

**AN INVESTIGATION INTO REGULATORY CAPITAL
ADEQUACY OF SOUTH AFRICAN BANKS UNDER THE
BASEL ACCORDS**

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DECLARATION

I declare that the dissertation, which I hereby submit for the degree of Masters of Commerce in Economic Sciences, is my own work and that all the sources obtained have been correctly recorded and acknowledged. This dissertation was not previously submitted by me for a degree at any institution of higher learning.

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To whom it may concern

This is to confirm that I, the undersigned, have language edited the completed research of Zandri Dickason for the Master of Commerce thesis entitled: *An investigation into regulatory capital adequacy of South African banks under the Basel accords*

The responsibility of implementing the recommended language changes rests with the author of the thesis.

Yours truly,

A handwritten signature in black ink, appearing to read 'Linda Scott', written in a cursive style.

Linda Scott

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First of all, I would like to thank my heavenly father, Jesus Christ, for helping me to finish this dissertation; without Him, it would not have been possible.

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ABSTRACT

An investigation into regulatory capital adequacy of South African banks under the Basel accords

Keywords: Basel accord, regulatory capital adequacy, South Africa

One objective of the BCBS is to implement minimum supervisory capital standards in the banking sector. Basel I to Basel III attempted to maintain a minimum capital standard for credit risk, market risk and operational risk. Many loopholes were highlighted through years when political and economic disturbances occurred and caused volatility in the financial markets. This study analysed five major South African banks from 2002–2012 to determine the size of these disturbances on the regulatory capital levels. The empirical portion of this study comprised of statistical models to be applied to the quantitative observations of capital levels. These measurements served as the bases of comparison between the five banks. After the investigation it was evident that the capital levels of these five banks first decreased as the South African economy prevailed in a boom phase and banks were at ease. When the 2007–2009 financial crisis struck, the capital levels increased again in respect of the three risks. Global volatility surfaced as economic and political factors were introduced into the markets.

OPSOMMING

Keywords: Basel ooreenkoms, regulatoriese kapitaal-voldoenbaarheid, Suid-Afrika

Een van die doelwitte van die BCBS is om die minimum toesighoudende kapitaal-standaarde in die banksektor te implementeer. Vanaf Basel I tot Basel III word daar gepoog om 'n minimum kapitaal-standaard vir krediet risiko, mark risiko en operasionele risiko te handhaaf. Baie leemtes is deur die jare uitgelig, veral toe politiese- en ekonomiese versteurings voorgekom het en wisselvalligheid in die finansiële markte te weeg gebring is. Vyf groot Suid-Afrikaanse banke is vanaf 2002–2012 ontleed om die grootte van hierdie versteurings op die regulatoriese kapitaal-vlakke te bepaal. Die empiriese gedeelte van die studie het van statistiese modelle gebruik gemaak wat toegepas is om die kwantitatiewe waarnemings van kapitaal-vlakke te bepaal. Hierdie metings het as die basis gedien met vergelyking tussen die vyf banke. Na die ondersoek was dit duidelik dat die kapitaal-vlakke van hierdie vyf banke eerste afgeneem het soos die Suid-Afrikaanse ekonomie in die opswaai fase die oorhand gekry het en banke was gemaklik daarmee. Toe die finansiële krisis in 2007–2009 toeslaan het die kapitaal-vlakke weereens verhoog ten opsigte van die drie risiko's. Globale wisselvalligheid het verskyn toe ekonomiese- en politiese faktore in die markte bekendgestel was.

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CHAPTER 1: INTRODUCTION AND PROBLEM STATEMENT

1.1 INTRODUCTION

Banks consist of many functions, but the primary function of a bank is to obtain funds – called deposits (Gobat, 2012:38). Banks obtain deposits from those with excess funds, pool the funds together, and distribute the funds to those in need in the form of loans. All banks face various types of risks. A risk can be defined as the probability of an undesirable event to occur (GARP, 2012:2). Typical examples of risks faced by banks are call risk, prepayment risk, credit risk, operational risk, market risk, liquidity risk, legal risk and interest rate risk. The risk management function in a bank monitor, manage and measure these types of risks. Government policies have been designed to limit bank failures and forms of panic in the financial sector, therefore, the need for some form of regulation existed (Berger *et al.*, 1995:403).

Banking regulators from major developed countries attempted to create a globally valid and applicable framework for banks and their risk management practices. From a regulatory perspective, the size and risk of a bank's assets are some of the most important determinants of how much regulatory capital must be set aside. Basel accords, the cornerstone of international risk-based banking regulation, identified core types of risks. The Basel accords are a sensitive-to-risk system with regard to capital requirements, and offer a wide range of protection against various types of risk (Rose & Hudgins, 2008:493). The focus of Basel started upon capital adequacy and, which focus remains up to the present. There has been increased attention paid to the adequacy by regulators of bank capital throughout the years. Regulators expect high capital requirements to offer some form of protection to depositors to reduce overall risk-taking (Koch & Macdonald, 2003:463). Banks need a regulator in order to identify the risks, suggest capital requirements for risk mitigation, and to regulate the implementation of these actions.

According to Rose and Hudgins (2010:488), in 1988 a Basel agreement was reached for the first time in the heart of Switzerland. This agreement was a breakthrough in terms of establishing uniform capital standards for various countries. All financial institutions had to comply with the imposed capital standards. The aim of the Basel agreement was to keep the leading banks' financial position strong and to eliminate inequalities in capital requirements

among different countries. The proposed Basel standards only came into effect in 1993, with continuous changes made regarding the allowance of capital instruments and adjustments of risk exposures.

Basel I set out the rules for capital in order to keep capital positions strong, to reduce inequalities, and to keep up with rapid changes in financial services. Basel I is a document for all banking regulations formulated by the Basel Committee on Banking Supervision (BCBS) aimed at minimising credit risk and maintaining minimum capital requirements. Basel I only focused on credit risk; market risk entered the accord as an amendment in 1994. Basel II was introduced in 2008 and took into account credit risk, market risk, and operational risk. The credit crisis, which wreaked havoc on the global economy later in 2007, forced the BCBS to formulate Basel III, introduced in 2010 to close gaps found in Basel II. Basel I consisted of tier 1 and tier 2 capital while Basel II instituted tier 3 capital. Among other rules, Basel III eliminated tier 3 capital again (Lounsbury, 2010:10).

The Basel Committee recognised three types of capital, namely tier 1, tier 2 and tier 3 capitals. Tier 1 is a term used to describe the capital adequacy of a bank. Tier 1 capital is core capital; this includes equity capital and disclosed reserves (BCBS, 2001:123). Equity capital is composed of instruments that cannot be redeemed at the option of the holder. The second part of the two-tier risk-based standard is commonly used by regulatory agencies (such as a central bank) to assess a financial institution's capital adequacy (Larson, 2011:9). Like tier 1, tier 2 also describes the capital adequacy of a bank. Tier 2 capital is secondary bank capital that includes items such as undisclosed reserves, general loss reserves, subordinated term debt, and more.

Basel II was implemented with rules to make market risk capital charges more risk-sensitive, recognising the various forms of credit risk mitigation, and adding capital requirements to operational risk (Bessis, 2010:233). According to Rose and Hudgins (2008:493), Basel II set up a system where the capital requirements were more sensitive to risk and where Basel II offered a wider range of protection against various forms of risks. Rose and Hudgins (2008:293) state that reliance was placed on the Basel II approach to determine the minimum capital requirements based on risk-measurement techniques. It was argued that if it could be achieved, instability in the global financial system should be reduced.

The function of capital in a financial institution is to provide a cushion against the risk of failure, provide funds to help institutions get started, promote public confidence, provide funds for growth, regulate growth, improve the growth in bank mergers, and is a regulatory tool to limit risk exposure (Rose & Hudgins, 2010:217). Rose and Hudgins (2008:486) argue that systemic failures are not priced correctly and, therefore, the purpose of capital regulation is to limit the risk of failures, preserve public confidence, and limit the losses to government arising from deposit insurance claims. Rose and Hudgins (2008:293) stated that reliance was placed upon Basel II to calculate the minimum capital requirements based upon advanced risk-measurement techniques to reduce the instabilities in the global financial system. Basel II provided a three-pillar approach to capital adequacy. Pillar 1 is the minimum capital requirements, Pillar 2 is about the supervisory review process, and Pillar 3 is about greater public disclosure (Bessis, 2010:233).

The following are the key aspects of Basel II (BCBS, 2006:12–226):

- Minimum capital requirements for banks are based on the estimation from their credit, market and operational risk exposure;
- Supervisory review will be conducted to ensure that banks have adequate capital and risk-assessment procedures; and
- Greater public disclosure of banks true financial conditions to allow the market discipline to force banks to lower their high-risk exposure.

One of the key aspects of Basel II is the minimum capital requirements for banks. The minimum capital requirement is based on the estimation of a bank's credit risk, market risk and operational risk exposure (BCBS, 2003:6).

1.1.1 Credit risk

Credit risk is about losing money when one party defaults on payment (Hull, 2008:525). Credit risk is regarded as the most important risk due to the high default rate of transactions (Bessis, 2007:13). Credit risk models are developed in order to determine the degree of losses resulting from an adverse event. Credit risk estimates are based upon: (1) borrower credit ratings; (2) the probability of those ratings changing; (3) the probable amount of recovery should loans default; and (4) the possibility of changing interest rate spreads between riskier and less-risky loans (Rose & Hudgins, 2008:294). Credit risk models determine how much

capital is necessary to cover potential loan losses, and at the same time protect the solvency of the lending bank.

1.1.2 Operational risk

BCBS (2003:120) defined operational risk as a risk that occurs due to external disturbances, losses made from improper operating systems, and inexperienced people. This definition also includes legal risk. Reputational risks are excluded, as well as risks arising from strategic decisions. The definition given by the Bank of International Settlements focuses on the causes of operational risk, which can be deemed as appropriate for risk management, and finally, the measurement of it. The BCBS (2001:6) clearly state that the more efficient the risk management and precision of measurement methodology, the bigger the reward should be with a reduction in the regulatory operational risk capital requirement.

1.1.3 Market risk

Market risk arises from the probability of loss due to changes in market prices and interest rates (MAS, 2013:1). According to Rose and Hudgins (2013:184), price risk arises when the market interest rates rise, and simultaneously, the market values of bonds and fixed-rate loans fall. Interest rate risk is the risk to earnings arising from interest rates, for example when interest rates decrease, or when the earnings on that interest simultaneously decrease (Marx, 2005:193).

According to Walter (2010:1), Basel III promotes a higher level of financial stability. Banking crises are associated with deeper economic and financial downturns than realised. Walter (2010:1) explains the reason for this is that banks are the centre point of financial intermediation. Banks motivate savings, make loans available to clients, ensure liquidity, and provide payment services.

The most blame for the 2007–2009 financial crisis was placed on excess liquidity, which led to too much credit. Walter (2010:1) stresses the fact that the banking sector became vulnerable to the build-up of risk in the system. This vulnerability was due to excess leverage, too little capital, and inadequate liquidity buffers. In addition, there was the financial institutions' trust that they were too large to fail, combined with pro-cyclical deleveraging process. Major shortcomings identified by Walter (2010:3) were risk management, corporate governance, market transparency and the quality of supervision.

The minimum capital requirements are composed of three fundamental elements (BCBS 2003:6):

- A definition of regulatory capital;
- Risk weighted assets; and
- The minimum ratio of capital to risk weighted assets.

Masschelein (2007:15) defines regulatory capital as mandatory capital regulators required to be maintained. Basel III made several new proposals in order to increase capital requirements and to reduce pro-cyclicality by introducing counter-cyclical capital buffers (BCBS, 2010:7). The risk based capital (RBC) regulatory regime places more pressure on the business cycle's downturn, as RBC requires banks to keep more capital aside in order to be adequately capitalised. Banks provide less credit due to stricter credit approvals. Masschelein (2007:5) state that positive net present value loans are denied during an economic downturn. The two main challenges with capital regulation are (BCBS, 2002:05):

- If capital is set out to provide protection against credit losses to compensate for the business cycle trends, changes in risk occur through time; and
- It is essential to ensure that risk-based capital requirements do not have macroeconomic consequences in the form of an increased amplitude of economic cycles.

In the calculation of the ratio of minimum capital requirements, the denominator or the total risk-weighted assets will be determined by multiplying the capital requirements for market risk and operational risk by 12.5, and by adding the answer to the sum of risk-weighted assets compiled for credit risk. The ratio will then be calculated in relation to the denominator, using regulatory capital as the numerator.

Importance of capital (Elliott, 2010:02):

- Supervisors have long emphasised that a bank's capital needs to be sufficient relative to its risk of loss;
- Strong capital levels reduce the potential for bank failures and promote financial stability by reducing chances of systemic failures;
- Capital levels are an important indicator of safety and soundness; and
- Capital adequacy typically is measured as capital relative to a measure of risk of loss.

1.2 PROBLEM STATEMENT

The Basel accords set out rules with which financial institutions must comply. The accords have improved from Basel I to Basel III, all focusing on the improvement of the soundness of financial systems. A continuous evaluation and critique of the minimum level of capital South African banks would have needed had they been fully compliant with the Basel accords since 1988. The aim is to determine how much minimum regulatory capital South African banks have needed over the years, since 2002. Five South African banks has been selected, namely ABSA, First National Bank, Nedbank, Investec and Standard Bank, to test the regulatory capital levels.

While analysing the minimum capital levels since 2002, specific reference was given to the Asian crisis (1997–1999) and the financial crisis (2007–2009). From the findings, it was evident that the impact of the various crises contributed towards the movement of capital levels for the five South African banks.

1.3 OBJECTIVES OF THE STUDY

The following objectives have been formulated for the study:

1.3.1 Primary objectives

The primary objective of this study was to determine if the capital levels of the five banks changed as various accords were introduced due to respective crises that occurred in the financial sector.

1.3.2 Theoretical objectives

In order to achieve the primary objective, the following theoretical objectives were formulated for the study:

- To study theory pertaining to Basel I, Basel II and Basel III;
- To investigate the minimum capital requirements set from one Basel accord to the next; and
- To analyse the adjustments made by the Basel accords with respect to credit risk, market risk and operational risk.

1.3.3 Empirical objectives

In accordance with the primary objective of the study, the following empirical objectives were formulated:

- To investigate by how much the capital requirements of the five South African banks changed in accordance with the Basel accord requirements over the 2002-2012 period and to draw conclusions;
- To investigate the need for updated Basel accords during the period of 2002-2012,
- To investigate how the 2007-2009 financial crisis contributed towards updating of Basel I to Basel II;
- A thorough analysis of the minimum capital requirements as set out by Basel I in terms of market risk and capital risk for the five South African banks;
- To investigate by much regulatory capital increased from Basel I to Basel II for the five South African banks taking into account market risk, credit risk and operational risk;
- To analyse the volatility index over the period of 2002-2012 to determine what economical- or political factors caused volatility in the markets; and
- To investigate how European markets reacted on the new requirements imposed by Basel accords.

1.4 RESEARCH DESIGN AND METHODOLOGY

The study comprised of a literature review and the use of statistical empirical models to reach the objectives set above. Quantitative positivistic observations of capital levels were used for the empirical portion of the study.

1.4.1 Literature review

The literature study focused on theory, past research, and current information with regard to Basel accords. This involved the use of books and Internet sources.

1.4.2 Empirical study

The empirical portion of this study comprised of statistical models to be applied to the quantitative observations of capital levels. Simulated models were developed to measure the capital levels for all five banks from 2002-2012. These measurements served as the bases of comparison between the five banks. The programme, Microsoft Excel, was used to compute all calculations.

1.4.2.1 Sampling frame

Data were collected from ABSA, First National Bank, Standard Bank, Investec and Nedbank.

1.4.3 Statistical analysis

The data was analysed using the programme Microsoft Excel. Simulated models were used, which consisted of Basel formulas.

The simulated models consisted of the following approaches and formulas:

1.4.3.1 Credit risk

The internal rating-based advanced approach served as the guide for this calculation. Under this approach, banks should calculate the effective maturity (M), and provide their own estimates of the probability of default (PD), loss of given default (LGD), and exposure at default (EAD).

$$K_{credit} = LGD \times \left[N \left(\sqrt{\frac{1}{1-\rho}} \cdot N^{-1}(PD) + \sqrt{\frac{\rho}{1-\rho}} \cdot N^{-1}(0.999) \right) - PD \right] \times \left(\frac{1 + (M - 2.5)b}{1 - 1.5b} \right)$$

Two specific sections of credit risk were included in the model:

- Residential mortgage exposure

$$K_{credit} = LGD \times \left[N \left(\sqrt{\frac{1}{1-\rho}} \cdot N^{-1}(PD) + \sqrt{\frac{\rho}{1-\rho}} \cdot N^{-1}(0.999) \right) - PD \right]$$

- Other retail exposure

$$K_{credit} = LGD \times \left[N \left(\sqrt{\frac{1}{1-\rho}} \cdot N^{-1}(PD) + \sqrt{\frac{\rho}{1-\rho}} \cdot N^{-1}(0.999) \right) - PD \right]$$

1.4.3.2 Operational risk

The basic indicator approach:

- Uses gross income as a proxy for operational risk
- Uses capital charge equal to 15 percent of the average gross income for the last three years (denoted alpha (α)). This charge may be expressed as follows:

$$CR_{BIA} = [\sum (GI_{Bi} \times \alpha)] / n$$

The advanced approach:

- Is used for retail and commercial banking;
- Was introduced to eliminate double counting of risks;
- Banks, at supervisor's discretion, may be permitted to substitute an alternative measure in the case of retail and commercial banking; and
- The volume of outstanding loans should be multiplied by the beta (β) factor and the result multiplied by 3.5 percent.

$$CR_{IMAJ} = Y_{ij} \times E_{ij} \times PE_{ij} \times LGE_{ij}$$

1.4.3.3 Market risk

Value at Risk (VaR) calculates the worst expected loss over a given horizon at a given confidence level under normal market conditions. VaR estimates should be calculated for various types of risk such as market, credit, and operational.

$$MRC = \max\left(k \cdot \sum_{i=1}^{60} \frac{VaR_i}{60}, VaR_{i-1}\right) + SR + SVaR + IRC$$

1.5 CHAPTER CLASSIFICATION

This study comprises of the following chapters:

Chapter 1 Introduction

Chapter 1 focused on the background information and the scope of the study.

Chapter 2 Overview of Basel accords

Chapter 2 provides a background for the Basel accords. A detailed explanation of the Basel accords, why they were introduced into the financial sectors, why banks needed these accords to function properly, and also how these accords function is provided in this chapter.

Chapter 3 Basel accords and capital levels

Chapter 3 discusses the rules as set by the Basel accords in terms of capital levels and how the empirical data were analysed.

Chapter 4 Analysis of capital levels

Chapter 4 analyses the capital levels for the five banks. This chapter comprised of calculations from the various accords in terms of minimum capital requirements, considering applicable risks.

Chapter 5 Summary and conclusion

Chapter 5 summarised the research project. The summary focused on the findings of the capital levels of the five banks in South Africa.

CHAPTER 2: OVERVIEW OF BASEL ACCORDS

2.1 INTRODUCTION

In 1988 the Basel agreement was reached. This agreement was a breakthrough for financial institutions in terms of establishing uniform capital standards for various countries (Griffith-Jones & Spratt, 2001:2). All financial institutions had to comply with the imposed capital standards. The aim of the Basel agreement was to keep the leading banks' financial position strong and to eliminate inequalities in capital requirements among different countries. The proposed Basel capital standards only came into effect in 1993 with constant amendments to capital instruments and risk exposures.

The main focus of Basel is capital adequacy. Throughout the years, regulators of bank capital have paid considerable attention to capital adequacy. Regulators expect high capital requirements to offer some form of protection to depositors in order to reduce overall risk-taking (Koch & MacDonald, 2003:463). Historically, bankers have preferred lower capital requirements, which increased financial leverage. Capital plays a significant role in the risk-return trade-off at banks (Koch & MacDonald, 2003:464). In order to combat instability of earnings, decrease unexpected growth opportunities and eliminate the probability of bank failures, higher capital requirements need to be in place. This can also reduce expected returns to shareholders, as equity is more expensive than debt.

The Asset and Liability Management Committee (ALCO) aims to determine the optimal capital level (Pieniazek, 2012:1). A well-managed ALCO meets on a regular basis (quarterly, monthly or weekly) to manage, for example, a financial firm's interest rate risk (IRR) and credit exposure. Many risk exposures are taken into account during these meetings. ALCO estimates a financial firm's risk exposure to its net interest margin and net worth ratios and develops appropriate strategies to keep the applicable risk exposure within set limits (Rose & Hudgins, 2010:217).

The central bank governors established the Basel Committee on Banking Supervision (BCBS) as the committee on banking regulations and supervisory practices. The BCBS was established at the end of 1974, after disturbances in international currency where banking markets started to receive attention. It provides a medium for regular cooperation between its member countries on banking supervisory matters.

2.1.1 Objective of the BCBS

The objective of the BCBS is to improve supervisory responsibilities and the quality of banking supervision worldwide. It seeks to do this in three principal ways, by exchanging information on national supervisory arrangements, by improving the effectiveness of techniques for supervising international banking business, and by setting minimum supervisory standards in areas where needed (BCBS, 2009:1). It is also imperative to keep in mind that the amendments made by the BCBS do not have any legal force on banks. If anything, the committee merely encourages banks' convergence towards common approaches and standards, without attempting detailed harmonisation of member countries' supervisory techniques (BCBS, 2009:1).

Banks regularly hold large portions of short-term liabilities that can be withdrawn immediately when public confidence falls. Failure to meet these short-term public liquidity needs may cause depositors to raise questions about the soundness of the bank (Kaufman, 2004:1). Therefore, maintaining an adequate capital reserve is essential for the daily operations of banks. This capital reserve predicament gave birth to the development of the BCBS, to put forward proposals. These proposals were initiated to close the gap in international supervision to ensure capital adequacy, and to level the playing field of internationally active banks. Numerous amendments to the Basel agreement on international capital standards have been made over the years, not only to improve them but also to adjust them to the infusion of new information.

Chapter 2 provides a background to the Basel accords. A detailed explanation, which outlines the motivation behind the introduction of the Basel accords, the reason why these accords need to function properly, and the manner in which these accords function, is provided in this chapter.

2.2 BASEL I (1988–2008)

The original Basel capital standards are known today as Basel I (Rose & Hudgins, 2010:488). All capital regulations proposed under Basel I in 1988 came into effect in December 1992 beginning 1993. Basel I, according to Rose and Hudgins (2010:499), focused primarily on credit risk inherent to bank balance-sheet assets, and among off-balance-sheet items (such as derivative contracts and credit commitments). The two main aims of the proposed Basel I were to eliminate

international competitiveness and to ensure banks have enough capital to absorb losses (Blundell-Wignall & Atkinson, 2010:2). Basel I also measured the market risk exposure from changing interest rates, and currency, with the later addition of commodity prices. Under the terms of Basel I, the various sources of capital were divided into tier 1 and tier 2. This agreement allowed a credit risk measurement framework, with a minimum capital standard of 8 percent by the end of 1992 beginning 1993, to be implemented (Jones, 2000:35). In 1994, the market risk amendment was established by using internal models (BCBS, 1999:29). Rules stipulated for market risk were more complex, as the regulations aimed at capturing the economics of market risk by taking advantage of all the information available on market parameters and prices. The international convergence of capital measurement and the capital standards document on Basel I, divided capital into two tiers, core capital and supplementary capital (Jones, 2000:36).

A significant challenge experienced by Basel I was to define capital for banks (BCBS, 1988:1). The committee, therefore, confirmed that at least half of a bank's capital base, for meeting the standard, must consist of a core element, comprised of equity capital, and published reserves from post-tax retained earnings.

2.2.1 Tier 1 capital

Tier 1 is a term used to describe the capital adequacy of a bank, which consists of core capital. This includes equity capital and disclosed reserves (Jones, 2000:36). Equity capital includes instruments that cannot be redeemed at the option of the holder. Tier 1 is essentially shareholders funds, which include minority interests, but with some deductions, divided by risk-weighted assets. Generally, preference share capital is included, subject to requirements that may differ between countries. Preference shares that are cumulative, redeemable, or on which the dividend payments are not discretionary, are excluded (Van Roy, 2005:5).

2.2.2 Tier 2 capital

The second part of the two-tier risk-based standard, generally used by regulatory agencies (such as a central bank), is to assess a financial institution's capital adequacy. Also known as supplemental capital, it includes subordinated debt, convertible securities, and a percentage of loan-loss reserves (Chami & Cosimano, 2003:2). Similar to tier 1, tier 2 also describes the capital adequacy of a bank. Tier 2 capital is secondary bank capital that includes items such as undisclosed reserves, general loss reserves, subordinated term debt, and more.

Basel I stipulated that banks should have a minimum tier 1 ratio of 4 percent, and a minimum total capital ratio of 8 percent. The combination of tier 1 and tier 2 should not exceed the total of 50 percent of total capital (Van Roy, 2005:6). Basel I, according to Rose and Hudgins (2010:489), stipulated that for a bank to qualify as adequately capitalised, to avoid capital risk it must have, amongst others, the following:

- Tier 1 ratio = tier 1 capital/risk-weighted assets ≥ 0.04 ;
- Total capital ratio = tier 1 capital and tier 2 capital/risk-weighted assets ≥ 0.08 ; and
- Tier 1 capital \geq tier 2 capital.

2.2.3 Risk-weighted assets

In its quest to obtain an adequate amount of regulatory capital, a bank must compare its tier 1 and tier 2 capital to its total risk-weighted assets (RWA). This will enable the bank to determine whether the amount of capital obtained is adequate (Latham & Watkins, 2011:5).

