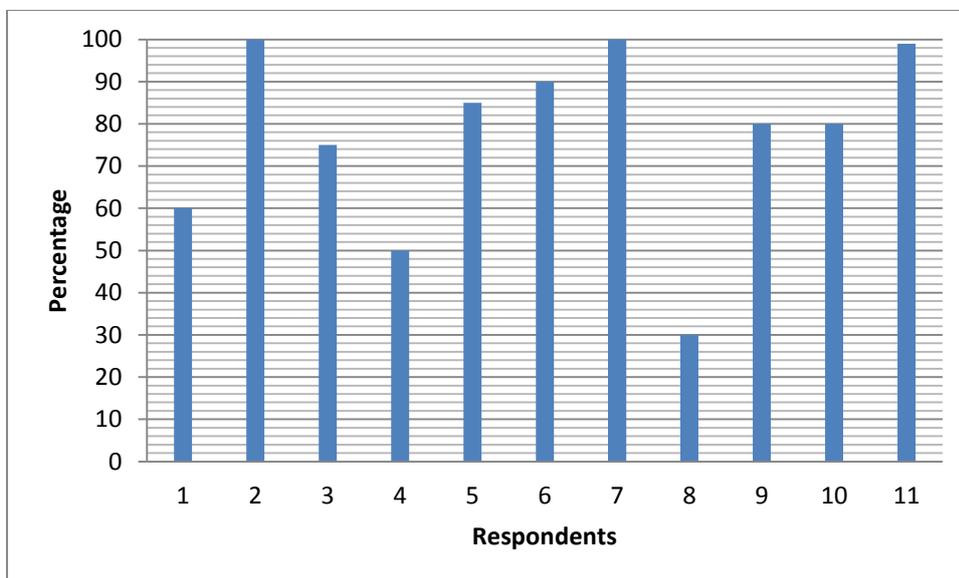


Figure 5.5: The use of bond options to speculate
Source: Own composition

Figure 5.5 indicates that OTC bond options were considered an excellent speculative financial instrument. The mean was 77.18% with a standard deviation of 22.41%.

The percentile rankings indicated that more than 50% of the responses were above 80%. Only three responses had a percentage of 60% or lower.

The opinion of the South African respondents was that OTC bond options make for an excellent speculative instrument. This was in agreement with Lawton (2012) and Dai *et al.* (2010) who aver that there is a need for speculative traders and that these traders add value to the OTC bond option market.

5.3.4 Question 1.4: The use of OTC bond options could derive riskless profits

Arbitrageurs are risk-averse investors who invest with the objective of maximising the gain without taking any additional risk (Hull 2008). Greenwood and Vayanos (2010) found that bonds are most sensitive to interest rate shocks. This means that bond prices are volatile in times of varying interest rates. As bond option prices are derived from a bond, interest rate shocks may have an influence on whether OTC bond options could be used for arbitrage. Figure 5.6 reflects a graphic representation of the opinion of the respondents.

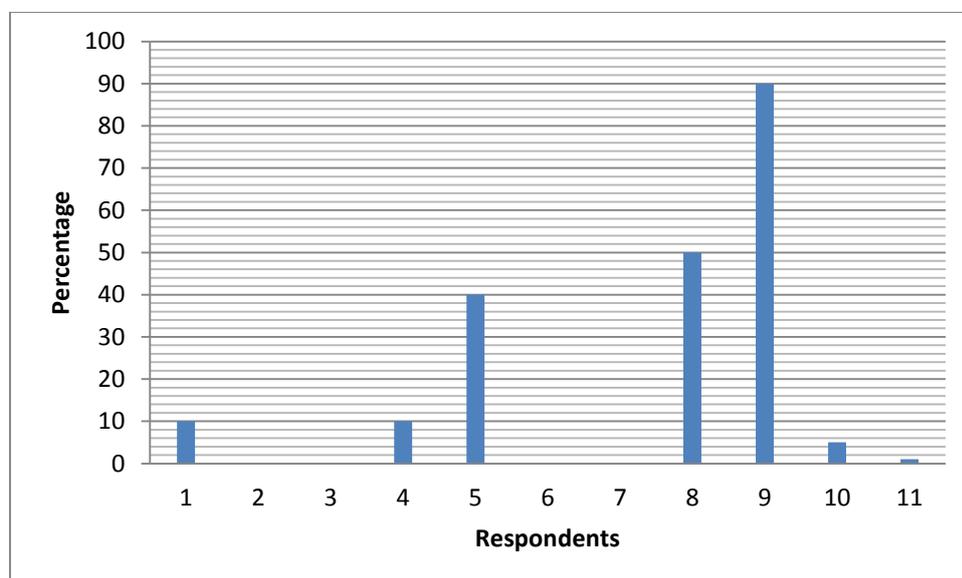


Figure 5.6: The use of OTC bond options for arbitrage

Source: Own composition

Figure 5.6 shows that the respondents were not of the opinion that OTC bond options should be used for arbitrage, as the mean was 18.73%. The skewness of

1.786 indicated most responses were lower than the mean. The kurtosis was 2.73, which represented an almost normal distribution. A kurtosis of 3.00 represents a normal distribution. The standard deviation was 29.27% and more than 50 per cent of all the responses for this question were below 5%.

The respondents were of the opinion that OTC bond options should not be used to derive riskless profits. Only two respondents indicated with some certainty that they would recommend this product for arbitrage profits. However, the majority of respondents did not believe that it was a viable option for arbitrage profits.

Based on the average response on the four questions, this section showed an average of 52.93% and a median of 57.91%. This indicated that the respondents agreed that there was an advantage for a country that had an OTC bond option market. It is possible that the median of 57.91% could be the result of the negative response from question 1.4, using bond options to derive riskless profits. According to Aling and Hassan (2012), bond options could be used for arbitrage but it was definitely not the intended use. As OTC bond options offer some advantage in a financial market, the significance must be determined.

5.4 SECTION 2: THE SIGNIFICANCE OF OTC BOND OPTIONS IN SOUTH AFRICA

This section determines the significance of the OTC bond option market. South Africa is considered a hub into Africa for foreign investors as South Africa received the highest inflow of FDI among the Southern African countries (United Nations 2014). As international markets offer products such as bond options, South Africa could also derive potential benefit from offering similar products. Question 2.1 to question 2.4 aimed to find whether OTC bond options still had a significant role in the South African financial market as hedging instrument.

5.4.1 Question 2.1: To attract more participants into the bond option market a successful OTC bond option market is necessary

Bond options have a number of benefits in financial markets (see 2.6 and 3.4). The benefits that bond options offer are improved risk management, price discovery, speculation and innovative financial products (Adelegan 2009; Milne 2009). For a financial market to gain from the benefits mentioned, a successful bond option market is necessary. Figure 5.7 depicts a representation of the opinion of respondents on the question whether OTC bond options could attract more participants into the bond option market.

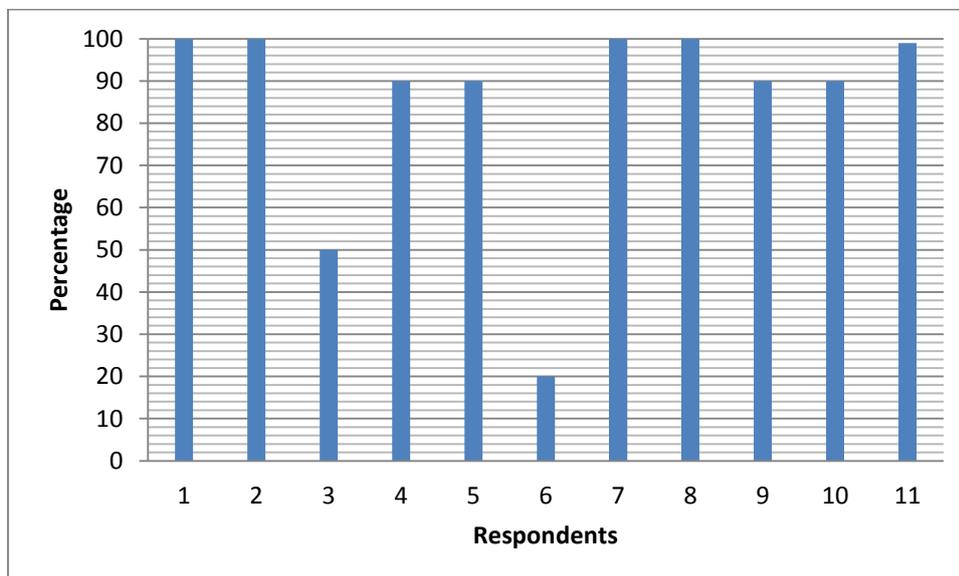


Figure 5.7: An OTC bond option market increases investor participation

Source: Own composition

Figure 5.7 illustrates that respondents were of the opinion that an OTC bond option market could attract more investors to the bond option market. The mean of the responses was 84.46%. The skewness of -2.069 indicated that most responses were larger than the mean. Only two respondents did not share the opinion that an OTC bond option market could attract more investors to the bond option market.

The benefits identified by Adelegan (2009) and Milne (2009) are reached when the bond option market is efficient. These benefits are improved speculation, price discovery, risk management and innovative financial products. The opinion of the

respondents indicated that an OTC market was necessary for an efficient bond option market. It can thus be concluded that the respondents were aware of the benefits that could be obtained if there was an efficient bond option market.

5.4.2 Question 2.2: The use of OTC bond options could reduce risks of changes in market volatility

Dodd (2009) reports that investors who are uninformed could be exposed to high risks as financial markets change continuously. According to Adelegan (2009), bond options are financial instruments that could be used to reduce the risk in this ever-changing environment.

More than fifty per cent of respondents were of the opinion that OTC bond options could reduce the risks of the volatile financial markets. The mean was lower than the median, with values of 67.82% and 80% respectively. The skewness was -0.938, an indication that there were extreme values at the lower end of the data (cf. Fielding & Gilbert 2006).

The results indicated that the respondents felt that the volatility in the market could be reduced if the OTC bond option market was used effectively. Respondents agreed with Adelegan (2009) and Dodd (2009) that risk of volatile markets could be reduced if OTC bond options were incorporated into a portfolio.

5.4.3 Question 2.3: The use of OTC bond options could improve liquidity within the bond market

This question aimed to find whether respondents were of the opinion that OTC bond options improved liquidity in the bond market. Liquidity is essential in a financial market as it could attract participants and improve trading activity (Chordia *et al.* 2001). Figure 5.8 shows a graphic illustration of the opinions of the respondents.

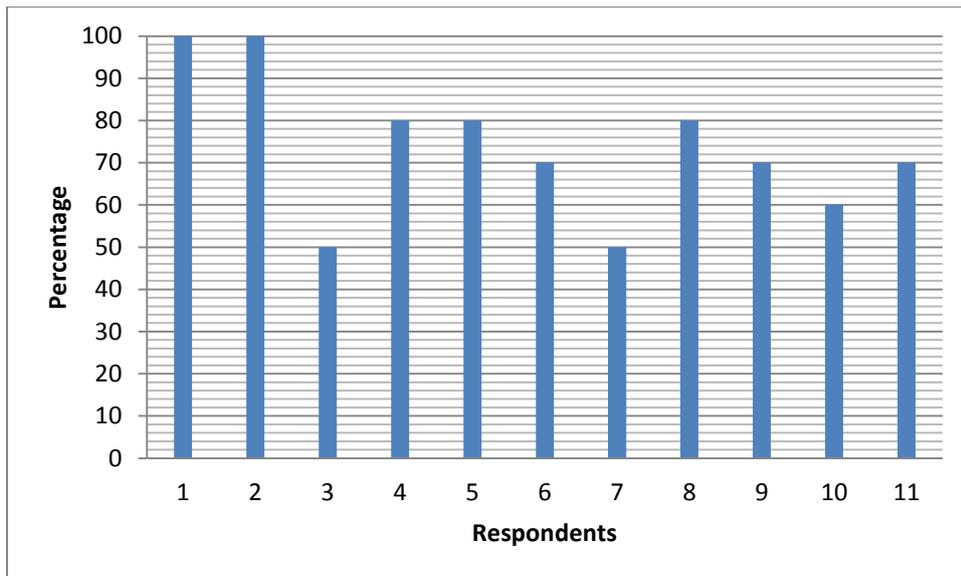


Figure 5.8: OTC bond options improve liquidity in the bond market
 Source: Own composition

Figure 5.8 illustrates that the respondents were of the opinion that liquidity in the OTC bond option market could improve liquidity in the bond market. The mean response was 73.64% and the median 70%. The minimum response was 50% and the skewness was 0.211.

The opinions of the respondents were similar to those in the study by Chordia *et al.* (2001) where it was found that liquidity in the OTC bond option market could improve liquidity in the underlying market. More liquid markets could possibly attract more investors to the financial market.

5.4.4 Question 2.4: The use of OTC bond options could attract international investors

South Africa as an emerging market has higher GDP growth compared to that of developed economies (Mihaljek & Packer 2010). According to Adelegan (2009), South Africa became more competitive in the international sphere as the liquidity and risk management of the derivatives market improved.

The respondents were not of the opinion that the OTC bond option market attracted more international investors. The mean of the responses were 45% and the median

30%, with a standard deviation of 29.58%. The results were skewed to the right with skewness of 0.606.

The results indicated that the respondents did not agree with Adelegan (2009) that a successful bond option market could attract international investors. The respondents could have been of the opinion that the OTC bond option market did not offer domestic investors any benefit and therefore an international investor would not benefit from this market either.

The objective of the questions in this section of the questionnaire was to determine whether respondents were of the opinion that the South African bond option market played a significant role in the South African financial market. The combined responses had a mean of 67.73% with a standard deviation of 14.42%. From these results, it may be concluded that the respondents were of the opinion that the OTC bond option market played a significant role in the South African financial market. This was a key finding as the JSE (2011) reports that the OTC bond option market deteriorated to such an extent between 2001 and 2011 that it may be considered insignificant. The next section of the questionnaire was used to establish why the OTC bond option market deteriorated.

5.5 DETERIORATION OF THE SOUTH AFRICAN OTC BOND OPTION MARKET

The respondents were of the opinion that the OTC bond option market played a significant role in the South African financial market. This section aimed to determine the cause of the apparent deterioration of the OTC bond option market between 2001 and 2011 according to the respondents. The findings provide an indication of what caused the apparent deterioration of the South African OTC bond option market. Figure 5.9 reflects a box and whiskers plot (Rodriguez 2007) of the responses on question 3.1 to question 3.10.

