THE EMBEDDED VALUE CONCEPT AND ITS APPLICATION IN SOUTH AFRICA

Jen-Chieh Huang

A research report submitted to the Faculty of Science, University of the Witwatersrand, Johannesburg, in partial fulfilment of the requirements for the degree of Master of Science.

Johannesburg, 2006

DECLARATION

I declare that this research report is my own work. It is being submitted for the Degree of Master of Science in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in any other University.

_____

Jen-Chieh Huang

_____ day of _____

ABSTRACT

The purpose of this research report is to review the embedded value concept and to examine its practical use in South Africa. Important recent developments relating to the embedded value concept are discussed and compared with the existing embedded value concept. These developments include fair value accounting, market-consistent embedded value and the European Embedded Value Principle.

In the second part of the report, the disclosure of the embedded value information of four major South African life assurance companies is examined. It was found that the market capitalisations of these companies were smaller than their embedded values for most of the period under the investigation. Reasons for this phenomenon are considered and tested against the data available.

It was found that the risk discount rates used by some life assurance companies in calculating their embedded values may be too low. It appears that a 'herding' tendency exists among South African life assurance companies when selecting risk discount rates for the embedded value calculation.

It is suggested that a more market consistent approach for the embedded value calculation and a better disclosure for the embedded value reporting should be considered by life assurance companies in South Africa. This should improve investors' understanding and confidence in the embedded value disclosed, which in turn should help narrow or eliminate the discount of the market capitalisation to the embedded value observed in the market.

ACKNOWLEDGEMENTS

I would like to thank my supervisor, Prof. W. J. Haslam, for his guidance, encouragement and patience.

Table of Contents

List of Tables

List of Figures

CHAPTER 1: INTRODUCTION

1.1 Background

Traditionally, when assessing the financial performance of a company one usually considers accounting indicators such as operating profit, earnings per share and return on equity. And when valuing a company, one may rely on applying a multiplier to current or forecast earnings of a company. Despite their wide usage, many researchers have criticised the use of accounting numbers in the situations mentioned above.

For example, Rappaport (1986) in his book *Creating Shareholder Value* demonstrates some shortcomings of accounting numbers and argues that accounting earnings fail to measure changes in the economic value of a company. Included among the shortcomings illustrated by Rappaport (1986) are that accounting numbers do not allow for the level of risk and time value of money.

Life assurance business by its nature can be very long term and profits may emerge only many years after a policy has been sold. This would make accounting indicators even less suitable for measuring the financial performance of a life assurance company. Furthermore, as suggested by Rider (2001), accounting profits of a life assurance company could be manipulated by adjusting actuarial reserves and companies rapidly growing their new business may suffer new business strains (i.e. technical losses occurring in the first year of a policy) and report lower profits. Therefore assessing the value or the financial performance of a life assurance company can be more complicated than assessing the value or the financial performance of other types of companies. Although regular valuations may be required for life assurance companies, they are normally intended for demonstrating solvency rather than providing an indication of the value or the financial performance of a life assurance company.

One of the solutions to providing a better indication of the value and the financial performance of a life assurance company is the embedded value concept. The embedded value concept was developed in the 1970s in the United Kingdom, when the financial reporting basis for insurance companies was based on a solvency statement and the statutory valuation consequently tended to undervalue insurance companies. This led to some of the life assurance companies becoming targets of unwanted acquisition bids. As a result insurance companies started producing embedded value type results in an attempt to give shareholders a better indication of the company's worth. The embedded value concept is now well established in Europe and in the United Kingdom. It is also accepted and widely used in Australia, Canada and South Africa. (Briggs and Bennett, 2002; Mueller, 2003)

1.2 Aim and Structure of the Research Report

The purpose of this research is to review the embedded value concept and to examine its use in South Africa. Recent developments and key issues relating to the embedded value concept are also discussed. When examining the use of embedded value in South Africa, the embedded values of selected South African life assurance companies are compared with their market capitalisations. Reasons for the differences between the two are considered and tested against the data available.

The definition of an embedded value and the advantages and shortcomings of the embedded value concept are given and discussed in Chapter 2. Developments of valuation techniques in other industries are also briefly discussed and compared with the embedded value concept.

In Chapter 3, other key developments relating to the embedded value concept are discussed. These developments include fair value accounting, market-consistent embedded value and the European Embedded Value Principle. Comparisons between these developments and the embedded value concept are also drawn.

The disclosure of the embedded value information of four major South African life assurance companies is examined in Chapter 4. These four companies are Liberty Group Limited, Metropolitan Holdings Limited, Old Mutual plc and Sanlam Limited. Chapter 4 concludes with some preliminary findings that form the basis for further investigations in Chapter 5.

Chapter 5 details the questions that are investigated after examining the disclosure of the embedded value information of major South African life assurance companies in Chapter 4. The methodology and data collection performed to carry out these investigations are also discussed. The results, analyses and conclusions of these investigations are then presented in Chapter 6.

Chapter 7 summarises the major findings of this research.

CHAPTER 2: A REVIEW OF EMBEDDED VALUE CONCEPT

2.1 Definition of Embedded Value

The embedded value of a life assurance company can be defined as follows (Actuarial Society of South Africa Life Assurance Committee, unpublished):

Embedded Value = Net Worth + Value of In-Force Business – Cost of Capital at Risk

The three components of an embedded value can be summarised as follows:

- Net worth: this is the excess of the value of assets over the value of liabilities. In South Africa, the professional guidance note 107 (PGN107) published by the Actuarial Society of South Africa states that assets should be valued at fair value and liabilities should be calculated on the Financial Soundness Valuation basis.
- Value of In-Force Business: this is the net present value placed on the future distributable profits arising from insurance contracts that are currently in force using the asset and liability valuation basis set out for the net worth.
- Cost of Capital at Risk: this represents the present value of the difference between the risk discount rate and the expected investment return as applied to the required solvency margins. In South Africa, this solvency margin is taken as the Capital Adequacy Requirements, which is the minimum amount of capital in excess of the financial soundness reserve required by the supervisory authority. (Actuarial Society of South Africa Life Assurance Committee, unpublished; Wessels, 2001)

Another value which is closely related to an embedded value is the actuarial appraisal value. The actuarial appraisal value is generally defined as the embedded value plus the value of future new business or goodwill. Some researchers have suggested that a theoretical relationship exists between the actuarial appraisal value and the market value of a life assurance company. For example, Arabeyre and Hardwick (2001)

suggest that the market value of a life assurance company should be equal to the company's appraisal value.