Basel considered that a weighted risk ratio in which capital relates to different categories of assets or off-balance-sheet exposure, weighted according to broad categories of relative riskiness, is the preferred method to assess the capital adequacy of banks (BCBS, 1988:8). To calculate the total weighted risk assets according to Smuts (2003:15), exposures are multiplied by their respective risk weighting and then summed. Off-balance-sheet items include unused commissions, standby credit agreements, and derivative contracts converted into credit equivalent exposure (CEEs) by multiplying them by the relevant credit conversion factors (Rose & Hudgins, 2010:141). Derivatives are converted to CEEs by marking them to market and then adding a prescribed percentage to the notional principal amount to allow for future volatility during the remaining life of the contract. In practice, a spreadsheet of differently weighted assets will always add up to a lower figure than their combined book value (Smuts, 2003:15).

This is not to say that other methods of capital measurement are not also useful, but are considered by the committee to be supplementary to the risk-weight approach. The committee believes that a risk ratio has the following advantages over the simpler gearing ratio approach (BCBS, 1988:8):

- It provides a fairer basis for making international comparisons between banking systems whose structures may differ;
- It allows off-balance-sheet exposures to be incorporated more easily into the measure; and
- It does not deter banks from holding liquid or other assets, which carry low risk.

This classification system grouped a bank's assets into five risk categories (Van Roy, 2005:6):

- 0 percent – cash, central bank and government debt and any organisation for economic corporation and development (OECD) government debt (bucket 1);
- 0 percent, 10 percent, 20 percent or 50 percent – public sector debt;
- 20 percent – development bank debt, OECD bank debt, OECD securities firm debt, non-OECD bank debt (under one year maturity) and non-OECD public sector debt, cash in collection (bucket 2);
- 50 percent – residential mortgages (bucket 3); and
- 100 percent – private sector debt, non-OECD bank debt (maturity over a year), real estate, plant and equipment, capital instruments issued at other banks (bucket 4).

$$RWA = 0*(\text{bucket 1}) + 0.2*(\text{bucket 2}) + 0.5*(\text{bucket 3}) + 1.0*(\text{bucket 4})$$

According to the BCBS (1988:8), there are inevitable broad-brush judgements when faced with the decision of which weight should apply to different types of assets. These weights should not be regarded as a substitute for commercial judgement for purposes of market pricing of the different instruments.

2.2.4 Categories of risk captured in Basel the framework

The banks' management need to guard against many different kinds of risks. For most banks credit risk is regarded as a major risk, however, there are many other kinds of risks – for example, investment-, interest rate-, exchange rate- and concentration risk. The central focus of this framework is credit risk, and as a further aspect of credit risk, country transfer risk. In addition, individual supervisory authorities have the discretion to build in certain other types of risk. Some countries, for example, will wish to retain a weighting for open foreign exchange positions, or for some aspects of investment risk. No standardisation has been attempted in the treatment of these other kinds of risk in the framework (BCBS, 1988:8).

The BCBS considered the desirability of seeking to incorporate additional weightings to reflect the investment risk in holdings of fixed rate government securities – one manifestation of interest rate risk, which is of course present across the whole range of a bank's activities, on and off the balance sheet. It was concluded that individual supervisory authorities should be free to apply either a zero or a low weight to claims on governments (for example 10 percent for all securities, or 10 percent for those maturing in less than one year, and 20 percent for one year and over) (BCBS, 1988:9).

All members agreed, however, that interest rate risk generally required further study and that if, in due course, further work made it possible, to develop a satisfactory method of measurement. Consideration should be given to applying some appropriate control alongside this credit risk framework; work is already underway to explore the possibilities in this regard (BCBS, 1988:9).

In addressing country transfer risk, the BCBS has been very conscious about the difficulty to devise a satisfactory method to incorporate country transfer risk into the framework of measurement. In its earlier consultative paper, two alternative approaches were put forward for consideration and comment. Firstly, there was a simple differentiation between claims on domestic institutions (central government, official sector and banks) and claims on all foreign countries; second, there was a differentiation on the basis of an approach which involved the selection of a defined group of countries considered to be of high credit standing (BCBS, 1988:10).

The comments, submitted to the BCBS by banks and banking associations in G-10 countries during the consultative period, were in favour of the second alternative. In support of this view, three particular arguments were represented to the committee. The first argument stressed that a simple domestic/foreign split effectively ignores the reality that transfer risk varies greatly between different countries. Since this risk is so significant, it is necessary to ensure that the system of measurement makes and captures broad distinctions between the credit standing of industrialised and non-industrialised countries. This system should be designed particularly for international banks (BCBS, 1988:10).

Second, it was argued that the domestic/foreign split does not reflect the global integration of financial markets, and international banks would be discouraged from holding securities

issued by central governments of major foreign countries as liquid cover against their Euro-currency liabilities. To that extent, a domestic/foreign approach would run counter to an important objective of the risk-weighting framework, namely that prudent liquidity management should be encouraged (BCBS, 1988:10).

The last argument, although regarded as the most important, emphasised that the member states of the European community are absolutely committed to the principle that all claims on banks, central governments, and the official sector within the European community countries should be treated in the same way. Where such a principle is placed in a system, there would be an undesirable asymmetry in the manner in which a domestic/foreign split was applied by the seven G-10 countries, which are members of the community, compared to the manner in which it was applied by the non-community countries (BCBS, 1988:10).

2.2.5 Claims on non-central-government, public sector entities (PSEs)

The BCBS concluded that it was not possible and favourable to settle on a single common weight that can be applied to all claims on domestic public-sector entities below the level of central government (for example states and local authorities) in view of the special character and varying creditworthiness of these entities in different member countries. The BCBS, therefore, opted to allow discretion to each national supervisory authority to determine the appropriate weighting factors for the PSEs within that country (BCBS, 1988:11).

To preserve a degree of convergence in the application of such discretion, the committee agreed that the weights ascribed in this way should be 0 percent, 10 percent, 20 percent or 50 percent for domestic PSEs. PSEs in foreign countries within the OECD should attract a standard 20 percent weight. These arrangements were reviewed by the BCBS in pursuit of further convergence towards common weights and consistent definitions in member countries, and in the light of decisions to be taken within the European community on the specification of a common solvency ratio for credit institutions (BCBS, 1988:11).

2.2.6 Collateral and guarantees

In an effort to reduce credit risk the framework emphasised the importance of collateral, however, only to a limited extent. In view of the varying practices among banks in different countries for taking collateral and different experiences of the stability of physical or

financial collateral values, it is impractical to develop a basis for recognising collateral generally in the weighting system (BCBS, 1988:12).

Limited recognition of collateral will apply only to loans secured against cash or against securities issued by OECD central governments and specified multilateral development banks. These will attract the weight given to the collateral (a zero or low weight). Loans partially collateralised by these assets will also attract the equivalent low weights on that part of the loan, which is fully collateralised (BCBS, 1988:12).

With regard to loans or other exposures guaranteed by third parties, the committee has agreed that loans guaranteed by OECD central governments, OECD public-sector entities, or OECD incorporated banks will attract the weight allocated to a direct claim on the guarantor (for example 20 percent in the case of banks). Non-OECD incorporated banks that guarantee loans will also be recognised by the application of a 20 percent weight, applicable only where the underlying transaction has a residual maturity not exceeding one year. The committee intends to monitor the application of this latter arrangement to ensure that it does not give rise to inappropriate weighting of commercial loans. In the case of loans covered by partial guarantees, only that part of the loan covered by the guarantee will attract the reduced weight. The contingent liability assumed by banks in respect of guarantees will attract a credit conversion factor of 100 percent (BCBS, 1988:12).

2.2.7 Loans secured on residential property

Loans fully secured by mortgage on occupied residential property have a very low record of loss in most countries. Recognition from the framework is obtained where the framework assigns a 50 percent weight to loans fully secured by mortgage on residential property, which is rented (or is intended to be) or occupied by the borrower. In applying the 50 percent weight, the supervisory authorities will satisfy themselves, according to their national arrangements for the provision of housing finance, that this concessionary weight is applied restrictively for residential purposes and in accordance with strict prudential criteria (BCBS, 1988:13).

This may indicate, for example, that in some member countries the 50 percent weight will only apply to first mortgages, which will create a first charge on the property; and that in other member countries it will only be applied where strict, legally-based, valuation rules

ensure a substantial margin of additional security over the amount of the loan. The 50 percent weight will not be applied to loans specifically to companies engaged in speculative residential building or property development. Other collateral will not be regarded as justifying the reduction of the weightings that would otherwise apply (BCBS, 1988:13).

2.2.8 Off-balance-sheet items

The BCBS believes that it is of importance to catch all off-balance-sheet activity within the capital adequacy framework. At the same time, it is recognised that there is only limited experience in assessing the risks in some of the activities. In addition, for some countries a complex analytical approach, and detailed and frequent reporting systems cannot easily be justified when the amounts of such business, particularly in the newer, more innovative instruments, are small (BCBS, 1988:14).

The approach agreed upon, which is on the same lines as that described in the committee's report on the supervisory treatment of off-balance-sheet exposures issued to banks in March 1986. This approach is comprehensive in that all categories of off-balance-sheet engagements, including recent innovations, will be converted to credit risk equivalents. This will be done by multiplying the nominal principal amounts by a credit conversion factor; the resulting amounts will then be weighted according to the nature of the counterparty. The different instruments and techniques are divided into five broad categories, within which member countries will have some limited discretion to allocate particular instruments according to their individual characteristics in national markets (BCBS, 1988:14):

- Those that substitute for loans (for example general guarantees of indebtedness, bank acceptance guarantees and standby letters of credit serving as financial guarantees for loans and securities) will carry a 100 percent credit risk conversion factor;
- Certain transaction-related contingencies (for example performance bonds, bid bonds, warranties and standby letters of credit related to particular transactions) will have a 50 percent credit risk conversion factor; and
- Short-term, self-liquidating trade-related contingent liabilities arising from the movement of goods (for example documentary credits collateralised by the underlying shipments) will have a 20 percent credit risk conversion factor.

2.2.3 Criticisms of Basel I

The Basel I accord has been criticised on several grounds. The main criticisms include (Bessis, 1998:218):

- Limited differentiation of credit risk – four broad risk weightings are identified (0 percent, 20 percent, 50 percent and 100 percent), based on an 8 percent minimum capital ratio;
- Static measure of default risk – default risk is not taken into account when it is assumed that a minimum 8 percent capital ratio is deemed sufficient;
- No recognition of term-structure of credit risk – the maturity of credit exposure is ignored when capital charges are at the same level;
- Simplified calculation of potential future counterparty risk – the current capital requirements ignore the different level of risks associated with different currencies and macroeconomic risk. In other words, it assumes a common market to all actors, which is not true in reality; and
- Lack of recognition of portfolio diversification effects – in reality, the sum of individual risk exposures is not the same as the risk reduction through portfolio diversification. Therefore, summing all risks might provide incorrect judgment of risk. A remedy would be to create an internal credit risk model, for example one similar to the model as developed by the bank to calculate market risk. This remark is also valid for all other weaknesses.

2.2.5 East Asian crisis

Radelet and Sachs (2000:105) stated that the East Asian growth started decreasing in 1997 and reached the lowest point in 1998. The biggest focus was on the international financial system, also taking into account the mismanagement of banking systems. This crisis that struck Asia is proof of international capital markets shortcomings', and the vulnerability of these markets in terms of market confidence reversals. The market was characterised by an increase of international lending followed by a sudden decrease and withdrawal of funds. Large amounts of foreign money flowed into the Asian financial system, which became sensitive to panics. According to Radelet and Sachs (2000:106), supported by Bustelo (1998:8), there was more to this crisis than just a bursting bubble.

Capital inflows supported a tremendous section of the Asian economic activity, which caused some hazard when the capital inflows were withdrawn from the financial system. Radelet and Sachs (2000:107) opine that there was a big portion of panic contributing towards the downfall. Panic from international investment communities, policy mistakes on behalf of Asian governments, and poorly designed and implemented rescue plans contributed towards the final downfall. Although there were imbalances between the microeconomic and macroeconomic levels of Asia, the imbalance was not big enough to cause a financial crisis. Panic was the most detrimental factor, which caused the East Asian crisis.

Financial panic occurs when there are multiple equilibria in financial markets. The Asian crisis was characterised by panic, the burst of a financial bubble and a disorderly workout. Panic is the result of when the opposite from expected equilibrium outcome is achieved (Radelet & Sachs, 2000:108). Usually panic exists when short-term assets exceed short-term debts, no existing lender of last resort, and no creditor is large enough to cover all short-term debt. On the other hand, a financial bubble is when speculators purchase financial assets above its market value and have the expectation of achieving even higher capital gains from it. A disorderly workout occurs when an illiquid creditor forces liquidation, even if the borrower is worth more. This occurs in the financial markets when there is no creditor coordination.

The preceding five reasons explain that panic and disorderly conduct was to blame for the Asian crisis (IMF, 1998:1; FRBSF, 1998:1):

- The Asian crisis was unanticipated;
- Large portions of lending to borrowers who were not protected by state guarantees;
- Seizing up of bank credits to viable enterprises;
- Markets reacted in a positive manner when alignment took place between creditors and debtors; and
- The result of the crisis was a sudden withdrawal of funds.

East Asia had no choice but to borrow foreign currency and lend money to its citizens in local currencies. The banks in Asia had to face foreign exchange risk due to Asia's currency depreciation. The borrowings were also made on a short-term basis and lent locally on a longer-term basis, leading to a run risk. Withdrawals of funds led to an increase in interest

rates and made liquidity scarce. Investors started to panic and withdrew their funds because of concerns surrounding profitability. Financial institutions in Asia experienced more underperforming loans and struggled to keep to the capital adequacy standards. FRBSF (1998:2) stated that policy misjudgements and mistakes aided towards the panic Asia experienced. According to Table 2.1, growth turned negative for South Africa (SA) in 1998 and the economy recovered from 1999 onwards.

Table 2.1: Economic growth rates for 1996-1999

Periods	Real gross domestic product (Real GDP)¹	Real gross national income (Real GNI)¹	Real gross domestic product per capita (Real GDP per capita)¹	Real gross national income per capita (Real GNI per capita)¹
1996	4.3	5.2	2.1	3.0
1997	2.6	2.3	0.5	0.2
1998	0.5	0.1	-1.6	-2.0
1999	2.4	1.4	0.2	-0.7

¹ Percentage changes in selected data at constant 2005 prices, compared with preceding period.

Source: SARB (2011)

Evident from the East Asian crisis, is that many shortcomings were exposed in the financial system during that time. The criticisms of Basel I led to the creation of a new Basel accord, known as Basel II, which added operational risk and defined new calculations for credit risk. Basel II was imposed in an attempt to reduce the financial instability in financial systems.

2.3 BASEL II AND BASEL II.V (2008 – PRESENT)

Before going into detail about Basel II it is important to first look at the need thereof, and this would include the discrepancies as put forward by Basel I. A comparison of the changing rules for international regulation of bank capital will be used to successfully compare the different features of the two capital accords.

In its rules, Basel I identified the principle types of capital acceptable to regulators, and was the first capital standard to account for risk exposure from off-balance-sheet transactions (Rose & Hudgins, 2010:499). Basel II provided greater sensitivity to innovation in the marketplace, which demanded more flexible capital rules than Basel I allowed. Basel II, according to Rose and Hudgins (2010:499), also recognised that different banks have different exposures to risk (this would be the beta (β) value which explains a banks' risk exposure taking into account all the variables necessary). Banks therefore may employ different measures to their own risk exposures. This means that other banks may be subject to different capital requirements.

Basel II identified Basel I's discrepancies, and in attempting to rectify the deficiencies in Basel I, broadened the types of risks considered, and established minimum capital requirement

for credit-, market-, and operational risks. For this reason, Elizalde (2007:12) opine that it is regarded as substantially more risk sensitive than Basel I. Basel II also requires each bank to develop in-house risk management models and stress tests for assessing risk exposure under a variety of different marketplace scenarios. Each bank should determine its own capital requirement based on its own calculated risk exposure, but still need to be coordinated with the requirement as proposed by Basel, and the reserve requirements as proposed by the South African Reserve Bank (SARB). This is unlike Basel I that applied the same minimum capital requirements to all banks (including a 4 percent minimum ratio of tier 1 capital and an 8 percent minimum of tier 2 capital, to risk weighted assets). Finally, as will be seen on the third Pillar of Basel II, public disclosure plays a huge role.

Basel II is a set of minimum standards to which banks are required to comply. The objective of Basel II is to strengthen the safety and soundness of individual banks, thereby enhancing the safety and soundness of the banking- and broader financial system to the benefit of the economy. Basel II represents a major adjustment of the international standard on bank capital adequacy that was introduced in 1988 (Basel I), and has an alternative goal to improve financial stability in the global economy. It aligns the capital measurement framework with sound current practices in banking, and promotes improvements in risk management (The Banking Association South Africa, 2005:1).

Smit (2009:13) stated that Basel II is a framework that is well known for its risk-sensitive and comprehensive coverage of banking risks. The regulation of a bank's capital is the prime focus of bank risk managers under Basel II (Smit, 2009:1). The three main role-players in the process of global regulations are the Bank for International Settlement (BIS), the Basel Committee for Banking Supervision and the document of the International Convergence of Capital Measurement and Capital standards (Basel accord). Due to controversy over regulatory supervision of international banks, the Basel accord was established, pioneered by the BCBS.

One important objective of the BCBS has been to close gaps in international supervisory coverage in pursuit of two basic principles (BCBS, 2006:16):

- No foreign banking establishment should escape supervision; and
- Supervision should be adequate.

2.3.1 Basel II: New Basel Capital Accord

In 2007, Basel II was implemented with rules to make market risk capital charges more risk-sensitive, recognising the various forms of credit risk mitigation, and adding capital requirements to operational risk (Bessis, 2010:233).

According to Rose and Hudgins, (2008:493) Basel II sets up a system where the capital requirements are more sensitive to risk, and where it offers a wider range of protection against various forms of risks. Elizalde (2007:2) argues that reliance was placed on the Basel II approach to determine the minimum capital requirements based on risk-measurement techniques. It was argued that if this could be achieved, instability in the global financial system could be reduced. Basel II is applied to internationally active banks, which will ensure that the integrity of capital in banks are kept on a high level by eliminating double gearing (double counting) (BCBS, 2003:1).

Features of the Basel II (BCBS, 2003:1; Rose & Hudgins, 2008:495; and Smit, 2009:13) include:

- The application of this new accord will capture the risk of the whole banking group;
- Basel II recognise that banks have different risk exposures and thus apply different methods;
- A requirement of each bank to develop their own in-house risk management models to assess risk exposure where applicable;
- Each bank is required to calculate their own risk exposure in order to determine its capital requirements;
- Basel II is applied to all internationally active banks at every tier applicable to the banking group;
- The main objective of supervision is to protect the depositors by ensuring that banks are adequately capitalised on a stand-alone basis;
- All financial activities conducted within a group are captured through consolidation;
- Capital charges of Basel II are focused on the quality of assets and banks are given the opportunity to select from a list of acceptable approaches;
- Basel II is an improved measure for aligning risk and capital requirements more effectively; thus, Basel II has a more complex set of financial regulation frameworks; and
- Basel II has a three-pillar approach to capital adequacy.

2.3.2 The three Pillars of Basel II

Saurina (2008:30) opines that hope was placed on Basel II to calculate the minimum capital requirements based upon advanced risk-measurement techniques to reduce the instabilities in the global financial system. Basel II provides a three-pillar approach to capital adequacy. Pillar 1 incorporates the minimum capital requirements, Pillar 2 is about the supervisory review process, and Pillar 3 about market discipline (Bessis, 2010:233).

2.3.2.1 Pillar 1: Minimum capital requirements

The first key aspect of Basel II is the minimum capital requirements for banks, which is based on the estimation of their credit-, market- and operational risk exposure (BCBS, 2003:6). This key aspect of Basel II focuses on the calculation of the total minimum capital requirements of credit-, operational-, and market risk (Saurina, 2008:30-32). A bank is required to maintain minimum capital against credit-, market-, and operational risk exposures (The Banking Association South Africa, 2005:2). The minimum capital requirements, as explained by Pillar 1 according to BCBS (2003:6), comprise three fundamental elements – a definition of regulatory capital, risk-weighted assets, and the minimum ratio of capital to risk-weighted assets.

The minimum capital requirements comprise three fundamental elements (BCBS, 2003:6):

- A definition of regulatory capital;
- Risk weighted assets; and
- The minimum ratio of capital to risk weighted assets.

The calculation of the capital ratio, according to BCBS (2003:7), is when the RWA is determined by multiplying 12.5 with the capital requirements for market and operational risk. Then the resulting figures should be added to the sum of risk-weighted assets for credit risk. In this calculation, the numerator will be the regulatory capital. Regulatory capital will stay the same as stipulated in the 1988 Basel accord. The ratio must not be lower than 8 percent for total capital, and tier 2 capital will still be limited to 100 percent of tier 1 capital.

2.3.2.1.1 Credit risk

Credit risk is defined as the probability that some of the financial institution's assets, especially its loans, will decline in value and perhaps become worthless. Credit risk is a combination of default-, downgrade- and credit spread risk (Marx, 2013:209). Credit risk is associated with the quality of individual assets and the likelihood of default from the obligor (counterparty, issuer, and borrower) as stated by Koen and Fermor (2002:18). Whenever a bank acquires earning assets, it assumes the risk that the borrower will default, that is, not repay the principle and interest on a timely basis (Koch & Macdonald, 2003:119). Credit risk is, therefore, the potential variation in net income and market value of equity resulting from this non-payment or delayed payment.

Three approaches are used in order to deal with credit risk (BCBS, 2003:6) & (Smit, 2010:19):

- The standardised approach (SA);
- Foundation internal ratings-based approach (FIRB); and
- The advanced internal ratings-based approach.

Credit risk: Standardised approach

The standardised approach (SA) has been refined since Basel I, and therefore, has an increased number of risk buckets. Loans are classified according to their inherent risk by banks. All loans with similar risks are classified into a bucket. The Basel II SA is more risk sensitive and uses external rating agencies' counterparty ratings as assistance to determine risks. The SA relies completely on external ratings, which provide a more accurate differentiation of risks.

Banks use the assessments prepared by certain External Credit Assessment Institution (ECAI) to determine the risk weight attached to relevant credit exposures. The ECAI is required to satisfy the following criteria (BCBS, 2003:14-15):

- Objectivity – The methodology for assigning credit assessments must be appropriate, systematic, and conform to some form of validation based on historical experience. Moreover, assessments must be subject to on-going review and responsive to changes in financial conditions.

- Independence – An ECAI should be independent and should not be subject to political or economic pressures that may cause variations on ratings. The assessment process should be as free as possible from any constraint that could arise in situations where the composition of the board of directors or the shareholder structure of the assessment institution may be seen as creating a conflict of interest.
- International access or transparency – Individual assessment should be available to both domestic and foreign institutions who indicate legitimate interests at equivalent terms. In addition, the general methodology used by the ECAI should be publicly available.
- Disclosure – An ECAI should disclose information about its assessment methodologies, including the definition of default, the time horizon, and the meaning of each rating, the actual default rates experienced in each assessment category, and the transitions of the assessments, for example the likelihood of AA ratings becoming A over time.
- Resources – An ECAI should contain sufficient resources to deliver high quality credit assessments. These resources should allow for substantial on-going contact with senior and operational levels within the entities assessed in order to add value to the credit assessments. Such assessments should be based on methodologies combining qualitative and quantitative approaches.
- Credibility – The reliance on an ECAI's external credit assessments by independent parties (investors, insurers, trading partners) is evidence of the credibility of the assessments of an ECAI. The credibility of an ECAI is also underpinned by the existence of internal procedures to prevent the misuse of confidential information.

Credit risk: Foundation internal ratings-based approach

The foundation internal ratings based (FIRB) approach allows banks to use their own internal estimates as inputs to calculate the amount of capital needed. The methodology to calculate the capital requirements given by Basel II consists of four inputs, the probability of clients default (PD), the loss given default (LGD), the exposure at default (EAD), and the effective maturity (M).

Credit risk: Advanced internal ratings-based approach

This component of the new accord defines the internal ratings-based approach to credit risk. Banks are subject to certain minimum conditions and disclosure requirements, and may make use of their own internal estimates of risk components for a given exposure. The advanced

internal ratings-based approach allows banks to use their own internally-modelled measures for the PD, LGD and EAD inputs (Smit, 2010:51).

2.3.2.1.2 Operational risk

The BCBS (2003:120) defines operational risk as “the risk of loss resulting from inadequate or failed internal processes, people and systems or from external events”. This definition includes legal risk.

There are three methods for calculating operational risk (BCBS, 2003:120):

- The basic indicator approach (BIA);
- The standardised approach (SA); and
- The advance measurement approach (AMA).

Operational risk: The basic indicator approach

The aim of this approach is for banks to hold capital for operational risk that is equal to a specified fixed percentage of average annual gross income over the previous three years. The advantage of this approach is that there are no prerequisites for the use of this method. It is a default approach aimed at smaller local banks.

Operational risk: The standardised approach

The SA takes into consideration the possibility that operational risks arise in different business lines, which each have different characteristics and risk profiles. Eight business lines in banks, each with an assigned business line-specific risk weight, are identified under the SA. The eight business lines are: corporate finance, trading and sales, retail banking, commercial banking, payment and settlement, agency services, asset management and retail brokerage (BCBS, 2003:122). Smit (2010:52) states that the total capital charge under the standardised approach is equal to the average of the simple summation of regulatory capital charges across each business line in each year.

Operational risk: The advanced measurement approach

The AMA allows banks to input more into the process of calculating capital charges for operational risk (Smit, 2010:53). The capital charge is based on internally developed models. The internal models are based on internal loss experienced, scenario analysis and historical

experiences of other banks. In order for banks to qualify for the AMA, regulators need to be satisfied by the banks' ability to meet the quantitative- and qualitative criteria.

2.3.2.1.3 Market risk

Market risk is the possibility arising that the value of an investment may decline due to economic events (Gitman, 2010:208). Market risk is composed of interest rate- and price risk. Price risk arises when the market interest rates rise, and simultaneously the market values of bonds and fixed-rate loans fall. Interest rate risk is the risk of earnings rising from interest rates, for example when interest rates decrease, the earnings on that interest simultaneously decrease.