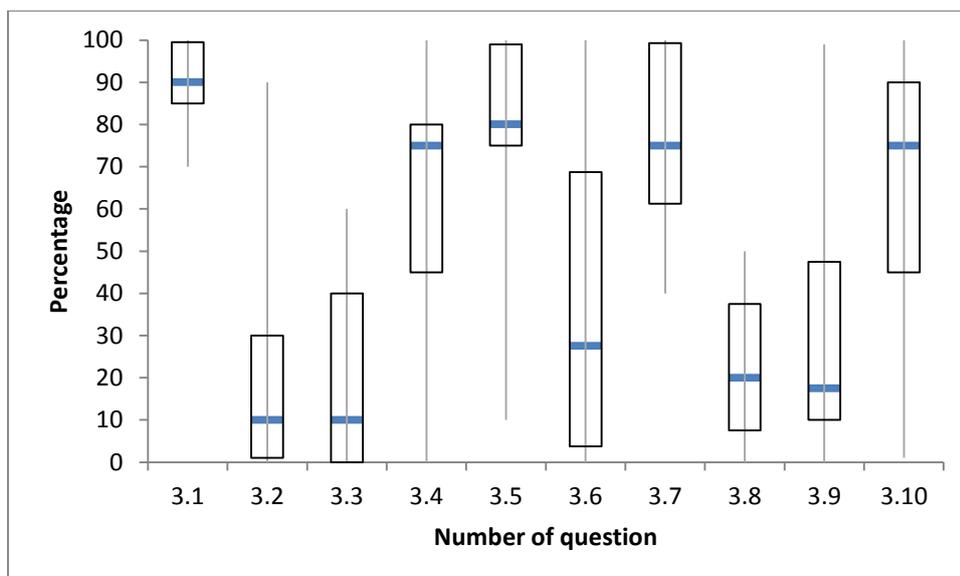


Figure 5.9: Box and whiskers plot of question 3.1 to question 3.10

Source: Own composition

Figure 5.9, the box and whiskers plot, shows a graphic representation of the minimum, lower quartile, median, upper quartile and the maximum value of the responses on questions 3.1 to 3.10. The values indicate the lowest value, the point where 25% of the values are less than the indicated value, the middle of the dataset, the upper quartile, which is the point where the remaining values are larger than the indicated value and the maximum value. The following ten questions addressed the factors that led to the apparent decline of the South African OTC bond option market between 2001 and 2011.

5.5.1 Question 3.1: The decline in the OTC bond option market in recent years is of such an extent that the market could be considered as insignificant

The JSE (2011) discusses the deterioration of the OTC bond option market between 2001 and 2011. The JSE (2011) found that the OTC bond option market had declined between 2001 and 2011. The ET bond option market is however still active.

Figure 5.7 indicates that the median is 90% and the mean, 90.44%. The standard deviation is 10.03% with a skewness of -1.151, an indication that most responses

were higher than the mean. The first quartile indicates that all the values were above 85%, suggesting that most respondents were of the opinion that the OTC bond option market had deteriorated to such an extent that it might be considered insignificant.

The respondents agreed with the statement by the JSE (2011) that this market was insignificant according to current (2014) market activity. They however indicated that it played an important role in the financial market. The conflicting results supported the significance of this research because, even though respondents were of the opinion that the OTC bond option market is important, the market was inactive. The factors that contributed to the deterioration were addressed in the remaining questions of this section.

5.5.2 Question 3.2: The lack of activity from bond issuers issuing new bonds in the South African financial market leads to the decline in OTC bond option activity

As derivatives are written on an underlying asset, the number of assets available to write these options on is essential to the growth of the market (see 3.4). EMEs, such as South Africa, have a small number of companies who issue bonds (Durbin & Ng 2005). Parastatals and government issue the majority of bonds in South Africa (National Treasury n.d.). Greenwood and Vayanos (2010) found that it was in a country's best interest to have a small budget deficit as this would encourage government to issue bonds.

The respondents were not of the opinion that issuers were responsible for the decline in the South African OTC bond option market. The mean was 22.36% and the median 10%. Fewer than 75% of the respondents indicated that bond issuers contributed to the market deterioration between 2001 and 2011. The third quartile percentage was 30%, which indicated that respondents rejected this question.

Even though South Africa has a small corporate bond market, the respondents did not find it necessary to have a larger bond market to restore OTC bond option trading. The reason for this response may be that the South African financial market

is more developed than other EMEs and does not experience the same challenges other EMEs experience, as identified by Durbin and Ng (2005).

5.5.3 Question 3.3: The decline in South African short-term interest rates leads to the apparent decline in OTC bond option activity

South African investors could experience adverse effects on their investments due to fluctuating interest rates (Chinzara 2010). Bonds carry a high level of interest rate risk and have an influence on the price of a bond option (Greenwood & Vayanos 2010).

The respondents did not agree that the interest rates caused the apparent decline in the OTC bond option market between 2001 and 2011. The mean of the responses was 16.55% with a median of 10%. Figure 5.7 indicates that at least 75% of all respondents did not agree that interest rates led to the decline in the market. The responses were skewed to the right as the distribution had skewness of 1.211.

Literature did not agree with the opinion of the respondents because the literature (Chinzara 2010; Greenwood & Vayanos 2010) warned that the interest rate has a negative effect on the price of bonds. However, after the 2007 subprime crisis most countries lowered their interest rates in order to stimulate economic activity (Arestis & Karakitsos 2009). Therefore, the South African interest rates may have been low in 2009 but compared to the USA and UK, the South African interest rate was still relatively high.

5.5.4 Question 3.4: The volatility skew incorporated into the modified Black formula is an effective method of pricing OTC bond options

Milne (2009) found that most financial institutions use a proprietary pricing model when pricing options. Merton (1973) as well as Ho and Lee (1986) was the first researchers to recommend bond option pricing models. These models incorporated similar variables as default-free bonds and were priced according to a volatility skew. A volatility skew is still used in the current market to price bond instruments. The

respondents were asked whether the volatility skew published was effective when they used their proprietary models to calculate a price for an OTC bond option.

The median for this question was 75% and the mean, 61.11%, which indicated that the respondents were of the opinion that the volatility skew published was accurate when used to calculate bond option prices. The standard deviation was 29.66% and the responses were negatively skewed, indicating that most responses were larger than the mean.

There was a range of opinions as some respondents were of the opinion that the volatility skew incorporated into bond option pricing was accurate while other respondents did not agree. Since these pricing models are of a proprietary nature some respondents did not respond on the question of the effectiveness of the pricing model.

5.5.5 Question 3.5: Wide bid–offer spreads in option pricing led to the deterioration of the OTC bond option market

Hearn and Piesse (2012) determine that the bid–offer spread acts as a measurement of liquidity. This question wanted to determine whether the OTC bond option market is liquid. Deuskar *et al.* (2011) found that liquidity is essential to determine the price of a bond option accurately. Figure 5.10 depicts the opinions of the respondents.

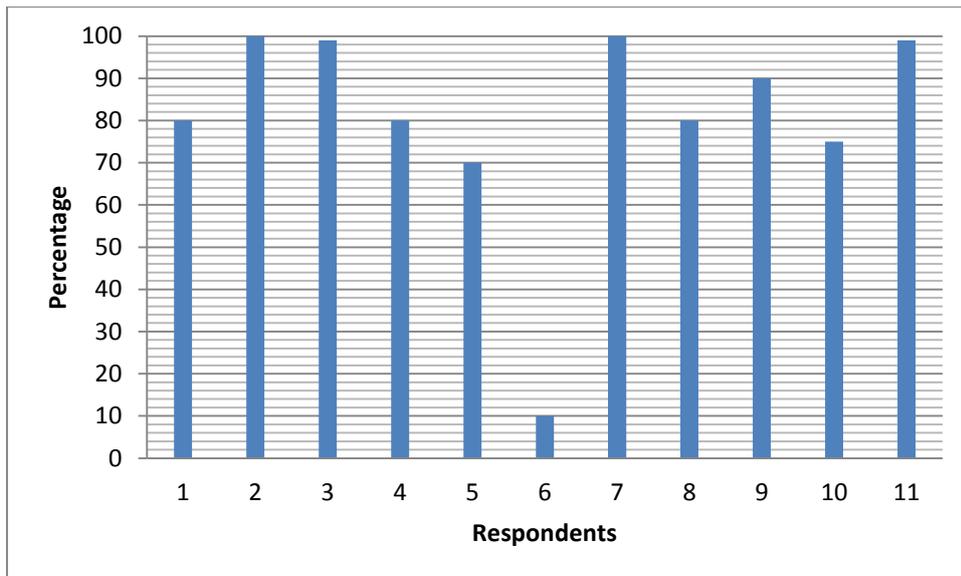


Figure 5.10: Wide bid–offer spreads caused the deterioration in the OTC bond option market

Source: Own composition

Figure 5.10 emphasises the results by showing each of the individual opinions of the respondents. The skewness was -2.274, which indicates that most responses were recorded for higher values. The kurtosis was 6.191, which emphasised that the extreme values were close to the mean. The mean was 80.27% with a median of 80% and a standard deviation of 25.78%.

The results showed that respondents were of the opinion that the bid–offer spreads used to quote prices for OTC bond options were one of the main drivers of the market deterioration, which occurred between 2001 and 2011. Respondents experienced that the market makers did not quote reasonable prices on OTC bond options. These wide spreads made it cost-inefficient to hedge the positions that an investor had in the market.

5.5.6 Question 3.6: The OTC bond option market is efficiently regulated and overseen

Chordia *et al.* (2001) report that liquidity has a positive influence on the financial market regulation. Ball *et al.* (2011) conclude that the yield of a bond is influenced by the regulations enforced in the bond market. The derivatives market has to be

effectively regulated and should address the prudential regulation, accounting rules and transparency (Arestis & Karakitsos 2009).

The respondents did not agree that the South African OTC bond option market was efficiently regulated and overseen. The mean for this question was 36.5%, with a median of 27.5%. The responses were positively skewed with skewness of 0.658. The kurtosis was -0.892, an indication that the responses were distributed far from the mean. The minimum and maximum values were 0% and 100% respectively.

Perhaps regulation was insufficient for the OTC bond option market or the regulation might not have been enforced efficiently. Respondents might have been of the opinion that there was insufficient investor protection in this market. However, one of the main motivations to trade OTC products is to transact outside a regulated exchange (Dodd 2012; Stulz 2005).

5.5.7 Question 3.7: Standardised ISDA agreements are sufficient to regulate the OTC bond option market

De Larosière (2009) encourages regulators to simplify and standardise the OTC derivatives market as OTC derivatives led to increased risk instead of mitigating risk. The responses from question 3.6 suggest that regulation and oversight in the OTC bond option market was inefficient.

The respondents were of the opinion that the standardised ISDA contracts were sufficient to regulate the OTC bond option market. The mean was 76.4% and the responses were skewed to the left, which indicated most responses were above the mean. All responses from the 50th percentile onwards were above 75%, which indicated that more than half of the respondents agreed that standardised ISDA agreements sufficiently regulated the OTC bond option market.

The response on question 3.7 indicates that respondents were of the opinion that ISDA agreements were sufficient in regulating the OTC bond option market. However, in question 3.6 respondents indicated that the regulation and oversight of the market were inefficient. An assumption might be that the OTC market was less

regulated than the ET market, because investors who transact on the OTC market were more informed than the investor who transact on the ET market.

5.5.8 Question 3.8: The South African exchange-traded bond option market replaced the OTC bond option market

The Turner review (Turner 2009), the De Larosière report (De Larosière 2009) and the Dodd–Frank Act (2010) motivated a simplified derivatives market that was regulated and standardised. In South Africa, bond options traded OTC prior to BESA introducing Intersec, the electronic exchange for trading bond options (Adelegan 2009). Investors can now choose whether they wish to transact within the OTC market or within the standardised ET market. Since investors have the option of both markets, respondents were asked whether they were of the opinion that the ET market crowded out the OTC bond option market.

Respondents disagreed with the question, with some respondents rejecting the question. The mean was 22.22% and the median, 20% with a standard deviation of 16.6%. The minimum and maximum responses were 0% and 50% respectively, which emphasised that respondents were not at all convinced the ET market crowded out the OTC market.

The results suggest that respondents were of the opinion that regulatory changes to a standardised exchange would affect the OTC market. The results indicate that the recommendations of the acts and reports did not affect the market but only improved the stability of the overall financial system as systematic risk was reduced.

5.5.9 Question 3.9: Intermediaries/Brokers actively participate in the OTC bond option market

IOSCO (2010) researched a number of EMEs and found that functions of intermediaries had to be assessed. Milne (2009) researched intermediaries, and found that intermediaries that disseminated incorrect information into the bond markets caused inaccurate pricing and decreased market competitiveness.

The respondents were of the opinion that the intermediaries and brokers were inactive in the OTC bond option market. The mean for the question was 30.5% and the median, 17.5%. The results were positively skewed at 1.531, which indicated an outlier may exist at higher percentages. The kurtosis was 2.361, which indicated that the most values were spread away from the mean. When calculating the mean without the single outlier, the mean decreased to 20.71%, which was 9.79% less than when the outlier was included.

The outlier might have been a respondent that was biased as the respondent could have been an intermediary in the OTC bond option market. The low rate of participation by intermediaries called attention to the wide bid–offer spreads that might have been the result of the low levels of intermediary activity or incorrect pricing. This led to lower liquidity in the OTC bond option market.

5.5.10 Question 3.10: All institutional investors have access to OTC bond options

Adelegan (2009) argues that the expansion of institutional investors improved liquidity. The question was however whether all institutional investors has access to the OTC bond option market.

Most respondents were of the opinion that institutional investors had access to the OTC bond option market. The mean was 63.44% and the median, 75%. The results were slightly negatively skewed at -0.789 with kurtosis of 0.555, an indication that values were distributed far from the mean. This was confirmed as the standard deviation was 31.67%.

The majority of respondents were of the opinion that the OTC bond option market was available for those who wished to transact in this market. This question confirmed that, even though OTC bond options were available to be traded, investors did not necessarily wish to incorporate it into their portfolios. This was a contradiction, because respondents earlier were of the opinion that OTC bond options were still significant in the financial market.

This section reported on the opinions of the respondents on the apparent deterioration in the OTC bond option market between 2001 and 2011. The respondents agreed that the OTC bond option market deteriorated. The possible reasons that were perceived to have contributed and that actually contributed from the opinion of the respondents are summarised in Table 5.1.

Table 5.1: Factors that led to deterioration in the OTC bond option market

Actual factors	Perceived factors
Inactive intermediaries	ISDA agreements
Unreasonable bid–offer spreads	Number of issued bonds
Regulation and market oversight	Low short-term interest rates
Number of international investors in the market	Volatility skew used to price options
	Overcrowding from the ET market

Source: Own composition

Table 5.1 presented a summary of the factors that were perceived to have led to the deterioration in the OTC bond option market as well as the factors that actually led to the deterioration in the OTC bond option market. This was according to the opinions of the respondents active in the OTC bond option market. The next subsection of questions seeks to identify which interventions could restore the South African OTC bond option market as primary hedging instrument.

5.6 ENHANCING OTC BOND OPTIONS IN SOUTH AFRICA AS A PRIMARY HEDGING INSTRUMENT

The first part of the results were used to establish:

- whether OTC bond options should form part of a country’s financial markets;
- whether OTC bond options play a significant role in South Africa and
- what caused the apparent deterioration of the OTC bond options in the South African financial market.

This section aims to find methods that could restore OTC bond options as an effective hedging instrument. The responses for question 4.1 to question 4.7 are

illustrated in a box and whiskers plot in Figure 5.11. This box and whiskers plot is a graphic representation of the median, minimum, maximum, lower quartile and upper quartile.