2.2 Important Uses and Advantages of Embedded Value

This section examines the uses and advantages of embedded value from the different perspectives of the various stakeholders of a life assurance company. The limitations of embedded value are discussed in the next section.

2.2.1 Management

For the management of a life assurance company, the embedded value concept enables them to adopt valued-based methods to manage their company. Valued-based methods, as described by McLean *et al*. (2001), are based on the concept that the financial performance of a business is best represented by the change in its economic value or equivalently the change in the net present value of its expected future cash flows. Using embedded values as a management tool has the following advantages:

- The shareholders' and management's interests can be aligned.
- The management can make strategic decisions based on, among other things, whether the decisions will create value for the shareholders. This in turn could enable appropriate compensation plans to be designed to reward the management for creating value for the shareholders.

It can be seen that these advantages also benefit the shareholders of a company by ensuring that the management act in the best interests of the shareholders.

2.2.2 Shareholders

From the perspective of the shareholders of life assurance companies, embedded values have the following advantages:

- They enable the shareholders to assess the value of a company and the performance of the management more accurately than traditional accounting indicators or other valuation techniques.

- Embedded values could also be considered as the shareholder values of life assurance companies and therefore represent the shareholders' interests in a life assurance company.
- In merger and acquisition situations, embedded values can provide a suitable basis for determining the value of the target company. This can prevent shareholders' interests from being detrimentally affected.

The last point can be made clearer by considering an example. Pearl Group of UK was taken over by a subsidiary of the Australian Mutual Provident Society in 1989. O'Keeffe *et al*. (2005) suggest that many believed the result of this takeover was detrimental to the shareholders of Pearl Group because of the lack of published financial information at the early stage of the takeover bid. Subsequently Sherlock *et al*. (1994) suggest that, for the purpose of a proper evaluation of a bid for a quoted life assurance company, a valuation based on actuarial techniques such as an appraisal value should be provided; the principal bases and assumptions underlying the valuation as well as information on sensitivity tests should also be provided.

2.2.3 Security analysts

Outside of the life assurance industry, embedded values have also gained acceptance by security analysts, who use embedded values to assess the values and the financial performance of life assurance companies. Wessels (2001) suggests that the traditional valuation measures available to security analysts in the life assurance industry have the following shortcomings:

- They fail to distinguish between new business and in-force business.
- They do not provide a measure of the profitability of the in-force business.
- They do not demonstrate how actual experience is unfolding compared to pricing assumptions.
- They do not tell the reader whether the new business written is adding or diminishing profit.

These shortcomings can be overcome by using the embedded value information provided within the published financial statements of life assurance companies, provided that the disclosure of the embedded value information is adequate. In particular, if the sensitivities of in-force and new business to changes in key assumptions are provided, analysts will be able to adjust embedded values based on their own views of those key assumptions.

2.2.4 Other advantages

For multinational companies, adding up the statutory or GAAP results of their companies in different territories is difficult since interpretations of these accounting results may differ in different territories. Jay, Lasorella and Mueller (2002) suggest that the adoption of the embedded value method helps multinational companies to overcome this problem because the embedded value method allows a more consistent evaluation of the performance of companies in different countries.

Some researchers suggest that analysis of embedded value movements could provide useful information. For example, Dardis (2002) suggests that for analysis and reporting of liability risk positions, the performance of embedded-value-added analysis and variance analysis on individual risk elements can allow companies to understand how each risk element has contributed to the overall change in value. Similarly, Rider (2001) also suggests that looking at the embedded value reconciliation of life assurance companies can provide indications as to the level of caution contained within the assumptions set by the companies.

Finally, in addition to the advantages that have already been mentioned, some significant advantages of embedded values can be identified by comparing embedded values with accounting numbers:

- Embedded values take into account the future profit on in-force business, so the assessment of business performance would not be distorted by new business strain. This also makes comparison between different companies more

consistent since companies that write more new business will not appear less profitable than companies that write less business.

- By taking into account the future profit on in-force business, embedded values also better reflect the value of life assurance business than accounting numbers, which only reflect current earnings.
- Embedded values allow for risk and the time value of money.

2.3 Limitations of Embedded Value

2.3.1 Risk discount rate

The choice of risk discount rate is central to the determination of an embedded value (O'Keeffe *et al*., 2005). However, the subjectivity and difficulty in determining the risk discount rate has led to many debates on how it should be determined. O'Keeffe *et al*. (2005) argue that the final choice of the risk discount rate depends heavily on the judgement of the company's management or actuary. This makes the comparison of embedded value results between different life assurance companies more difficult as there is not an agreed, standardised methodology in determining the risk discount rate.

2.3.2 Mismatch profits

Abbink and Saker (2002), Asher (2002), Blight, Kapel and Bice (2003) (referred to as BKB), O'Keeffe *et al*. (2005) and Sheard *et al*. (2001) all point out that under the traditional embedded value calculation, holding riskier assets could lead to higher expected returns in cash flow projections and therefore higher embedded values. This is because the projection of returns on assets under the traditional embedded value calculation depends on assets held to back the liabilities.

Therefore if the mismatching risk is not allowed for appropriately, mismatching assets and liabilities through holding riskier assets could give rise to immediate profits under the traditional embedded value calculation. As pointed out by BKB and Asher (2002), this contradicts the principle of no arbitrage.