2.3.2.2 Pillar 2: Supervisory review

Supervisory review will be conducted to ensure that banks take note of the importance of assessing their adequate capital levels in relation to their risks. Supervisors can then respond to these assessments (Young, 2006:19). A supervisor should also address areas such as securitisation, credit concentration risk, residual risk and operational risk. Local regulators will intervene if a bank's risk is greater than the capital held.

The BCBS (2003:138) argues that supervisory review is important because it ensures that banks have adequate capital to support all risks, and encourages banks to improve their risk management techniques. Supervisory review recognises the responsibility of banks to develop internal capital assessment processes and setting capital targets, which is in alignment with a bank's risk profile. Supervisors are allowed to intervene at any stage to ensure that capital needs are relative to risks.

There are four key principles of supervisory review, which include (BCBS, 2003:139):

- Banks must have a process in place to assess their overall capital adequacy in relation to their risk profile, and need to obtain strategies to maintain capital levels;
- Action should be taken by supervisors if they are not happy with the results of the internal capital adequacy assessments and strategies;
- Supervisors will have the expectation that banks will operate above the minimum regulatory capital ratios and may require banks to hold excess capital to the minimum level; and

- Supervisors should intervene when capital falls below the minimum level and action should be taken if capital is not maintained.

2.3.2.3 Pillar 3: Greater public disclosure

According to Young (2006:20), greater public disclosure of a bank's true financial conditions allows the market discipline to force banks to lower their high-risk exposure. The Basel Committee encourages market discipline by establishing a set of disclosure requirements of which the market participants can access key information. For safety reasons, supervisors can ask banks to disclose information, and to provide information at any time. Information can also be reported on a regular basis, which can be made publicly available (BCBS, 2003:154).

Aims of Pillar 3

The five main aims of Pillar 3 include (Smit, 2010:67):

- Complementing the functioning of Pillar 1 and Pillar 2;
- Market transparency which allows key information to be publicly available;
- Allowing all market participants to access the key information;
- Aiming to improve the quality and quantity of the information provided in order for investors to make more accurate decisions; and
- Enhancing financial stability.

2.3.3 2007–2009 financial crisis

It is compulsory for all banks to comply with Basel II, as it aims to stabilise global financial systems and stipulate measures to reduce risks. Basel II failed when the 2007–2009 financial crisis struck, as the world experienced financial instability.

According to Mohr (2010:114), South Africa was faced with mostly positive growth up to 2008. As can be derived from Table 2.2, South Africa experienced positive economic growth rates in 2007 by looking at the four measurements of economic growth. In 2008 the real GDP, real GNI, real GDP per capita, and real GNI per capita declined, and the real GDP, real GDP per capita, and real GNI per capita turned negative in 2009. According to Mohr (2010:114), South Africa experienced a period where uncertainty arose regarding the upswing of the business cycle. This was due to a financial crisis that spilled over to the South

African economy and led to a recession. This global economic crisis was called the sub-prime mortgage crisis.

Table 2.2: Economic growth rates for 2007–2009

Periods	Real gross domestic product (Real GDP)¹	Real gross national income (Real GNI)¹	Real gross domestic product per capita (Real GDP per capita)¹	Real gross national income per capita (Real GNI per capita)¹
2007	5.5	4.7	4.3	3.4
2008	3.6	4.1	2.4	2.9
2009	-1.5	0.7	-2.6	-0.4

¹ Percentage changes in selected data at constant 2005 prices. Compared with preceding period.

Source: SARB (2011)

The efficiency of markets received blame for this crisis due to the expansion of lending. During periods of high economic growth, low inflation and low interest rates, certain new financial instruments were designed and implemented to contribute towards the growth of lending. The biggest problem was that the risk of excessive credit was shifted to third parties. The faith that markets were efficient at that point in time and that it was impossible for the United States of America (USA) housing bubble to burst, led to many questions regarding the efficient market hypothesis. According to Mohr (2010:114), the efficient market hypothesis (EMH) states that all assets are priced correctly and that no bubble would burst.

Van Zyl *et al.* (2009:21) defines an efficient market as, “a market where there are a large number of rational profit maximizers actively competing, with each trying to predict future market values of individual securities, and where important current information is freely available to all participants.” Three forms of the EMH exist, namely the weak form, semi-strong form and the strong form. Under the weak form, all data of market prices in the past reflect in the current prices. In the semi-strong form, the current prices incorporate all information disclosed publicly. The strong forms current prices are composed of all publicly disclosed information and insider information.

According to Mohr (2010:115), the EMH were proven inefficient when taking into account that the bubble eventually burst. The prices of property increased tremendously in the USA, with the support provided by mortgage lending. Once the market satisfied the most credit-

worthy borrowers' needs in terms of loans, the financial market turned to the less credit-worthy borrowers. These less credit-worthy borrowers could not meet the basic credit standards according to the rules and regulations followed by financial institutions. Loans to the value of \$600bn were granted to USA borrowers without specifying and validating their monthly incomes. Bianco (2008:14) stated that all risky loans were grouped together and the risk was transferred to third parties and the rest of the world. Later, during 2007 and at the beginning of 2008, the property prices started to decline and hence, the house prices dropped below the mortgage amounts. Default on loan repayments came to the forefront and the financial sectors were under pressure, not only in the USA, but also in the rest of the world. Treanor (2013:1) states that trust was eroded between financial institutions and clients, which led to spending and consumption to decrease.

According to Feldstein (2008:25), six causes contributed towards the 2007–2009 financial instability:

- Low interest rates contributed towards the housing boom;
- Inadequacy occurred in terms of supervision with regard to banks, also inadequate supervision of asset quality and a lack of attention towards capital adequacy;
- Poor credit ratings on behalf of rating agencies, *inter alia* Moody's;
- Government legislation motivated ownership of houses on behalf of low income households;
- Due to excessive securitisation of mortgages no renegotiations were possible between lenders and borrowers; and
- Compensation systems led to encouragement of taking high risks.

Because South Africa incorporated and implemented the Credit Act in June 2007, the impact of the sub-prime crisis was not that harsh. It is, however, important to keep in mind that South Africa could not escape from the consequences in the real economy caused by the sub-prime crisis. The full effects of the sub-prime crisis struck South Africa during 2008 (Mohr, 2010:115). The major contributor to the decline in economic growth in South Africa was the lower demand for commodities; this contributed to the decrease in growth experienced during the period of 2007–2009 in South Africa.

2.3.4 Basel II.V

The BCBS increased the capital charges on banks because of the 2007–2009 sub-prime crisis. S&P (2012:3) highlighted the focus points of Basel II.V:

- A stressed value at risk model (SVaR), which contributes to the VaR-based capital requirements stipulated in Basel II;
- Incremental risk charge (IRC) focuses on default and credit movement risks;
- Securitisation and re-securitisation received new standardised charges; and
- A comprehensive risk measure (CRM) for correlating trading positions.

A prevailing gap in Basel II.V is the fact that certain risks, for example interest rate risk in the banking book, were not addressed properly. The effect of this unaddressed risk is that Pillar 1's regulatory capital charges have not been calculated correctly. With the use of internal models under Basel II and Basel II.V for market risk frameworks, various financial institutions would treat the same risk in different ways, and it led to inconsistencies (S&P, 2012:4). An overlapping factor of double-counting featured in some of the same risks.

2.4 BASEL III (2011–2018)

According to Walter (2010:1), Basel III promotes a higher level of financial stability. Basel III is not a new accord, but it fulfils the shortcomings identified in Basel II. Banking crises are associated with deeper economic and financial downturns than realised. Walter (2010:1) explains the reason for this as banks being the centre point of financial intermediation. Banks motivate savings, make loans available to clients, ensure liquidity, and provide payment services.

Most blame for the 2007-2009 financial crisis was placed on excess liquidity, which led to too much credit. Walter (2010:1) stresses the fact that the banking sector became vulnerable to the build-up of risk in the system. This vulnerability was due to excess leverage, too little capital and inadequate liquidity buffers. In addition, there was the financial institutions' trust that they were too large to fail, combined with pro-cyclical deleveraging process. Major shortcomings identified by Walter (2010:3) were risk management, corporate governance, market transparency, and the quality of supervision.

BCBS (2010:1) stated that pro-cyclicality should be addressed according to a set of objectives:

- Decrease excess cyclicality of the minimum capital requirement;
- Promote forward looking provisions;
- Conserve capital to build buffers that can be used in periods of stress; and
- Achieve the broader macro prudential goal of protecting financial institutions from excess credit growth.

2.4.1 Pillar 1: Minimum capital requirements

According to BCBS (2010:15), capital buffers were introduced in an attempt to reduce pro-cyclicality.

2.4.1.1 Minimum common equity and tier 1 capital requirements

Morrison and Foerster (2010:1) clearly set out the minimum common equity and tier 1 capital, which is also illustrated by Figure 2.1, according to the Basel Committee:

- The minimum requirement for common equity, the highest form of loss-absorbing capital, will be raised from the current 2 percent to 4.5 percent of total RWAs;
- The overall tier 1 capital requirement, comprising not only common equity but also other qualifying financial instruments, will increase from the current minimum of 4 percent to 6 percent; and
- There will be no change to the minimum total capital requirement, which will remain at the current 8 percent level.

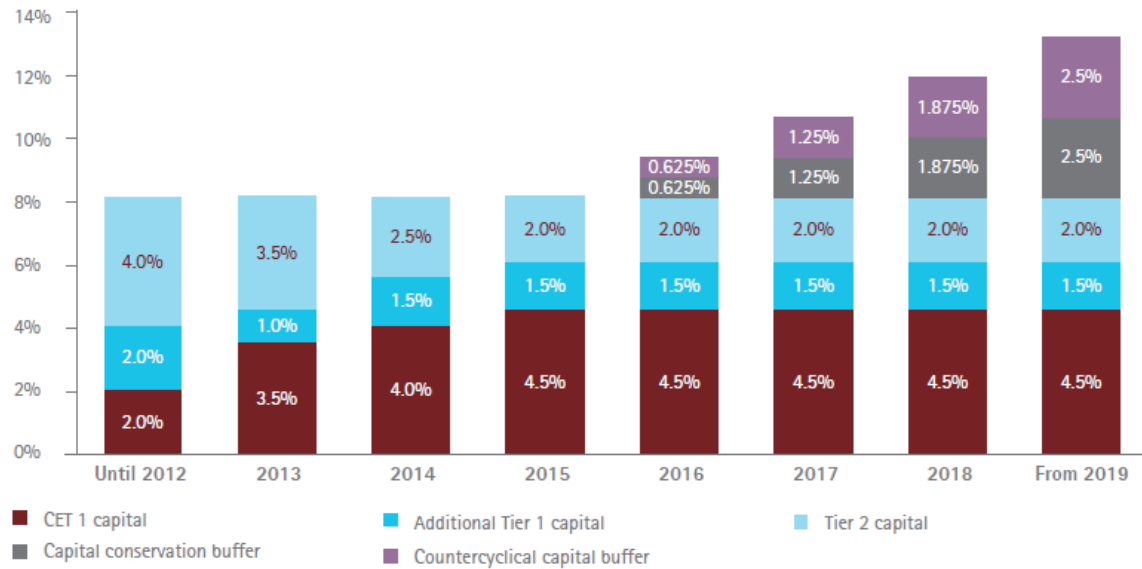


Figure 2.1: Minimum capital requirements

Source: Accenture (2012)

2.4.1.2 Capital conservation buffer

In addition to the minimum capital requirements, it will be mandatory for banks in the implementation of Basel III to hold a capital conservation buffer of 2.5 percent (Figure 2.2) (Morrison & Foerster, 2010:1). This buffer will be handy in stressful events in that it may be used to absorb losses during periods of financial and economic stress. A bank is not required to hold anything less than 2.5 percent, if this is the case, the bank will find itself subject to constraints on the payment of dividends and discretionary bonuses, until the buffer is replenished (Morrison & Foerster, 2010:1). Common equity must fund this buffer after application of deductions. This effectively mandates a minimum core tier 1 capital ratio of 7 percent (4.5 percent minimum requirement for equity plus 2.5 percent capital conservation buffer). Walter (2010:2) mentions that when capital falls below the requirement of 2.5 percent, it is the responsibility of supervisors to cut back on bonuses and distributions. In addition, the problem should be addressed before the relevant crisis, which is known as market pressure that keeps on paying out dividends. Thus, capital can be conserved during a downturn of the economic cycle and rebuilt during an upswing.

2.4.1.3 Countercyclical buffer

A requirement to maintain a countercyclical buffer in the range of 0 percent to 2.5 percent, consisting of common equity or other fully loss-absorbing capital, will be phased in, in order to protect the banking sector from periods of “excess aggregate credit growth”, by effectively extending the required amount of the capital conservation buffer to counter a system-wide build-

up of risk resulting from such credit growth (Morrison & Foerster, 2010:2). The aim of a countercyclical buffer is to protect financial systems against excess credit growth (Walter, 2010:1).

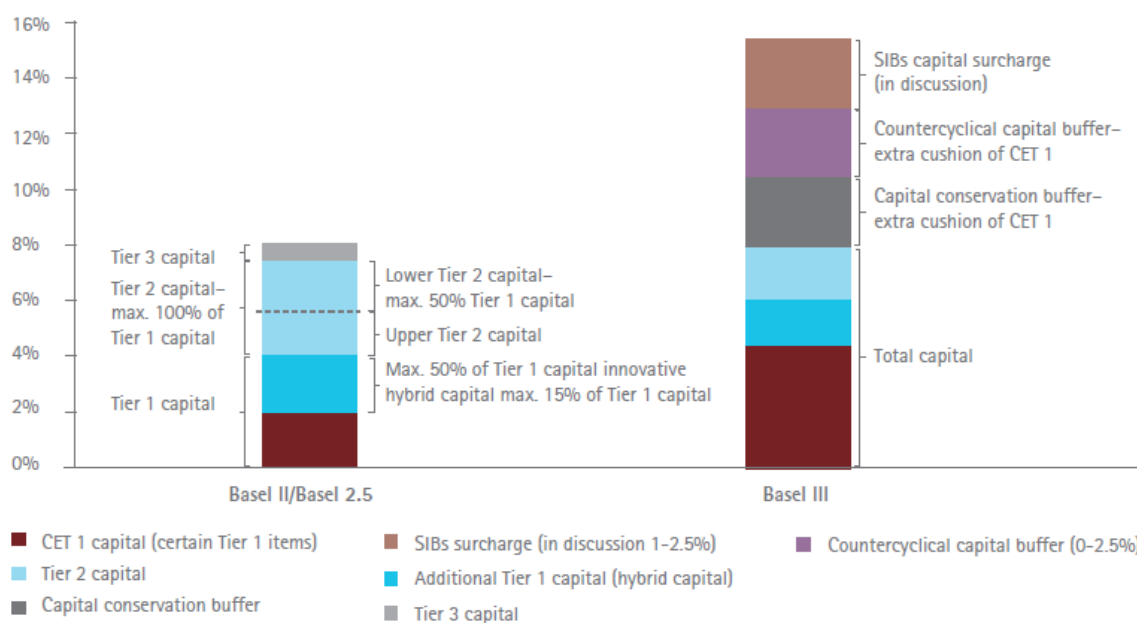


Figure 2.2: Comparing Basel II/II.V and Basel III

Source: Accenture (2012)

2.4.1.4 Leverage ratio

As a backstop to these risk-based measures, a non-risk-based leverage ratio, according to Morrison and Foerster (2010:2), will also be introduced in 2018. Currently, the proposal is that a minimum tier 1 leverage ratio of 3 percent be tested during a parallel run period, and then subjected to an appropriate review and calibration process before migrating to Pillar 1 treatment. BCBS (2010:1) emphasised the fact the function of leveraged ratios is to constrain excessive risk taking and serve as backstop for the risk-based capital measure.

2.4.1.5 Systemically important banks

The BCBS intends that systemically important banks should have loss-absorbing capacity beyond these minimum standards. The Financial Stability Board (FSB) and the BCBS are carrying out work on this issue to develop an integrated approach, which may include a combination of capital surcharges, contingent capital and bail-in debt. In addition, work is continuing to strengthen resolution regimes and the loss-absorbency of non-common tier 1 and tier 2 capital instruments (Accenture, 2012:14).

2.4.2 Pillar 2: Supervisory review

In July 2009, the Basel Committee conducted an evaluation of the Pillar 2 supervisory review process to address several notable weaknesses revealed in bank risk management processes during the financial crisis. The areas addressed include (BCBS, 2010:6):

- Firm-wide governance and risk management;
- Capturing the risk of off-balance-sheet exposures and securitisation activities;
- Managing risk concentrations;
- Providing incentives for banks to improve management of risk and returns over the long term; and
- Sound compensation practices.

Walter (2010:4) claimed that the committee has strengthened the supervisory review process, and some other areas received attention such as corporate governance, risk aggregation and stress testing.

2.4.3 Pillar 3: Greater public disclosure

Transparency requirements of Pillar 3 increased in order to handle more complex capital market activities (Walter, 2010:4). BCBS (2010:14) stated the Basel Committee agreed to revise Pillar 3 requirements with regard to securitisation exposures and off-balance-sheet sponsored vehicles. Insufficient information, regarding the components of capital, makes it difficult to do comparisons with other banks. To improve transparency and market discipline, the committee requests banks to disclose all elements of the regulatory capital base, deductions applied, and full reconciliation to financial accounts.

The Basel Committee and the FSB developed a proposal for Pillar 3 – disclosure requirements for remuneration. The aim is to ensure that banks disclose understandable, comprehensive and timely information regarding remuneration practices. The goal is to promote more effective market discipline.

2.4.3.1 Other focus areas of Basel III

The Basel Committee is also conducting work in other areas, namely (BCBS, 2010:8):

- The trading book is being reviewed;
- Analysing external ratings in the securitisation capital framework;

- Policy response to systematically important banks;
- Treatments on large exposures;
- Increase cross border banking resolution;
- Reviews on Core Principles for Effective Banking and Supervision to analyse the lessons from the crisis; and
- Ensuring standards are implemented and more effective collaboration among supervisors.

Basel III is not conducted as the perfect regulatory framework for the financial systems all over the world and therefore needs some amendments. Areas that will receive some attention are the trading book boundary, moving from a value at risk measure to expected shortfall, models-based approach and standardised approach should be revised, better treatment of credit, and improvements on hedging and diversification. Basel III should be adjusted with these amendments (called Basel IV) and be introduced to the financial sectors in order to eliminate the gaps found in Basel III (BCBS, 2012:3).

These weaknesses of Basel III can be classified into three main points (BCBS, 2012:8):

- Regulatory capital framework, especially instruments in the framework exposed to credit risk in the trading book;
- Risk measurement methodologies; and
- The valuation framework.

2.5 CONCLUSION

The Basel I accord aimed to assess capital in relation to credit risk, or the risk that a loss will occur if a party does not fulfil its obligations. It launched the trend toward increasing risk-modelling research. However, its over-simplified calculations, and classifications have simultaneously called for its disappearance, paving the way for the Basel II accord. Further agreements needed to refine risk and capital. Nevertheless, Basel I, as the first international instrument assessing the importance of risk in relation to capital, will remain a milestone in the finance and banking history. Basel III provides financial institutions with a whole shift to a new level of how banking regulation and supervision will be conducted.

CHAPTER 3: BASEL ACCORDS AND CAPITAL LEVELS

3.1 INTRODUCTION

The aim of risk regulations is to prevent failures of financial institutions by imposing minimum standards that are risk driven in relation to the capital base (Bessis, 2010:8). Capital is regulated for two main reasons in the financial world. The first is to protect customers from the misuse of better-informed financial institutions, and the second is to minimise systemic risks (Saidenberg & Scheuermann, 2003:2). Basel created a set of minimum capital standards to which internationally active banks should comply in order to reduce systemic risk. Regulatory capital is the minimum capital required by the regulator (Elizalde & Repullo, 2006:1). Minimum capital levels are imposed on a bank to ensure the bank will be in a position to repay the customer, and to ensure that managers of financial institutions do not engage in fraudulent activities. Basel I relied on a ratio called the Cooke ratio, which specified that the capital charge for lending should be 8 percent of risk-weighted assets (RWA) (Bessis, 2010:9). The minimum required capital level was set at 8 percent of risk-adjusted assets, which lead to the focus of Basel II. The Basel II capital accord aimed to improve the alignment between regulatory capital and risk through focus on systemic risk.

The formulas for operational-, credit- and market risk were expanded from Basel I to Basel III to be more effective to calculate regulatory capital. Basel I, which was introduced into the financial systems in 1988, made no provision for operational risk. Basel I was based on a simple framework of only a few risk buckets for sovereigns, banks, corporates and mortgages (IMF, 2012:6). Basel II on the other hand had attempted to improve the risk sensitivity of capital requirements. Basel II improved the method for calculating the minimum capital requirements for credit-, and market risk, and made provision for operational risk. Basel IV proposes to incorporate the expected shortfall approach in order to calculate regulatory capital for market risk (BCBS, 2012:3).

3.2 BASEL ACCORDS

3.2.1 Basel I (1988–2008)

Basel I was introduced into the financial markets in 1988 in order to strengthen banking practices, risk management techniques, supervisory approaches and financial markets (Benzin *et al.*, 2005:1). Banks were required to hold at least 8 percent of a basket of various

assets measured in terms of their riskiness. Capital was defined in two tiers (Benzin *et al.*, 2005:2):

- Tier 1: Shareholders equity and retained earnings; and
- Tier 2: Additional internal and external resources to banks' availability.

RWA can be described as the amount of capital at risk, subject to losses, and is weighted by a coefficient that varies between 0 percent and 100 percent. The idea was that the values match the proxies of the possibility of unexpected credit losses, while the diversification of lending portfolios was considered (Bessis, 2010:9). Amendments were made to the original Basel document, and the amendments focused on market risk. The value at risk (VaR) was a popular measure of market risk as it measures the possible losses in a single figure. Latham and Watkins (2011:8) claim that capital could have been reduced significantly with almost no transfer risk under Basel I. Basel I did not make any provisions for operational risk as it only phased-in in 2008.

Under Basel I the capital requirements was calculated as (KPMG, 2003:21):

Total capital / credit risk + market risk = The bank's capital ratio (minimum 8 percent)

(Equation 1)

3.2.1.1 Operational risk

Operational risk only came into effect in 2008 (KPMG, 2003:6).

3.2.1.2 Market risk

In 1994, some amendments were made to Basel I, including the market risk amendment (Bessis, 2010:225). Bank regulators introduced and used VaR in order to calculate the total capital needed to compensate the risks bearing. VaR is measured by using one of the following three techniques, Monte Carlo, variance-covariance and historical simulation (Hull, 2012:471). Monte Carlo simulations generate future value sets selected randomly of an economic factor and of specific risk. The assets' value is derived directly from the economic factor and specific risk (Bessis, 2010:608). The variance-covariance approach is an analytical estimate of the return of assets and the correlation between asset price movements (Market Timing, 2012:1). A multivariate normal distribution exists for the underlying market factors.

Banks mainly use the historical measure of VaR, and it is based on past data to determine what is going to happen in the future. Only a few assumptions need to be made about the

statistical distributions of underlying market factors (Linsmeier & Pearson, 1996:6). Basel I was amended in 1996, when it was stated that banks should hold capital back for market risk. In the trading book (composed out of stocks, bonds, swaps, and options etcetera) VaR was calculated by using i (trading days) = 10 and X (confidence level) = 99 percent. The focus was on the revaluation loss over 10 days that was expected to exceed only 1 percent of the time. In order to calculate the capital required to hold back the multiplier (k), where k can be anything between three and four, it must be multiplied with the 60-day average VaR. Basel developed a framework in order to perform daily back testing on VaR, see Table 3.1.

Exceptions between zero and four are acceptable in the green zone, and any exception higher than five falls into the yellow and red zone. The market capital charge is expressed as a multiplier of the 10-day VaR at the 99 percent confidence level. The multiplier is set at a minimum of three and can be increased to four, and the multiplier can be increased by the factors explained in Table 3.1 (Chang *et al.*, 2011:5).

Table 3.1: Penalty zones

Zone	Number of exceptions	Potential increase in k
Green	0 – 4	0.00
Yellow	5	0.40
	6	0.50
	7	0.65
	8	0.75
	9	0.85
Red	≥ 10	1.00

Source: Chang *et al.* (2011)

General market risk incorporated interest rate, commodity, equity, FX and credit spread risks where specific risk (SR) incorporated event and peculiar risks (Ernst & Young, 2012:2).

$$MRC = \max\left(k \cdot \sum_{i=1}^{60} \frac{VaR_i}{60}, VaR_{i-1}\right) + SR \quad \text{(Equation 2)}$$

Where

$i = 10$ days

k = multiplier

SR = specific risk

3.2.1.3 Credit risk

The Basel accord required banks to keep regulatory capital for credit risk. Credit risk exists due to counterparties that default on payments on banking assets and the risk of loss (Benzin *et al.*, 2005:2). Steps were taken in order to measure these risks and an approach developed to classify assets into four bucket lists. Requirements were placed upon banks to hold at least 50 percent of capital in the tier 1 form (Bessis, 2010:227). Tier 1 capital was constrained by a minimum of 3 percent of total assets. Weights were placed onto categories of capital measured in terms of quality in the credit standing. It became apparent that some assets had no capital requirements, while other do have capital requirements. The four categories of each bucket list are represented in Figure 3.1 (Bessis, 2010:237):

- Claims on the Organisation of Economic Co-ordination and Development (OECD) governments have a 0 percent risk weight;
- Claims on banks integrated in the OECD countries have a risk weight of 20 percent;
- Residential mortgage claims have a 50 percent risk weight; and
- Claims on consumers and corporates have a 100 percent risk weight.

These respective risk weights are then multiplied by exposures, which gives the specific RWA.