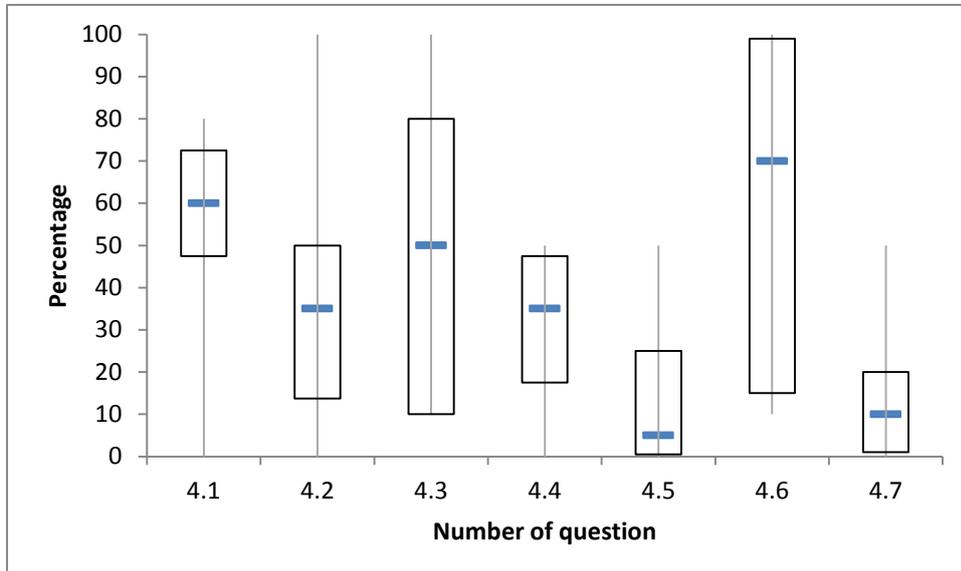


Figure 5.11: Box and whiskers plot of question 4.1 to question 4.7

Source: Own composition

Figure 5.11 introduced the descriptive statistics of question 4.1 to question 4.7. These responses were described in order to provide the reader with an accurate account of the opinions of the respondents. The questions supported the research objective of restoring OTC bond options as hedging instrument. The questions that addressed this objective were questions regarding:

- the integration of the product into the financial markets;
- the influence of the maturities on the product;
- interbank trading activity;
- the exotic option market activity;
- the market liquidity; and
- market transparency.

5.6.1 Question 4.1: Investors who make use of OTC bond options have a full understanding of trading these products

Derivatives are often a source of financial losses and have a significant effect on financial markets as derivatives could cause institutional failures under certain circumstances (Ameer *et al.* 2011; Cummins *et al.* 2001). According to Bezzina and Grima (2012), investors often misunderstand derivatives or investors do not have the necessary expertise to trade OTC bond options. This lack of knowledge subsequently discourages investors to use derivatives or OTC bond options in their portfolios (Ameer *et al.* 2011; Bezzina & Grima 2012; Cummins *et al.* 2001).

The respondents were of the opinion that investors had some knowledge but not a full understanding of the OTC bond options as the mean was 55% and the median, 60%. The maximum response was 80%, which indicated that none of the respondents were of the opinion that an individual had full understanding of the OTC bond option market. The responses were negatively skewed with a factor of -1.499, indicating most values were larger than the mean.

The opinion of the respondents confirmed the findings of the literature reviewed (Ameer *et al.* 2011; Cummins *et al.* 2001; Bezzina & Grima 2012) that investors do not have a full understanding of OTC bond options. Investor education could stimulate the OTC bond option market.

5.6.2 Question 4.2: The OTC bond option market is effectively integrated into other South African financial markets

Integration between the asset classes in a financial market could add or reduce risks. IOSCO (2010) found that financial systems in EMEs are less complex than financial systems of developed market economies and do not experience a significant loss in times of financial crisis. The integration of the OTC bond option market could however be used to reduce the risks in a portfolio.

According to the respondents, the OTC bond option market is not effectively integrated into the other financial markets. The mean was 36.5% and the median,

27.5%. The kurtosis was 1.913, which was flatter than a normal curve in a platykurtic¹⁹ form. This value indicated that the probability of extreme values was less and the responses were generally spread far from the mean. The standard deviation was 28.21%, which confirmed that responses were away from the mean.

According to IOSCO (2010) markets that are less integrated had a lower risk of high losses or institutional failures. The opinion of the respondents was that the market between the OTC bond option market and the remainder of the financial market was not integrated, which reduced the probability of losses. South Africa is however a less developed economy than countries such as the UK or USA, and might offer benefits of reduced risk if the market is effectively integrated between asset classes.

5.6.3 Question 4.3: Shorter maturity OTC bond options could stimulate the OTC bond option market

The OTC bond option market is unregulated, with custom maturity, size, settlement and price (Dodd & Griffith-Jones 2007). Investors who transact in this market make use of this market because products can be tailored to a specific need (Dodd 2012; Stulz 2005).

The responses ranged from 10% to 100%, the mean of the responses was 46.36% and the median was 50%. These values indicated that shorter maturities did not necessarily stimulate the market. The kurtosis of the responses was -1.568, which indicated that most responses were situated far from the mean. The standard deviation was 33.47%, which emphasised the distance from the mean.

The conflicting opinions of the respondents indicated that the maturity of OTC bond options does not necessarily improve market activity as some respondents were of the opinion that shorter maturities provide an effective method of increasing market activity while other respondents did not share this opinion. The benefit that shorter maturity OTC bond options offered was beneficial for interbank transactions.

¹⁹ A platykurtic distribution is a distribution that is spread far from the mode (Fielding & Gilbert 2006).

5.6.4 Question 4.4: There is regular interbank trading of OTC bond options in the market

Banks need to transact in the OTC market, as their financial positions need to adhere to the regulatory requirements that prescribe capital adequacy levels (see 2.4.2 and 2.5.3). As OTC bond options are written specifically for maturity, size and settlement, these options are preferred instead of their regulated and standardised counterparts (Stulz 2005; Choudhry 2001).

The mean of the opinions was 31.25% and the median was 35%. The responses were negatively skewed at -0.733. The standard deviation was 17.47% and the kurtosis, -0.179, while the minimum and maximum responses for this question were 0% and 50% respectively.

The opinion was that there was insufficient interbank trading of OTC bond options. It was possible that the OTC bond options were replaced by alternative products such as swaptions. A swaption is an option on a swap contract (Bodie *et al.* 2009). It is also possible that banks use a broker or intermediary to transact on their behalf; therefore, no interbank trading is necessary.

5.6.5 Question 4.5: JSE exotic options crowded out the need for OTC bond options

Financial innovation was researched by Arestis and Karakitsos (2009) as well as by Dodd (2009). These authors found that, when experimenting with various option combinations, new innovative financial structures are created. A derivative offered by the JSE provides the investor with an option that can be tailored to a specific need, and is known as an exotic option (JSE n.d.).

The respondents were not of the opinion that the exotic options crowded out OTC bond options as the minimum and maximum values were 0% and 50% respectively. The mean was 14% and the median, 5%. The results were positively skewed at 1.368, indicating that most values were lower than the mean.

The respondents did not agree that the exotic options crowded out the OTC bond options. Exotic options are not necessarily a product that could reduce activity in the OTC bond option market. This indicates that exotic options cannot replace the OTC bond option market. Therefore, a liquid OTC bond option market has a place in a financial market.

5.6.6 Question 4.6: The secondary bond market is liquid and active

The Australian bond option market and underlying bond market are highly efficient, according to PIMCO (2011). Based on PIMCO (2011), an assumption was made that the underlying market should be active in order for a derivative market to be successful. Figure 5.12 shows the individual responses of the respondents on the question whether a liquid and active underlying market is necessary for an effective OTC bond option market.

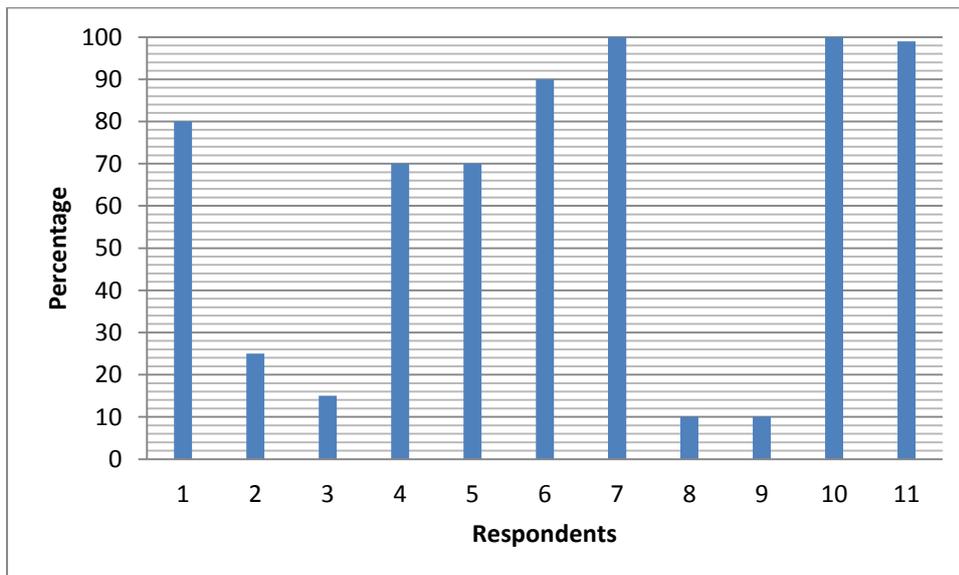


Figure 5.12: Perceived need for an active and liquid underlying market

Source: Own composition

Figure 5.12 illustrates the responses of the respondents graphically. The respondents agreed with this statement. The mean was 60.82% and the median, 70%. The standard deviation of the respondents was 38.03% with kurtosis of -1.791, a platykurtic curve, which indicated that values were spread away from the mean.

As a derivative is written on an underlying asset, in this case a bond, the opinions of the respondents indicated that the underlying assets must be active and liquid. OTC bond options could be used to hedge, and therefore accurate pricing is necessary in the underlying and derivative market. Liquidity improves the accuracy of pricing as an investor can easily buy and sell in a liquid market (Ping & Qin 2011).

5.6.7 Question 4.7: The OTC bond option market is transparent

Brazil has the most transparent OTC markets among the EME countries (Dodd & Griffith-Jones 2007). However, although Brazil has a transparent OTC market, the market is illiquid (Leal & Carvalhal-da-Silva 2006).

The opinion of the respondents was that the South African OTC bond option market is non-transparent. The mean was 14.18% and the median, 15% with a standard deviation of 15.05%. The results ranged from a minimum of 0% to a maximum of 50%. The results were positively skewed at 1.478, an indication that the majority of the responses were smaller than the mean. The distribution of the results was platykurtic at 2.376. This distribution is a flatter than normal distribution with values spread relatively far from the mean.

The Brazilian financial market has a high level of transparency and an illiquid bond market. South Africa, however, has a liquid bond market that is non-transparent, with an inactive OTC bond option market. Dodd (2009) and Sherman (2009) recommend that inefficiencies have to be resolved with regulation. Regulations often reduce the risks that derivatives add to financial markets.

This section aimed to determine which interventions could possibly restore the OTC bond option market as a hedging instrument. The respondents presented their opinions on which interventions would stimulate the market and which interventions would not stimulate the market. These interventions and their ability to restore OTC bond options as a hedging instrument are summarised in Table 5.2.

Table 5.2: Interventions to restore the OTC bond option market

Effective interventions	Ineffective interventions/Inconclusive
Improved liquidity	Shorter maturity OTC bond options
Investor education	Crowding-out effect of exotic options
Improved transparency	
Increased interbank trading	
Improved integration in the financial markets	

Source: Own composition

Table 5.2 presents a summary of the interventions that could possibly restore OTC bond options as a hedging instrument as well as the interventions that would not achieve this objective. This was derived from the opinions of the respondents regarding the OTC bond option market opinions. The next subsection reports on whether the respondents were of the opinion that OTC bond options should be used as a hedging instrument in the South African financial market.

5.7 OTC BOND OPTIONS AS A HEDGING INSTRUMENT

The respondents indicated that there were possible interventions available that could restore the OTC bond option market. These interventions are investor education, market integration, improved liquidity, increased interbank trading and improved transparency. These interventions could restore this market but whether the investors would incorporate OTC bond options in their portfolio was not clear from their answers.

5.7.1 Question 5.1: In your view, should OTC bond options be considered again in order to hedge?

Adelegan (2009) found that speculators and hedgers came together and transacted in the OTC market, which improved liquidity in the financial market. Deuskar *et al.* (2011) reported that, in their study, bond options were the first choice for investors who aimed to hedge their portfolio. Dodd (2009), however, concludes that hedging

in the bond option market was often costly due to transaction costs, replication costs, contract sizes and volatility. Additionally, a perfect hedge in the OTC bond option market is not always possible. Investors who make use of bond options often only hedge as it is prescribed by the fund mandate. The pie chart in Figure 5.13 reflects the opinions of the respondents.

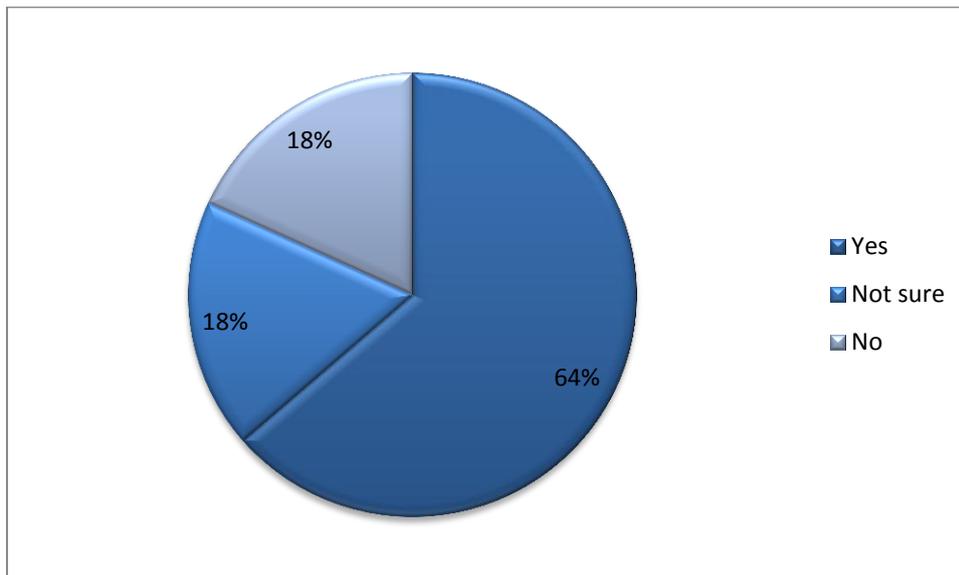


Figure 5.13: OTC bond options used to hedge

Source: Own composition

Figure 5.13 illustrates the opinions of the respondents on the question whether OTC bond options should be used as a hedging instrument. Of the respondents, 64% agreed that the market should be reconsidered as a hedging instrument, 18% did not agree that it should be used to hedge, while the remaining 18% was not sure whether it should be reconsidered as a hedging instrument. Respondents motivated their opinions and similar motivations were grouped together.

Respondents who were of the opinion that OTC bond options could still be used as a hedging instrument were indifferent to whether the bond option market should be ET or OTC. The objective of the investor determines how the hedging strategy is applied. An issuer incorporates options into a portfolio in order to reduce the rate of funding, while speculators use options to derive superior profits when the market is liquid. Liquidity is the main deterrent from the OTC bond option market. Respondents were of the opinion that, if the market is liquid, investors would make

adequate use of this market. However, without liquidity the premiums are high and hedging becomes costly.