As a result, Sheard *et al*. (2001) suggest that assessing the management performance based on changes in the embedded value is inappropriate as this may encourage the management to raise the risk profile of the asset base to increase the embedded value. Asher (2002) suggests that embedded values should be calculated using the risk-neutral model or deflators to avoid this problem.

2.3.3 Cost of options and guarantees

Another major criticism of the use of embedded values is that embedded values do not fully reflect the costs of options and guarantees contained in insurance contracts. Embedded value calculations are usually performed deterministically using best estimates for parameters. Therefore the costs of options and guarantees contained in insurance contracts are also allowed for using the best estimate scenario.

One way to overcome this problem, as suggested by Sheard *et al*. (2001), is to calculate embedded values using stochastic models. Sheard *et al*. (2001) argue that stochastic models would be capable of evaluating various scenarios and their potential impact on cash flows. This in turn will capture the costs of options and guarantees contained in insurance contracts.

2.4 Value Measurements in Other Industries

Interest in searching for a better technique to value a business and to assess the financial performance of a business is not confined to the life assurance industry. The developments of shareholder value approach and Economic Value Added outside of the life assurance industry are examples of how other industries, like the life assurance industry, have sought for better valuation techniques over the last two to three decades.

2.4.1 Shareholder value approach

Rappaport (1986) suggests the "shareholder value approach" to performance evaluation and management planning of any business. The "shareholder value approach" estimates the economic value of an investment by discounting forecast

cash flows using the cost of capital as the discount rate. More formally, the shareholder value of a company, according to Rappaport (1986), can be defined as follows:

Shareholder Value = Present value of cash flows from operations + Residual value + Marketable securities – Debt

Where "present value of cash flows from operations" is derived by estimating cash flows from operations for each year within the forecast period and then discounted back to the present using the cost of capital as the discount rate.

Other components are summarised as follows (Rappaport, 1986):

- Residual value: this represents the present value of cash flows attributable to the period after the forecast period.
- Marketable securities: this represents the current value of marketable securities and other investments that are not essential to operating the business, so these investments and their income are not included in cash flows from operations.
- Debt: this includes claims to the company such as the market value of debt, unfunded pension liabilities and the market value of other claims such as preference shares.

2.4.2 Economic Value Added

More recently, Stern Stewart & Co developed the concept of Economic Value Added (EVA) in 1991. According to Affleck and Schreiber (1998), the concept of EVA has now been adopted by many well-known corporations such as Coca-Cola and AT&T. The definition of EVA is as follows (Stewart III, 1991):

EVA = Net Operating Profit after Taxes – Capital × the Cost of Capital

Another measure that is closely related to EVA is Market Value Added (MVA), which is defined as follows (Stewart III, 1991):

MVA = present value of sum of expected future EVA

Stewart III (1991) suggests that the market value of a company should equal to the sum of the company's capital and MVA.

Even though shareholder value and EVA were originally developed for industries that have different characteristics from life assurance companies, they still share some common characteristics with the embedded value concept used by life assurance companies. When comparing embedded value with EVA and shareholder value, it can be seen that all three approaches:

- are based on discounted cash flow techniques and therefore allow for time value of cash flows
- Recognise that capital has a cost
- Can be regarded as shareholder value orientated

Furthermore, the relationship between embedded value and Rappaport's (1986) definition of shareholder value can be explored by considering embedded value as the present value of shareholders' interests in a life assurance company. Van der Linde (1998) also argues that embedded value is a good proxy for the amount of equity capital tied up in a life assurance company.

2.5 Concluding Remark

The development of the shareholder value concept and EVA concept outside of the life assurance industry shows that companies in other industries have also started to adopt valuation techniques that are conceptually very similar to the embedded value technique used by the life assurance industry. There also appears to be a trend towards shareholder value orientated framework when valuing a business. This should provide shareholders with better and more transparent information regarding their interests in life assurance companies. In South Africa, such development is

particularly important as certain mutual companies have demutualised in the last decade and have started to compete for investors' capital.

The actuarial valuation technique has traditionally focused on demonstrating solvency. However, the embedded value concept does seem to fit into the framework of shareholder value approach and is more capable of reflecting shareholders' interests in a life assurance company than other actuarial valuation techniques. Indeed, O'Keeffe *et al*. (2005) suggest that an aim of embedded value reporting is to report from the management to the shareholders on whether the management have been creating or destroying shareholder value. It may therefore be argued that the embedded value concept has taken actuarial valuation techniques one step further and allow many uses, such as business planning and valuation for mergers and acquisitions, that other actuarial valuation techniques have previously been unable to perform satisfactorily.

CHAPTER 3: OTHER RELATED DEVELOPMENTS

3.1 Fair Value Accounting

3.1.1 Background

In 1997 the International Accounting Standards Board ("IASB"), which was formerly known as the International Accounting Standards Committee, started a project on insurance accounting. The aim of the project was to develop an International Accounting Standard for insurance business. (Hairs *et al*., 2002)

The IASB later delegated the project to a Steering Committee consisting of representatives from all the major insurance markets around the world. This Steering Committee subsequently proposed that the new insurance standard should be based on fair values. In 2001, the committee produced a Draft Statement of Principles ("DSOP") setting out the principles of fair value which will be applied to insurance business in the near future. (ibid.)

3.1.2 Definition of fair value

Fair value is defined by the IASB as "the amount for which an asset could be exchanged or a liability settled between knowledgeable, willing parties in an arm's length transaction" (Hairs *et al*., 2002). Where the assets or liabilities under consideration are traded in a deep and liquid market, their fair values are generally taken as their quoted market values.

As noted by Hairs *et al*. (2002), fair value is a technical term and should not be taken to mean a financially correct value.

3.1.3 Comparison between embedded value and fair value methodologies

Some of the significant differences between embedded value and fair value methodologies are discussed below.