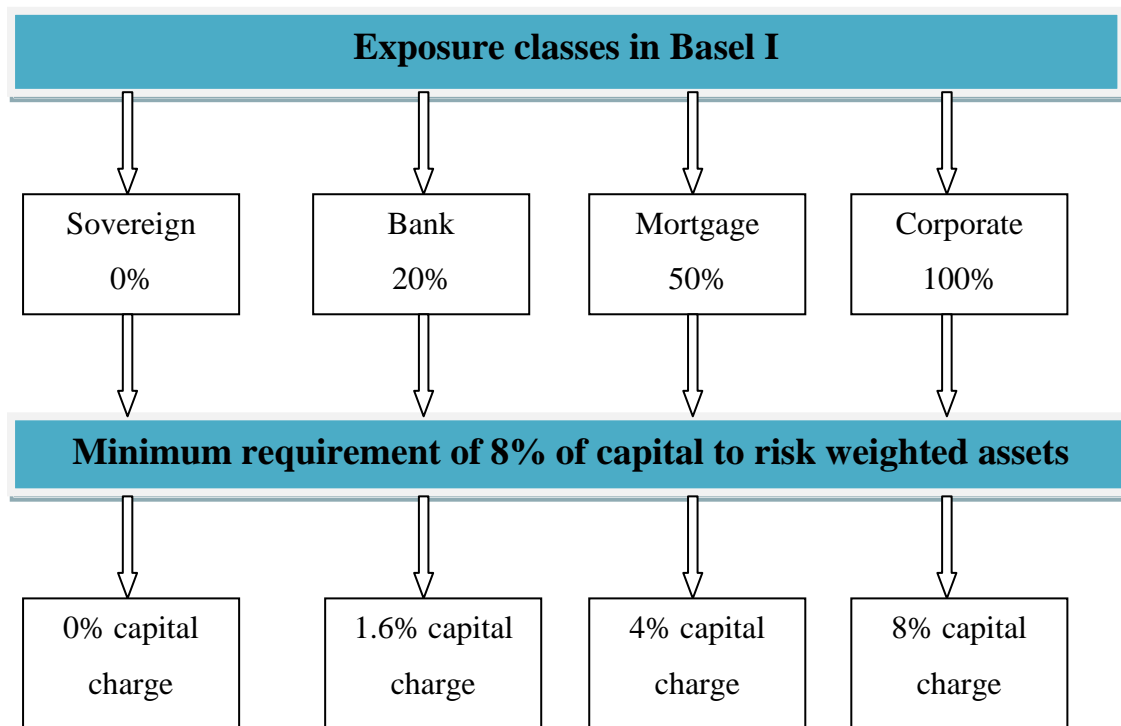


Figure 3.1: Exposure classes

Source: Benzin *et al.* (2005)

3.2.1.3.1 Drawbacks

Even though the Cooke ratio was notorious for its simplicity, a few drawbacks were also identified. The major concern was that no distinction was made between large corporations and small businesses in terms of the 8 percent ratio (Bessis, 2010:228). The risk-sensitiveness was not evenly distributed, and some short facilities had a zero weight, while other long facilities had a full capital load. This resulted in banks that renewed short-term loans and reduced the amount of long-term loans. This 8 percent ratio was applicable to all credit risk portfolios, irrespective of the diversification of the portfolio.

3.2.2 Basel II and Basel II.V (2008–present)

Basel II came into full effect in 2008 and was characterised with more risk sensitivity (Latham & Watkins, 2011:8). The main objective highlighted in Basel II was to improve systematic risk management practices in the credit risk area, and to improve capital adequacy. The focus of Basel II was placed on the improvement of capital adequacy by introducing three pillars, namely (Saidenberg & Scheuermann, 2003:6): (1) minimum capital requirements, (2) supervisory review, and (3) public exposure. The minimum capital

requirements under Pillar 1 were based on operational-, market- and credit risk. Operational risk is calculated by means of the basic indicator, standardised or advanced measurement approach under Pillar 1. Basel II expanded the market risk formula by adding incremental risk capital (IRC) charge and stressed VaR (SVaR). Credit risk assessment under Pillar 1 was based on the standardised approach (SA) and the internal ratings-based (IRB) approach. Pillar 2 encourages banks to develop and maintain internal economic capital to identify, measure, and control risks. Public disclosure was encouraged under Pillar 3 in order to improve transparency of risk information and capital adequacy (Latham & Watkins, 2011:12). Basel II.V introduced higher charges for market risk in the bank's trading operations (Feyen & Del Mazo, 2012:17).

Under Basel II, capital requirements were calculated as follows (KPMG, 2003:21):

$$\text{Total capital (unchanged) / credit risk + market risk + operational risk} = \text{The bank's capital ratio (minimum 8\%)} \quad \text{(Equation 3)}$$

3.2.2.1 Operational risk

The three approaches used to calculate operational risk are summarised in Table 3.2.

Table 3.2: Operational risk approaches

Basic Indicator Approach (BIA)	Standardised Approach (SA)	Advanced Measurement Approach (AMA)
Supervisor – specified parameters	Supervisor – specified parameters	Bank-defined framework
Bank-wide measure	Business line based	Significant flexibility
Exposure = GI x 15%	Exposure = GI x Beta where Beta = 12% – 18%	Supervisor-defined standards
No specific criteria	Qualifying criteria regarding risk management, risk assessment and governance.	Qualifying criteria

Source: Balta & Fontnouvelle (2009)

Basic indicator approach (BIA)

BIA is an appropriate operational risk measure for smaller banks with a basic risk management system (Volová, 2011:36).

The method for calculating the capital requirements under BIA:

$$CR_{BIA} = [\sum (GI_{Bi} \times \alpha)] / n \quad \text{(Equation 4)}$$

Where

CR_{BIA} = the capital requirement for operational risk under BIA

GI_{Bi} = annual gross income of the bank i

α = 15%

n = number of previous three years where income is positive

Standardised approach (SA)

The SA considers operational risks for each activity. Activities are divided into business lines and the beta (β) can be anything between 12 percent and 18 percent as indicated in Table 3.3 (Volová, 2011:37). Each business line is assigned an exposure indicator (EI) which is the average annual gross income for that specific line of business. Where positive, the gross annual income was positive for three years. The beta that is assigned to each business line is a single multiplier (capital factor) that reflects the riskiness of the business line (Crouhy *et al.*, 2006:336).

Table 3.3: Value of beta

Business lines	Beta factors
Corporate finance	18%
Trading and sales	18%
Retail banking	12%
Commercial banking	15%
Payment & settlement	18%
Agency services	15%
Asset management	12%
Retail brokerage	12%

Source: BCBS (2004)

Banks' activities are divided into different business lines, these business lines can be provided to a variety of banks. The percentage assigned to each business line reflects the risk activities. In order to calculate the required capital, the beta is multiplied by the business line

(FSC, 2013:9). The total capital requirement is the sum of each business lines' capital requirement.

$$CR_{SA} = \{\sum_{years1-3} \max [\sum(GI_{Bi 1-8} \times \beta_{1-8})]\} / 3 \quad \text{(Equation 5)}$$

Where

CR_{SA} = the capital requirement for operational risk under SA

$GI_{Bi 1-8}$ = annual gross income of the bank for each business line

β_{1-8} = risk multiplier value for each business line

Advanced measurement approach (AMA)

The AMA is based on a models approach where the model must meet the requirements of internal- and external data, scenario analysis, business environment- and internal controls.

Three types of approaches were identified by means of the AMA (Volová, 2011:39):

- Internal measure where there is a linear relationship expected between expected losses and unexpected losses;
- Distribution losses where unexpected losses are derived from compound probability losses. It is assumed that banks know the distribution of losses and can estimate the expected loss; and
- Systems indicator where capital levels for operational risk can be set for each business line or as a whole. Banks correct the level over time based on the achieved values of the set indicators. Indicators are focused on the evaluation of the risk profile and environment for managing operational risk.

Table 3.4: Combination of business lines and operational risk losses

Business lines	Operational risk losses
Corporate finance	Inside unfair practices
Trading and sales	Outside unfair practices
Payment and settlement	Labour law relations, events and battles
Commercial banking	Infringement of business proceeding
Agency services	Depreciation of real assets
Retail banking	Failure of systems or infrastructure
Asset management	Failure under ,management, supplies of goods and services
Retail brokerage	-

Source: Bank of Israel (2008)

Table 3.4 indicates the type of operational risk involved in each type of business line. Capital requirements for operational risk under the AMA are calculated as follows (Bank of Israel, 2008:12):

$$CR_{IMAij} = Y_{ij} \times El_{ij} \times PE_{ij} \times LGE_{ij} \quad \text{(Equation 6)}$$

Where

CR_{IMAij} = capital requirement for operational risk for business line i and type of operating loss j

Y_{ij} = gamma factor applied for an estimate of unexpected losses converting from an estimate of expected losses

El_{ij} = indicator of exposure for business line i and type of operating loss j

PE_{ij} = probability of loss events in one year time horizon for business line i and operating loss j

LGE_{ij} = average amount of loss for business line i and operating loss j when event occur

The total sum of required capital for operational risk under the AMA is equal to the sum of individual business lines and their operating loss.

3.2.2.2 Market risk

The 2007–2009 financial crises revealed some gaps in the market risk formula used under Basel I. More than expected losses and a build-up of leverage appeared in the trading book (BCBS, 2011:1). The committee made a decision to add incremental risk capital charge to the VaR formula. The migration risk for unsecuritised credit products and default risks were incorporated into IRC. Another addition was made to the original VaR formula and that is the stressed value at risk requirement. Banks encountered higher risks than what there was provision made for under the market risk minimum capital requirements (BCBS, 2011:16). The SVaR takes into account a one year observation period where most losses occurred, and is then calculated the same way as VaR. The SVaR is an addition to the market risk formula.

$$IRC = \max [IRC_{\text{most recent}}, IRC_{12\text{week avg}}] \quad \text{(Equation 7)}$$

$$MRC = \max \left(k \cdot \sum_{i=1}^{60} \frac{VaR_i}{60}, VaR_{i-1} \right) + SR + SVaR + IRC \quad \text{(Equation 8)}$$

Where

SR = specific risk

SVaR = stressed value at risk

IRC = incremental risk capital charge

3.2.2.3 Credit risk

Two new approaches were developed and implemented in Basel II to calculate credit risk. These approaches include the standardised approach (SA) and the internal ratings-based (IRB) approach. Figure 3.2 illustrates that the IRB approach has two extensions, namely the foundation IRB and the advanced IRB.

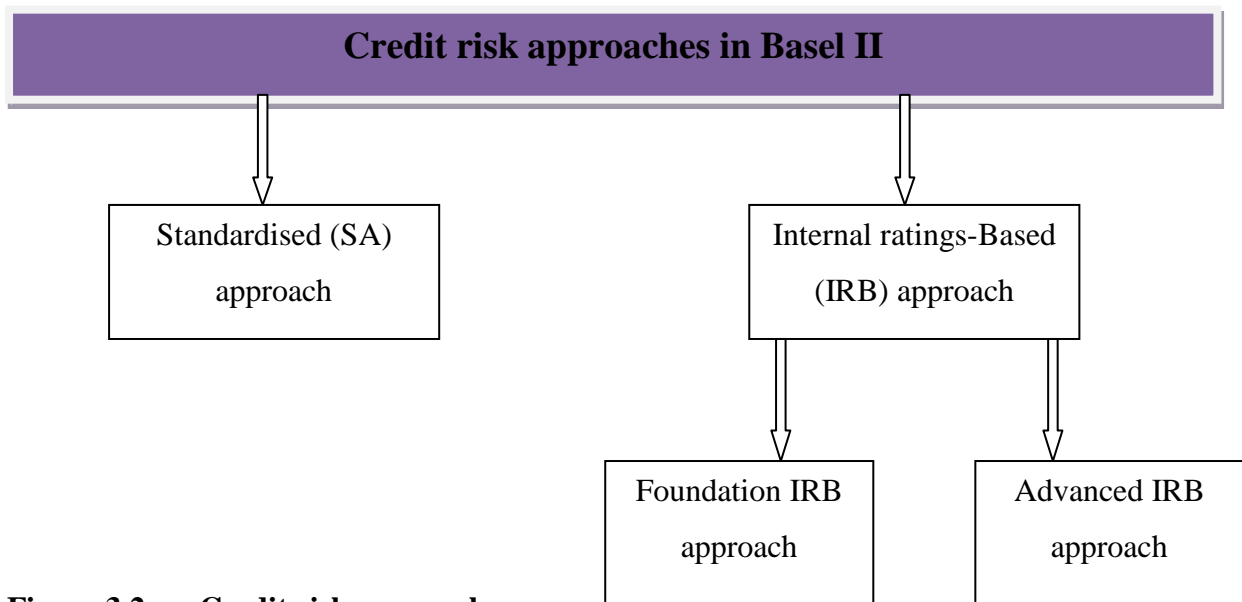


Figure 3.2: Credit risk approaches

Source: Benzin *et al.* (2005)

Standardised approach (SA)

The BCBS (2001:5) documented that the SA approach will be calculated in the same manner as in Basel I. The only difference highlighted was the fact that no distinction was made on the sovereign risk weighting depending on whether the specific sovereign was a member of the OECD. The risk weights of the exposures were depended on external credit assessments (ECB, 2005:11).

Internal ratings-based (IRB) approach

Under this approach, banks use the estimates of internal borrower creditworthiness. Specific analytical frameworks are used for different types of loan exposures with different loss characteristics (Benzin *et al.*, 2005:7). In this approach, banks take the borrower's creditworthiness and transform that into a potential future loss amount. The IRB approach takes into account the expected loss (EL), unexpected loss (UL) and catastrophic losses in order to calculate the capital for credit risk (RBI, 2011:6). Assets are divided into six classes in order to arrive at RWA, which include (RBI, 2011:8):

- Corporate – debt owed by a company to a bank;
- Sovereign – covers credit exposures to counterparties;
- Bank – includes branches of foreign banks, Bank for International Settlements etcetera;

- Retail – the exposure is extended to an individual, and the individual is part of larger exposure pool managed by a bank, *inter alia* credit cards;
- Equity – involves ownership interest directly or indirectly in the income and assets of a financial institution; and
- Others – for example loans and advances to staff, and fixed income

Foundation IRB approach

The foundation IRB approach estimates the probability of default of each borrower and the supervisors supply the other inputs (BCBS, 2001:12). In other words, only the probability of default (PD) is provided by the banks.

IRB approach uses the following formulas to calculate the risk weighted assets for corporate-, sovereign- and bank exposures:

$$K_{credit} = LGD \times \left[N \left(\sqrt{\frac{1}{1-\rho}} \cdot N^{-1}(PD) + \sqrt{\frac{\rho}{1-\rho}} \cdot N^{-1}(0.999) \right) - PD \right] \times \left(\frac{1 + (M - 2.5)b}{1 - 1.5b} \right)$$

(Equation 9)

$$\rho = 0.24 - 0.12 \cdot \left[1 - \frac{\exp(-50 \cdot PD)}{1 - \exp(-50)} \right]$$

(Equation 10)

$$b = [0.11852 - 0.05478 \cdot \ln(PD)]^2$$

(Equation 11)

The formula to calculate credit risk for credit cards is as follows:

$$K_{credit} = LGD \times \left[N \left(\sqrt{\frac{1}{1-\rho}} \cdot N^{-1}(PD) + \sqrt{\frac{\rho}{1-\rho}} \cdot N^{-1}(0.999) \right) - PD \right]$$

(Equation 12)

$$\text{Correlation} = 4\%$$

(Equation 13)

Credit risk for mortgage loans is calculated as follow:

$$K_{credit} = LGD \times \left[N \left(\sqrt{\frac{1}{1-\rho}} \cdot N^{-1}(PD) + \sqrt{\frac{\rho}{1-\rho}} \cdot N^{-1}(0.999) \right) - PD \right]$$

(Equation 14)

Correlation = 15%

(Equation 15)

Where

K = capital requirement

EAD = exposure at default

PD = probability of default

LGD = loss given default

M = effective maturity

ρ = asset correlation between the loan value and the state of the world

0.999 = state of the world

b = maturity adjustment factor

ln = natural logarithm

Advanced IRB approach

If banks are equipped with an effective internal capital allocation system, the other inputs can be supplied by the banks. Under the IRB advanced approach the EAD, LGD and PD are provided by banks (BCBS, 2001:12). Asset correlation is the only factor that is provided by the Basel Committee on Banking Supervision.

Below is the capital calculation for credit risk under sovereign-, bank- and corporate loans:

$$K_{credit} = LGD \times \left[N \left(\sqrt{\frac{1}{1-\rho}} \cdot N^{-1}(PD) + \sqrt{\frac{\rho}{1-\rho}} \cdot N^{-1}(0.999) \right) - PD \right] \\ \times \left(\frac{1 + (M - 2.5)b}{1 - 1.5b} \right)$$

(Equation 16)

$$\rho = 0.24 - 0.12 \cdot \left[1 - \frac{\exp(-50 \cdot PD)}{1 - \exp(-50)} \right] \quad \text{(Equation 17)}$$

$$b = [0.11852 - 0.05478 \cdot \ln(PD)]^2 \quad \text{(Equation 18)}$$

The formula to calculate credit risk for credit cards is as follows:

$$K_{credit} = LGD \times \left[N \left(\sqrt{\frac{1}{1-\rho}} \cdot N^{-1}(PD) + \sqrt{\frac{\rho}{1-\rho}} \cdot N^{-1}(0.999) \right) - PD \right] \quad \text{(Equation 19)}$$

$$\text{Correlation} = 4\% \quad \text{(Equation 20)}$$

Credit risk for mortgage loans will be calculated as follow:

$$K_{credit} = LGD \times \left[N \left(\sqrt{\frac{1}{1-\rho}} \cdot N^{-1}(PD) + \sqrt{\frac{\rho}{1-\rho}} \cdot N^{-1}(0.999) \right) - PD \right] \quad \text{(Equation 21)}$$

$$\text{Correlation} = 15\% \quad \text{(Equation 22)}$$

Where

K = capital requirement

EAD = exposure at default

PD = probability of default

LGD = loss given default

M = effective maturity

ρ = asset correlation between the loan value and the state of the world

0.999 = state of the world

b = maturity adjustment factor

\ln = natural logarithm

Capital charge is calculated as follows (Bessis, 2010:234):

$$\text{Capital} = RW \times \text{exposure} \times 8\% \quad \text{(Equation 23)}$$

Credit risk components form part of the IRB approach and serve as inputs to the risk-weight functions. Under Basel II, four main risk components were identified (Bessis, 2010:234):

- Probability of default (PD), this component determines the borrower’s probability of defaulting on payments;
- Loss given default (LGD), this component measures the amount that is subject to the risk that is lost under the default;
- Exposure at default (EAD), this is the maximum amount that can be lost under default; and
- Credit conversion factor (CCF) focuses on the commitments and off-balance sheet commitments.

3.2.3 Basel III (2011–2018)

Latham and Watkins (2011:8) highlighted the trading book, bank liquidity and bank leverage as areas for greatest impact. Capital charges will increase and certain banking activities will be more capital intensive. Greater capital conservation buffers (Table 3.5) were introduced in order to reduce procyclicality (BCBS, 2010:15). Procyclicality is the risk weight of each loan that is related adversely to a customer’s credit quality. When an economy is facing an overall downturn, credit quality worsens and minimum capital becomes more rigorous (Covas & Fujita, 2010:2). Basel III places focus on the improvement of the risk weights on exposures to market risk whereas credit risk exposures remained unchanged.

Table 3.5: Summary of capital ratio increase phases

	2011 B II	2012	2013	2014	2015	2016	2017	2018	2019 B III
Minimum common capital ratio	2%	2%	3.5%	4%	4.5%	4.5%	4.5%	4.5%	4.5%
Capital conservation buffer	0%	0%	0%	0%	0%	0.625%	1.25%	1.875%	2.5%
Minimum common equity plus capital conservation buffer	2%	2%	3.5%	4%	4.5%	5.125%	5.75%	6.375%	7%
Phase-in of deductions	0%	0%	0%	20%	40%	60%	80%	100%	100%
Minimum tier 1 capital	4%	4%	4.5%	5.5%	6%	6%	6%	6%	6%
Minimum total capital	8%	8%	8%	8%	8%	8%	8%	8%	8%
Minimum total capital plus conservation buffer	8%	8%	8%	8%	8%	8.625%	9.25%	9.875%	10.5%

Source: Latham & Watkins (2011)

3.2.3.1 Operational risk

Operational risk is calculated in the same manner as under Basel II (RBI, 2011:7).

3.2.3.2 Market risk

BCBS (2012:3) stated that some weaknesses were identified with the VaR method under Basel III. The biggest concern was the fact that VaR struggled to capture tail risk. The expected shortfall (ES) as under Basel IV is designed to take into account the size and the probability of losses above a specified confidence level. In other words, the value of the losses expected above a certain level. Expected shortfall is the average of the possible losses beyond the VaR value.

$$MRC = \text{average}(\text{Losses beyond } n\text{th percentile VaR}) \quad (\text{Equation 24})$$

3.2.3.3 Credit risk

There was no change, under Basel III, on how to calculate credit risk. Increased capital charges have come in the form of new definitions of eligible capital, extra buffer capital requirements, liquidity constraints, and leverage ratio requirements (RBI, 2011:7).

3.3 CONCLUSION

Many changes took place in terms of the manner in which the minimum capital requirements for the various risks are calculated. Basel I started with an 8 percent Cooke ratio risk-adjustment on assets, however, some shortcomings were identified. Basel I only took market- and credit risk into account to calculate the minimum capital requirements. When the 2007-2009 financial crisis struck it was revealed that Basel I needed to be updated and introduce new improved methods. Various shortcomings of Basel I were highlighted, which include the simplicity of calculating minimum capital requirements. Basel II came into effect in 2008 and introduced new ways to calculate the minimum capital requirements for operational-, market- and credit risk. Operational risk was included for this first time as Basel made provision for operational risk measurements. The minimum capital requirement for operational risk was calculated by either using the basic indicator approach, standardised approach or the advanced measurement approach. Basel III introduced new capital ratios into the market by increasing the minimum capital requirements. An adjustment was made to Basel III, which included the replacement of VaR by expected shortfall.

CHAPTER 4: ANALYSIS OF CAPITAL LEVELS

4.1 INTRODUCTION

The Banks Act 94 of 1990 states that all banks within the South African borders should comply with the regulation provided and maintain adequate levels of capital (SARB, 1990:2). South Africa encountered strong economic growth from 2002 to 2007. Global price volatility was encountered from 2002 to 2003 due to the uncertainty after the 9/11 attacks on the United States of America (US) (Suleman, 2012:98).

In 2007, the National Credit Act (NCA) was released for the South African financial system, and bank managers enforced new rules and regulations (The Banking Association of South Africa, 2013:1). One of the focus points of this act was to eliminate reckless lending by ensuring that the consumer can repay the loan. Credit information such as interest charges, insurance, repayment time, and the consequences of payment failure should be disclosed transparently in agreements (NCR, 2007:7). The credit bureaux's information about consumers' credit history should be updated regularly to ensure that reliable information is provided to credit providers (NCR, 2007:4). The NCA specifically regulates mortgages, one of the main downfalls that caused the 2007–2009 financial crisis. The NCA saved South Africa from the severe effects of the financial crisis.

The annual reports of five banks, which include ABSA, First National Bank (FNB), Investec, Nedbank and Standard Bank were analysed to determine the regulatory capital for respective risks. Regulatory capital is known as the minimum capital that is required by the BCBS; the Basel accord regulates the required minimum capital (Elizalde & Repullo, 2006:1). The focus of this study was to determine if there was an increase or decrease in regulatory capital as new accords were phased into the financial system. The regulatory capital for market, credit and operational risk was also compared to that of South Africa (SA). The effects of the different crises are indicated by the calculated regulatory capital of the five aforementioned commercial banks.

4.2 ECONOMIC TRENDS

The South African economy found itself in an upward phase from September 1999 to November 2007, 99 months in total (SARB, 2011:153). During the 2007–2009 financial

crisis the South African economy encountered a 21-month downward phase, from December 2007 to August 2009.

4.2.1 Gross domestic product (GDP)

Table 4.1 indicates that economic growth continued to increase to the period of 2007. Real GDP increased from 2002 to 2007 by 1.8 percent. Real GDP per capita increased with just over 50 percent from 2002 (1.9 percent) to 2007 (4.3 percent).

Table 4.1: Economic growth rates for the period 2002–2012

Periods	Real gross domestic product (Real GDP)¹	Real gross national income (Real GNI)¹	Real gross domestic product per capita (Real GDP per capita)¹	Real gross national income per capita (Real GNI per capita)¹
2002	3.7	4.9	1.9	3.1
2003	2.9	3.2	1.3	1.6
2004	4.6	5.8	3.1	4.3
2005	5.3	5.6	3.9	4.2
2006	5.6	6.8	4.2	5.4
2007	5.5	4.7	4.3	3.4
2008	3.6	4.1	2.4	2.9
2009	-1.5	0.7	-2.6	-0.4
2010	2.9	5.0	1.9	3.9
2011	3.5	3.9	2.3	2.7
2012	3.2	2.0	1.4	0.8

¹ Percentage changes in selected data at constant 2005 prices. Compared with preceding period.