Respondents who were of the opinion that the OTC bond option market cannot be used to hedge were of the opinion that the market had changed considerably since its inception in 1983. The market changed from an ad hoc²⁰ basis schedule structure to an auction²¹ market driven by primary dealers. The lack of participation of major institutions also prohibits a revival in this market. The major institutions are described as natural writers of options that carry the negative gamma²² risk of these options. Respondents were also of the opinion that it was not possible to remove credit risk efficiently with bond options.

The respondents who were not sure whether the market should be used to hedge were of the opinion that superior profits were not possible when hedging. They responded that hedging in the OTC bond option market was expensive and inefficient.

Sixty-four per cent of the respondents agreed with Deuskar *et al.* (2011) that the OTC bond option market should be used as a hedging instrument. Some respondents were concerned that hedging in this market was inefficient as the cost of a hedge is non-competitive. However, the majority of the respondents indicated that they would use the OTC bond option market to hedge against risks.

5.8 REGULATION AND STANDARDISATION OF OTC BOND OPTIONS

The respondents were of the opinion that the OTC bond option market plays a significant role in the financial markets but that it deteriorated in recent years (between 2001 and 2011). Sixty-four per cent the respondents agreed that the instrument should still be considered as a hedging alternative if OTC bond options were restored as a hedging instrument. The objective of this section was to

²⁰ An ad hoc basis schedule structure refers to irregular trading of financial instruments (Blommestein, Elmadag & Ejsing 2012).

²¹ An auction market is a market where buyers bid the highest price for a financial instrument and sellers offer the lowest price for the financial instrument. When the prices of the highest bid and lowest offer match, a transaction takes place (Teall 2012).

²² Gamma is the rate of change in delta in relation to the underlying asset (Hull 2008).

establish whether the OTC market was the only market in which investors wanted to transact or whether they would consider an ET market.

5.8.1 Question 6.1: Should OTC bond options be standardised to such an extent that only a regulated exchange exists to trade bond options?

Internationally, regulators motivate standardised regulated markets, reducing OTC transactions for improved liquidity and reduced risk (Bernanke 2011). The role of CRAs and the way they evaluate riskier assets is also part of the international drive for healthier financial markets (Arestis & Karakitsos 2009). Ball *et al.* (2011) report that the regulations enforced on bond markets affect the yield of the bonds. Bond yields improve liquidity as regulatory standards change (Chordia *et al.* 2001). This gives rise to the question whether regulation should therefore be enforced to such an extent that the OTC bond option market should be replaced by a regulated and standardised exchange. Figure 5.14 illustrates the responses in the form of a pie chart.

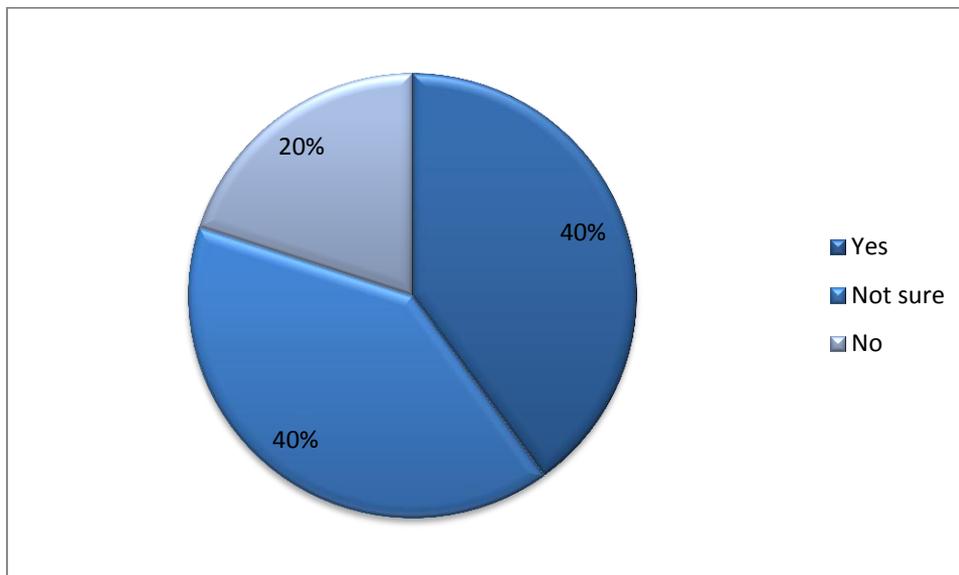


Figure 5.14: ET bond options compared to OTC bond option market

Source: Own composition

Figure 5.14 illustrates the opinions of the respondents in the form of a pie chart. The responses indicated that 40% of the respondents agreed that the market should be purely ET, 20% did not agree, stating that the market should allow OTC transactions,

while the remaining 40% was not sure whether it should be an ET or OTC market. The opinions of respondents were grouped according to their similarities.

The respondents who were of the opinion that the market should be a regulated ET market stated that the market would contain products that are more tradable. An increased number of tradable products would allow wider access to the market. Respondents were of the opinion that OTC bond options often exclude some fund managers as fund managers have to adhere to fund mandates (cf. Financial Services Board 2007). However, with additional tradable products, fund managers of small funds could act within their mandate and acquire these financial instruments. ET products are often allowed according to a fund mandate while OTC products are often excluded from the fund mandate. The respondents stated that the ET equivalents could be replications of the OTC bond options.

The motivation against an ET market was that regulation and regulatory requirements to enforce transparent markets reduce liquidity in the market. According to this group of respondents, an ET market should co-exist with an OTC market. Market efficiency is promoted when these markets are integrated in the financial market.

Respondents who were not sure whether an ET market would be the solution, stated that the market needed the variability of an OTC market and that they were not convinced that the OTC market could ever be standardised. The group of respondents elaborated and said that, if the market was standardised it would require cooperation between various investors who had different roles in this market. Price makers and price takers have to quote consistent reasonable prices on the bid–offer spread to allow the possibility of changing the OTC market into an ET market.

Arestis and Karakitsos (2009) conclude that standardised ET markets improve risk management and liquidity. However, if regulation is too strict it may reduce the liquidity in the market due to overregulation (Schwarcz 2011). According to Chordia *et al.* (2001), regulations have a positive effect on the liquidity in the market. Respondents who preferred an ET market stated that investors then had the

opportunity to hedge against interest rate movements while adhering to the fund mandate.

5.9 OTHER

Respondents had the opportunity to answer an open-ended question on the OTC bond option market. The primary objective of this question was to determine whether respondents had any suggestions on restoring OTC bond options as hedging instrument.

5.9.1 Question 7.1: Shortly describe any other possible method of enhancing the OTC bond option market

Respondents were of the opinion that investor education, regulatory changes, market participation, option applications, underlying assets, alternative products and the trading platform were possible aspects that could contribute to restoration of the OTC bond option market. Similar suggestions were grouped together and are presented as a single suggestion here in the research report.

Respondents were of the opinion that investors did not understand OTC bond options nor were they aware of the benefits this product offered. Since investors do not incorporate new trading strategies and followed the same zero-cost collar option strategy hedges became ineffective. A zero-cost collar option strategy is taking a long position in put options simultaneously funded by proceeds of a short position in call options (Bettis, Bizjak & Lemmon 2001). If traders have wider risk limits to test new strategies, they would not have to revert to alternative products such as interest rate forward rate agreements (FRAs) and swaptions. Investor education could inform investors of the different strategies to promote the effective use of OTC bond options and reduce the use of other products that might not offer the benefits that bond options offer (see 2.6 and 3.4).

The respondents were of opinion that the international drive for super transparency harms the OTC bond option market. Regulatory changes have an effect on

investors who participate in the market. Overregulation can become a burden and reduce market activity.

At the time of the research, respondents were of the opinion that primary dealers and foreign banks dominated the market. Due to the nature of the participants in the market, curve traders and domestic banks withdrew from the market since 1998 when the SARB offered commercial banks the opportunity to become primary dealers. Respondents suggested that parastatals should reopen their option books to improve efficiency and prohibit one-directional bid–offer spread quotes. The findings of this research is summarised in the next section.

5.10 SYNOPSIS OF FINDINGS

To conclude this findings chapter a synopsis of the results obtained from the questionnaire is presented. Table 5.3 presents the synopsis of the findings and is presented to correspond with the constructs of the questionnaire.

Table 5.3: Synopsis of findings

Construct	Findings
<p>The need for an over-the-counter (OTC) bond option market</p>	<p>OTC bond options might be essential for risk management;</p> <p>OTC bond options could be used to create funding structures;</p> <p>OTC bond options are excellent speculative instruments; and</p> <p>OTC bond options should not be used to derive arbitrage profits.</p>
<p>The significance of over-the-counter (OTC) bond options in South Africa</p>	<p>OTC bond options could attract more participants to the bond option market;</p> <p>OTC bond options could be used to reduce volatility of returns in a portfolio;</p> <p>OTC bond options could lead to increased liquidity in the bond market; and</p>

	<p>OTC bond options will not attract international investors.</p>
<p>Deterioration of the South African over-the-counter (OTC) bond option market</p>	<ul style="list-style-type: none"> • The OTC bond option market deteriorated significantly. <p>Factors that contributed to the deterioration of the South African OTC bond option market between 2001 and 2011:</p> <ul style="list-style-type: none"> • inactive intermediaries; • unreasonable bid–offer spreads; • regulation and market oversight; and • lack of international investor participation. <p>Factors that did not contribute to the deterioration of the South African OTC bond option market:</p> <ul style="list-style-type: none"> • standardised ISDA agreements; • number of issued bonds outstanding; • low short-term interest rates; • the OTC bond option pricing methods; and • overcrowding from the ET bond option market.
<p>Enhancing OTC bond options in South Africa as a primary hedging instrument</p>	<p>Effective interventions that could enhance the South African OTC bond option market:</p> <ul style="list-style-type: none"> • improved liquidity; • investor education in terms of OTC bond options; • improved transparency in the OTC market; • increased interbank trading; and • improved integration of the financial instruments in the financial market. <p>Ineffective or inconclusive results on possible interventions that could enhance the South African OTC bond option market:</p> <ul style="list-style-type: none"> • shorter maturity OTC bond options; and • crowding-out effect of exotic options.

OTC bond options as a hedging instrument	64% of respondents agreed that OTC bond options should be used again as a hedging instrument.
Regulating and standardisation of OTC bond options	Of the respondents, 40% were of the opinion that OTC bond options should only trade on an exchange, while another 40% of respondents were of the opinion that OTC bond options should not only trade on a regulated and standardised exchange while the remainder of the respondents were not sure of the benefits that either would hold, and recommended a balance between the ET and OTC market.
Other possible interventions to enhance the South African OTC bond option market	Investors should use unique option trading strategies; Allow traders wider risk limits; and Reasonable transparency requirements for the OTC bond option market.
The role of the respondent in the South African OTC bond option market	Objectives of respondents in the market: <ul style="list-style-type: none"> • 25% arbitrage; • 37% speculation; and • 38% hedging. Types of institutions respondents were employed at in the market: <ul style="list-style-type: none"> • 9% issuers; • 9% regulators/other; • 18% market makers; • 55% participants; and • 9% others.

Source: Own composition

Table 5.3 presented a synopsis of the findings obtained from the data analysed. The contribution from the empirical research was the actual factors that had an effect on the deterioration of the OTC bond option market between 2001 and 2011 and the possible interventions that would be most effective to restore the OTC bond option market. The actual factors that led to the deterioration of the South African OTC bond option market were identified as inactive intermediaries, unreasonable bid–

offer spreads, ineffective regulation and market oversight as well as the limited number of international investors in the market. The possible effective interventions that could enhance the South African OTC bond option market were to improve liquidity, educate investors on applications of OTC bond options, improve transparency in the market, increase interbank trading and integration of the financial markets.

The findings from the questionnaire were discussed in this section. Each construct of the questionnaire was introduced before the questions pertaining to the construct were presented according to the contributing literature, followed by the empirical results and synthesis of the results and literature. The section was concluded with a table which presented the findings before the chapter was summarised.

5.11 SUMMARY

This chapter reported the findings on the data collected from the respondents. Data was collected by means of a questionnaire. The data was analysed and presented in the form of descriptive statistics. The objective of the data collection was to obtain results and to provide possible solutions for the research questions.

The descriptive statistical techniques used to present the analysed data included the standard deviation, minimum, maximum, average, mode, median, skewness and kurtosis. Histograms, pie charts and box and whiskers plots graphically illustrated the statistical results. The results were compared to findings from literature in order to establish whether the results delivered similar findings than that described in the literature that was reviewed.

The respondents were representative of the different institutions that were classified as intermediaries, regulators, market makers, issuers and participants in the OTC bond option market. Each respondent also had a different objective in the market, namely speculation, hedging or arbitrage. The results obtained from the questionnaire presented some expected, yet interesting findings (see e.g. 5.5.2 and 5.6.5).

The results from the closed-ended questions indicated that the respondents were of the opinion that OTC bond options were part of a flourishing economy. However, the role of this instrument in the economy should be established. Respondents were of the opinion that OTC bond options in South Africa play a significant role as hedging instrument. This was a key finding as the result that the OTC bond option market is a good hedging instrument contradicted the levels of current market activity (see Figure 1.2). The results also identified factors that led to the deterioration in the market in the period between 2001 and 2011.

The results showed that:

- the bid–offer spreads quoted in OTC markets were too wide;
- regulatory influences affected the market negatively;
- intermediaries did not actively participate in the market; and
- there were too few market participants.

The possible methods of restoring the market could be achieved by:

- investor education;
- effective market integration;
- increased interbank trading;
- higher levels of liquidity; and
- improved transparency.

The respondents had the opportunity to add further comments on the market with open-ended questions, which addressed OTC bond options as hedging instrument as well as regulated standardised ET markets.

The findings indicated that the majority of respondents were of the opinion that a bond option market should be used as a hedging instrument. However, respondents were concerned that there were no natural option writers. Without natural option writers, entities with open option books have increased levels of risk. The results showed that hedging is ineffective as hedging costs are too high due to wide bid–offer spreads and illiquidity. The respondents who agreed that the market should be ET only, motivated their response by stating that an ET market offered portfolio managers who may only transact in an ET market an opportunity to hedge.

The findings further indicated that the perception exists among South African investors that there is a need for OTC bond options in the financial market; however, there are other products available in the market that deliver the same result as OTC bond options. These products are interest rate FRAs and swaptions.

The final chapter of the research is the conclusion. The conclusion provides a comprehensive summary of this research, and is presented in Chapter 6. The conclusion also contains the contribution of this research and recommendations for future research.

CHAPTER 6

CONCLUSION

6.1 INTRODUCTION

Derivate instruments, such as bond options, enable investors to hedge, speculate or take advantage of arbitrage opportunities as part of modifying the risk-return characteristics of the portfolios they manage. ET derivatives enable price discovery, provide liquidity and enhance market efficiency. However, OTC trading obscures price discovery from other participants in the market and require counterparties who are prepared to accept the risk of OTC transactions (see 2.5.2.1).

Equally, other derivative instruments have been introduced that achieved similar results using standardised contracts and the benefits of using an exchange. The OTC market for bond options grew at a significant rate up to the early years of 2000 but declined between 2001 and 2011 to such an extent that it has been regarded as insignificant since 2011 (Adelegan 2009; JSE 2011).

The purpose of this research was to determine whether the OTC bond option market could still be considered a significant market in the South African financial environment and whether it could be restored as hedging instrument.

This chapter serves to conclude the research, firstly by revisiting the research questions. The key findings of the literature review and empirical results are also presented. The chapter will then be concluded and recommendations for future research will be provided.