Assumptions

The DSOP states that the starting point for determining the discount rate for insurance liabilities and insurance assets under the fair value approach should be a pre-tax risk-free rate of return. For other assumptions used to project cash flows under the fair value approach, the DSOP states that the assumptions should be market-consistent if the assumptions are market related. For non-market related assumptions, as suggested by Abbink and Saker (2002), they should be determined by reference to factors such as historical information, the characteristics of the portfolio and industry data.

To allow for risk and uncertainty, the DSOP states that adjustments for risk and uncertainty should be allowed for preferably in the cash flows, or alternatively in the discount rates. As a result, the fair value liabilities would exceed best estimate liabilities either through the increased liability cash flows or through the reduced discount rate. These excesses are generally referred to as market value margins. Furthermore, as noted by Abbink and Saker (2002), the DSOP requires that both diversifiable and undiversifiable risk should be allowed for when valuing insurance liabilities.

In contrast to the fair value approach, assumptions used in embedded value calculations are usually based on expected values or best estimates, while risks and cost of equity capital are usually allowed for by adding a risk premium to the discount rate. Sheard *et al*. (2001) also suggest that, the embedded value calculation generally uses one risk discount rate for all cash flows whilst fair value approach may use different discount rates for different insurance products to reflect different levels of risk involved.

Projection of return on assets

As discussed in Section 2.3.2, under the traditional embedded value calculation the projection of returns on assets would depend on assets that were actually held to back

liabilities, and therefore it is possible to increase an embedded value by investing in riskier assets – a situation which is logically unacceptable.

In contrast to the embedded value calculation, the fair value approach measurement of the value of both assets and liabilities is independent of the actual assets held to back the liabilities. Under the fair value approach, assets are valued at their market values and liability cash flows are discounted using the discount rates that are independent of the assets held to back the liabilities. Therefore holding riskier assets would not increase the value of assets nor decrease the value of liabilities. The exceptions to this are with-profit and unit-linked business. For these two classes of business, the policyholder benefits are linked to the performance of the assets held. As a result, the valuation of the liabilities under these two classes of business will be affected by the expected returns on the actual assets held. (Abbink and Saker, 2002)

Cost of options and guarantees

As discussed in Section 2.3.3, one of the major criticisms of the embedded value calculation is that the embedded value usually does not allow for the costs of options and guarantees appropriately. To address this concern, the DSOP states that option pricing models should be used to value costs of options and guarantees.

Other differences

The definition of embedded value suggests that embedded value calculations usually allow for the cost of holding regulatory capital within the insurance company. However, this is not permitted under the DSOP. The rationale behind this is that holding regulatory capital does not affect the expected liabilities of a life assurance company directly. (Abbink and Saker, 2002)

Embedded value calculations are usually performed deterministically, while calculations of insurance liabilities under the fair value approach should, at least in principle, be performed stochastically. (Abbink and Saker, 2002)

3.2 Market-Consistent Embedded Value

3.2.1 Overview

Within the framework of market-consistent embedded value, assets and liabilities are valued at their market values if free and liquid markets exist for these assets and liabilities. For assets and liabilities that are not traded in a free and liquid market, their cash flows can be valued with reference to comparable assets and liabilities or with reference to the value of a replicating portfolio, if such a portfolio exists. For more complicated cash flows, such as those arising from options and guarantees, techniques such as stochastic modelling may be required.

Sheldon and Smith (2004) suggest that "In recent years there has been a trend towards market consistent valuation in those institutions for which actuaries have responsibilities". According to them, there are three motivations for using market consistent valuations:

- understanding the behaviour of a company's share price
- measuring a company's solvency on a market consistent basis, in order to offer some protection to policyholders or creditors
- producing comparable valuations which reduce the need for subjective judgement of the parameters used in the embedded value calculation.

Sheldon and Smith's (2004) view seems to be reinforced not only by the recent development of fair value accounting, but also by the development of the market-consistent embedded value concept. Market-consistent valuation techniques, as suggested by BKB and O'Keeffe *et al*. (2005), are based on principles derived from a combination of research fields that include actuarial science, financial economics and corporate finance.

3.2.2 Comparison between embedded value and market-consistent embedded value

Risk discount rate

In contrast with the traditional embedded value calculations, under which the determination of the risk discount rate usually involves subjective judgement, determination of the risk discount rates within the market-consistent embedded value framework is more objective. It involves examining risks inherent in cash flows and then applying different discount rates to these cash flows to reflect the different levels of risk in a market-consistent manner.

For example, BKB suggest that cash flows that are certain and fixed should be discounted by using the risk-free rate of return observed in the market. Similarly, cash flows that only involve diversifiable risks should also be discounted by using the risk-free rate since investors are not rewarded for taking on diversifiable risks in an efficient market. However, cash flows involving market-related risks should be discounted by using the discount rates that reflect the market's valuation of these risks.

Cost of options and guarantees

The discounting approach suggested above is applicable to non-option cash flows. For cash flows relating to contracts with simple options and guarantees, BKB suggest that option pricing theory can be used to determine market-consistent costs of such options. For more complicated options, BKB suggest that stochastic modelling can be used to value the costs of these options.

It can be seen that in contrast to the traditional embedded value approach, under which the costs of options or guarantees embedded are only allowed for based on a set of deterministic assumptions, costs of options and guarantees are valued more explicitly under the market-consistent embedded value approach.

Cost of capital

Within a market-consistent embedded value framework, the cost of capital is calculated by explicitly valuing the frictional costs such as limited liability put options, double taxation, taxation shields, agency costs and financial distress costs. Therefore the calculation of the cost of capital is separated from the valuation of assets and liabilities, and hence the allowance for asset and liability risk, as suggested by BKB.

Under the traditional embedded value calculations, however, the cost of capital was calculated based on the difference between the risk discount rate used and the projected returns on the capital. BKB argue that such an approach to the cost of capital calculation combines an allowance for risk together with the true economic costs associated with holding capital and can lead to certain shortcomings, such as the counter-intuitive result that capital invested in riskier assets incurs a lower cost.