Source: SARB Quarterly Bulletin (2011 & 2013)

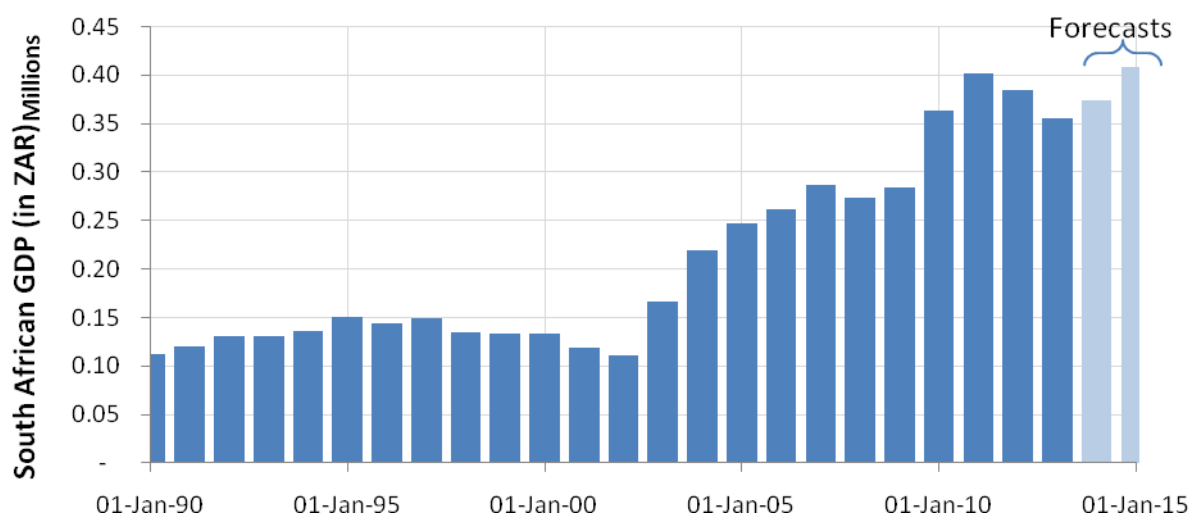


Figure 4.1: South Africa’s GDP

Source: Fitch Ratings, UK (2013)

A slight decrease of just over 21 percent in SAs GDP was experienced in 2002 and 2003 due to the political unrest of the 9/11 incident in the US in 2011. Considerable uncertainty was experienced around this time, which had an effect on growth. Economic growth was experienced from 2003 to 2007 due to the fact that SA experienced an upward phase in the economy (SARB, 2011:153). When the 2007–2009 financial crisis surfaced, the South African economy entered a downward phase (SARB, 2011:153). In Figure 4.1, the effects of the 2007–2009 financial crisis decreased growth rates and after 2009, the growth rates increased gradually again for South Africa.

4.2.2 Leading indicators

In 1939, Mitchell and Burns instigated leading indicators to serve as an assistance measure to detect and predict business cycle turning points (Jordaan & Moolman, 2004:2). If any changes occur in economic activity, these indicators give warning signs. Jordaan and Moolman (2004:3) indicated that leading indicators are successful indicators to determine the South African business cycle turning points. A leading indicator is an indicator that takes the lead ahead of the business cycle (Roux, 2008:30). Mohr (2010:122) highlighted some examples of South Africa’s leading indicators, namely survey based on opinion with regard to the size of orders in manufacturing, classes of shares categorised according to prices,

volume of approved residential building plans, and advertisements regarding employment in the Sunday Times newspaper.

Venter and Pretorius (2004:1) opine that the turning points of the business cycle, *inter alia* the trough or peak, are determined by using the coincident and leading business cycle indicators. This can be done by calculating a historical diffusion index and a current diffusion index. Venter and Pretorius (2004:2) defined a historical diffusion index as, “a measure of dispersion of the changes in a number of economic time series in a specific time period.” This index is composed of various seasonally adjusted time series through taking into account the different sections in the economy, *inter alia* income, production and employment. The turning point of the deviation from every trend in the time series is established. Afterwards, it can be concluded that for every series, there will be a peak after a period of a trough. The index value for a particular month is then calculated by expressing the number of increasing time series as a percentage of the total number of time series. If the index value is below 50 it indicates that the business cycle is heading into a downswing phase. While, if the index value is above 50 the business cycle is heading into an upswing phase (Venter & Pretorius, 2001:64).

The current diffusion index uses the data from the historical diffusion index. According to Venter and Pretorius (2004:2) the current diffusion index is an index compiled by using actual month-to-month percentage changes in each seasonally adjusted time series (also used to develop the historical diffusion index). The deviation of the current diffusion index from the long-term trend provides an indication for the cyclical movement of economic activity.

Venter and Pretorius (2001:63) explained that a coincident business cycle indicator moves in harmony with the business cycle. Whenever the leading indicator indicates a change on the business cycle, the direction of the coincident indicator will also change. Thus, the chance for the business cycle to have reached its turning point might be a reality. The main focus rests on the leading indicator due to the fact that it is characterised by its forward looking properties. If any increase in the leading indicator proceeds for 6 months, the GDP is likely to increase in the following months.

Table 4.2 highlights that South Africa’s leading indicator turned negative during the political unrest period of 2002 and 2003. The leading indicator remained positive up to the 2007–2009 financial crisis by recording -6.7 in 2008, and -5.1 in 2009.

Table 4.2: Leading indicator for South Africa (2002 – 2012)

Periods	Leading indicator
2002	10.4
2003	-2.7
2004	10.3
2005	3.2
2006	5.9
2007	0.2
2008	-6.7
2009	-5.1
2010	16.0
2011	1.4
2012	-0.8

Source: SARB Quarterly Bulletin (2005); SARB Quarterly Bulletin (2013)

4.2.3 National Credit Act

The five commercial banks analysed in this research project are all known in South Africa as credit providers. In June 2007, the National Credit Act of South Africa came into effect in order to (Klinkerberg, 2013:1):

- Promote an environment where all consumers can access credit without any discrimination;
- Updated information and improved regulation on consumers;
- Eliminate unfair credit practices;
- Control responsible credit granting;
- Assist consumers in indebtedness; and
- Appoint a national credit regulator.

Prior to the 2007–2009 financial crisis, the main aim was to maintain the minimum capital requirement set by Basel as it serves as protection for a bank’s assets (Shin, 2012:17).

Through this protection, the depositor is also protected from possible losses. If a bank's management team is aware of the capital requirements balance, it can enhance their ability to control moral hazards. When the 2007–2009 financial crisis occurred, questions were raised of how effective these minimum requirements were, according to Basel I, to protect the banks and their consumers. That was the main reason for introducing Basel II and Basel III into the markets.

Globally, all banks tend to lower the reserves they are required to hold in an attempt to increase earnings (Chicago Tribune, 2013:1). If banks can decrease the minimum capital requirements, they can invest the money or make it available for credit to consumers to increase earnings. The NCA was established in South African markets to ensure that the borrowing amount does not exceed the amount they could afford to repay. Before the financial crisis occurred, South Africa's financial system was protected by tightening credit. Under the NCA, the lenders who engage in reckless lending can leave the market without causing systemic risks due to the capital requirements set in Basel II (Goodwin-Groen, 2006:46). When the rest of the world fell into a recession, the South African regulators tightened credit standards even further in an attempt to avoid the recession (Madubeko, 2010:37).

The NCA was incorporated into the South African financial system in order to reduce consumer default payments. The act imposed on South Africa placed pressure on management positions in banks. Bank managers were more careful and followed the NCA to ensure safety and soundness. With the NCA, South Africa could not just lower regulatory capital as wished and follow the rest of the world. As a result of the implementation of the act, the probability of default was expected to be lower, and thus regulatory capital decreased (Madubeko, 2010:8).

4.3 MARKET RISK

Market risk was analysed for the period 2002 to 2012 in Table 4.3. The regulatory capital figure for market risk was obtained from the annual reports on year-ends. Five different banks' data were gathered in order to determine if regulatory capital increased or decreased when new Basel accords were introduced over the years. The year 2002 was rebased to 100 percent in order to determine by what percentage the regulatory capital for market risk increased or decreased, to make better comparisons.

Table 4.3: Regulatory capital for market risk rebased

Reg Cap	ABSA	FNB	Investec	Nedbank	Standard Bank
2002	100	100	100	100	100
2003	65	50	66	41	74
2004	40	13	31	23	37
2005	27	30	25	12	21
2006	20	19	20	20	39
2007	28	21	19	12	33
2008	24	16	16	18	28
2009	50	43	39	43	64
2010	79	38	36	27	53
2011	67	46	37	33	64
2012	139	72	98	78	152

Source: Calculations based on bank data (2013)

Listed in Table 4.4, the absolute figures give an apparent indication that from 2010 the five banks experienced substantial increases in regulatory capital for market risk. This increase was due to Basel II.V's introduction into the market, with the focus on the incremental risk capital (IRC) charge and value at risk (VaR). In Table 4.3, it is evident that ABSA recorded an increase in regulatory market risk capital of 60 percent from 2010 to 2012. FNB experienced an increase of 34 percent, while Investec increased their market risk capital with 62 percent. Nedbanks' required regulatory capital increased with 51 percent and Standard Bank recorded the highest increase in market risk regulatory capital of 99 percent.

Table 4.4: Regulatory capital for market risk (absolute figures)

Reg Cap	ABSA	FNB	Investec	Nedbank	Standard Bank
2002	13694	28863	48059	31564	16037
2003	8965	14340	31649	13013	11799
2004	5427	3890	15020	7412	5972
2005	3654	8763	11956	3845	3329
2006	2749	5483	9393	6347	6245
2007	3804	5924	9044	3816	5217
2008	3252	4487	7651	5606	4523
2009	6885	12409	18582	13432	10218
2010	10823	10930	17426	8550	8496
2011	9107	13190	17756	10291	10331
2012	19057	20860	47327	24740	24417

Source: Calculations based on bank data (2013)

The effect of the political unrest due to the 9/11 terrorist attacks in the US can be seen where the regulatory capital for market risk decreased from 2002 to 2003 for all five commercial banks. Basel I introduced market risk in 1994; this formula for calculating regulatory capital for market risk was used until 2010:

$$K_{\text{market}} = \max \left(VaR_{t-1}^{99\%,10d}, k \times \sum_{i=1}^{60} \frac{1}{60} VaR_{i-1}^{99\%,10d} \right)$$

In 2010, the Basel Committee on Banking Supervision (BCBS) introduced Basel II.V. For market risk there were two add-ons, namely stressed value at risk (sVaR) and incremental risk capital charge (S&P, 2012:3). It is evident from Table 4.4 that from 2010 onwards regulatory capital for market risk increased as proposed by Basel II.V. The formula used from 2010 until 2013 for calculating market risk regulatory capital is:

$$K_{\text{market}} = K_{\text{market(oid)}} + IRC + VaR_{\text{stressed}} + CRM$$

For market risk, the new proposals made to Basel III (Basel IV), will be calculated by using the expected shortfall calculation instead of VaR (BCBC, 2012:3).

It is evident from Figure 4.2 that all five banks registered a decrease in market risk regulatory capital from 2002 to 2007, and this was due to the reduction in market volatility. The market volatility of the credit crisis saw an increase in volatility, which led to a major increase in market risk regulatory capital. Basel II.V came into effect in 2012 (introducing stress VaR and credit risk in the trading book, which also increased market risk capital) (S&P, 2012:3). The volatility experienced in 2010/2011 was due to the European Union sovereign failures (for example Greece, Italy and Spain).

Figure 4.2 illustrates that the South African markets experienced a steady decrease in market risk capital. During this period of 2002 to 2007, South Africa experienced a decrease in market risk capital, and from 2008 economic growth accelerated and there was more stability in the South African markets.

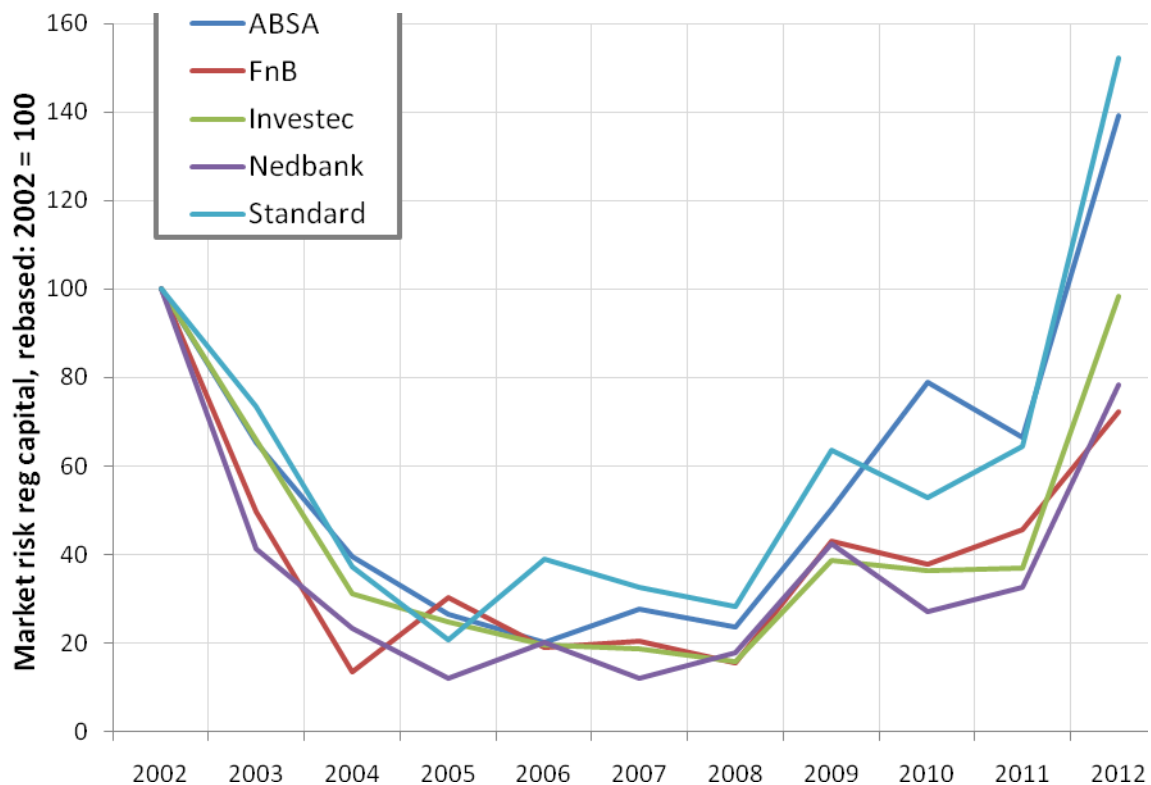


Figure 4.2: Trend of regulatory capital for market risk

Source: Calculations based on bank data (2013)

4.4 CREDIT RISK

As at 31 December 2009, it was reported that 14 local banks used the standardised approach, one bank used the foundation internal-ratings based approach, and three banks used the advanced internal ratings-based approach in SA (SARB, 2009:46). It was recorded that 12

branches of international banks in South Africa made use of the standardised approach, and one branch implemented the advanced internal ratings-based approach.

The data recorded in Table 4.5 are rebased to 100 percent in 2002 in order to draw conclusions that are more appropriate. It is evident from Table 4.5 that regulatory capital decreased from 2002 until 2007/2008. The reason for this reduction can be contributed towards the decrease in probability of default (PD) and abundant credit. The decrease in credit risk made an impression that people did not default on loan payments. Feldstein (2008:25) stated that people pretended not to default on loan payments, but they actually were during the 2002 to 2008 phase.

Table 4.5: Regulatory capital for credit risk rebased

Reg cap	ABSA	FNB	Investec	Nedbank	Standard Bank
2002	100	100	100	100	100
2003	95	74	88	94	101
2004	99	79	76	98	85
2005	85	83	66	91	85
2006	83	69	56	93	63
2007	72	64	51	78	61
2008	4	42	30	44	17
2009	25	51	80	83	57
2010	46	56	100	87	66
2011	34	35	85	112	101
2012	78	80	112	118	136

Source: Calculations based on bank data (2013)

From the absolute figures in Table 4.6, the 2007–2009 financial crisis increased the PDs and the loss given defaults (LGDs), which caused a sharp increase from 2009 to 2012 (Smit, 2010:51). ABSA increased credit risk capital with 74 percent from 2008 to 2012; whereas, FNB increased credit regulatory capital with 38 percent (Table 4.5). Investec’s credit risk augmented substantially with 82 percent, and Nedbank’s regulatory capital for credit risk increased with 74 percent from 2008 to 2012. Standard Bank had once again the highest increase in regulatory capital for credit risk, with 119 percent from 2008 to 2012.

The NCA that came into effect in 2007 protected the markets, and prevented markets to decrease PD with an excessive amount to lower regulatory capital for credit risk.

In 1988, Basel I established a formula that calculated credit risk:

$$K_{credit} \geq RWA \times 8\%$$

In other words, credit risk calculated by using lookup risk weighted assets (RWA) tables. In 2008, Basel II came into effect and the new formula developed to calculate credit risk was:

$$K_{credit} = LGD \times \left[N \left(\sqrt{\frac{1}{1-\rho}} \cdot N^{-1}(PD) + \sqrt{\frac{\rho}{1-\rho}} \cdot N^{-1}(0.999) \right) \right] \times \left(1 + \frac{(M-2.5)b}{1-1.5b} \right)$$

The decrease in regulatory capital for credit risk is evident from Figure 4.3. The lowest amounts recorded for credit risk regulatory capital was in 2008. After the 2007–2009 financial crisis ABSA, FNB, Nedbank, Investec and Standard Bank increased regulatory capital for credit risk. Due to the increase in PDs and LGDs, banks reduced lending to clients and attempted to get rid of assets in order to reduce their risk weights.

Table 4.6: Regulatory capital for credit risk (absolute figures)

Reg cap	ABSA	FNB	Investec	Nedbank	Standard Bank
2002	511 179	349 160	186 723	265 930	395 472
2003	486 910	258 589	163 772	249 960	398 032
2004	504 312	274 122	142 306	260 034	334 909
2005	435 590	289 654	123 950	242 092	335 215
2006	423 750	241 608	104 658	246 793	248 807
2007	367 199	221 851	95 392	208 092	242 634
2008	18 130	147 432	55 451	117 404	68 700
2009	126 171	176 866	149 090	221 008	224 283
2010	234 212	195 301	187 153	230 050	260 950
2011	175 036	120 724	158 251	298 408	399 911
2012	400 706	280 076	209 791	313 747	537 989

Source: Calculations based on bank data (2013)

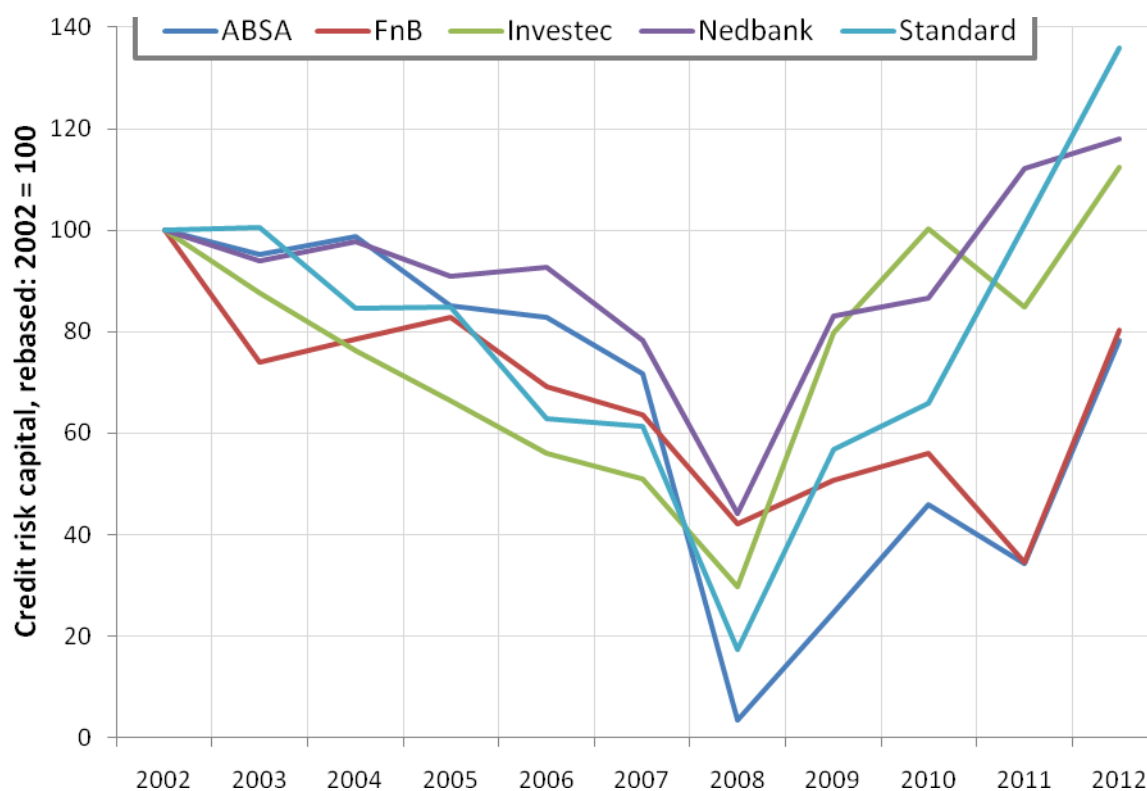


Figure 4.3: Trend of regulatory capital for credit risk

Source: Calculations based on bank data (2013)

4.5 OPERATIONAL RISK

Operational risk measurements were only enforced onto financial institutions in 2008 in accordance with the Basel accord regulations (Bessis, 2010:233). Table 4.7 and Table 4.8 indicate that there was mainly an increase in regulatory capital for operational risk of the relevant banks. Regulatory capital for operational risk was not affected that much by the sovereign and liquidity crises in 2010 to 2012.

Table 4.7: Regulatory capital for operational risk rebased

Reg cap	ABSA	FNB	Investec	Nedbank	Standard Bank
2008	100	100	100	100	100
2009	128	83	123	129	124
2010	129	90	137	119	123
2011	135	113	140	127	77
2012	123	129	143	143	82

Source: Calculations based on bank data (2013)

Table 4.8: Regulatory capital for operational risk (absolute figures)

Reg cap	ABSA	FNB	Investec	Nedbank	Standard Bank
2008	37 942	56 472	1 261	36 497	8 366
2009	48 700	47 125	1 555	47 222	10 362
2010	48 819	51 058	1 722	43 415	10 328
2011	51 067	63 649	1 769	46 251	6 448
2012	46 697	72 963	1 802	52 135	6 881

Source: Calculations based on bank data (2013)

In 2008, Basel II incorporated operational risk into the Basel accord, and the formula for calculating operational risk was:

$$K_{operational} = \alpha \cdot EI \text{ (standardised)} \quad K_{operational} = \sum_{i=1}^n EI_i \times \beta_i \text{ (advanced)}$$

In Figure 4.4, it is clear that operational risk mainly increased from 2008 to 2012. Standard Bank experienced a decrease in regulatory capital for operational risk in 2011, and FNB reached a low figure of 47 125 in 2009 for regulatory capital in operational risk (Table 4.8), just after the 2007–2009 financial crisis.

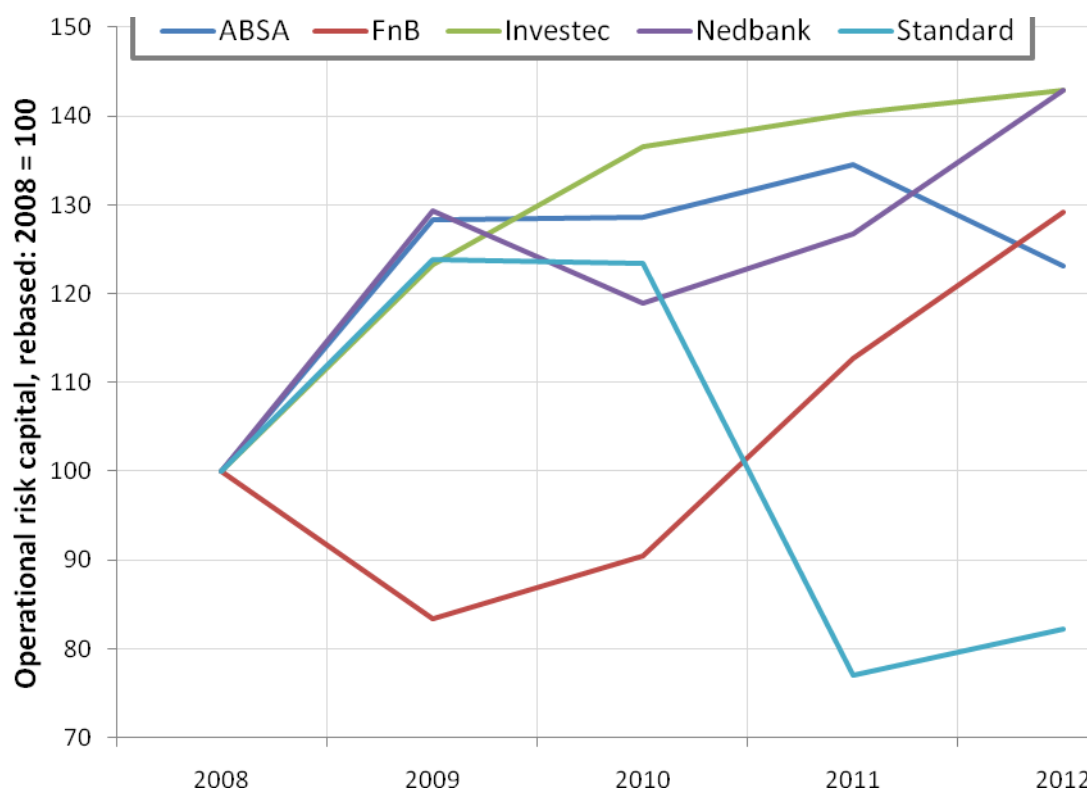


Figure 4.4: Trend of regulatory capital for operational risk

Source: Calculations based on bank data (2013)

4.6 Total capital

Regulatory capital increased from 2008 to 2012 (Table 4.9). From 2013 onwards the regulatory capital will most definitely increase due to the all the add-ons stipulated in Basel III. Basel III proposed to include liquidity risk, procyclical buffer, increased capital and leveraged ratio (Morrison & Foerster, 2010:1). The calculations from here on are only conducted from 2008 when Basel II considered all three risks namely, credit-, market- and operational risk.

Table 4.9: Total capital rebased

Reg cap	ABSA	FNB	Investec	Nedbank	Standard Bank
2008	100	100	100	100	100
2009	107	100	106	110	104
2010	120	108	117	105	118
2011	135	125	132	122	142
2012	178	168	147	136	186

Source: Calculations based on bank data (2013)

In Table 4.10, it is clear that Investec had the biggest amount of regulatory capital from 2008 to 2012. For all five banks, the regulatory capital increased from 2008 to 2012, as represented in Figure 4.5.