6.2 RESEARCH QUESTIONS

The primary research question was to establish whether OTC bond options could still be considered a hedging instrument in the South African financial market. In support of the primary research question, three secondary questions intended to address the following:

- the need for an effective OTC bond option market in a country;
- the apparent causes for the deteriorating South African OTC bond option market between 2001 and 2011; and
- an evaluation of the possibility to restore the South African OTC bond option market as primary hedging instrument.

The key findings of the literature review and the key findings of the empirical results were presented according to the research questions to promote the relevance of the literature and empirical results.

6.3 METHODOLOGY

The research that was used in this research followed a two-stage design. The two-stage design was executed from a methodological framework. The primary objective of the methodology was to support a research design that was reliable, dependable and professional. According to Cooper and Schindler (2008), reliability, dependability and professionalism are the characteristics of academic research.

Table 6.1 is a representation of the methodological approach that was followed in order to collect the data. The data collected comprised the opinions of the respondents who were active in the South African OTC bond option market.

Table 6.1: Adaption of a quantitative research design

Phase	Steps
I: Research topic and theoretical background	Primary objective: determine whether OTC bond options still have a role to play in the South African financial market as a primary hedging instrument.

II: Design and formulation	Secondary objectives: <ul style="list-style-type: none"> • establish the importance of an effective bond option market in an economy; • determine the possible causes that contributed to the inactivity and deterioration of the South African OTC bond option market; and • suggest possible solutions to possibly enhance bond options as viable hedging instrument in South Africa.
	Conducted a thorough literature review. The objective of the literature review was to find international and domestic literature that supported the primary and secondary research questions.
	Followed a quantitative approach to collect data for the research.
	Constructed a structured questionnaire that was supported by the literature.
	Obtained ethical clearance and adhered to the ethical policies as stipulated by the Unisa policy.
III: Planning	Followed a quantitative research design.
	Identified the population.
	Used an appropriate sampling method to identify the prospective respondents.
	Obtained contact information of the individuals identified in the sample.
	Conducted a pilot study.
IV: Implementation	Distributed the questionnaire in order to collect data from respondents.
V: Data analysis, interpretation and presentation	Processed and analysed the collected data.
	Interpreted the results and wrote concluding remarks on the research.

Source: Own composition – adapted from Bryman and Bell (2011)

Table 6.1 reflected the step-by-step methodology that was followed by the researcher in order to propose a research topic, supported by the theoretical background. Table 6.1 further showed how the research was designed, formulated, planned and implemented. The final phase of the research design indicated the steps that were followed in order to analyse, interpret and present the data that had been collected. The following section presents an overview of the literature review and empirical research.

6.4 CONCLUDING REMARKS ON LITERATURE REVIEW

The literature review contextualised the research and evaluated past studies to support the research questions. The contributions from past studies emphasised why OTC bond options were essential in a financial market. It further identified possible factors that could have led to the possible deterioration of OTC bond option activity in the South African financial market. The findings also recommended certain activities that theoretically could stimulate the OTC bond option market. The literature review also identified the potential benefits of an active OTC bond option market (see 2.6 and 3.4).

6.4.1 The existence of an effective bond option market in the financial market of a country

Derivatives, such as bond options, have the potential to limit upside or downside risk in an economy if they are incorporated effectively into portfolios. However, in recent years, derivatives such as bond options, played a role in institutional failures and financial turmoil (Bezzina & Grima 2012). The question was raised then, why would an effective bond option market be necessary in the financial market of a country?

Financial regulation is one of the main contributors of an effective financial market. The complexities of OTC bond options are understood by only a few (Bezzina & Grima 2012). Financial regulation enforced to manage the risks associated with this market has to be effective in order to promote efficiency in the OTC bond option market (Adelegan 2009). The efficiency in the OTC bond option market potentially

has an effect on the remainder of the financial market. According to Burger *et al.* (2012), effective regulation attracts additional FDI.

Investment in a financial market allows investors to achieve their objectives in the financial market as a hedger, speculator or arbitrageur (see 2.5.4). An effective OTC bond option market therefore has investors who seek to hedge the potential risk implied by an open position in order to limit losses due to market fluctuations (Bezzina & Grima 2012). According to Lawton (2012), speculation in financial markets improves liquidity; therefore, an effective OTC bond option market potentially adds liquidity to financial markets. Arbitrage opportunities may arise if mispricing occurs. Deuskar *et al.* (2011) suggested in this regard that illiquidity has an adverse effect on pricing of derivatives.

Milne (2009) found that financial institutions prefer to not make use of general pricing models as these institutions often find that their own proprietary models are more accurate than general pricing models and financial institutions adapt, change or create their own pricing models to be more appropriate for their specific needs. Therefore financial innovation is motivated in an effective OTC bond option market (Arestis & Karakitsos 2009).

The results of a survey conducted by IOSCO (2010) indicated that the level of financial market integration varied among countries, especially when considering developed financial markets against less developed financial markets. A more integrated financial market is associated with a developed financial market, supporting the motivation for an incorporated financial market in a country (IOSCO 2010).

OTC bond options have the potential to reduce the risks experienced in a financial market where bonds form part of an investment portfolio. An effective OTC bond option market can be portrayed as a financial market with effective regulation that promotes efficiency in the financial market. An efficient OTC bond option market attracts FDI into a country, allowing investors to participate in hedging, speculative and arbitrage activities. The financial market should further be integrated to such an extent that the financial innovations in the OTC bond option market positively affect

the remainder of the financial market. These essentials for an effective OTC bond option market could however also be part of the apparent causes for the deterioration in the South African OTC bond option market.

6.4.2 The causes of the apparent deterioration of the South African OTC bond option market

The objective of the South African derivatives market is to improve liquidity and risk management in order to be more competitive internationally in the derivatives market (Adelegan 2009). The OTC bond option market in South Africa however deteriorated to such an extent in the period between 2001 and 2011 that it was considered insignificant by 2011 (JSE 2011). The same factors that have a positive effect on the OTC bond option market could therefore also lead to the demise of the OTC bond option market. Regulation, pricing, exchanges, financial innovation and the underlying asset could potentially affect the OTC bond option market negatively.

Developed financial markets, such as the Australian Securities Exchange (ASX), have a flourishing OTC bond option market as well as an effective bond market (PIMCO 2011). The example of the Australian market indicates that a relationship exists between an effective bond market and bond option market. South Africa has the largest bond market among the sub Saharan African countries (Mu *et al.* 2013). The most liquid bonds in this market are the South African government bonds (Aling & Hassan 2012). There are however fewer corporate bonds available (National Treasury n.d.). The limited number of corporate bonds in South Africa negatively affects the liquidity in the market (Ball *et al.* 2011; Reid 2009). The illiquidity in the South African bond market therefore has a potentially negative effect on the South African bond option market.

Illiquidity in the South African bond market also influences the pricing of the derivatives. Hull and White (2014) suggest that liquidity is essential to value a derivative accurately. According to Ben-Ameur *et al.* (2007), some derivatives cannot be valued with analytical formulae; therefore, other methods are used when valuing such derivatives. Incorrectly priced derivatives are often the source of

financial losses and incorrect financial information disseminated into the market that could lead to reduced financial innovation (Dodd 2009; Milne 2009).

The deterioration in the South African financial market in the period between 2001 and 2011 was not necessarily the result of a lack of accurate pricing but rather a consequence of the nature of the OTC market. Deuskar *et al.* (2011) describe the nature of an OTC market to be illiquid. Further, Dodd (2012) and Stulz (2005) conclude that the investors in the OTC market are informed, indicating that investors have the knowledge to value derivatives in the OTC market accurately.

The difference between an OTC market and an ET market has decreased to such an extent, according to Ball *et al.* (2011), that the only difference that remain is the regulatory consequences. The OTC bond option market in South Africa is standardised but unregulated (National Treasury 2012). According to Adelegan (2009), South Africa does not have the capacity to regulate the financial market with prudential regulation.

The deterioration in the South African OTC bond option market might have been the result of an illiquid underlying bond market, which led to inaccurate bond option pricing (cf. Goyenko *et al.* 2011). The liquidity in the bond option market could be attributed to the nature of the OTC market as OTC markets tend to be illiquid (see 2.5.2.1). Additionally, the lack of adequate regulation and supervision also has a detrimental effect on the OTC bond option market.

6.4.3 Restoring OTC bond options as the primary hedging instrument in the South African financial market

From the inception of OTC bond options (in 1983 [Bullard 1987]) until 1998, the South African financial market primarily used OTC bond options to hedge against interest rate risks. In 1998, the SARB, as the only primary dealer, offered other institutions the opportunity to become primary dealers (Naidoo 2012). In the course of financial innovation, products such as swaptions became available to hedge against interest rate risk. It was however possible to restore the South African OTC bond option market by establishing OTC bond options as the primary hedging

instrument. To improve the marketability of OTC bond option risk management techniques should be re-evaluated, regulation should be improved, liquidity should be enhanced and derivatives should be priced accurately (Adelegan 2009).

The primary objective of an investor who hedges a position is to limit the upside and downside risk of an investment (Hull 2008). Investors who wish to hedge their positions often do not make use of the most suitable instrument (Dodd 2009). South African investors should be informed of the hedging instruments available to make appropriate hedging decisions. If an investor uses an inappropriate derivative to hedge the risks associated with his or her open position, the hedge is often inefficient (Milne 2009).

Inefficiencies in the OTC bond option market may be reduced with improved regulation. Sherman (2009) concludes that the most effective method to limit market inefficiencies is effective regulation. Adelegan (2009) advocates that South African financial regulation must be reformed to regulate and supervise the financial markets effectively. According to Botha and Makina (2011), regulatory improvements in South Africa are addressed by the Twin Peaks model. Financial engineers however consistently engineer new methods to exploit regulation to their own benefit (Arestis & Karakitsos 2009). The regulation to transact in the OTC bond option market must therefore be specific for the derivatives market in order to improve the market activity (Adelegan 2009).

An increase in market activity could restore OTC bond options as a primary hedging instrument. Adelegan (2009) concludes that improved market activity would broaden the base of institutional investors and increase liquidity. The improved liquidity positively influences the price and pricing of a bond option. A liquid market allows reduced transaction costs and adaptable contract sizes (Deuskar *et al.* 2011). The improved liquidity, adaptable contract sizes and reduced transaction costs could restore OTC bond options as the primary hedging instrument in the South African financial market.

The South African OTC bond option market may be restored by establishing OTC bond options as the primary hedging instrument. To establish the OTC market as

the primary hedging instrument the South African financial market needs to highlight that the most appropriate financial instrument to hedge against interest rate volatility is OTC bond options. The regulatory reform in South Africa should specifically address derivative regulation to achieve the objective of restoring OTC bond options as the primary hedging instrument. The improved activity should broaden the base of institutional investors and increase liquidity that would lead to reduced costs to investors who actively participate in the OTC bond option market.

6.4.4 Benefits of bond options in an economy

An active and efficient OTC bond option market holds a number of benefits in a financial market. After the subprime crisis of 2007, derivatives in general were identified as financial instruments that led to financial losses, ignoring the benefits that derivatives offer (Adelegan 2009). According to Stulz (2010), credit derivatives in particular lead to the financial losses. This type of derivative sells the default risk to a party other than the lender. In layman's terms, credit derivatives are seen as an insurance contract against default risk (Stulz 2009). In any financial market, OTC bond options have the ability to accelerate growth within an economy (Acaravci *et al.* 2009). The benefit of economic growth should invigorate the need for investors to incorporate OTC bond options in a portfolio independent of any other benefits (see 2.6 and 3.4).

The OTC bond option market often inspires regulatory reform, improvements in transparency, additional accounting rules and enhanced financial market integration (Arestis & Karakitsos 2009). These components benefit financial markets by improving risk management techniques, promoting price discovery and stimulating the design of new financial products.

Risk management should be the primary purpose of an OTC bond option as the OTC bond option can be structured according to the needs of an investor. According to Milne (2009), financial institutions experience pressure to manage risks in their exposed open market positions effectively. De Beer (2011) identified a number of option strategies (see 2.3.1) that can be used to manage risks by entering into bond and bond option transactions. Bond options reduce the cost of speculation. This is

essential for risk management as lower trading costs encourage investors to manage portfolio risks (Dai *et al.* 2010). Active risk management aids price discovery as market liquidity improves.

The OTC bond option market makes it possible for investors to price assets in the underlying market accurately. According to Bezzina and Grima (2012), the price of the underlying instrument can be derived from the value of the associated derivatives. The process of price discovery is also an indication of the future view of the market participants (CEC 2009). Active trading of OTC bond options therefore benefits the underlying bond market.

OTC bond options are often classified as a source of uncertainty. This uncertainty is a result of the misunderstanding investors have of bond options. According to Dodd (2009), OTC bond options can be applied to construct synthetic derivative contracts by investors who understand the mechanics of OTC bond options. Investors who understand OTC bond options are enabled to self-insure or source credit from this derivative (Adelegan 2009). It is often a lack of knowledge of OTC bond options that leads to financial losses (Bezzina & Grima 2012).

The benefits of an active and efficient OTC bond option market should not be underestimated. Benefits that OTC bond options offer investors are economic growth and efficient risk management (Acaravci *et al.* 2009; Adelegan 2009). By actively managing risk, price discovery was promoted. Financial innovation is inspired by price discovery as price discovery makes it possible to accurately determine prices of financial instruments. Newly developed products are incorporated into investment portfolios and add to liquidity in a financial market.

The research questions were evaluated by reviewing literature of other researchers in support of the research problem. The literature indicated that an effective OTC bond option market is necessary in a financial market. The factors that influenced the apparent deterioration of the OTC bond option market in South Africa in the period 2001 to 2011 were researched. The research concluded that bond option pricing, investor information and regulation could have contributed to the deterioration of the South African OTC bond option market (see e.g. 2.5.3 and 2.5.7).

The literature suggested multiple interventions to restore the OTC bond option market as primary hedging instrument. These interventions include improved risk management, regulatory reforms and accurate OTC bond option pricing (see e.g. 3.3.2 and 3.3.4).

The benefits of using OTC bond options in a financial market were discussed (see 2.6 and 3.4). OTC bond options create an environment for hedgers, speculators and arbitrageurs to transact in the market and could accelerate the economic growth of a country. Investors also benefit from improved risk management, accurately priced financial instruments and new financial products. The review of the empirical results will compare whether the research findings are similar to that reported in the literature referenced in this research.

6.5 EMPIRICAL RESEARCH FINDINGS

The empirical findings were obtained by using a research instrument to gauge the perspectives of respondents who were active in the South African OTC bond option market at the time of the research. The literature supported the questions asked in the research instrument. The purposive sample allowed the researcher to obtain data from respondents who represented different employers at certain institutions. The employers were classified as issuers, intermediaries, market makers, regulators and participants (see 4.8). The respondents transacted as hedgers, speculators or arbitrageurs in the South African OTC bond option market. The data collected was analysed and was presented by way of descriptive statistics. The results are discussed in the sections below.

6.5.1 The need for an OTC bond option market

The perspective of the respondents on the possible need for an OTC bond option market was obtained by using the research instrument, namely a questionnaire. Respondents were asked whether they deemed the OTC bond option market essential for risk management purposes. Their perspective on using bond options to create new funding structures and the use of OTC bond options for speculation and arbitrage was also assessed.