3.2.3 Comparison between market-consistent embedded value and fair value

Although both market-consistent embedded value and fair value aim to place market consistent values on assets and liabilities of life assurance companies, there are other differences between the two approaches.

Allowance of diversifiable risk

Principle 5.4 of the DSOP states that the fair value of an insurance liability or insurance asset should always reflect both diversifiable and undiversifiable risk. In contrast to this, market-consistent embedded values may or may not reflect diversifiable risk. This is because there is still no consensus as to whether one should use a risk free rate or a risk discount rate to discount cash flows involving diversifiable risk under the market-consistent embedded value approach, as noted by O'Keeffe *et al*. (2005). For example, it was mentioned in Section 3.2.2 that BKB suggest that cash flows with diversifiable risk should be discounted using the risk free rate. The rationale is that according to economic theory, investors should not be rewarded for taking diversifiable risk in an efficient market. However, some believe

that adjusting the discount rate for cash flows involving diversifiable risk has merit when diversifiable risk has more significant impact on the value of business than market risk (O'Keeffe *et al*, 2005).

Other differences

In addition to the difference discussed above, O'Keeffe *et al*. (2005) also point out the following differences between market consistent embedded value and fair value:

- The present value of future profits of new business at the point of sale may be restricted to a maximum of zero under fair value accounting, whereas market-consistent embedded value has no such restriction.
- As discussed in Section 3.1.3, fair values may allow for market value margins as prudential adjustments to best estimate assumptions, but market-consistent embedded values do not have such adjustments.
- Principle 4.2 of the DSOP states that cash flows from future renewals should only be included in fair value accounting if such inclusion would increase the insurer's liability or the renewable options cannot be cancelled and are potentially valuable to policyholders. Market-consistent embedded values do not have such a constraint.
- Market-consistent embedded values explicitly adjust for frictional costs but fair value accounting does not include such adjustments.

3.2.4 Concluding remark

O'Keeffe *et al*. (2005) recognise that market-consistent embedded value methodology is still in relative infancy and there are still areas of debate regarding its implementation. Nevertheless, they state that they see considerable virtue in market-consistent techniques, such as their more transparent and consistent way of allowing for market risk than traditional techniques. As a result, they anticipate that the use of market-consistent techniques will grow rapidly.

3.3 European Embedded Value Principles

3.3.1 Background

The CFO Forum was created in 2002 by the chief financial officers of its member companies which are the major European insurance companies. As stated on its website (http://www.cfoforum.nl/), the aim of the CFO Forum is to provide a forum for the chief financial officers of its member companies to "discuss issues relating to proposed new accounting regulations for their businesses and how they can create greater transparency for investors". In May 2004, the CFO Forum published the European Embedded Value Principles ("EEV Principles") together with the Basis for Conclusions. The EEV Principles consist of 12 principles which are intended to provide guidance on the implementation of embedded value reporting for the member companies of the CFO Forum. O'Keeffe *et al*. (2005) comment that the EEV Principles are likely to provide "a strong momentum towards a common European framework for embedded value reporting".

3.3.2 Some significant features of EEV principles

Cost of options and guarantees

Principle 6 and Principle 7 of EEV Principles address the concerns on how the cost of options and guarantees should be dealt with in an embedded value calculation.

Principle 6 requires the value of options and guarantees be allowed for when valuing the future cash flows from in-force covered business, where "covered business" is the term used by EEV Principles to describe the contracts to which the embedded value methodology has been applied. Principle 7 requires that the allowance for the cost of financial options and guarantees "must include the time value of financial options and guarantees based on stochastic techniques consistent with the methodology and assumptions used in the underlying embedded value calculations." The glossary of the EEV Principles defines the time value of an option as "the additional value ascribable to the potential for benefits under the option to increase in value prior to expiry". (CFO Forum, 2004a)

The Basis for Conclusions provides the rationale behind the requirement to explicitly include the time value of financial options and guarantees. The Basis for Conclusions suggests that traditional embedded value calculations may allow for the time value of an embedded option indirectly by adjusting the discount rate. However, the large volumes and values of financial options and guarantees, coupled with the recent reductions in interest rates and declining equity market performance have increased the need for recognising the time value of these financial options and guarantees. This in turn has prompted the CFO Forum to consider a more direct method for the allowance of the time value and therefore the requirement stipulated by Principle 7. (CFO Forum, 2004b)

Economic assumptions

Principle 10 of EEV Principles states that economic assumptions must be internally consistent and should be consistent with observable market data.

In particular, the Basis for Conclusions recognises that the significant judgement involved in selecting risk discount rates under traditional embedded value reporting has led to a 'herding' tendency. That is, companies tend to incorporate similar risk margins in their risk discount rates rather than selecting risk margins that differ from one company to another to reflect the different levels of risks being faced by the different companies. Furthermore, the Basis for Conclusions also suggests that where greater risks are being taken by investing in riskier assets, both the level of required capital and the discount rate applied to shareholder cash flows should be increased to counter the impact of higher expected investment returns. (CFO Forum, 2004b)

As a result, it was stated under Principle 7 of the EEV Principles that the risk margin within the risk discount rates should reflect "any risk associated with the emergence of distributable earnings that is not allowed for elsewhere in the valuation."

Improved disclosure

The Basis for Conclusions recognises that historically embedded value reporting varied widely between companies in terms of volume, style and quality of the reports. The Basis for Conclusions suggests that consistency of content and layout would make it easier for users of embedded value reports to understand disclosures from individual companies and to make comparisons between different companies. (CFO Forum, 2004b)

Therefore Principle 12 of EEV Principles sets out the minimum level and the format of disclosure required by the EEV Principles. Items that should be disclosed in respect of each important area such as methodology, assumptions and sensitivities are listed by Principle 12. For example, the techniques used to value financial options and guarantees are required to be disclosed under methodology.