Table 4.10: Total capital (absolute figures)

Reg cap	ABSA	FNB	Investec	Nedbank	Standard Bank
2008	38 816	35 266	12 395 024	34 103	67 853
2009	41 653	35 257	13 159 000	37 544	70 755
2010	46 616	38 202	14 465 000	35 929	79 988
2011	52 577	43 912	16 377 000	41 498	96 062
2012	69 156	59 405	18 276 000	46 396	126 480

Source: Calculations based on bank data (2013)

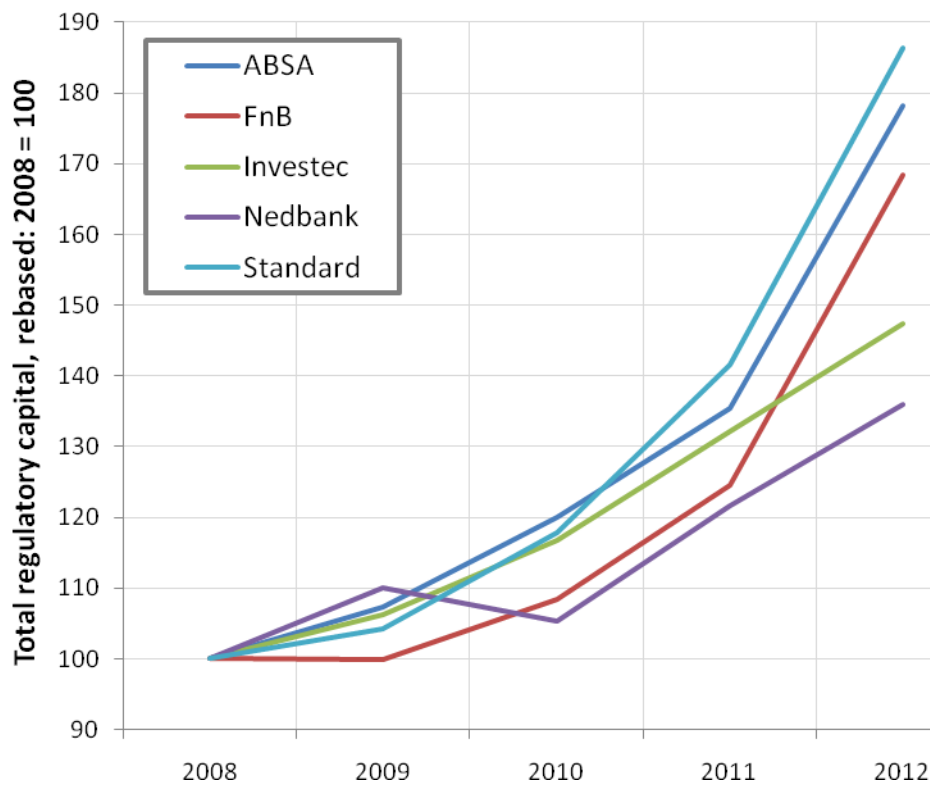


Figure 4.5: Trend for total capital

Source: Calculations based on bank data (2013)

The capital ratio had a slight increase from the period 2008 to 2012, which can be seen in Table 4.11 and Figure 4.6. The total capital increased for the five commercial banks in SA

due to several crises, namely the liquidity crisis and the three sovereign crises. Banks attempted to keep more reserves as stipulated by Basel II.

Table 4.11: Capital ratio

Cap ratio	ABSA	FNB	Investec	Nedbank	Standard Bank
2008	11.0%	9.4%	10.3%	9.6%	10.7%
2009	11.6%	10.7%	10.8%	11.5%	11.8%
2010	11.9%	11.7%	11.7%	11.1%	12.9%
2011	12.1%	11.4%	11.5%	12.5%	10.7%
2012	12.4%	12.6%	11.6%	12.9%	11.3%

Source: Calculations based on bank data (2013)

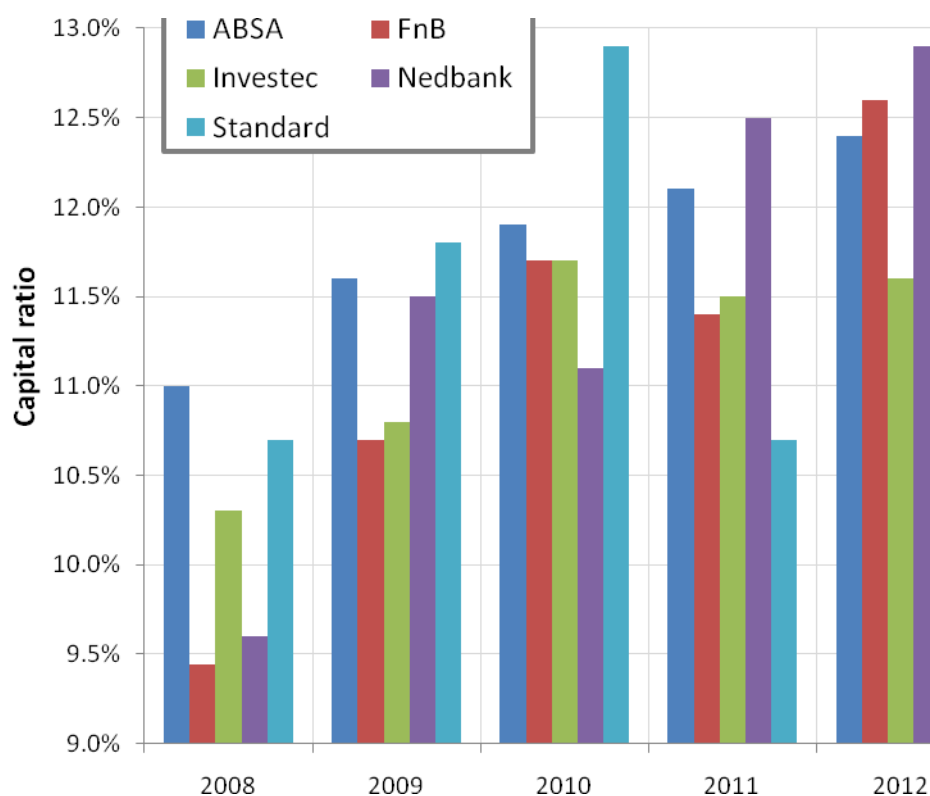


Figure 4.6: Trend of capital ratio

Source: Calculations based on bank data (2013)

Table 4.12 indicates that RWA increased from 2008 to 2012 for FNB, Investec and Nedbank. In addition, RWA decreased for ABSA and Standard Bank (Table 4.13).

Table 4.12: Risk-weighted assets rebased

RWA	ABSA	FNB	Investec	Nedbank	Standard Bank
2008	100	100	100	100	100
2009	102	88	93	92	95
2010	111	87	95	91	98
2011	109	103	109	93	68
2012	89	126	121	101	79

Source: Calculations based on bank data (2013)

Table 4.13: Risk-weighted assets (absolute figures)

RWA	ABSA	FNB	Investec	Nedbank	Standard Bank
2008	352 871	373 584	130 493 934	355 235	634 148
2009	359 074	329 504	121 842 593	326 466	599 622
2010	391 735	326 515	123 632 479	323 681	620 064
2011	384 933	385 190	142 408 696	331 980	430 484
2012	315 773	471 468	157 551 724	359 658	499 819

Source: Calculations based on bank data (2013)

In Figure 4.7, Standard Bank had an enormous decrease from 2010 to 2011 in terms of RWA, and recovered again from 2011 to 2012, while ABSA experienced a decrease in RWA from 2011 to 2012. Nedbank increased their RWA gradually over time, whereas FNB and Investec experienced growth in RWA from 2010 onwards.

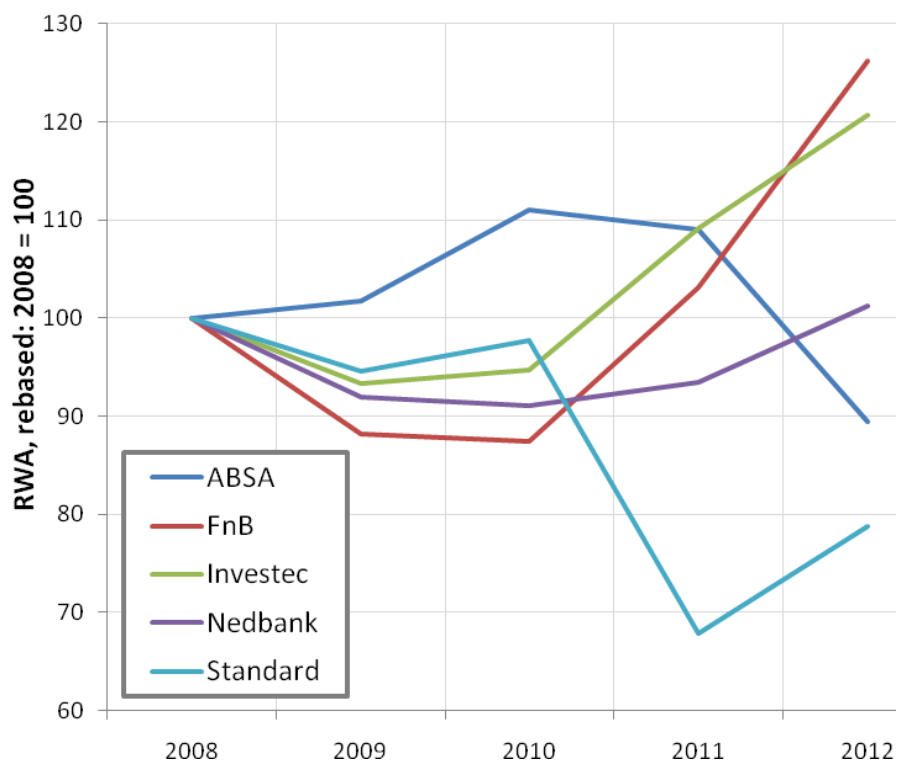


Figure 4.7: Trend of risk-weighted assets

Source: Calculations based on bank data (2013)

Table 4.14 is a summary of the period 2008 to 2012 in terms of total assets. All five banks recorded an increase in total assets, and FNB recorded the biggest increase in total assets.

Table 4.14: Total assets

Total assets	ABSA	FNB	Investec	Nedbank	Standard Bank
2008	773 541	211 412	178 758 814	651 404	858 330
2009	673 774	200 848	160 319 201	657 907	791 101
2010	680 923	288 932	169 359 560	711 288	836 316
2011	787 719	425 012	187 379 863	760 358	921 689
2012	807 939	770 074	218 821 839	833 474	1 549 018

Source: Calculations based on bank data (2013)

Risk weights decreased for ABSA from 117 percent in 2009, to 86 in 2012 (Table 4.15). Standard bank had the biggest decrease of 59 percent, from 2009 to 2012.

Table 4.15: Risk weights rebased

RW	ABSA	FNB	Investec	Nedbank	Standard Bank
2008	100	100	100	100	100
2009	117	93	104	91	103
2010	126	64	100	83	100
2011	107	51	104	80	63
2012	86	35	99	79	44

Source: Calculations based on bank data (2013)

Table 4.15 is a clear indication of dramatically decreased risk weight percentages. FNB decreased from 177 percent in 2008 to 61 percent in 2012. Standard Bank decreased with 41 percent from 2008 to 2012.

Table 4.16: Risk weights percentage

RW	ABSA	FNB	Investec	Nedbank	Standard Bank
2008	46%	177%	73%	55%	74%
2009	53%	164%	76%	50%	76%
2010	58%	113%	73%	46%	74%
2011	49%	91%	76%	44%	47%
2012	39%	61%	72%	43%	32%

Source: Calculations based on bank data (2013)

As illustrated in Figure 4.8 and Figure 4.9, FNB experienced decreases in average risk weights from 2008 to 2012, ranging from 1 percent to 116 percent. The decrease in risk weights is 116 percent, which is the biggest decrease in risk weights percentage across banks.

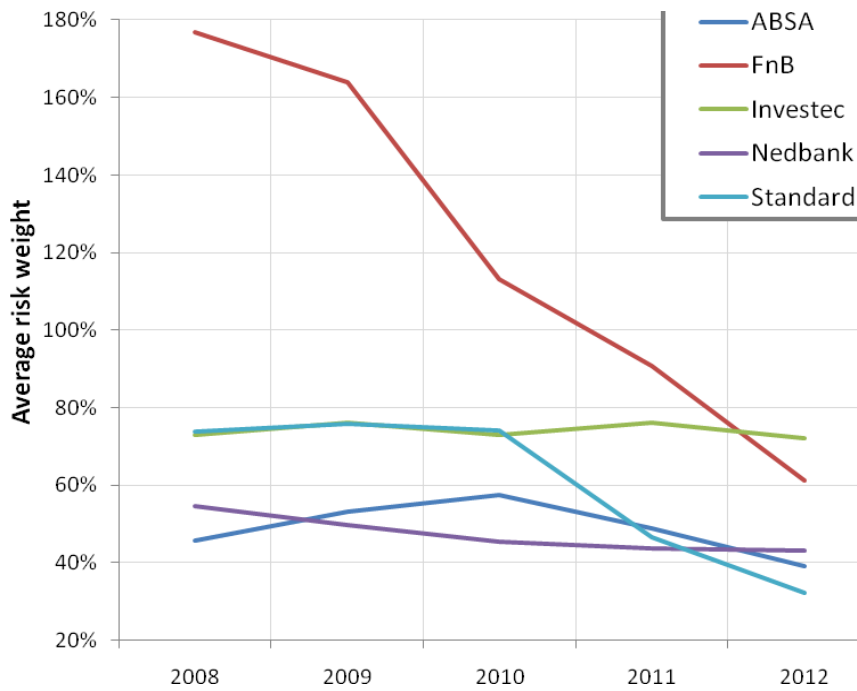


Figure 4.8: Trend of average risk weights

Source: Calculations based on bank data (2013)

In Figure 4.8, FNBs decrease in risk weights are illustrated in red. Standard Bank also experienced a decrease of 42 percent from 2010 to 2012. In Figure 4.9, ABSA experienced a decrease of 19 percent from 2010 to 2012, whereas Nedbank decreased gradually over time.

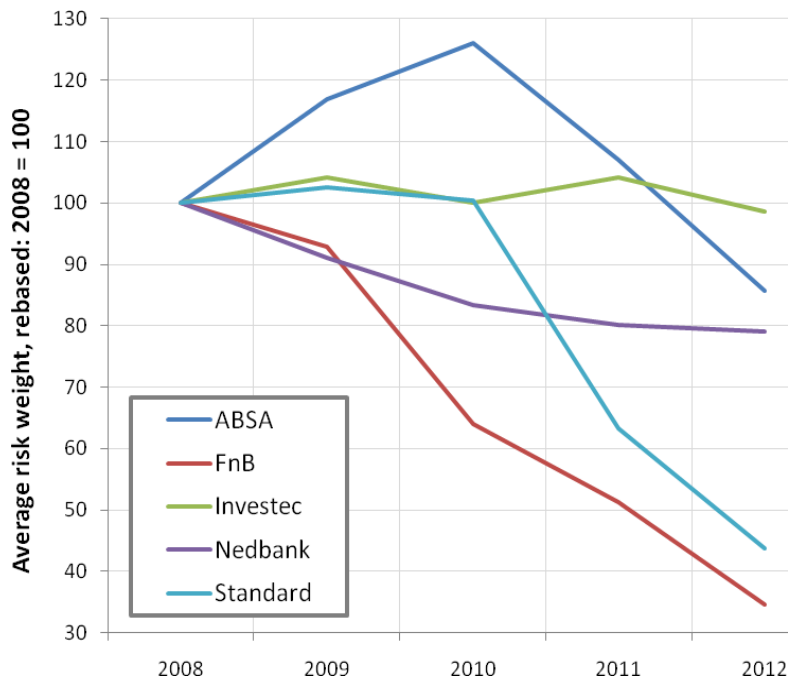


Figure 4.9: Trend of risk weights

Source: Calculations based on bank data (2013)

4.7 THE GLOBAL VOLATILITY INDEX (VIX)

Global price volatility was experienced during the period of 2002 and 2003. After the terrorist attacks on 9 September 2001, the US president, George Bush, declared war on terror (BBC News, 2001:1). George Bush's war on terror commenced on 8 October 2001, where the United States and the United Kingdom (UK) forces bombed Afghanistan and Iraq.

Due to the terrorist attack on the US, the confidence level of consumers and investors decreased (Johnston & Nedelescu, 2005:5). Financial markets were, not only hampered by the physical damage and losses, but also with market volatility and uncertainty. The US stock market decreased for a few days in terms of trading, for example between 17 September and 21 September, Standard and Poor's index decreased by 11.6 percent.

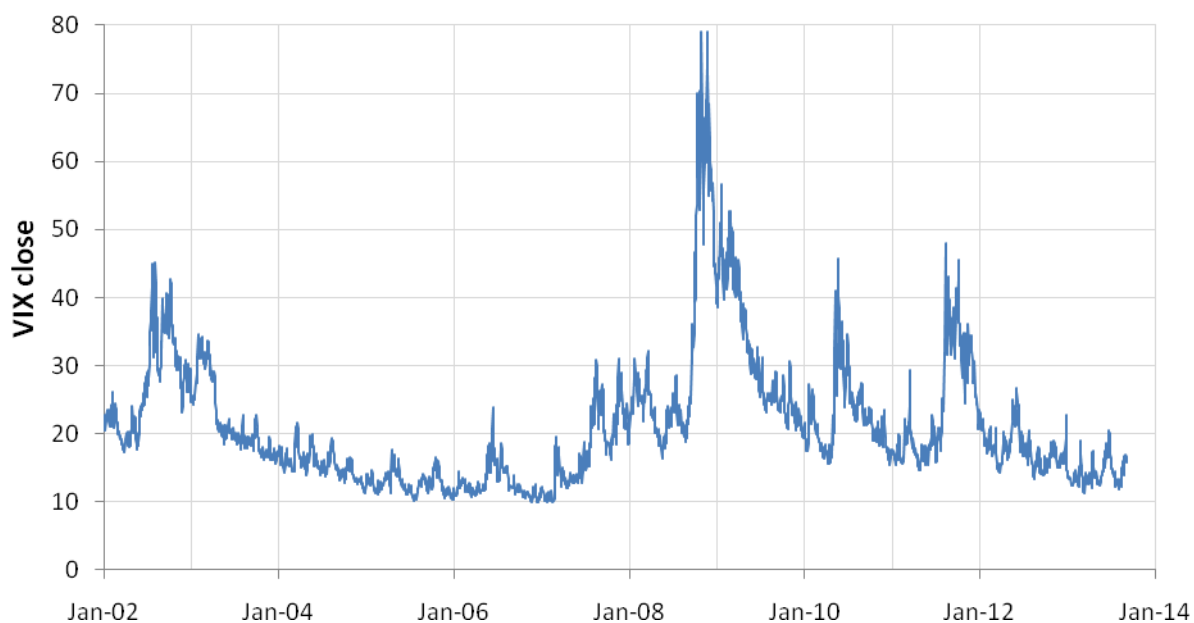


Figure 4.10: Global volatility index

Source: Calculations based on bank data (2013)

After the terrorist attack the oil prices increased, which caused transportation costs and production costs to increase. The average oil price increased from US\$22.73 in 2001 to US\$23.47 in 2002 (Table 4.17). The result was that consumers had to pay more for commodities. A general increase in prices led to higher inflation, which in turn released pressure on higher interest rates (Kollias *et al.*, 2011:7). Through increased uncertainty, the expected return on investments decreased, which placed substantial stress on capital. Due to

all the uncertainty of whether more attacks would have prevailed, markets became overall uncertain, which caused volatility in global prices as presented in Figure 4.10; an index plotted on a graph to measure the global volatility through various crises. Confidence from US citizens decreased during the 9/11 terrorists attacks (Table 4.18). Personal consumption expenditure (PCE) decreased from 5.1 percent in 1999 to 2.5 percent in 2001. Personal savings also declined from US\$168.5bn in 2000 to US\$132.2bn in 2001 due to the uncertainty that prevailed in the US markets. In late 2003, the war was declared over and therefore some stability became apparent.

Table 4.17: Oil prices

Periods	Average price of crude oil \$US
1997	18.28
1998	11.82
1999	17.13
2000	27.07
2001	22.73
2002	23.47
2003	27.11
2004	34.62
2005	49.87
2006	60.32
2007	70.91

Source: Jackson (2008)

Table 4.18: Consumer confidence analysis (billion dollars)

Year	PCE (Personal consumption expenditure)	PI (Personal income)	DPI (Disposable personal income)	PS Personal savings)	PS/DI (Personal savings as a percentage of disposable income)
1998	5.0	7423	6395.9	276.8	4.3%
1999	5.1	7802.4	6695	158.6	2.4%
2000	4.7	8429.7	7194	168.5	2.3%
2001	2.5	8724.1	7486.8	132.3	1.8%
2002	2.7	8881.9	7830.1	184.7	2.4%
2003	2.8	9163.6	8162.5	174.9	2.1%
2004	3.6	9727.2	8680.9	181.7	2.1%
2005	3.2	10301.1	9092.0	44.6	0.5%

Source: Jackson (2008)

During the 2007–2009 financial crisis, considerable volatility was experienced and the highest point was reached in 2009. Reasons for the volatility during the year 2007 include (Guillén, 2009:1-3):

- February 2007 – US subprime mortgages linked with the losses of HSBC;
- June 2007 – Subprime mortgages held by two Bear Stearns hedge funds were exposed to large losses and forced to dump assets;
- July 2007 – Bear Stearns reveal to their investors that they would get hardly any money back invested in two hedge funds as rival banks refuse to bail these banks out;
- August 2007 – BNP Paribas informed investors that they could not take any money out of investments in two specific funds due to unvalued assets. The European Central Bank invested billions of Euros into the banking market with the aim of improving liquidity. Intervention took place by the US Federal Reserve, the Bank of Canada, and the Bank of Japan. The US Federal Reserve Bank decreased the lending rate to banks with half a percentage point;
- September 2007 – The London interbank offered rate (LIBOR) that banks use to lend to each other increased to a high of 6.7975 percent. The biggest British bank, Northern Rock, had to get bailed out by the Bank of England after depositors withdrew their money;

- October 2007 – Citigroup bank revealed a loss of €40bn; and
- December 2007 – More funding was made available from the central banks and the Bank of England decreased interest rates with a quarter of one percentage. Standards and Poor's downgraded the rating of monoline insurers.

During 2008, the richest nations were hit, and economic growth slowed down. Some highlights of the year 2008, which contributed to the volatility exposure in Figure 4.10, include (Guillén, 2009:3-24):

- January 2008 – Stock markets over the world, including London's FTSE 100 index, experienced a big decrease. US Federal Reserve decreased rates with three quarters of a percentage in order prevent a recession;
- February 2008 – UK reposessed 27 000 homes. Northern Rock was nationalised by the British government;
- March 2008 – In an attempt to improve the liquidity market the US Federal Reserve contributed US\$200bn;
- April 2008 – Confidence in the UK housing market reached the lowest point in years;
- May 2008 – A Swiss bank, UBS, claimed US\$15.5bn in an attempt to recover some of the US\$37bn loss due to the credit crunch;
- July 2008 – UK was on the verge of a recession and the London's FTSE 100 index fell into a bear market;
- August 2008 – The European Central Bank fuelled over €200bn into the banking sector to improve liquidity. In a year's time the house prices in UK decreased by 10.5 percent and it was stated by Alistair Darling that it was the worst crisis in 60 years that the economy faced;
- September 2008 – The economic growth prediction from the European Central Bank decreased from 1.5 percent to 1.2 percent. The London's FTSE 100 index experienced the steepest decline since 2002. Lehman Brothers recorded a loss of US\$4bn and were up for sale. Shares in the European stock exchanges plunged and the FTSE 100 closed at 4 percent. The Russian stock market was closed for two days and Asia panicked when the Nikkei dropped with 260 points. Ireland was the first state that fell into a recession. The massive banking and insurance company, Fortis, was halfway nationalised and Netherlands, Belgium and Luxembourg contributed €11.2bn;

- October 2008 – Shares in the banking sector decreased and some of Europe’s largest economies, for example Sweden, responded and increased the protection levels. Japan’s Nikkei index decreased with 10 percent and the FTSE 100 fell by 10 percent. The unemployment rate increased to 5.7 percent, the highest in a few years. Dow Jones dropped to 5.7 percent and car sales decreased with 3.8 percent, where the Dow Jones industrial average made a big gain the following day of 401 points. The repo rate of India was decreased with a full percentage point, and in Denmark interest rates increased with 0.5 percent. The Bank of Japan decreased their key interest rates from 0.5 percent to 0.3 percent in response to the global crisis;
- November 2008 – In an attempt to reduce the effects of the recession, the European Central Bank decreased the Euro-zone rates from 3.25 percent to 2.75 percent. The Dow Jones and FTSE 100 decreased gradually through this month. Pakistan needed money to prevent defaulting on international debt and the IMF provided assistance; and
- December 2008 – The US recession was confirmed and the European Central Bank, Bank of England, Bank of Sweden and Bank of Denmark reduced interest rates again in an attempt to cut the recession short. Unemployment rates kept on increasing.