The results indicated that the respondents perceived that OTC bond options could be used to create new funding structures. The results further indicated that OTC bond options were excellent instruments for financial speculation. The results were however inconclusive in determining whether OTC bond options are essential for risk management. Participating investors did not perceive OTC bond options in South Africa as an instrument that could be used to derive arbitrage profits. These findings disagreed with research by Aling and Hassan (2012) who found that bond options were excellent instruments for arbitrage transactions.

The respondents were of the opinion that the OTC bond option market is an essential component of the financial market. There was consensus among the respondents that an OTC bond option market is essential, but that the significance of the OTC bond option market in the current financial market climate should be established.

6.5.2 The apparent significance of OTC bond options in South Africa

The results confirmed that a vibrant OTC bond option market is essential in a financial market. A concern raised was that the market may be essential but currently insignificant in the South African financial market (see 5.4.4). The JSE (2011) found that the South African OTC bond option market declined to such an extent in the period 2001 to 2011 that it was considered insignificant. The respondents were consequently asked whether they thought the OTC bond option market still had a significant role in South Africa.

The opinions of the respondents were used to determine the significance of the OTC bond option market in South Africa. Questions were asked to determine the significance of the OTC bond option market in South Africa and whether a successful OTC bond option market could attract additional market participants and increase FDI. The perceived effect on volatility was also measured as well as the perceived benefits of market liquidity.

The results indicated that respondents were of the opinion that a successful OTC bond option market would attract additional activity to the remainder of the bond

option market. The respondents were also of the opinion that the volatility in the market would be reduced if OTC bond options were used (see 5.4.2). Adequate use of OTC bonds would further improve the liquidity of the market according to the respondents. The perception that the OTC bond option market would attract international investment was however not supported by the respondents.

The results obtained from the research indicated that respondents were of the opinion that the South African OTC bond option market could still be significant. This was in contradiction with popular belief because the market had deteriorated in recent years (2001 to 2011) (JSE 2011). The opinions of the respondents on the possible reasons for the deterioration in the OTC bond option market were also researched. The next section presents the findings on the opinions of the respondents on the deterioration of the OTC bond option market.

6.5.3 Deterioration of the South African OTC bond option market

The literature review identified factors that could possibly have added to the deterioration of the OTC bond option market in the period 2001 to 2011. These factors were reconstructed in a questionnaire to assess whether respondents were of the opinion that these factors could have contributed to the recent deterioration of the South African OTC bond option market (see Appendix 1). The factors that were identified were:

- the lack of new bond issues;
- the declining short-term interest rate;
- the bond option pricing using the modified Black formula and incorporating the volatility skew;
- the effect that wide bid–offer spreads have on bond option activity;
- the market regulation oversight;
- the standardised ISDA agreements used as binding contracts;
- the market in which OTC bond option contracts trade;
- the intermediary and broker participation in the market; and
- access to the market.

The key findings suggested that not all the factors had a negative effect on the OTC bond option market. The respondents were of the opinion that wide bid–offer spreads and the regulatory environment in the bond option market made OTC bond option transactions non-competitive. Respondents were of the opinion that ISDA agreements were efficient in regulating OTC bond option market transactions. Respondents were also of the opinion that only a limited number of investors participated in this market even though all institutional investors had access to the market. The respondents disagreed that short-term interest rates had a negative effect on the OTC bond option market. The respondents did not support the view that the ET bond option market crowded out the OTC bond option market.

The respondents' opinions differed from the findings indicated in the literature as they did not believe that bond option pricing or the number of bond issues contributed to the deterioration of the market. The respondents were of the opinion that other market inefficiencies also caused the market to deteriorate. These inefficiencies were perceived to be caused by unreasonable bond option bid–offer quotes, poor regulatory oversight and low market activity. The deterioration of the OTC bond option market could therefore be the cause of inefficient hedging, which results in fewer possibilities for arbitrage and speculation.

6.5.4 Restoring the South African OTC bond option market as a primary hedging instrument

There appears to be several possible methods available to restore the South African OTC bond option market. The literature suggested that investor education, market integration, shorter maturity options, liquidity and efficient regulation could possibly aid the restoration of the South African OTC bond option market (Ameer *et al.* 2011; Arestis & Karakitsos 2009; Bezzina & Grima 2012; Choudhry 2001; Cummins *et al.* 2001; Dodd 2012; Dodd 2009; Dodd & Griffith-Jones 2007; IOSCO 2010; PIMCO 2011; Stulz 2005). The objective of the questionnaire used in the current research was to establish whether the respondents perceived that these methods of restoring the market could be effective.

According to the respondents, some methods could restore the South African OTC bond option market. The opinion of the respondents was that uninformed investors who were active in the financial market did not fully comprehend the benefits of using OTC bond options, and therefore they did not make use of the instrument. The respondents were of the opinion that the market was non-transparent (see 5.6.7), which further decreased the use of this instrument. According to the respondents, at the time of the study, the OTC bond option market was neither fully integrated nor was the instrument regularly traded in the financial market. Respondents were of the opinion that none of the interventions such as new exotic options or the shorter maturity OTC bond options would restore the OTC bond option market activity. Improved investor education, regulation, integration and liquidity could however potentially restore or improve activity in this market.

A question whether the OTC market was the most suitable platform for trading bond options was raised. Respondents were of the opinion that OTC and ET markets should co-exist. The opinions of the respondents with regard to the interaction between these markets could serve as recommendations to improve the OTC bond option market.

Some respondents were of the opinion that regulation and fund mandates restricted some portfolio managers from trading in the OTC market. This implied that entities who did not have to adhere to regulatory requirements, such as pension fund legislation, participated in hedging their open positions in the OTC bond option market. The respondents were of the opinion that price makers and price takers in the OTC bond option market should be more consistent when pricing these instruments. This would essentially increase the liquidity of the market. Therefore, the OTC market was regarded as suitable for bond option trading. Should the market improve in terms of the mentioned aspects, an upswing in activity might be experienced.

The OTC bond option market in South Africa could potentially be an effective tool for risk management (Adelegan 2009). Currently, the lack of liquidity and market integration prohibit investors from benefiting from the use of OTC bond options. The limited market integration makes hedging inefficient to investors. Even though exotic

options do not pose a threat to the OTC bond option market, other instruments such as swaptions and FRAs prove to be more efficient tools to reduce exposure to risky bond instruments. If the bond option market were restored, bond options could potentially be used to hedge, speculate or derive arbitrage profits. However, the cost-benefit compared to the use of a swaption or FRA would have to be evaluated.

The empirical results of the current research were based on the opinions of the respondents who participated in this research. These respondents were active in the South African OTC bond option market. The respondents were employed to perform hedging, speculative or arbitrage transactions at the institutions where they were employed at the time of the research. The institutions formed part of the market as issuers, market makers, intermediaries, participants and regulators. The respondents provided their perspectives on the need for an OTC bond option market in South Africa. They identified the most probable causes for the deterioration of the OTC bond option market between 2001 and 2011, and possible methods for restoring segments of this market.

6.6 CONTRIBUTION

The current research determined which factors led to the deterioration of the OTC bond option market in South Africa in the period between 2001 and 2011 and the interventions that could be effective to restore the OTC bond option market. Table 6.2 reflects a combination of Tables 5.1 and 5.2 and states the actual factors that led to the OTC bond option market deterioration and the effective interventions that could restore OTC bond option market activity according to the respondents.

Table 6.2: Contribution of factors and interventions

Actual factors	Effective interventions
Inactive intermediaries	Improved liquidity
Unreasonable bid–offer spreads	Investor education
Regulation and market oversight	Improved transparency
Number of international investors in the market	Increased interbank trading
	Improved integration in the financial markets

Source: Own composition

Table 6.2 lists the factors that led to the deterioration of the OTC bond option market between 2001 and 2011 and possible interventions to restore the OTC bond option market as a hedging instrument in South Africa. These factors and interventions were concluded from the results of the data obtained from the respondents in this research. To restore the South African OTC bond option market, market makers, issuers, regulators, participants and intermediaries could apply the following recommendations.

6.7 RECOMMENDATIONS

The contribution of the current research enabled the researcher to make certain recommendations that could possibly aid the recovery of the South African OTC bond option market. It is recommended issuers, intermediaries, market makers, participants and regulators act on the following recommendations to restore the South African OTC bond option market:

- increase the liquidity in the OTC bond option market;
- encourage regular interbank trading of OTC bond options;
- encourage continuous education for investors and traders;
- improve the transparency in the OTC bond option market; and
- integrate the various financial instruments effectively in the financial markets.

In subsections 6.7.1 to 6.7.5, each of the recommendations is now explained in greater detail.

6.7.1 Increased liquidity

Liquidity, or the ease of buying and selling bond options (Dodd 2012), can be increased from two perspectives, namely a market perspective and a trader perspective (see 5.6). The market comprises all economic units who are active in the OTC bond option market while the traders are the individuals who transact in the OTC bond option market.

There are two possible interventions from a market perspective that could improve the liquidity in the South African OTC bond option market. The first recommendation is that parastatals reopen their respective option books to write options on the bond issued by the entity. The second recommendation is that one-directional bid–offer quotes primary dealers should be discouraged with regulatory intervention. Regulation often limits market potential but in a market that has limited activity regulation has the potential to increase liquidity.

Traders have to act within prescribed risk limits. These risk limits reduce the exposure of a bank to possible adverse movements in their open positions. The limits however also affect the financial instruments that a trader can use as some financial instruments carry higher risk than others do. Therefore, to increase the liquidity of OTC bond options, risk limits for traders should be revised according to the financial instrument included in their respective portfolios.

If these recommendations are considered there should be an increase in the OTC bond option market activity. The open option books of parastatals would allow traders increased access to specific bond options while the traders would be allowed to transact in this market as the risk limits are more flexible depending on the traded instrument.

6.7.2 Regular interbank trading

Banks are required to hold certain positions on their balance sheets as prescribed by Basel Accords (BIS n.d. b). The position on their balance sheet commonly refers to the capital adequacy requirements. By transacting within the South African OTC bond option market banks could achieve their required levels of capital. In the current market environment, banks may use intermediaries or brokers to transact on their behalf.

South African OTC bond options may attract banks and promote regular interbank trading if shorter maturity OTC bond options were introduced. Even though shorter maturity OTC bond options might not stimulate the entire OTC bond option market, shorter maturity OTC bond options would promote regular interbank trading. Banks should also be encouraged to transact directly in the market as the use of brokers or intermediaries reduces transparency and decreases interbank transactions (see 5.6).

The South African OTC bond option market would experience a revival if banks used these instruments to manage their open positions or maintain capital adequacy requirements. The market would further achieve increased transparency if banks were only allowed to trade in the OTC bond option market in their own capacity instead of trading through an intermediary.

6.7.3 Continuous education

The financial markets have changed considerably over the years. The history of the option market proves that this market changes continuously (see 1.1.1). Individuals who are active in this market should therefore strive to be well informed of the latest changes at all times. Continuous professional development (CPD) is essential in any field, therefore also in the field of investment management.

It was found that individuals who were active in the OTC bond option market followed a similar zero-cost collar strategy in their transactions (see 5.9.1). This replication of the same strategy for different investors leads to the reduced effectiveness of hedging. It is therefore recommended that traders and individuals

who are active within the OTC bond option market form part of a professional body that encourages CPD, similar to the Financial Planning Institute (FPI) of Southern Africa except that it should address the needs of investors in the bond option market.

The recommended CPD could aid the recovery of the OTC bond option market, as possible CPD interventions could include education on structuring innovative strategies with OTC bond options. New information and the introduction of alternative option strategies could lead to investors who use OTC bond options to hedge, speculate or perform arbitrage transactions effectively.

6.7.4 Improved transparency

OTC transactions are known to be non-transparent (see 2.5.2.1). Transparent transactions allow market participants to value financial instruments accurately as transparent markets allow easy access to the financial information required to conduct these valuations.

To restore the South African OTC bond option market it is recommended that large institutions, such as banks, do not revert to the use of brokers or intermediaries to perform transactions. Transparency is reduced in some transactions as certain institutions make use of intermediaries to limit the information about their own financial position disseminated into the financial market. Institutions should be encouraged to transact in the market in their unique legal capacity. If an incentive, such as a possible tax incentive, is introduced for institutions to transact in their own capacity it would increase the transparency in the market.

Transparent markets have a number of benefits (see 2.5.3). If the South African OTC bond option market became more transparent it would allow analysts to price these instruments better as more information would be available. Transparency would further lead to improved regulatory enforcements as the transactions would become public. Improved transparency and new information would also allow active market members to improve their knowledge continuously as new transactions introduce new data into the market.

6.7.5 Financial instrument and financial market integration

In the context of this research, the accuracy of the price dissemination between the movements amongst the derivative market and the underlying market was considered as financial integration. Effective integration allows the entities who are active within the market to use OTC bond options effectively to achieve their desired objectives in the financial market.

It is recommended that financial products and the financial market be integrated in order to improve the hedge effectiveness of OTC bond options (see 5.6.2). This can be achieved by improved liquidity in the OTC bond option market and reduced premiums for OTC bond options. If OTC bond options are effectively integrated into the market, ET bond options that mimic the movements in the OTC bond option market can be created for fund managers. Fund managers have to perform according to fund mandates that often restrict them from trading OTC products. The proposed market integration would allow market inclusion.

The recommendation of market integration would make the financial market inclusive and increase the base of financial entities that transact within the OTC bond option market. The integrated market should also allow informational efficiency as prices disseminated into the financial market would be accurate.

It is recommended that issuers, intermediaries, market makers, participants and regulators attempt to incorporate the proposed recommendations. The recommendations suggest that liquidity be increased, regular interbank trading be promoted, transparency be improved, CPD be encouraged and that the financial products and the financial market be integrated in order to enable the South African OTC bond option market to recover from the deteriorated position it entered into since 2001. Though these recommendations may restore the South African OTC bond option market as a hedging instrument it is recommended that further research be conducted on regulation, derivative products and CPD interventions.

6.8 FURTHER RESEARCH

The specific recommendations of this research and the changes in the South African financial market make it possible to suggest areas for further research. Global regulatory requirements and recommendations such as the Basel Accords (see 2.5.3) have a significant effect on the derivatives market. It is recommended that further research be conducted on:

- domestic, foreign and global regulatory changes and the effects on OTC derivative markets;
- a comparison between the effectiveness of options, swaptions and interest rate FRAs for risk management and hedging; and
- different CPD interventions that could improve the knowledge of the issuers, intermediaries, market makers, participants and regulators.

6.8.1 Regulatory changes

After the 2007 subprime crisis there has been a drive for markets that are more regulated and possibly excluding the OTC market from financial market (see 2.5.3). Therefore, further research could be conducted on the proposed global requirements prescribed by the BIS and disseminated through the Basel Accords. There are also changes to the regulation of foreign economies and this could have a potential effect on the South African market. Foreign regulatory changes would refer to the Turner review, De Larosière report and the Dodd–Frank Act (see 2.5.3). In the domestic market, the effect of the new proposed Twin Peaks model (see 3.2.2) should be evaluated on the derivatives market.

6.8.2 Comparison of derivative instruments

Investors and institutions have a variety of derivatives at their disposal. In South Africa, traders currently use swaptions, interest rate FRAs, ET bond options and to a lesser extent, OTC bond options to hedge against risk in the bond market. Further research could be conducted to compare the effectiveness, efficiency and appropriateness of the different derivatives used to manage risk in the underlying

bond market. The researcher should aim to recommend the most suitable derivatives for the South African financial market and possibly for other EMEs.