The greater disclosure requirement under the EEV Principles leads to O'Keeffe *et al*.'s (2005) suggestion that the consistency of the level and extent of disclosure of embedded value information will increase following the adoption of the EEV Principles. Similarly, Horbatt (2004) also suggests that the development of the EEV Principles, especially the improved disclosure, should be welcomed by readers of embedded value reports.

CHAPTER 4: EMBEDDED VALUE DISCLOSURE IN SOUTH AFRICA

The life assurance industry in South Africa is relatively small by world standards. However, it has one of the highest per capita ownership of life insurance in the world and is also one of the most innovative. South African life assurance companies had also played an important role in the development of unit-linked life products in the early 1960s and universal life-type products in the late 1970s. The concepts of "Dread Disease" or critical illness and "Terminal Illness Benefits" also originated in South Africa and were first put into practice in the early 1980s. (Benfield, 2004)

4.1 Case Studies

This chapter examines the embedded values disclosed by four major South African life assurance companies since they started to publish embedded value information. These four companies are Liberty Group Limited ("Liberty"), Metropolitan Holdings Limited ("Metropolitan"), Old Mutual plc ("Old Mutual") and Sanlam Limited ("Sanlam"). In addition, the risk discount rates used in calculating the embedded values are examined and compared with South African ten year government bond yields. Comparisons between the embedded values and the market capitalisations of the four companies are also examined. Different theories that attempt to explain the differences are tested against the data that are available.

All four companies studied publish their financial statements and hence embedded value information twice a year in the form of an interim and a final report. Coincidentally, all four companies have their financial years ending as at 31 December and hence the interim reporting periods end on 30 June. Therefore each company discloses its embedded value twice a year as at 30 June and 31 December.

The four companies studied, together with Discovery Holdings Limited ("Discovery"), represent the largest five life assurance companies by market capitalisation on the Johannesburg Securities Exchange ("JSE") currently. However,

Discovery is excluded from the study because its business is different to that of the others and is mainly comprised of medical insurance. Its listing has moved from the general insurance section to the life assurance section on the JSE only recently.

4.1.1 Data collection

The source of data used in this chapter is given below. More details on data collection and data adjustments are given in the next chapter in which further investigations are discussed.

The embedded values and the risk discount rates used in calculating the embedded values were manually captured from each company's interim and final report for the relevant period, unless otherwise stated. It is noted that some companies were involved in share unbundling and capital reduction programs during the period under study, so adjustments were made on the embedded values of these companies at the relevant reporting dates. These adjustments are discussed in more detail when each company is discussed in turn.

Except for Metropolitan, the market capitalisation figures for each company were downloaded from I-NET Bridge. The market capitalisation figures for Metropolitan were obtained from its interim and final reports. The South African ten year government bond yields were also downloaded from I-NET Bridge.

4.1.2 Liberty

The history of Liberty involves a number of merger and acquisition activities. It was founded in 1958 as the "Liberty Life Association of Africa Limited", which merged with the "Manufacturers Life Insurance Company of Toronto Canada" in 1972. Then in 1974, the same group merged with the "Sun Life Assurance Company of Canada". The group became the largest South African proprietary life assurance company from the mid 1970s. (Benfield, 2004)

The embedded value and the market capitalisation of Liberty at each reporting date since the end of 1998 is given in Table 4.1.

Date	Market Capitalisation R'million	Embedded Value R'million	Discount of Market cap to EV	Risk Discount Rate Used
1998/12/31	21,692	25,387	14.6 %	17.50 %
1999/06/30	20,860	19,581	-6.5 %	16.80 %
1999/12/31	19,187	13,849	-38.6 %	16.25 %
2000/06/30	17,469	14,255	-22.5 %	16.75 %
2000/12/31	18,338	15,464	-18.6 %	15.00 %
2001/06/30	15,800	13,441	-17.6 %	13.25 %
2001/12/31	15,037	14,767	-1.8 %	13.75 %
2002/06/30	15,292	15,478	1.2 %	14.50 %
2002/12/31	14,953	15,127	1.1 %	12.75 %
2003/06/30	13,852	14,623	5.3 %	11.50 %
2003/12/31	14,832	15,817	6.2 %	11.50 %
2004/06/30	14,068	15,887	11.4 %	12.50 %
2004/12/31	18,421	16,867	-9.2 %	10.25 %

Table 4.1 Market capitalisation and embedded value of Liberty

Liberty unbundled its Liberty International shares and Standard Bank Investment Corporation Limited ("Stanbic") shares to its shareholders in 1999. Shareholders were entitled to receive 46.62439 Liberty International shares for every 100 Liberty shares held on 23 June 1999, and 117.278071 Stanbic shares for every 100 Liberty shares held on 23 September 1999. Furthermore, at the end of 2000 Liberty announced a capital reduction of R10.50 per share. Shareholders registered at the end of March 2001 were entitled to receive this capital reduction.

Therefore in order to compare market capitalisation and embedded value on a consistent basis, the embedded value as at 31 December 1998 shown in Table 4.1 is calculated prior to the share unbundling, and the embedded value as at 31 December 2000 is calculated prior to the capital reduction.

Table 4.1 shows that, during most of the period from the end of 1998 to the end of 2004, the market capitalisation of Liberty was either at a premium or at a relatively small discount to its embedded value.

4.1.3 Metropolitan

Metropolitan Life has been a listed life company since 1986. In 2001, Metropolitan Life merged with the financial services interests of New Africa Investments Limited to form a financial services group called New Africa Capital. Subsequently, Metropolitan Life was de-listed from the JSE and re-emerged as New Africa Capital in September 2001. In 2003 New Africa Capital decided to change its name back to Metropolitan. Therefore, at the end of 2003 Metropolitan re-appeared on the board of the JSE. (News24, 2003)

The embedded value and the market capitalisation of Metropolitan at each reporting date since the end of 2000 are given in Table 4.2. It is noted that Metropolitan is a holding company and therefore it has other non life assurance assets. However, based on the examination of its financial statements it was found that the values of these non life assurance assets were small in comparison to the value of its life assurance operation (for the period under investigation, the total value of non life assurance assets was always less than 10% of the total net asset value). Furthermore, the fair values of these non life assurance assets have been included in its embedded values disclosed. Therefore the market capitalisation and the disclosed embedded value of Metropolitan are comparable.