During the 2008 to 2009 time frame the highest level of volatility was experienced all over the world (Figure 4.10). Some key areas that could have contributed towards this volatility are highlighted (Guillén, 2009:24-91):

- January 2009 – Due to the slowdown of the US economy the federal budget deficit had increased to more than US\$1tn. The Bank of England recorded the lowest interest rate in over 300 years. Markets in Japan decreased sharply during this month, and in Spain credit rating cuts occurred. Inflation decreased to 3.1 percent;
- February 2009 – Unemployment in Spain increased by 6 percent, and Japan’s exports decreased by 46 percent; Euro-zone GDP also declined dramatically;
- March 2009 – In this month the financial crisis spilled over to world markets. Canada decreased their key interest rates from 1 percent to 0.5 percent in an attempt to reduce the economic slowdown. The unemployment rate in the UK reached 8.1 percent;
- April 2009 – The US dollar recovered slightly against the Yen. The total number of unemployed persons for the 24 European Union (EU) members were 20 million;
- May 2009 – German car sales increased to 19 percent compared to 2008. The European Central Bank decreased interest rates to 1 percent. China’s consumer prices decreased

with 1.5 percent compared to the year 2008. Japan's current account surplus decreased with 50.2 percent. Japan's exports show signs of recovery. India's economy showed some stable growth compared to the previous year with 5.8 percent;

- June 2009 – Switzerland showed some signs that it is entering the recession and the Euro-zone recorded a negative figure for annual inflation;
- July 2009 – It was recorded that the worst part of the recession was over. German industrial output increased with 3.7 percent;
- August 2009 – Consumer spending in the US increased despite the high unemployment rate and low-income rate. The German and French economies grew with 0.3 percent and South Africa shocked the world by decreasing its lending rate with 0.5 percent. World stock markets have risen after it was announced that economies were recovering from the crisis;
- September 2009 – Unemployment remained a threat but confidence levels increased as the Australian dollar reached the highest level for the 2009;
- October 2009 – Australia increased its main interest rate from 3 percent to 3.25 percent as the world economies recovered. The Dow Jones reached the 10 000 mark for the first time in this year. The US economy recorded growth of 3.5 percent during July and September;
- November 2009 – Australia created more job opportunities and decreased the unemployment rate in this country. Unfortunately, the European shares experienced a decrease due to the concern of Dubai's financial health and the Dow Jones cleared with 1.5 percent; and
- December 2009 – The unemployment rate in the US recovered from 10.2 percent to 10 percent. Greece recorded the highest debt level in modern history. The retail sales in UK decreased unexpectedly.

Global price volatility was also experienced during 2010 to 2012 (Figure 4.10). This volatility originated where the European countries (Greece, Portugal, Spain, Italy and Ireland) failed to obtain economic growth in order to repay debt build up from the 2007–2009 financial crisis. As soon as a country sells off large quantities of bonds, that country becomes vulnerable to a sovereign debt crisis (Arellano *et al.*, 2012:1). Greece experienced a sovereign debt crisis that started in 2010. The International Monetary Fund (IMF) loaned €110bn to Greece with the agreement to reduce spending in order to reduce their budget deficit. When

economic growth decreases, tax income also decreases, which increases budget deficits (Rasmus, 2012:1). Irrespective of this loan package, and another €130bn, the Greece sovereign debt crisis continued until 2012.

Stabilisation occurred at the end of 2010 in terms of the Greece crisis with the aid of rescue funding and government bailouts. By late 2011, the whole Eurozone's private banking systems took on some strain. Some of the northern banks of Europe were also hit by this spread, for example the Deutsche bank in Germany, and Societe General in France. While the sovereign debt crisis grew, the Eurozone's government kept on raising the amount of rescue funds. Rescue funds that were used during this time of need were actually developed to bail out sovereign government debt and not the bank's debt. With the banking system crisis and Greece changing for the second time, threads of spreading up north came apparent. The Eurozone government developed another government bailout fund and assisted the private banks in order to eliminate further possibilities of collapsing. The European Central Bank injected US\$1.2tn into the banking sector to stabilise banks (Rasmus, 2012:5). Just after spring 2012, the sovereign debt crisis of Greece erupted again and this crisis spilled over to Italy and Spain. Banks in the UK and France were hit hard by this third erupted sovereign debt crisis. It was announced that the banks were stabilised at the end of 2012, but some risks still arose from region-recessions. In 2012, only four countries received AAA rating from Standard & Poor, namely Finland, Germany, Luxembourg and the Netherlands (Arellano *et al.*, 2012:2). Greece were not rated in 2012 but was listed as selectively defaulted (SD) on some issues.

The timeline for the 2010-2012 banking system crisis was as follows (Arellano *et al.*, 2012:5):

- January 2010 – Irregularities were observed from the Greek government in terms of accounting, where the budget deficit was 12 percent of the GDP for 2009;
- April 2010 – The European Union revised the budget deficits for Greece and Ireland. The new figures came out as a budget deficit of 13.6 percent of the GDP for Greece and a deficit for Ireland of 14.3 percent of the GDP for 2009;
- May 2010 – A European financial stability facility (EFSF) was established with capital guarantees of €440bn. A security market program (SMP) was developed by the European Central Bank (ECB) to buy the Greek, Irish and Portuguese bonds over several months;

- November 2010 – A rescue package was provided to Ireland of €85bn Euros from the IMF and EU;
- May 2011 – A rescue package from the IMF and EU was provided to Portugal of €78bn;
- July 2011 – The second rescue package for Greece was planned and EU banks were forced to accept a 50 percent decrease on Greek bonds;
- August 2011 – The ECB bought Irish, Italian, Portuguese and Spanish bonds;
- November 2011 – Papandreou and Berlusconi resigned as politicians in Greece;
- December 2011 – The ECB decrease the interest rate on repurchase agreements (loans to banks where bonds serve as collateral) to 1 percent;
- December 2011 to March 2012 – A new rule to control budget deficits was introduced and banks had to follow these rules to rectify their problem areas before they could get a rescue package from the EU and IMF; and
- March 2012 – A second rescue package of €130bn was finalised.

4.8 European overview of capital requirements

Many things were to be blamed for the 2007–2009 financial crisis, but the one thing that was highlighted and addressed by the BCBS was capital requirements (Hellwig, 2010:2). The BCBS attempted to improve the matter by establishing a universal definition of capital and introducing a leverage ratio. Another attempt from the BCBS was to reduce the effects of procyclicality on capital regulation. During the 2007–2009 financial crisis banks were required to sell assets (deleverage) or raise additional capital above the minimum required capital.

In 1988, Basel established minimum capital requirements of which credit risk's capital charge was subjected to 8 percent of the loan amount. The aim of Basel was to force banks to have equity capital higher than the capital charges. In 1993, Basel made a proposal to extend the capital regulation to credit risk and market risk. In 1994, the amendment was made to the capital accord to incorporate market risks where banks could measure the required capital based on their own risk models. The phasing in of Basel II in the mid 2000s provided the same options to calculate capital requirements for credit risk and market risk.

The objective of capital regulation is to maintain the safety and soundness of banks. Hellwig (2010:9) and Rose and Hudgins (2013:486) highlighted six purposes:

- Safety can be provided from capital against unexpected losses and risk of failure;
- Capital reduces the inducements for incurring risks;
- Supervisors can be provided with capital to intervene in banks before bank-insolvency;
- Capital can assist to ensure that growth is sustainable in the long run;
- Public's confidence must be promoted through capital; and
- Funds must be provided from capital to form new services and facilities.

Table 4.19: Analysis of capital requirements for Europe, US and Japan from 1997 to 2001

		All	US	Europe	Japan
Total capital ratio (%)	Median	11.2	11.9	10.8	10.9
	St. dev.	2.4	2.2	2.9	1.3
Tier 1 capital ratio (%)	Median	7.3	8.6	7.4	5.9
	St. dev.	2.8	2.5	3.0	1.7
Loan portfolio	Median	87	33	91	117
	St. dev.	116	92	74	168
Loan portfolio/total assets	Median	56	62	51	61
	St. dev.	15	19	13	10
Loan loss provision/loans	Median	0.67	0.52	0.53	1.90
	St. dev.	0.91	0.53	0.35	1.15
Number of banks	Median	128	33	57	33
	St. dev.				

Source: Peura & Jokivuolle (2004)

The median that all banks held was almost over 11 percent, which is in excess of the minimum capital requirement with 3 percent (Table 4.19). All banks in this sample were well above the minimum capital requirement of 8 percent. At least half of the total capital ratio must be made up with tier 1 capital as stipulated by Basel I (João & Santos, 2001:60). Figure 4.11 illustrates that more than 45 percent of banks in the US held a capital ratio of 11 percent.

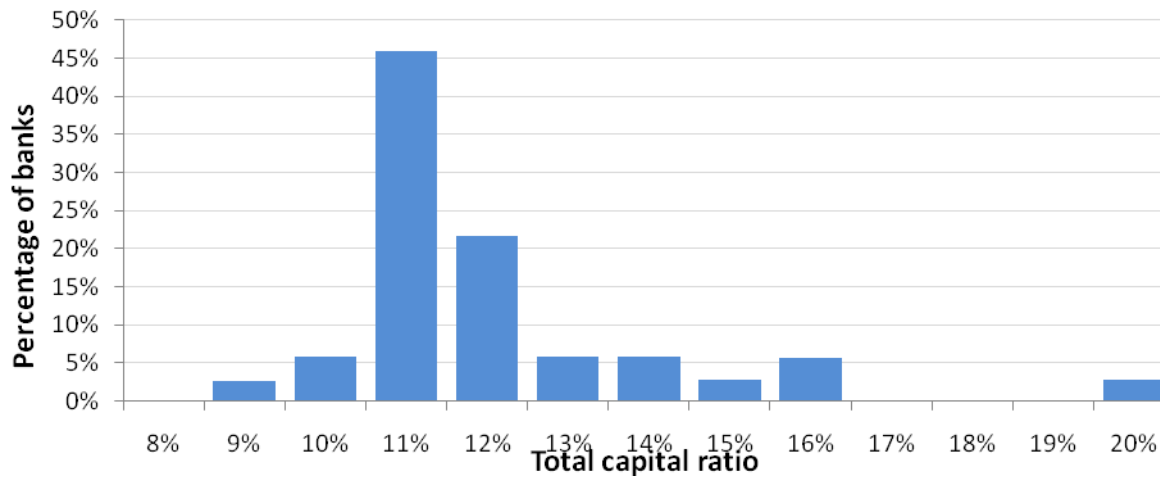


Figure 4.11: Banks in US and their total capital ratio

Source: Peura & Jokivuolle (2004)

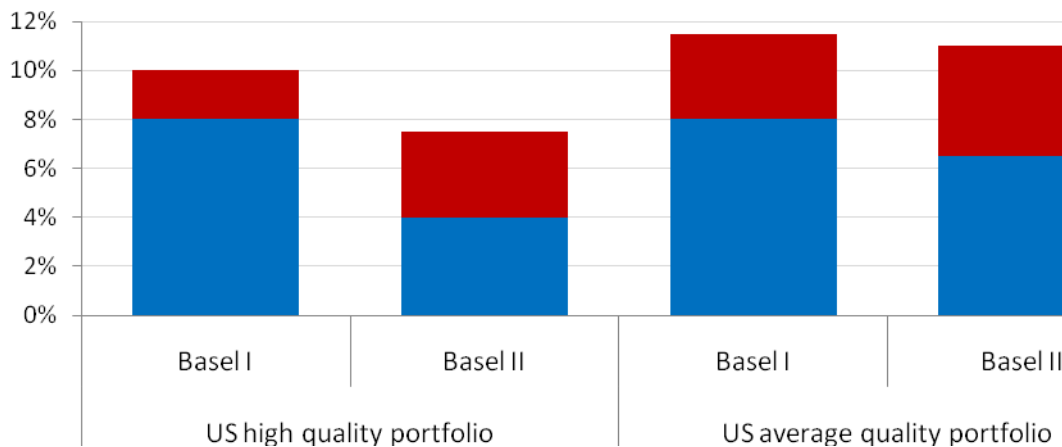


Figure 4.12: Minimum capital ratios for US under Basel I and Basel II

Source: Peura & Jokivuolle (2004)

The minimum capital ratio decreased from Basel I (US high quality portfolio) 8 percent to 4 percent, where the minimum capital ratio decreased with almost 2 percent (Figure 4.12).

The 2007–2009 financial crisis revealed some weaknesses in banking regulation (IMF, 2012:3). The biggest challenge banks face is to determine how risky the assets on the balance sheet are. The idea surrounding regulatory capital requirements are that it must be linked with bank risks, which was accepted internationally (Basel I). Basel II made the amendment that banks are required to hold a minimum of 8 percent of RWA and in Basel III, better and higher forms of capital, but a limited view on risk measurement.

Evidence was given that a positive relationship existed between RWA and market risk for three years before the 2007–2009 financial crisis (IMF, 2012:4). After this financial crisis the relationship between RWA and market risk became negative due to large market measure of risks. For over a decade, a decreasing trend of RWA was followed by US bank holding companies before the financial crisis (Figure 4.13). Accompanied with the decreasing RWA was also the decreasing trend for capital held as a percentage of RWA (Figure 4.14).

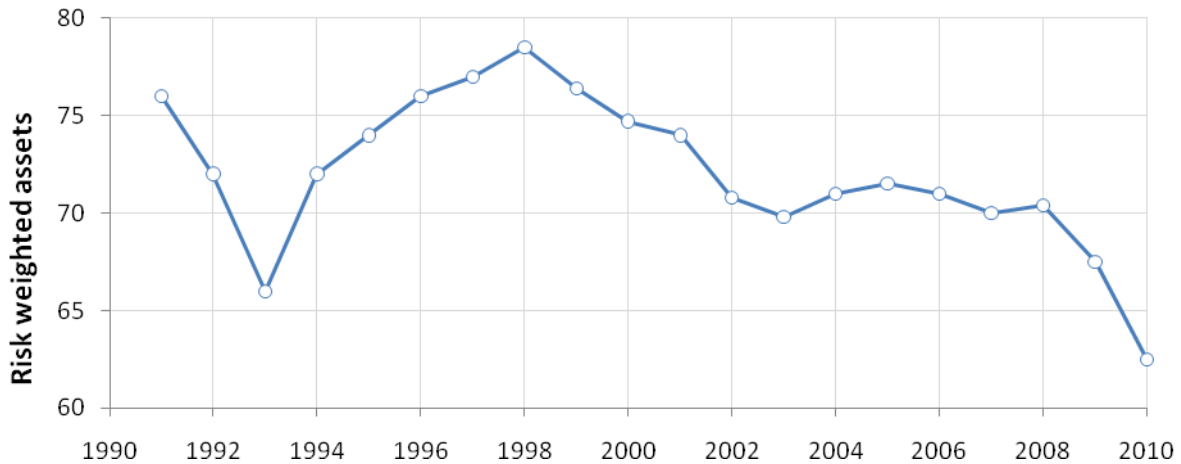


Figure 4.13: Trend of RWA for US bank holding companies

Source: IMF (2012)

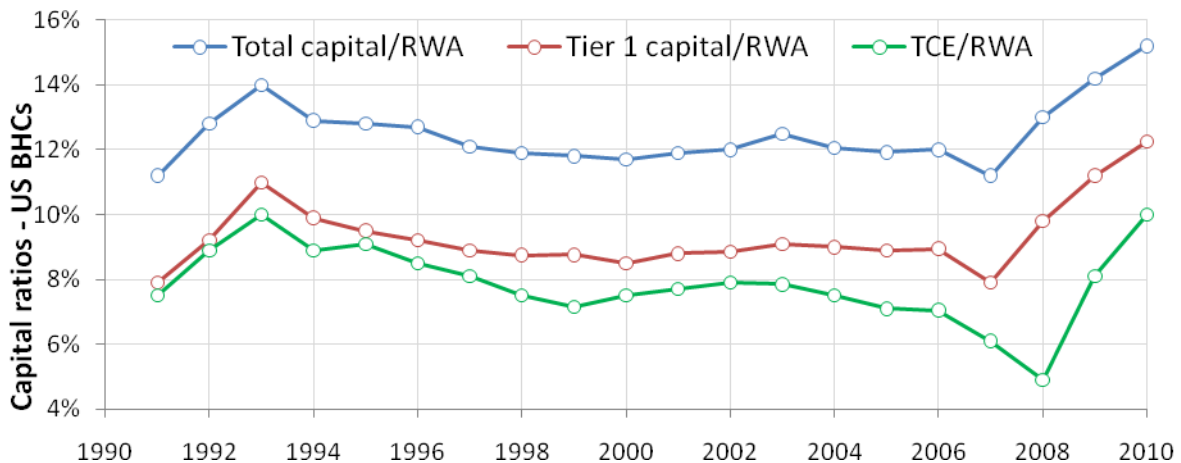


Figure 4.14: Trend of regulatory capital for US bank holding companies

Source: IMF (2012)

It became evident that large financial sectors in Asia followed Basel II while the smaller financial sectors followed Basel I at the time of the 2007–2009 financial crisis. According to IMF (2012:13) the EU Capital Requirements Directive sends an order that all countries in

Europe should have implemented the Basel II framework at the time of the financial crisis. The aim of this order was that banks can use their own internal models to determine the relevant risk weights. In the US, a different philosophy was followed. Only large financial sectors in the US should have followed Basel II during the financial crisis whereas the smaller financial sectors were only obliged to implement the Basel II framework in 2012. Due to this scenario, the conclusion was made that RWA for US and Asian banks were higher and lower for European banks. Due to this, the default history and the probability of default can influence the RWA reported (IMF, 2012:14).

Table 4.20: Total regulatory capital divided by risk-weighted assets

Number of banks	Categories	2006	2007	2008	2009	2010	Average
1103	EU 27	9106	9340	10105	12025	12305	10576
1021	EU 16	9072	9315	10097	12005	12277	10553
82	EU Enlarged 11	11586	10995	10640	13262	14056	120108
968	EU are 17	9830	9492	10388	12016	12289	10803
135	Non-Euro area 10	7045	8922	9397	12050	12345	9952
37	State	6045	10855	12955	14320	13874	11610
1086	Non-State	9569	9249	9849	11866	12220	10551
109	Listed	10599	10335	11162	12773	13209	11616
1014	Unlisted	8332	8819	9507	11633	11788	10016
1002	Main Country	8988	9000	10102	11503	12000	10318
121	Main & Foreign Country	9415	9772	10198	12619	12708	10942
27	XXL	8969	9314	10026	12191	12797	10659
18	XL	11527	11638	12658	14626	14177	12925
23	L	10700	9993	10528	11821	11792	10967
100	M	10371	9545	9834	11238	10694	10336
154	S	5122	5451	6007	7580	7850	6404
801	XS	4120	5944	8393	10129	10212	7760

Source: Eken *et al.*, (2012)

As indicated in Table 4.20, all banks in Europe's capital adequacy increased from the period 2006 to 2010. The European Commission (2011:1) highlighted that the 2007–2009 financial crisis highlighted some weaknesses in the European banking sector. During the financial

crisis, it became evident that banks held too little capital and the capital they held was not sufficient to recover the losses they faced. Another problem that became apparent was that European banks did not have enough liquid funds to cover losses. Banks held too many assets compared to capital, and when the crisis struck, the assets' value decreased. In an attempt to sell the assets, the value decreased further and it all contributed towards the 2007–2009 financial crisis. The change suggested after the crisis was that banks have to hold more capital consisting of better quality assets in order to ensure recovery of losses. Capital buffers must serve as a cushion against losses. Banks were required to reconsider the limits of assets they can hold against capital (leverage). In order to ensure banks follow a guide, the BCBS guide must be introduced and followed throughout Europe. New rules were introduced in 2012 and banks are given until 2019 for implementation of the rules (European Commission, 2011:2).

Basel III introduced new measures to increase the capital base of banks (BCBS, 2012(a):14). Expansion of risk coverage contributes to the increase of RWA. The biggest targets for Basel III are those areas that were highlighted during to 2007–2009 financial crisis, which include counterparty credit risk, securitised assets and trading book exposures.

4.9 CONCLUSION

After the 9/11 terrorist attacks, global financial markets experienced periods of uncertainty; President George Bush declared war and US citizens was terrified of more terrorist attacks. This uncertainty caused volatility in the global prices. South Africa experienced a growth period from 2002 to 2007, where the economy was in an upward phase. The regulatory capital for South Africa during this period decreased. This decrease was due the economy that was reaping the benefits of the upwards phase, and also the NCA that was introduced into the South African markets in 2007. This act protected South Africa from the severe effects of the 2007–2009 financial crisis. The South African economy was in a downward phase throughout this crisis, and Basel II came into effect and the capital requirements had to increase based on the new rules.

It can be concluded that regulatory capital for market-, credit- and operational risk increased when the 2007–2009 financial crisis struck. From 2012 to 2013, the regulatory capital continued to increase. From 2010 to 2012 several crises occurred which made banks want to hold more capital due to the uncertainty of the liquidity crisis and the three sovereign crises.

CHAPTER 5: SUMMARY AND CONCLUSIONS

5.1 SUMMARY

The Basel Committee on Banking Supervision (BCBS) highlighted one main objective, namely adequate capital levels. Introduced into the markets in 1988, Basel I focused mainly on credit risk. After the 2007–2009 financial crisis, Basel I was deemed to be inappropriate, and Basel II was introduced into the financial markets. Basel II placed emphasis on calculating minimum capital requirements in terms of credit-, operational- and market risk. Operational risk was introduced in the financial markets only in 2008. Some loopholes were encountered in Basel II and the BCBS introduced Basel III into financial sectors. Some of the elements of Basel III have been imposed on financial sectors already, and others will come into effect in phases until 2018.

Five South African banks' (ABSA, Nedbank, Investec, Standard bank and FNB) capital levels were analysed from the period 2002–2012 under each phase of the Basel accords. Some volatility in financial systems occurred during the selected period, and economic and political factors can take the blame. The basis of this study was to determine if regulatory capital levels increased or decreased during the period of 2002–2012 under the Basel regulation. The analysis focused on the standards of Basel, and simulated models were used to determine the capital levels of banks.

This study focused on the theoretical background of Basel. Basel I, which was introduced in 1988, only made provision for two risks, credit risk and market risk. Basel I released the regulation of capital requirements that banks should maintain and divided capital into two tiers, namely tier 1 and tier 2. Banks were supposed to retain 4 percent of tier 1 capital and 8 percent of total capital.

Basel II was introduced in 2008 and identified Basel I's discrepancies and remedies for the discrepancies by calculating minimum capital levels for market-, credit- and operational risk. Basel II was categorised into three pillars, namely Pillar 1, minimum capital requirements, Pillar 2, supervisory review, and Pillar 3, greater public disclosure. After the 2007–2009 financial crisis, some gaps were identified in Basel II, which led to the introduction of Basel III. Basel III emphasised that more capital should be held back by financial institutions. Some of the aspects of Basel III will only come into effect in 2018, and it is not seen as the perfect

regulatory framework. Some proposals made by Basel III were the use of the expected shortfall (ES) formula to calculate market risk instead of using value at risk (VaR). These proposals could possibly lead to a Basel IV.

An in depth analysis was provided to various Basel accords with the applicable formulas for credit-, market- and operational risk. The following is a summary of the formulas used to investigate the capital requirements of the stipulated banks:

Total capital / credit risk + market risk = The bank's capital ratio (minimum 8 percent)

Market risk was calculated under Basel I by using the historical VaR formula:

$$MRC = \max\left(k \cdot \sum_{i=1}^{60} \frac{VaR_i}{60}, VaR_{i-1}\right) + SR$$

Credit risk on the other hand was divided into the respective exposure classes. If the bank is in an exposure class of 20 percent, then the capital charge would be 1.6 percent (in relation to the 8 percent minimum capital requirements).

Basel II was introduced into the financial markets and the minimum capital levels were calculated as follows:

Total capital (unchanged) / credit risk + market risk + operational risk = The bank's capital ratio (minimum 8 percent)

Operational risk was introduced for the first time into financial markets in 2008. Three approaches were used to calculate minimum capital requirements, namely the basic indicator approach (BIA), the standardised approach (SA), and the advanced measurements approach (AMA).

The formula used to calculate the BIA:

$$CR_{BIA} = [\sum (GI_{Bi} \times \alpha)] / n$$

The formula used to calculate the SA:

$$CR_{SA} = \{\sum_{years 1-3} \max [\sum(GI_{Bi 1-8} \times \beta_{1-8})]\} / 3$$

The formula used to calculate the AMA:

$$CR_{IMAij} = Y_{ij} \times El_{ij} \times PE_{ij} \times LGE_{ij}$$

Some gaps were identified for market risk under Basel I; therefore, Basel II was introduced into the markets to remedy the gaps. Basel II made provision to include the incremental risk factor (IRC) and also the stressed value at risk (sVaR). The formula used under Basel II to calculate market risk was:

$$MRC = \max\left(k \cdot \sum_{i=1}^{60} \frac{VaR_i}{60}, VaR_{i-1}\right) + SR + SVaR + IRC$$

Credit risk was divided into two approaches under Basel II, namely the standardised approach (SA), and the internal ratings-based approach (IRB). The IRB approach can be divided into two sub-approaches, namely the advanced IRB approach and the foundation IRB approach.

The foundation IRB approach is calculated by the following formulas:

$$K_{credit} = LGD \times \left[N \left(\sqrt{\frac{1}{1-\rho}} \cdot N^{-1}(PD) + \sqrt{\frac{\rho}{1-\rho}} \cdot N^{-1}(0.999) \right) - PD \right] \times \left(\frac{1 + (M - 2.5)b}{1 - 1.5b} \right)$$

$$\rho = 0.24 - 0.12 \cdot \left[1 - \frac{\exp(-50 \cdot PD)}{1 - \exp(-50)} \right]$$

$$b = [0.11852 - 0.05478 \cdot \ln(PD)]^2$$

The formula to calculate credit risk for credit cards is as follows:

$$K_{credit} = LGD \times \left[N \left(\sqrt{\frac{1}{1-\rho}} \cdot N^{-1}(PD) + \sqrt{\frac{\rho}{1-\rho}} \cdot N^{-1}(0.999) \right) - PD \right]$$

$$\text{Correlation} = 4\%$$

Credit risk for mortgage loans is calculated as follow:

$$K_{credit} = LGD \times \left[N \left(\sqrt{\frac{1}{1-\rho}} \cdot N^{-1}(PD) + \sqrt{\frac{\rho}{1-\rho}} \cdot N^{-1}(0.999) \right) - PD \right]$$

Correlation = 15%

The advanced IRB approach uses the following formulas to calculate credit risk:

$$K_{credit} = LGD \times \left[N \left(\sqrt{\frac{1}{1-\rho}} \cdot N^{-1}(PD) + \sqrt{\frac{\rho}{1-\rho}} \cdot N^{-1}(0.999) \right) - PD \right] \\ \times \left(\frac{1 + (M - 2.5)b}{1 - 1.5b} \right)$$

$$\rho = 0.24 - 0.12 \cdot \left[1 - \frac{\exp(-50 \cdot PD)}{1 - \exp(-50)} \right]$$

$$b = [0.11852 - 0.05478 \cdot \ln(PD)]^2$$

The formula to calculate credit risk for credit cards is as follows:

$$K_{credit} = LGD \times \left[N \left(\sqrt{\frac{1}{1-\rho}} \cdot N^{-1}(PD) + \sqrt{\frac{\rho}{1-\rho}} \cdot N^{-1}(0.999) \right) - PD \right]$$

Correlation = 4%

Credit risk for mortgage loans will be calculated as follow:

$$K_{credit} = LGD \times \left[N \left(\sqrt{\frac{1}{1-\rho}} \cdot N^{-1}(PD) + \sqrt{\frac{\rho}{1-\rho}} \cdot N^{-1}(0.999) \right) - PD \right]$$

Correlation = 15%

Operational risk calculation and credit risk calculation remained unchanged from Basel II to Basel III. Basel III requires financial institutions to keep more capital, and introduced new capital levels for the minimum requirements. The VaR measure seemed to be unreliable and

new proposals are drawn up to amend market risk by substituting the VaR method with the ES method.