6.8.3 Continuous professional development (CPD)

The findings of this research showed that traders revert to using a similar zero-cost collar option strategy (see 5.9.1) and that individuals who are active in the market do not have sufficient knowledge of OTC bond options (see 5.6.1). It is recommended that further research be conducted on the training needs of individuals who are active in the OTC bond option market. Once the training needs have been identified, courses should be developed to aid the CPD of the individuals in the OTC bond option market.

The further research opportunities identified could further contribute to the OTC bond option market and also possibly aid in restoring OTC bond options as a hedging instrument. Further research also has the potential to recommend other derivatives and possible training interventions that could assist investors in hedging upside or downside risk in the bond market more efficiently.

6.9 CONCLUSION

This chapter provided an overview of the research problem, the way the research was conducted, and summarised the key findings of both the literature review and the empirical research. The chapter revisited the primary and secondary research questions. The research questions were used to present the key findings of the literature review and the empirical results.

The literature review revealed that an OTC bond option market could improve the financial market. The OTC bond option market has the potential to improve regulation, reduce the interest rate risk, increase FDI and promote the development of new financial products in the financial market. The respondents agreed that there are definite benefits in a financial market that offers OTC bond options to investors. However, respondents were of opinion that a financial market can exist without these instruments.

Literature suggested that OTC bond options play a significant role in a financial market. OTC bond options could potentially boost economic growth and could be used as a risk management instrument (see 2.6 and 3.4). The opinion of the respondents was that the value of South African OTC bond options should not be discounted (see 5.4). However, according to the JSE (2011), the OTC bond option market declined during 2001 to 2011 to such an extent that it may be considered insignificant in the South African financial market.

There are a number of factors that could have caused the decline in the South African OTC bond option market. Apparent causes are unreasonable bond option bid–offer quotes, an illiquid market and restrictive regulation (see 5.5). Respondents agreed that these market inefficiencies were the main drivers of the deterioration in the period between 2001 and 2011. As was indicated in the literature, the respondents agreed that liquidity, regulation and pricing were determining factors in the OTC bond option market deterioration.

Respondents were of the opinion that the South African bond option market could be restored as the primary hedging instrument in the financial market. This could be achieved if the number of institutional investors increase naturally, improving liquidity and reducing the costs that made hedging with bond options ineffective. Respondents were also of the opinion that liquidity and market integration could improve the use of OTC bond options (see 5.6). The respondents reiterated that regulation should not be restrictive as too restrictive regulation hinders the use of OTC products. The respondents were of the opinion that self-regulation would be preferred to government-imposed regulations.

In support of the findings, the research made five recommendations that should be implemented to restore the OTC bond option market:

- there should be improved liquidity from a trading and market perspective;
- interbank trading should be encouraged, and shorter maturity OTC bond options could possibly increase interbank trading;

- the OTC bond option market should be more transparent and transparency would improve if large institutions transact in their own capacity without involving intermediaries;
- CPD interventions to either refresh or increase an investor's knowledge should be made available; and
- efficient integration between the bonds and their associated option contracts is advised.

The findings also suggested that opportunities exist for further research that could potentially aid in restoring the South African OTC bond option market. Further research should determine whether the changes in international, foreign and domestic regulations have an effect on the OTC bond option market. Additional research should assess and compare the effectiveness, efficiency and appropriateness of the different derivatives that are used to mitigate the interest rate risk of bonds. Finally, to ensure that investors are always informed of the latest developments in the derivatives market a needs assessment with possible training interventions should be researched.

In conclusion, the primary and secondary research questions were addressed. The key findings from the literature review and empirical results were presented according to the problem statement and the objectives of the research. The findings from the research clearly indicated that respondents found the OTC bond option market in South Africa to be significant. However, new products such as swaptions and interest rate FRAs were more suitable financial instruments to hedge against interest rate risk. Based on the findings, five recommendations were made to restore the South African OTC bond option market. The research was concluded with the suggestion of three other possible areas for further research that would also benefit the South African OTC bond option market.

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APPENDICES

APPENDIX 1: RESEARCH QUESTIONNAIRE

Questionnaire: The applicability, purpose and impact of Bond options: The South African perspective.

Dear Participant,

My name is Coert Erasmus, I am a student at Unisa studying towards an MCom research degree. My research supervisors are Prof RH Mynhardt and Prof J Marx. We can be contacted at erasmcf@unisa.ac.za or mynharh@unisa.ac.za.

The purpose of each statement in the questionnaire is to measure the opinion of participants in the bond options market with specific regard to the benefits and significance of a bond options market. Questions regarding the underlying bond market are asked to determine if the bond market significantly impacts the bond options market. The questionnaire furthermore measures different aspects of the perception of the market participants regarding the apparent decline in the bond options market, whether the market has a significant purpose in the South African financial sphere and whether bond options could possibly be considered again as a viable instrument for hedging or speculation.

Your participation in the research is completely voluntary. There is no penalty for non-participation, nor is there any incentive or compensation for participation. The data collected will only be shared with the research supervisors, statistician and in extraordinary cases with the markers. The data will be kept in form of a password protected Excel document, however the individual responses will not be identifiable. Publishing the findings from the dissertation in an accredited academic journal may be considered. The data from the questionnaires will be treated as confidential. The questionnaire is anonymous and no personal information is collected in order to protect the identities of the respondents.

The estimated time needed to complete the questionnaire is **10 minutes**. By handing in the completed questionnaire you accept the terms of the ethical considerations detailed above.

i

Please turn over

Instructions:

Please rate the statement by providing a percentage out of 100%. There are no predetermined thresholds, thus you need to rate each statement according to the level that you agree with the given statement.

For an example should you be convinced that you strongly agree (as high as 99%) with the following statement, then the response would be indicated as follows:

Ex The effect of increasing interest rates		Per cent	N/A
Ex.1	Increasing interest rates would lead to capital losses on coupon bearing bonds.	99	

1 The need for an over-the-counter (OTC) bond options market.		Per-cent	N/A
1.1	It is essential to use OTC bond options to manage risk associated with bonds.	%	<input type="checkbox"/>
1.2	The use of OTC bond options is a method of creating new innovative funding structures.	%	<input type="checkbox"/>
1.3	The use of OTC bond options to speculate could derive additional profits.	%	<input type="checkbox"/>
1.4	The use of OTC bond options could derive riskless profits.	%	<input type="checkbox"/>

2 The significance of over-the-counter (OTC) bond options in South Africa.		Per-cent	N/A
2.1	To attract more participants into the bond options market a successful OTC bond options market is necessary.	%	<input type="checkbox"/>
2.2	The use of OTC bond options could reduce risks of changes in market volatility.	%	<input type="checkbox"/>
2.3	The use of OTC bond options could improve liquidity within the bond market.	%	<input type="checkbox"/>
2.4	The use of OTC bond options could attract international investors.	%	<input type="checkbox"/>

3 Deterioration of the South African over-the-counter (OTC) bond options market.		Per-cent	N/A
3.1	The decline in the OTC bond options market in recent years is of such an extent that the market could be considered as insignificant.	%	<input type="checkbox"/>
3.2	The lack of activity from bond issuers issuing new bonds in the South African financial market leads to the decline in OTC bond option activity.	%	<input type="checkbox"/>
3.3	The decline of South African short-term interest rates leads to the apparent decline in OTC bond option activity.	%	<input type="checkbox"/>
3.4	The volatility skew incorporated into the modified Black formula is an effective method of pricing OTC bond options.	%	<input type="checkbox"/>
3.5	Wide bid/offer spreads in option pricing lead to the deterioration of the OTC bond options market.	%	<input type="checkbox"/>
3.6	The OTC bond options market is efficiently regulated and overseen.	%	<input type="checkbox"/>

3.7	Standardised ISDA agreements are sufficient to regulate the OTC bond options market.	%	<input type="checkbox"/>
3.8	The South African exchange traded bond options market replaced the OTC bond options market.	%	<input type="checkbox"/>
3.9	Intermediaries/Brokers actively participate in the OTC bond options market.	%	<input type="checkbox"/>
3.10	All institutional investors have access to OTC bond options.	%	<input type="checkbox"/>

4 Enhancing OTC bond options in South Africa as a primary hedging instrument.		Per-cent	N/A
4.1	Investors who make use of OTC bond options have a full understanding of trading these products.	%	<input type="checkbox"/>
4.2	The OTC bond option market is effectively integrated into other South African financial markets.	%	<input type="checkbox"/>
4.3	Shorter maturity OTC bond options could stimulate the OTC bond options market.	%	<input type="checkbox"/>
4.4	There is regular interbank trading of OTC bond options in the market.	%	<input type="checkbox"/>
4.5	JSE exotic options crowded out the need for OTC bond options.	%	<input type="checkbox"/>
4.6	The secondary bond market is liquid and active.	%	<input type="checkbox"/>
4.7	The OTC bond options market is transparent.	%	<input type="checkbox"/>

5 OTC Bond options as a hedging instrument.

5.1	In your view, should OTC bond options be considered again in order to hedge?	Select
5.2	Please provide the most important reason for your answer to question 5.1.	

6 Regulating and standardisation of OTC Bond options.

6.1	Should the OTC bond options be standardised to such an extent that only a regulated exchange exists to trade bond options?	Select
6.2	Please provide the most important reason for your answer to question 6.1.	

7 Other: (If applicable)

7.1	Shortly describe any other possible method of enhancing the OTC bond options market.

8 Please describe your role in the South African bond options market.

8.1	I primarily transact in the market as a(n) ...	
	speculator	<input checked="" type="radio"/>
	hedger	<input type="radio"/>
	arbitrageur	<input type="radio"/>
8.2	The institution I am employed by can best be described as a(n) ...	
	issuer	<input checked="" type="radio"/>
	intermediary	<input type="radio"/>
	market maker	<input type="radio"/>
	participant	<input type="radio"/>
	other:	<input type="radio"/>

THANK YOU FOR YOUR PARTICIPATION IN THE RESEARCH ON THE SOUTH AFRICAN BOND OPTIONS MARKET.

APPENDIX 2: PILOT TEST REPORT



FROM: MR CF ERASMUS

SUBJECT: QUESTIONNAIRE – PILOT TEST REPORT

	Yes	No
Did each question measure what it should have measured?	X	
Did you understand the wording in the questionnaire?	X	
Were the proposed responses appropriate?	X	
Was the level of measurement easily understood?	X	
Did you understand the instructions?	X	
Was the questionnaire constructed professionally?	X	
Was there a natural flow of questions?	X	
Do you agree that the questionnaire addressed the primary and secondary research questions?	X	
What was the estimated time burden of the questionnaire?	9 min	



 Signature

Adapted from University of Wisconsin-Extension, Cooperative Extension (n.d.)

APPENDIX 3: POPULATION

Participants	Market makers	Intermediaries	Issuers	Regulators
28E Capital	Barclays Africa	Barclays Africa	Eskom	South African Reserve Bank (SARB)
Acumen Capital	Citigroup Global Markets	Citigroup Global Markets	Telkom SA	Financial Services Board (FSB)
Afrifocus Securities	Deutsche Bank	Deutsche Bank	Transnet	
AMB Advisory Services	HSBC Bank	HSBC Bank		
Anglorand Futop	Investec	Investec		
Applied Derivatives	JPMorgan Chase Bank	JPMorgan Chase Bank		
BIZ Africa 124	Nedbank Capital	Nedbank Capital		
BNP Paribas Cadiz Securities	Rand Merchant Bank	Rand Merchant Bank		
Bosveld Graan	Standard Bank	Standard Bank		
Bsec Derivative Brokers				
CJS Securities				
Commodity House				
Development Bank of Southern Africa				
DWT Securities				
Dynamic Wealth Derivatives				
FCB Harlow Butler				
FFO Securities				
Foord Asset Management				
Garban SA				
Golding Torr & De Decker				
Imara S.P. Reid				
Kagiso Bond Trading				
Macquarie Securities South Africa				

Market Traders				
Mercantile Bank Limited				
Merrill Lynch South Africa				
Navigare Securities				
Norton Derivatives				
Old Mutual				
Peregrine Derivatives				
Prescient Securities				
PSG				
Public Investment Commissioners				
Robinson Mulder De Waal Financial Services				
SA Derivatives				
SA International & Capital Market Brokers				
Sanlam Capital Markets				
Sasfin Securities				
STANLIB				
Taquanta Securities				
Thebe Stockbroking				
Thirty Four South Research & Trading				
Tradition Government Bond Brokers & Derivative Brokers				
TTSA Securities				
Vorlon				
Vunani Securities				
WWC Securities				

APPENDIX 4: ETHICAL CLEARANCE

	
FINANCE, RISK MANAGEMENT & BANKING RESEARCH ETHICS REVIEW COMMITTEE	
23 July 2014	
Dear Mr Erasmus,	<p>Ref #: 2014/CEMS/FRM&B/007 Name of applicant: Mr Coert Frederik Erasmus Student #: 4843-321-7 Supervisor: Prof RH Mynhardt Staff #: 90166388 Co-Supervisor: Prof Johan Marx Staff #: 1978438</p>
Decision: Ethics Approval	
<hr/>	
Name: Mr Coert Frederik Erasmus, erasmc@unisa.ac.za , 0124294949	
Supervisor: Prof RH Mynhardt, mynharh@unisa.ac.za , 0124294927	
Co-Supervisor: Prof Johan Marx, marxj@unisa.ac.za , 0124294513	
Proposal: The Applicability, Purpose and Impact of Bond Options: The South African Perspective	
Qualification: B.Com business Management	
<hr/>	
Thank you for the application for research ethics clearance by the Department of Finance, Risk management and Banking Research Ethics Review Committee for the above mentioned research. Final approval is granted for the duration of the project.	
<p>For full approval: The application was reviewed in compliance with the Unisa Policy on Research Ethics by the DFRB RERC on 30 June 2014.</p> <p>The proposed research may now commence with the proviso that:</p> <ol style="list-style-type: none">1) The researcher/s will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.2) Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study, as well as changes in the methodology, should	
	<small>University of South Africa Pretorius Street, Muckleneuk Ridge, City of Tshwane PO Box 392 UNISA 0003 South Africa Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150 www.unisa.ac.za</small>
Open Rubric	

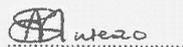
be communicated in writing to the department of Finance, Risk Management and Banking Ethics Review Committee. An amended application could be requested if there are substantial changes from the existing proposal, especially if those changes affect any of the study-related risks for the research participants.

- 3) The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study.

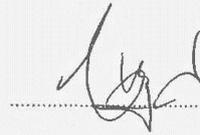
Note:

The reference number 2014/CEMS/FRM&B/007 should be clearly indicated on all forms of communication [e.g. Webmail, E-mail messages, letters] with the intended research participants, as well as with the [add unit/sub unit name] RERC.

Kind regards,



Ashley Mutezo
Chairperson: DFRB Research Ethics, Review Committee
0124294595/muteza@unisa.ac.za



Prof Valiant Clapper
Executive Dean: CEMS



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www.unisa.ac.za

APPENDIX 5: STATISTICAL RESULTS

GET

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/ORDER=ANALYSIS.

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/COMPRESSED.

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q3.10 q4.1 q4.2 q4.3 q4.4 q4.5 q4.6 q4.7

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/ORDER=ANALYSIS.