Date	Market Capitalisation R'million	Embedded Value R'million	Discount of Market cap to EV	Risk Discount Rate Used
2000/12/31	6,980	7,247	3.7 %	16.6 %
2001/06/30	6,950	7,750	10.3 %	14.8 %
2001/12/31	5,600	7,553	25.9 %	15.3 %
2002/06/30	4,210	6,767	37.8 %	15.8 %
2002/12/31	4,233	6,323	33.1 %	14.3 %
2003/06/30	4,130	6,321	34.7 %	13.3 %
2003/12/31	4,843	7,550	35.9 %	11.8 %
2004/06/30	4,850	7,262	33.2 %	13.0 %
2004/12/31	8,060	9,792	17.7 %	10.8 %

Table 4.2 Market capitalisation and embedded value of Metropolitan

Metropolitan announced a capital reduction program at the end of 2004 that qualified shareholders holding shares at 31 December 2004 for capital reduction payments. Therefore in order to compare market capitalisation and embedded value on a consistent basis, the embedded value as at 31 December 2004 shown in Table 4.2 was derived prior to the capital reduction. The embedded value of Metropolitan after the capital reduction was R9,053 million according to its 2004 financial statements.

Table 4.2 shows that, during most of the period from the end of 2000 to the end of 2004, the market capitalisation of Metropolitan has been at a relatively large discount to its embedded value.

4.1.4 Old Mutual

Old Mutual is the oldest life assurance company in South Africa. It was founded on 17 May 1845 as "Mutual Life Assurance Society of the Cape of Good Hope" (Benfield, 2004). Following the demutualisation in May 1999, its shares were listed on 12 July 1999 on five stock exchanges: London, Malawi, Namibia, Zimbabwe and

Johannesburg. It is currently the largest South African life assurance company by market capitalisation (Old Mutual Plc, unpublished).

The embedded value and the market capitalisation of Old Mutual at each reporting date since its listing in 1999 are given in Table 4.3. Similar to Metropolitan, Old Mutual is also a holding company. Based on the examination of its financial statements it was found that the values of its non life assurance subsidiaries have already been included in its embedded values disclosed, so the market capitalisation and the disclosed embedded value of Old Mutual are comparable.

Date	Market Capitalisation R'million	Embedded Value R'million	Discount of Market cap to EV	Risk Discount Rate Used
1999/12/31	55,631	53,794	-3.4 %	18.0 %
2000/06/30	51,669	53,583	3.6 %	18.5 %
2000/12/31	66,052	62,831	-5.1 %	17.0 %
2001/06/30	64,636	64,722	0.1 %	13.5 %
2001/12/31	56,330	61,364	8.2 %	14.5 %
2002/06/30	54,087	59,814	9.6 %	15.0 %
2002/12/31	45,577	54,267	16.0 %	13.5 %
2003/06/30	42,344	50,212	15.7 %	11.9 %
2003/12/31	42,702	49,230	13.3 %	11.9 %
2004/06/30	44,697	49,510	9.7 %	12.9 %
2004/12/31	55,084	58,134	5.2 %	10.8 %

Table 4.3 Market capitalisation and embedded value of Old Mutual

Table 4.3 shows that, except at the end of 1999 and 2000, the market capitalisation of Old Mutual has been at a discount to its embedded value at every reporting date, although the extent of the discount is relatively small when compared to Metropolitan.

4.1.5 Sanlam

Sanlam was founded on 8 June 1918 as “Die Suid-Afrikaanse Nasionale Lewens Assuransie Maatskappij Beperk”. When it was founded, it was a subsidiary of Suid-Afrikaanse Nasionale Trust en Assuransie Maatskappij, which is known as Santam today. On 28 January 1953, Sanlam was converted to a mutual society by a resolution of its shareholders. On 8 March 1954, it became an independent mutual life assurance company as well as the largest single shareholder in Santam. In 1998 Sanlam de-mutualised and became a proprietary company once again with its shares later listed on the JSE and Namibian Stock Exchange on 30 November 1998. (Benfield, 2004; Sanlam, unpublished)

The embedded value and the market capitalisation of Sanlam at each reporting date since its listing in 1998 is given in Table 4.4. Sanlam first started to disclose its embedded value information within its financial reports during the interim reporting period of 1999. The embedded value as at 31 December 1998 was therefore obtained from the 1999 final report.

Date	Market Capitalisation R'million	Embedded Value R'million	Discount of Market cap to EV	Risk Discount Rate Used
1998/12/31	15,385	21,952	29.9 %	19.0 %
1999/06/30	18,980	26,292	27.8 %	18.0 %
1999/12/31	22,829	26,656	14.4 %	16.1 %
2000/06/30	21,263	25,809	17.6 %	16.7 %
2000/12/31	25,378	27,238	6.8 %	15.6 %
2001/06/30	29,200	28,887	-1.1 %	13.6 %
2001/12/31	24,396	30,737	20.6 %	14.3 %
2002/06/30	22,803	28,727	20.6 %	14.7 %
2002/12/31	20,175	27,087	25.5 %	13.3 %
2003/06/30	18,582	26,841	30.8 %	11.9 %
2003/12/31	23,360	29,662	21.2 %	11.9 %
2004/06/30	24,355	30,905	21.2 %	12.9 %
2004/12/31	35,978	36,682	1.9 %	10.8 %

Table 4.4 Marekt capitalisation and embedded value of Sanlam

Table 4.4 shows that the market capitalisation of Sanlam has been smaller than its embedded value for most of the period since it disclosed its embedded value.