The formulas were used as indicated by the different Basel accords to determine if an increase or decrease in capital requirements could be visualised. These capital levels of the five respective banks in South Africa were calculated in terms of each respective risk. For the five banks, the capital levels were calculated from 2002 to 2012. During the early 2000s, the capital levels for credit risk and market risk were calculated under Basel I.

From the capital requirements of credit-, market- and operational risk presented in Chapter 4, it is clear the capital levels for the respective risks were low from 2002 to 2008. In addition, the South African economy was in an upward phase during that period. When the effects of the financial crisis could be felt by economies, regulatory capital increased for these five banks; that continuation of increased capital levels was noticed until 2012.

Global volatility was analysed using the global volatility index. The first track of volatility was during 2002–2003. This was just after the 9/11 terrorist attacks in 2001, when President George Bush declared war. This volatility was due to uncertainty from the public's side. Also, global volatility was encountered during 2007–2009 when the sub-prime mortgage financial crisis struck the world. This financial crisis placed many European countries (*inter alia* Portugal, Greece, Italy, Spain) in debt, and these countries struggled to repay their debt obligations. This caused global volatility during 2010–2012.

5.2 CONCLUSIONS

The South African economy indicated some strong growth signs, with Basel I not perfectly incorporated; the regulatory capital requirements for the five banks were decreasing from one year to the next. During and after the sub-prime mortgage crisis, capital levels increased drastically for credit-, market- and operational risk. The minimum capital levels of the five South African banks for credit-, market- and operational risk was calculated. Clear evidence was found that the 2007–2009 financial crisis highlighted weaknesses of financial sectors. An updated Basel I was needed to establish higher capital requirement levels. Basel II was introduced to financial sectors and new formulas were incorporated to calculate the risks for banks.

The following main conclusions were made from the study:

5.2.1 Lower capital levels for South African banks when the economy experienced a boom phase

The South African economy was in an upward phase from September 1999 to November 2007. During this period, the South African financial systems were subject to Basel I regulations. From the statistics provided in Chapter 4, capital levels for the five South African banks, namely ABSA, Nedbank, Investec, Standard Bank and FNB decreased from 2002 to 2008. Provision was made only for the calculations of minimum capital requirements of credit and market risk.

5.2.2 Basel II and the sub-prime mortgage financial crisis increased capital levels for South African banks

The 2007–2009 financial crisis had an effect on all economies around the world and caused most countries to fall into a recession. Economic growth decreased and most countries experienced negative economic growth rates. Capital levels for credit risk, market risk and operational risk for the five South African banks increased onwards from 2008. Some loopholes were identified in Basel I, and in 2008, Basel II was introduced in financial markets. Basel II made provision to calculate the minimum capital requirement for operational risk.

5.2.3 Factors that caused volatility from 2002 to 2012

Economic and political factors played a vital role in causing global volatility. Global volatility was experienced first in 2002–2003 after the 9/11 terrorist attacks in 2001. Uncertainty surrounded the financial markets and people did not know what to expect next. The 2007–2009 financial crisis caused moral hazard in financial markets, and global volatility reached new heights during this period. Several liquidity and sovereign crises followed 2008, which caused volatility in the market place.

5.3 RECOMMENDATIONS FOR FUTURE RESEARCH

A future study can be done on the five South African banks from the period 2012 onwards. The regulation will be under Basel III, and the amendments on Basel III (Basel IV) to determine if more capital is held back when tighter regulations are imposed on financial institutions. A future study on the five South African banks can be done in a new period to

determine the effects of the full implementation of Basel III and Basel IV and the effect on capital requirement levels for credit-, market- and operational risk.

Before Basel II labelled the unmeasured risks as operational risk, they existed in the financial sectors without receiving any attention. A future study can be done to determine what effects these unmeasured risks had on the operations of a bank.

BIBLIOGRAPHY

Accenture. 2012. Basel III handbook

<http://www.accenture.com/SiteCollectionDocuments/PDF/Accenture-Basel-III-Handbook.pdf> Date of access: 12 Aug. 2013.

Arellano, C., Conesa, J.C. & Kehoe, T.J. 2012. Chronic sovereign debt crisis in the Eurozone, 2010-2012.

http://www.minneapolisfed.org/publications_papers/pub_display.cfm?id=4877 Date of access: 28 Oct. 2013.

Balta, E. & Fontnouvelle, P. 2009. Basel II operational risk modeling, implementation & challenges. http://www.niss.org/sites/default/files/02_Balta%20&%20deFontnouvelle.pdf Date of access: 19 Sept. 2013.

Bank of Israel. 2008. Working framework for capital measurement and adequacy.

http://www.bankisrael.gov.il/en/BankingSupervision/SupervisorsDirectives/ProperConductOfBankingBusinessRegulations/206_et.pdf Date of access: 19 Sept. 2013.

BBC News. 2001. 2001: US declares war and terror.

http://news.bbc.co.uk/onthisday/hi/dates/stories/september/12/newsid_2515000/2515239.stm Date of access: 30 Oct. 2013.

BCBS. Basel Committee on Banking Supervision. 1988. International convergence of capital measurement and capital standard. <http://www.bis.org> Date of access: 8 Jul. 2013.

BCBS. Basel Committee on Banking Supervision. 1993. The supervisory treatment of market risk. <http://www.bis.org> Date of access: 17 Sept. 2013.

BCBS. Basel Committee on Banking Supervision. 1999. Working paper: Capital requirements and bank behaviour. <http://www.bis.org> Date of access: 8 Jul. 2013.

BCBS. Basel Committee on Banking Supervision. 2001. The internal ratings-based approach. <http://www.bis.org>. Date of access: 20 September 2013.

BCBS. Basel Committee on Banking Supervision. 2001. The standardised approach to credit risk. <http://www.bis.org>. Date of access: 20 September 2013.

BCBS. Basel Committee on Banking Supervision. 2002. <http://www.bis.org> Date of access: 4 Aug. 2011.

BCBS. Basel Committee on Banking Supervision. 2003. Sound practices for the management and supervision of operational risk. <http://www.bis.org>. Date of access: 8 Jul. 2013.

BCBS. Basel Committee on Banking Supervision. 2004. International convergence of capital measurement and capital standards. <http://www.bis.org>. Date of access: 19 September 2013.

BCBS. Basel Committee on Banking Supervision. 2006. International convergence of capital measurement and capital standard. <http://www.bis.org> Date of access: 8 Jul. 2013.

BCBS. Basel Committee on Banking Supervision. 2009. <http://www.bis.org> Date of access: 8 Jul. 2013.

BCBS. Basel Committee on Banking Supervision. 2010. Basel III: A global regulatory framework for more resilient banks and banking systems. <http://www.bis.org> Date of access: 8 Jul. 2013.

BCBS. Basel Committee on Banking Supervision. 2011. Revisions to the Basel II market risk framework. <http://www.bis.org>. Date of access: 18 September 2013.

BCBS. Basel Committee on Banking Supervision. 2012 (a). Fundamental review of the trading book. <http://www.bis.org> Date of access: 6 Aug. 2013.

BCBS. Basel Committee on Banking Supervision. 2012 (b). Post crisis evolution of the banking sector. <http://www.bis.org/publ/arpdf/ar2012e6.pdf> Date of access: 4 Oct. 2013.

Benzin, A., Trüch, S. & Rachev, S.T. 2005. Approaches to credit risk in the new Basel capital accord. http://statistik.econ.kit.edu/download/doc_secure1/benzin_trueck.pdf Date of access: 20 Sept. 2013.

Berger, A.N., Herring, R.J. & Szegö, G.P. 1995. The role of capital in financial markets. *Banking & Finance*, 19:393-430.

Bessis, J. 2010. Risk management in banking. 3rd ed. United Kingdom: John Wiley.

Bianco, K.M. 2008. The subprime lending crisis: causes and effects of the mortgage meltdown. <http://www.consejomexicano.org/Emails/subwprev.pdf> Date of access: 18 Nov. 2013.

Blundell-Wignall, A. & Atkinson, P. 2010. Financial market trends. *Thinking beyond Basel III: Necessary solution for capital and liquidity*. 1-23.

Bustelo, P. 1998. The East Asian financial crises: an analytical survey. <http://pendientedemigracion.ucm.es/info/eid/pb/ICEIwp10.pdf> Date of access: 18 Nov. 2013.

Calculations based on bank data. 2013. Annual reports of ABSA, FnB, Investec, Nedbank and Standard Bank. Period 2002-2012.

Chami, R. & Cosimano, T. 2003. . *The nature of capital adequacy constraint under the Basel Accord*: 1-10. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=456981. Date of access: November 2013.

Chang, C., Jiménez_Martin, J., McAleer, M. & Pérez-Amoral, T. 2011. Risk Management of Risk under the Basel Accord: Forecasting Value-at-Risk of VIX futures. <http://eprints.ucm.es/12285/1/1102.pdf> Date of access: 02 October 2013.

Chicago Tribune. 2013. US regulator warns on banks habit of reducing reserves. <http://articles.chicagotribune.com/2013-09-16/news/sns-rt-financial-regulationreserves->

20130916_1_big-banks-reserves-federal-deposit-insurance-corp Date of access: 31 Oct. 2013.

Covas, F. & Fujita, S. 2010. Procyclicality of capital requirements in a general equilibrium model of liquidity dependence. *International journal of central banking*, 6(4):137-173.

Crouhy, M., Galai, D. & Mark, R. 2006. The essentials of risk management. NY: McGraw-Hill.

ECB. European Central Bank. 2005. Credit ratings and the standardised approach to credit risk in Basel II. <http://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp517.pdf> Date of access: 20 Sept. 2013.

Eken, M.H., Selimler, H., Kale, S. & Ulosoy, V. 2012. The effects of global financial crisis on the behaviour of European banks: risk and profitability analysis approach. *ACRN Journal of Finance and Risk Perspectives*, 1(2012):29-31.

Elizalde, A. 2007. From Basel I to Basel II: an analysis of the three pillars. <ftp://ftp.cemfi.es/wp/07/0704.pdf> Date of access: 18 Nov. 2013.

Elizalde, A. & Repullo R. 2006. Economic and regulatory capital in banking: What is the difference? <http://www.abelelizalde.com/pdf/economic%20regulatory%20actual.pdf> Date of access: 29 Oct. 2013.

Elliott, D.J. 2010. A premier on bank capital. <http://www.brookings.edu/research/papers/2010/01/29-capital-elliott> Date of access: 24 May 2013.

Ernst & Young. 2012. Basel II.5 US market risk finale rule. [http://www.ey.com/Publication/vwLUAssets/Basel-2.5-June-2012/\\$FILE/Basel-2.5-June-2012.pdf](http://www.ey.com/Publication/vwLUAssets/Basel-2.5-June-2012/$FILE/Basel-2.5-June-2012.pdf) Date of access: 19 Sept. 2013.

European Commission. 2011. EU proposal for stricter capital requirements and better corporate governance for banks and investment firms.

http://ec.europa.eu/internal_market/bank/docs/regcapital/CRD4_reform/citizen_summary_en.pdf Date of access: 7 Oct. 2013.

Feldstein, M. 2008. Remarks on “Beyond price stability: The challenges ahead”. Seventh BIS annual conference. 26-29 June 2008.

Feyen, E. & G del Mazo. 2012. European bank deleveraging and global credit conditions: implications of a multi-year process on long-term finance and beyond.

<http://www.google.co.za/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=0CDAQFjAB&url=http%3A%2F%2Fwww.g20.org%2Fload%2F781245823&ei=RoxOUp7CKJGf7gaGwoHQCw&usg=AFQjCNGH7277tINsUzwhhXPnvt76Wlz0FQ&bvm=bv.53537100,d.ZGU>.
Date of access: 04 October 2013.

Fitch Ratings. 2013. South Africa’s GDP. www.fitchratings.com Date of access: 30 Oct. 2013.

FRBSF (Federal Reserve Bank of San Francisco). 1998. What caused East Asia’s financial crisis? <http://www.frbsf.org/economic-research/publications/economic-letter/1998/august/what-caused-east-asia-financial-crisis/> Date of access: 18 Nov. 2013.

FSC. Financial Services Commission. 2013. Capital requirements directive operational risk. <http://www.fsc.gi/download/adobe/banking/noteoperationalrisk.pdf> Date of access: 19 Sept. 2013.

GARP. 2012. Banks and risks. www.garp.org Date of access: 23 May 2013.

Gitman, L.J. 2010. Principles of managerial finance. CA: Pearson.

Gobat, J. 2012. What is a bank? *Finance and Development*, 49(1):38. www.imf.org Date of access: 23 May 2013.

Goodwin-Groen, R.P. 2006. The national credit act and its regulations in context of access to finance in South Africa. http://www.finmark.org.za/wp-content/uploads/NCA_regulations.pdf Date of access: 31 Oct. 2013.

Griffith-Jones, S. & Spratt, S. 2001. Will the proposed new Basel Capital Accord have a net negative effect on developing countries?
http://scholar.googleusercontent.com/scholar?q=cache:9n9C3shsJmoJ:scholar.google.com/+basel+and+developing+countries&hl=en&as_sdt=0,5 Date of access: 8 Jul. 2013.

Guillén, M.F. 2009. The global economic & financial crisis: a timeline. http://www-management.wharton.upenn.edu/guillen/2009_docs/crisis_financiera_formato_nuevo.pdf
Date of access: 8 Oct. 2013.

Hellwig, M. 2010. Working paper: Capital regulation after the crisis: business as usual?
<https://www.econstor.eu/dspace/bitstream/10419/57491/1/636803627.pdf> Date of access: 2 Oct. 2013.

Hull, J.C. 2008. Fundamentals of futures and options markets. 6th ed. England: Pearson.

Hull, J.C. 2012. Options, futures and other derivatives. 8th ed. England: Pearson.

IMF (International Monetary Fund). 1998. The Asian crisis: causes and cures. *Finance & Development*, 35:1-5.

IMF. International Monetary Fund. 2012. Working paper: How risky are bank's risk weighted assets? Evidence from the financial crisis.
http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1997749 Date of access: 2 Oct. 2013.

Jackson, O.A. 2008. The impact of the 9/11 terrorist attacks on the US economy.
<http://www.journalof911studies.com/volume/2008/OliviaJackson911andUS-Economy.pdf>
Date of access: 4 Nov. 2013.

- João, A. & Santos, C. 2001. Bank capital regulation in contemporary banking theory: a review of literature. *Financial Markets, Institutions and Instruments*, 10(2001):41-84.
- Johnston, R.B. & Nedelescu, O.A. 2005. IMF working paper: The impact of terrorism on financial markets. <http://www.mafhoum.com/press8/234E61.pdf> Date of access: 30 Oct. 2013.
- Jones, D. 2000. Emerging problems with the Basel Capital Accords. *Banking and finance*, 24:35-58.
- Jordaan, J. & Moolman, E. 2004. Can leading business cycle indicators predict the direction of the South African economy? PTA: University of Pretoria.
<http://www.commerce.uct.ac.za/economics/Conferences/2004/AES2004Conference/Papers/Jordaan-Moolamn%20final.pdf> Date of access: 22 Mar. 2012.
- Kaufman, G.G. 2004. Bank runs. <http://www.econlib.org/library/Enc/BankRuns.html> Date of access: 8 Jul. 2013.
- Koch, T.W. & MacDonald, S.S. 2003. Bank management. 4th ed. USA: Thomson.
- Koen, S. & Fermor, S. 2002. Credit risk transfer through credit derivatives and regulatory issues. <http://www.oecd.org/dataoecd/30/14/1939416.pdf> Date of access: 16 Feb. 2012.
- Latham & Watkins. 2011. Regulatory capital reform under Basel III.
http://www.garp.org/media/583507/regulatorycapitalreformbaseliii_nicolaides032311.pdf
Date of access: 18 Nov. 2013.
- Klinkenberg Incorporated. 2013. National Credit Act of South Africa.
<http://www.klinkenberg.co.za/conveyancing/national-credit-act?format=pdf> Date of access: 31 Oct. 2013.
- Koch, T.W. & MacDonald, S.S. 2003. Bank Management. 4th ed. USA: Thomson.

Kollias, C., Kyrtsov, C. & Papadamou, S. 2011. The effects of terrorism and war on the oil and prices- stock indices relationship.

http://www.diw.de/documents/publikationen/73/diw_01.c.391361.de/diw_econsec0057.pdf

Date of access: 30 Oct. 2013.

KPMG. 2003. Basel II: A worldwide challenge for the banking business.

<http://info.worldbank.org/etools/docs/library/153353/finsecissues2004/pdf/kpmg.pdf> Date of

access: 7 Nov. 2013.

Larson, J. 2011. The Basel capital accords.

<http://ebook.law.uiowa.edu/ebook/sites/default/files/Basel%20Accords%20FAQ.pdf> Date of

access: 4 Apr. 2013.

Latham & Watkins. 2011. Regulatory capital reform under Basel III.

http://www.garp.org/media/583507/regulatorycapitalreformbaseliii_nicolaidis032311.pdf.

Date of access: 18 November 2013.

Linsmeier, T.J. & Pearson, N.D. 1996. Risk Measurement: An introduction to value at risk.

<http://www.exinfm.com/training/pdffiles/valueatrisk.pdf> Date of access: 25 Sept. 2013.

Lounsbury, J. 2010. Basel III to tighten capital requirements.

<http://www.creditwritedowns.com/2010/09/basel-iii-tightens-capital-requirements.html> Date

of access: 5 Aug. 2011.

Madubeko, V. 2010. The global financial crisis and its impact on the South African

economy. http://ufh.netd.ac.za/bitstream/10353/363/1/Vongai%27s_Dissertation_2.pdf Date

of access: 31 Oct. 2013.

Market Timing. 2012. Value at Risk. <http://www.sniper.at/value-at-risk.htm>. Date of access:

19 Sept. 2013.

Marx, J. 2005. Investment management. 2nd ed. Pretoria: Van Schaik.

Marx, J. 2013. Investment management. 4th ed. Pretoria: Van Schaik.

MAS. 2013. Credit Risk. <http://www.mas.gov.sg/regulations-and-financial-stability/regulatory-and-supervisory-framework/risk-management/credit-risk.aspx> Date of access: 13 May 2013.

Masschelein, N. 2007. Monitoring pro-cyclicality under the capital requirements directive: preliminary concepts for developing a framework. <http://aei.pitt.edu/11015/> . Date of access: February 2013.

Mohr, P. 2010. Understanding the economy. Pretoria: Van Schaik.

Morrison & Foerster. 2010. The new global minimum capital standards under Basel III. News Bulletin. <http://www.mofo.com/files/Uploads/Images/100915-Basel-III.pdf>. September 2010.

NCR. National Credit Regulator. 2007. The National Credit Act, 2005. <http://www.ncr.org.za/pdfs/publications/consumer/ENGLISH.pdf> Date of access: 4 Nov. 2013.

Peura, S. & Jokivuolle, E. 2004. Simulation based stress tests of banks' regulatory capital adequacy. *Journal of Banking and Finance*, 28(2004):1801-1824.

Pieniazek, M. 2012. Asset/liability committee. <http://www.darlingconsulting.com/wp-content/uploads/2012/06/Bank-Director-Matt-061312-final.pdf> Date of access: 8 Jul. 2013.

Radelet, S. & Sachs, J.D. 2000. The onset of the East Asian financial crisis. <http://www.nber.org/chapters/c8691> Date of access: 2 Apr. 2012.

Rasmus, J. 2012. The Eurozone's triple crisis: part 2. <http://www.zcommunications.org/the-eurozone-s-triple-crisis-part-2-evolution-2010-2012-by-jack-rasmus.html> Date of access: 28 Oct. 2012.

RBI. Reserve Bank of India. 2011. Implementation of IRB approaches for calculation of capital charge for credit risk.

<http://rbidocs.rbi.org.in/rdocs/notification/PDFs/31ICB211211F.pdf> Date of access: 27 Sept. 2013.

Rose, P.S. & Hudgins, S.C. 2008. Bank management and financial services. 7th ed. New York: McGraw-Hill.

Rose, P.S. & Hudgins, S.C. 2010. Bank management and financial services. 8th ed. New York: McGraw-Hill.

Rose, P.S. & Hudgins, S.C. 2013. Bank management and financial services. 9th ed. New York: McGraw-Hill.

Roux, A. 2008. Everyone's guide to the South African economy. 9th ed. SA: Zebra press.

S&P. Standard & Poor's Rating Services. 2012. Basel 2.5 increases the squeeze on investment banking returns.

<http://www.standardandpoors.com/ratings/articles/en/us/?articleType=HTML&assetID=1245334380388> Date of access: 13 Aug. 2013.

Saidenberg, M. & Scheuermann, T. 2003. The new Basel capital accord and questions for research. <http://fic.wharton.upenn.edu/fic/papers/03/0314.pdf> Date of access: 25 Sept. 2013.

Samuelson, P.A. 1970. Economics. 8th ed. Tokyo: McGraw-Hill.

SARB (South African Reserve Bank). 1990. Banks Act (94 of 1990).

[http://www2.resbank.co.za/internet/Publication.nsf/LADV/0B2DBBD25565FE0242256D8D00341E9D/\\$File/Banks+Act+1990.pdf](http://www2.resbank.co.za/internet/Publication.nsf/LADV/0B2DBBD25565FE0242256D8D00341E9D/$File/Banks+Act+1990.pdf) Date of access: 29 Oct. 2013.

SARB (South African Reserve Bank). 2005. Quarterly bulletin.

<http://www.resbank.co.za/Lists/News%20and%20Publications/Attachments/4372/Statistical%20Tables%20-%20Key%20Information.pdf> Date of access: 30 Oct. 2013.

SARB (South African Reserve Bank). 2009. Bank supervision department. Annual report. <http://www.resbank.co.za/Publications/Reports/Documents/Full%20document%202009.pdf>
Date of access: 29 Oct. 2013.

SARB (South African Reserve Bank). 2011. Quarterly bulletin No.262. <https://www.resbank.co.za/Lists/News%20and%20Publications/Attachments/4899/01Full%20Quarterly%20Bulletin.pdf> Date of access: 29 Oct. 2013.

SARB (South African Reserve Bank). 2013. Quarterly bulletin. <http://www.resbank.co.za/Lists/News%20and%20Publications/Attachments/5892/11Statistical%20tables%20-%20Key%20information.pdf> Date of access: 30 Oct. 2013.

Saurina, J. 2008. Will Basel II help prevent crises or worsen them? <http://www.imf.org/external/pubs/ft/fandd/2008/06/pdf/saurina.pdf> Date of access: 18 Nov. 2013.

Shin, H.S. 2012. Adapting macro prudential approaches to emerging and developing economies. http://www.worldbank.org/content/dam/Worldbank/document/Poverty%20documents/EMERGING_WB_CH01_17-56.pdf Date of access: 31 Oct. 2013.

Smit, W. 2010. Historical development of international capital regulations and the New Capital Accord. New York: McGraw-Hill.

Smuts, R.E. 2003. Operational risk in bank risk management and its impact on capital adequacy. Potchefstroom: NWU. (Dissertation – BCom Hons).

Suleman, M.T. 2012. Stock market reaction to terrorist attacks: empirical evidence from a frontline state. *Australasian Accounting Business and Finance Journal*, 6(2012):97-110.

The Banking Association South Africa. 2005. Basel II – introduction and implementation in South Africa. http://www.banking.org.za/documents2005,FEBRUARY/Basel%20II%20Workshop%20One_Summary_070205.pdf Date of access: 8 Mar. 2011.

The Banking Association of South Africa. 2013. National Credit Act.
<http://www.banking.org.za/index.php/consumer-centre/national-credit-act> Date of access: 4 Nov. 2013.

Treanor, J. 2013. Closer ties needed to avoid future banking crisis.
<http://mg.co.za/article/2013-11-01-00-closer-ties-needed-to-avoid-future-banking-crisis/>
Date of access: 18 Nov. 2013.

Van Roy, P. 2005. Draft on Basel Accords . *The impact of the 1988 Basel Accord on banks' capital ratios and credit risk-taking*: 1-40.

Van Zyl, C., Botha, Z., Skerritt, P. & Goodspeed, I. 2009. Understanding South African financial markets. 3rd ed. Pretoria: Van Schaik.

Venter, J.C. & Pretorius, W.S. 2001. A note on the business cycle of South Africa during the period of 1997-1999. Quarterly bulletin. September. Pretoria: South African Reserve Bank.

Venter, J.C. & Pretorius, W.S. 2004. Revision on composite leading and coincident business cycle indicators. Quarterly bulletin. March. Pretoria: South African Reserve Bank.

Volová, I. 2011. Basel II approaches for the calculation of the regulatory capital for operational risk.
http://is.muni.cz/do/econ/soubory/aktivita/fai/21952347/FAI_issue2011_01_valova.pdf Date of access: 19 Sept. 2013.

Walter, S. 2010. Basel III and Financial stability. <http://www.bis.org> Date of access: 8 Feb. 2013.

Young, J. 2006. Operational risk management. Pretoria: Van Schaik.