Frequencies

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Comments	
Input	Data
	Active Dataset
	Filter
	Weight
	Split File
	N of Rows in Working Data File
Missing Value Handling	Definition of Missing
	Cases Used
Syntax	
Resources	Processor Time
	Elapsed Time

Notes		
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	Weight	<none>
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	N of Rows in Working Data File	11
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data.
Syntax		FREQUENCIES VARIABLES=q1.1 q1.2 q1.3 q1.4 q2.1 q2.2 q2.3 q2.4 q3.1 q3.2 q3.3 q3.4 q3.5 q3.6 q3.7 q3.8 q3.9 q3.10 q4.1 q4.2 q4.3 q4.4 q4.5 q4.6 q4.7 /FORMAT=NOTABLE /NTILES=4 /STATISTICS=STDDEV MINIMUM MAXIMUM MEAN MEDIAN SKEWNESS SESKEW KURTOSIS SEKURT /ORDER=ANALYSIS.
Resources	Processor Time	00:00:00,00
	Elapsed Time	00:00:00,00

Statistics							
		q1.1	q1.2	q1.3	q1.4	q2.1	q2.2
N	Valid	11	11	11	11	11	11
	Missing	0	0	0	0	0	0
Mean		49.545	66.273	77.182	18.727	84.455	67.818
Median		60.000	70.000	80.000	5.000	90.000	80.000
Std. Deviation		36.5003	30.7216	22.4135	29.2715	25.7735	32.9145
Skewness		.055	-.516	-1.014	1.786	-2.069	-.938
Std. Error of Skewness		.661	.661	.661	.661	.661	.661
Kurtosis		-1.508	-.799	.474	2.727	3.707	.051
Std. Error of Kurtosis		1.279	1.279	1.279	1.279	1.279	1.279
Minimum		.0	10.0	30.0	.0	20.0	1.0
Maximum		100.0	100.0	100.0	90.0	100.0	100.0
Percentiles	25	10.000	40.000	60.000	.000	90.000	50.000
	50	60.000	70.000	80.000	5.000	90.000	80.000
	75	80.000	99.000	99.000	40.000	100.000	100.000

Statistics							
		q2.3	q2.4	q3.1	q3.2	q3.3	q3.4
N	Valid	11	11	9	11	11	9
	Missing	0	0	2	0	0	2
Mean		73.636	45.000	90.444	22.364	16.545	61.111
Median		70.000	30.000	90.000	10.000	10.000	75.000
Std. Deviation		16.8954	29.5804	10.0264	30.2069	22.3399	29.6625
Skewness		.211	.606	-1.151	1.663	1.211	-1.002
Std. Error of Skewness		.661	.661	.717	.661	.661	.717
Kurtosis		-.498	-.930	.970	1.768	-.142	1.239
Std. Error of Kurtosis		1.279	1.279	1.400	1.279	1.279	1.400
Minimum		50.0	10.0	70.0	.0	.0	.0
Maximum		100.0	100.0	100.0	90.0	60.0	100.0
Percentiles	25	60.000	20.000	85.000	1.000	.000	45.000
	50	70.000	30.000	90.000	10.000	10.000	75.000
	75	80.000	70.000	99.500	30.000	40.000	80.000

Statistics							
		q3.5	q3.6	q3.7	q3.8	q3.9	q3.10
N	Valid	11	10	10	9	8	9
	Missing	0	1	1	2	3	2
Mean		80.273	36.500	76.400	22.222	30.500	63.444
Median		80.000	27.500	75.000	20.000	17.500	75.000
Std. Deviation		25.7802	35.6721	21.2300	16.6040	32.4786	31.6706
Skewness		-2.274	.658	-.410	.393	1.531	-.789
Std. Error of Skewness		.661	.687	.687	.717	.752	.717
Kurtosis		6.191	-.892	-.926	-.779	2.361	.555
Std. Error of Kurtosis		1.279	1.334	1.334	1.400	1.481	1.400
Minimum		10.0	.0	40.0	.0	.0	1.0
Maximum		100.0	100.0	100.0	50.0	99.0	100.0
Percentiles	25	75.000	3.750	61.250	7.500	10.000	45.000
	50	80.000	27.500	75.000	20.000	17.500	75.000
	75	99.000	68.750	99.250	37.500	47.500	90.000

Statistics							
		q4.1	q4.2	q4.3	q4.4	q4.5	q4.6
N	Valid	10	10	11	8	9	11
	Missing	1	1	0	3	2	0
Mean		55.000	37.500	46.364	31.250	14.000	60.818
Median		60.000	35.000	50.000	35.000	5.000	70.000
Std. Deviation		23.2140	28.2105	33.4732	17.4745	17.0000	38.0311
Skewness		-1.499	1.016	.243	-.733	1.368	-.434
Std. Error of Skewness		.687	.687	.661	.752	.717	.661
Kurtosis		3.204	1.913	-1.568	-.179	1.410	-1.791
Std. Error of Kurtosis		1.334	1.334	1.279	1.481	1.400	1.279
Minimum		.0	.0	10.0	.0	.0	10.0
Maximum		80.0	100.0	100.0	50.0	50.0	100.0
Percentiles	25	47.500	13.750	10.000	17.500	.500	15.000
	50	60.000	35.000	50.000	35.000	5.000	70.000
	75	72.500	50.000	80.000	47.500	25.000	99.000

Statistics		
		q4.7
N	Valid	11
	Missing	0
Mean		14.182
Median		10.000
Std. Deviation		15.0454
Skewness		1.478
Std. Error of Skewness		.661
Kurtosis		2.376
Std. Error of Kurtosis		1.279
Minimum		.0
Maximum		50.0
Percentiles	25	1.000
	50	10.000
	75	20.000

FREQUENCIES VARIABLES=q5.1 q6.1 q8.1 q8.2

/ORDER=ANALYSIS.

Frequencies

Notes	
Output Created	
Comments	
Input	Data
	Active Dataset
	Filter
	Weight
	Split File
	N of Rows in Working Data File
Missing Value Handling	Definition of Missing
	Cases Used
Syntax	
Resources	Processor Time
	Elapsed Time

Notes		
Output Created		08-MAY-2014 22:46:19
Comments		
Input	Data	E:\cbm 2014\coert erasmus\cerasmus data11.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	11
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data.
Syntax		FREQUENCIES VARIABLES=q5.1 q6.1 q8.1 q8.2 /ORDER=ANALYSIS.
Resources	Processor Time	00:00:00,00
	Elapsed Time	00:00:00,00

Statistics					
		q5.1	q6.1	q8.1	q8.2
N	Valid	11	10	8	11
	Missing	0	1	3	0

Frequency Table

q5.1					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.0	2	18.2	18.2	18.2
	1.0	7	63.6	63.6	81.8
	2.0	2	18.2	18.2	100.0
	Total	11	100.0	100.0	

q6.1					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.0	2	18.2	20.0	20.0
	1.0	4	36.4	40.0	60.0
	2.0	4	36.4	40.0	100.0
	Total	10	90.9	100.0	
Missing	System	1	9.1		
Total		11	100.0		

q8.1					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	3	27.3	37.5	37.5
	1	3	27.3	37.5	75.0
	2	2	18.2	25.0	100.0
	Total	8	72.7	100.0	
Missing	System	3	27.3		
Total		11	100.0		

q8.2					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.0	1	9.1	9.1	9.1
	1.0	1	9.1	9.1	18.2
	2.0	2	18.2	18.2	36.4
	3.0	5	45.5	45.5	81.8
	4.0	2	18.2	18.2	100.0
	Total	11	100.0	100.0	

NPAR TESTS

/M-W= q1.1 q1.2 q1.3 q1.4 q2.1 q2.2 q2.3 q2.4 q3.1 q3.2 q3.3 q3.4 q3.5 q3.6 q3.7 q3.8 q3.9 q3.10 q4.1 q4.2 q4.3 q4.4 q4.5 q4.6 q4.7 BY q6.1(1 2)

NPar Tests

Notes	
Output Created	
Comments	
Input	Data
	Active Dataset
	Filter
	Weight
	Split File
	N of Rows in Working Data File
Missing Value Handling	Definition of Missing
	Cases Used
Syntax	
Resources	Processor Time
	Elapsed Time
	Number of Cases Allowed ^a

Notes		
Output Created		08-MAY-2014 22:48:37
Comments		
Input	Data	E:\cbm 2014\coert erasmus\cerasmus data11.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	11
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics for each test are based on all cases with valid data for the variable(s) used in that test.
Syntax		NPAR TESTS /M-W= q1.1 q1.2 q1.3 q1.4 q2.1 q2.2 q2.3 q2.4 q3.1 q3.2 q3.3 q3.4 q3.5 q3.6 q3.7 q3.8 q3.9 q3.10 q4.1 q4.2 q4.3 q4.4 q4.5 q4.6 q4.7 BY q6.1(1 2) /MISSING ANALYSIS.
Resources	Processor Time	00:00:00,03
	Elapsed Time	00:00:00,06
	Number of Cases Allowed ^a	25368

a. Based on availability of workspace memory.

Mann-Whitney Test

Ranks				
	q6.1	N	Mean Rank	Sum of Ranks
q1.1	1.0	4	5.50	22.00
	2.0	4	3.50	14.00
	Total	8		
q1.2	1.0	4	5.50	22.00
	2.0	4	3.50	14.00
	Total	8		
q1.3	1.0	4	3.50	14.00
	2.0	4	5.50	22.00
	Total	8		
q1.4	1.0	4	5.38	21.50
	2.0	4	3.63	14.50
	Total	8		
q2.1	1.0	4	4.38	17.50
	2.0	4	4.63	18.50
	Total	8		
q2.2	1.0	4	2.63	10.50
	2.0	4	6.38	25.50
	Total	8		
q2.3	1.0	4	3.88	15.50
	2.0	4	5.13	20.50
	Total	8		
q2.4	1.0	4	5.13	20.50
	2.0	4	3.88	15.50
	Total	8		
q3.1	1.0	3	2.67	8.00
	2.0	3	4.33	13.00
	Total	6		
q3.2	1.0	4	5.75	23.00
	2.0	4	3.25	13.00
	Total	8		
q3.3	1.0	4	6.38	25.50
	2.0	4	2.63	10.50
	Total	8		
q3.4	1.0	3	3.17	9.50
	2.0	3	3.83	11.50
	Total	6		
q3.5	1.0	4	4.13	16.50
	2.0	4	4.88	19.50
	Total	8		
q3.6	1.0	3	5.00	15.00
	2.0	4	3.25	13.00
	Total	7		

q3.7	1.0	3	3.67	11.00
	2.0	4	4.25	17.00
	Total	7		
q3.8	1.0	2	2.75	5.50
	2.0	4	3.88	15.50
	Total	6		
q3.9	1.0	2	3.75	7.50
	2.0	3	2.50	7.50
	Total	5		
q3.10	1.0	3	2.00	6.00
	2.0	3	5.00	15.00
	Total	6		
q4.1	1.0	4	4.50	18.00
	2.0	3	3.33	10.00
	Total	7		
q4.2	1.0	3	4.00	12.00
	2.0	4	4.00	16.00
	Total	7		
q4.3	1.0	4	3.63	14.50
	2.0	4	5.38	21.50
	Total	8		
q4.4	1.0	2	3.00	6.00
	2.0	3	3.00	9.00
	Total	5		
q4.5	1.0	3	4.67	14.00
	2.0	3	2.33	7.00
	Total	6		
q4.6	1.0	4	4.13	16.50
	2.0	4	4.88	19.50
	Total	8		
q4.7	1.0	4	6.00	24.00
	2.0	4	3.00	12.00
	Total	8		

Test Statistics ^a						
	q1.1	q1.2	q1.3	q1.4	q2.1	q2.2
Mann-Whitney U	4.000	4.000	4.000	4.500	7.500	.500
Wilcoxon W	14.000	14.000	14.000	14.500	17.500	10.500
Z	-1.169	-1.155	-1.162	-1.076	-.149	-2.191
Asymp. Sig. (2-tailed)	.243	.248	.245	.282	.882	.028
Exact Sig. [2*(1-tailed Sig.)]	.343 ^b	.343 ^b	.343 ^b	.343 ^b	.886 ^b	.029 ^b

Test Statistics ^a						
	q2.3	q2.4	q3.1	q3.2	q3.3	q3.4
Mann-Whitney U	5.500	5.500	2.000	3.000	.500	3.500
Wilcoxon W	15.500	15.500	8.000	13.000	10.500	9.500
Z	-.735	-.730	-1.107	-1.452	-2.247	-.443
Asymp. Sig. (2-tailed)	.462	.465	.268	.146	.025	.658
Exact Sig. [2*(1-tailed Sig.)]	.486 ^b	.486 ^b	.400 ^b	.200 ^b	.029 ^b	.700 ^b

Test Statistics ^a						
	q3.5	q3.6	q3.7	q3.8	q3.9	q3.10
Mann-Whitney U	6.500	3.000	5.000	2.500	1.500	.000
Wilcoxon W	16.500	13.000	11.000	5.500	7.500	6.000
Z	-.441	-1.070	-.357	-.705	-.889	-1.993
Asymp. Sig. (2-tailed)	.659	.285	.721	.481	.374	.046
Exact Sig. [2*(1-tailed Sig.)]	.686 ^b	.400 ^b	.857 ^b	.533 ^b	.400 ^b	.100 ^b

Test Statistics ^a						
	q4.1	q4.2	q4.3	q4.4	q4.5	q4.6
Mann-Whitney U	4.000	6.000	4.500	3.000	1.000	6.500
Wilcoxon W	10.000	16.000	14.500	9.000	7.000	16.500
Z	-.720	.000	-1.016	.000	-1.550	-.436
Asymp. Sig. (2-tailed)	.471	1.000	.309	1.000	.121	.663
Exact Sig. [2*(1-tailed Sig.)]	.629 ^b	1.000 ^b	.343 ^b	1.000 ^b	.200 ^b	.686 ^b

Test Statistics ^a	
	q4.7
Mann-Whitney U	2.000
Wilcoxon W	12.000
Z	-1.742
Asymp. Sig. (2-tailed)	.081
Exact Sig. [2*(1-tailed Sig.)]	.114 ^b

a. Grouping Variable: q6.1

b. Not corrected for ties.

RECODE q1.1 (1 thru 50=1) (51 thru 100=2) INTO q1.1rec.

NPAR TESTS

/BINOMIAL (0.50)=q1.1rec

/MISSING ANALYSIS.

NPar Tests

Notes	
Output Created	
Comments	
Input	Data
	Active Dataset
	Filter
	Weight
	Split File
	N of Rows in Working Data File
Missing Value Handling	Definition of Missing
	Cases Used
Syntax	
Resources	Processor Time
	Elapsed Time
	Number of Cases Allowed ^a

Notes		
Output Created		08-MAY-2014 23:01:29
Comments		
Input	Data	E:\cbm 2014\coert erasmus\cerasmus data11.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	11
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics for each test are based on all cases with valid data for the variable(s) used in that test.
Syntax		NPAR TESTS /BINOMIAL (0.50)=q1.1rec /MISSING ANALYSIS.
Resources	Processor Time	00:00:00,00
	Elapsed Time	00:00:00,37
	Number of Cases Allowed ^a	196608

a. Based on availability of workspace memory.

Binomial Test						
		Category	N	Observed Prop.	Test Prop.	Exact Sig. (2-tailed)
q1.1rec	Group 1	2.00	6	.60	.50	.754
	Group 2	1.00	4	.40		
	Total		10	1.00		