4.2 Preliminary Findings

4.2.1 Risk discount rates

The risk discount rates used in calculating the embedded values by the four companies together with the South African ten year government bond yields are plotted in Figure 4.1. As shown in Figure 4.1, these risk discount rates have decreased in line with the declining interest rates in South Africa over the period under study.

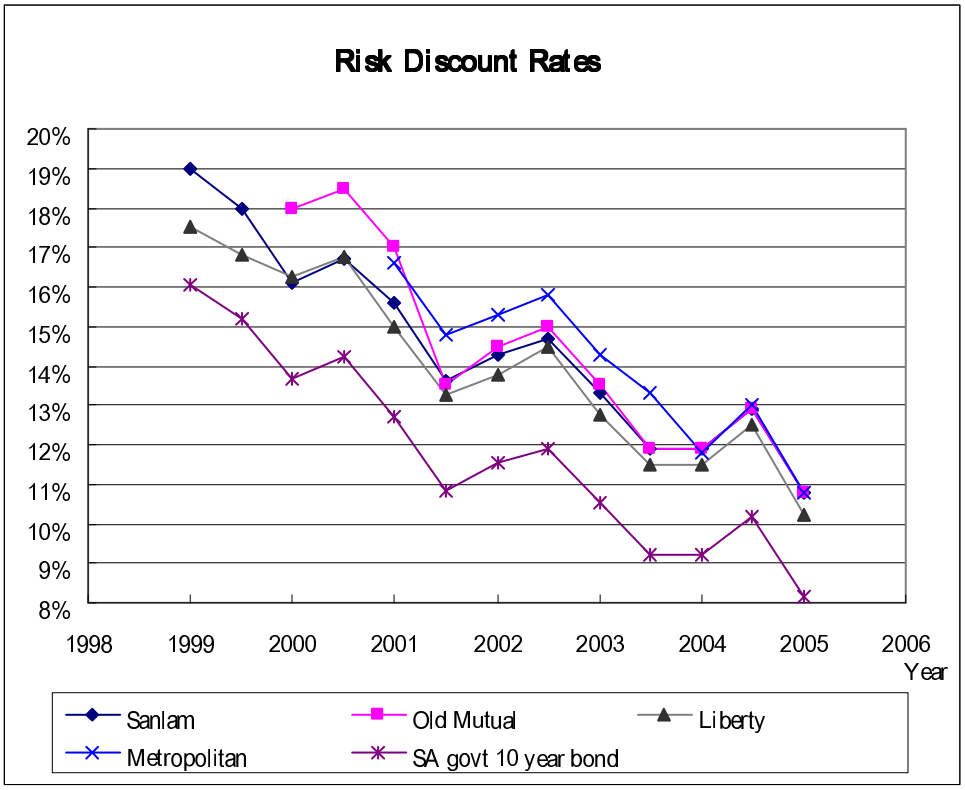

Figure 4.1 Risk discount rates against ten year bond yields

It is also noted that the levels of risk discount rates used by all four companies are very similar, especially at the last three reporting dates. As mentioned in Section 3.3.2, the Basis for Conclusions suggests that there is a 'herding' tendency among assurance companies when selecting risk discount rates under traditional embedded value calculations. This view is echoed by O'Keeffe *et al*. (2005) who observed that in the U.K., the risk discount rates used by major life assurance companies have been converging. They suggested that such convergence appears to be driven "more by a desire not to be out of line with their industry peers, rather than being truly reflective of the risk and uncertainty inherent in the business".

4.2.2 Discount of market capitalisation to embedded value

Van der Linde (1998) argues that the market value of a life assurance company consists of the actuarial appraisal value and the "future growth value", where future growth value is the present value of the improved future embedded value earnings less the cost of equity capital. Burrows and Whitehead (1987) also suggest that an

actuarial appraisal value is the best estimate of the economic value of a life assurance company's expected returns on an ongoing basis. On the other hand, the market capitalisation of a listed company may be considered as the market's best estimate of the economic value of the company. This estimate should normally include the value of goodwill. Therefore one would expect the market capitalisation of a life assurance company to be close, if not at a premium, to its embedded value in an efficient market. This is because an embedded value can be considered as an appraisal value less the value of future new business or goodwill.

From the inspection of the above tables, it appears that the market capitalisation and the embedded value of each of the four selected companies do move broadly in line with each other over time. However, with the exception of Liberty, and to a lesser extent Old Mutual, the market capitalisations of the companies studied have been smaller than their embedded values over the period. This is contrary to the conclusion of the previous paragraph.

Inefficient capital management

Salmon (2003) argues that an embedded value does not provide a reasonable basis for calculating the market price of a life assurance company in South Africa for the following reasons. He compared the investment returns on the free assets of some South African life assurance companies with that of benchmark portfolios constructed to match the composition of the free assets of the companies studied. He concluded that the investment returns on the free assets of the life assurance companies have been substantially lower than that of the benchmark portfolios.

He suggested two factors for the poor investment returns on the free assets. The first one is that life assurance companies are poor managers of their capital. The second one is that operational performance of life assurance companies is being enhanced at the expense of their investment performance on free assets. In other words, the investment returns on the free assets are reduced to boost the returns on the in-force business.

Level of risk discount rate

Another factor that can have a significant impact on the valuation of embedded value and hence on the difference between the market capitalisation and the embedded value, is the level of the risk discount rate. As discussed in Chapter 2, the risk discount rate is one of the most important assumptions in determining embedded values, but the subjectivity involved in setting the risk discount rate has always been an area of criticism. Some analysts have also suggested that it is not for the life assurance companies themselves to determine the risk discount rate, but rather for analysts and the investment community to make that decision (Wessels, 2001).

Section 4.2.1 shows that the risk discount rates used by the companies studied are very similar. One way of determining whether these risk discount rates are appropriate given the different risk profiles of each company is by comparing them with the risk discount rates derived from the Capital Asset Pricing Model. This will be discussed and investigated further in the next chapter.

CHAPTER 5: FURTHER INVESTIGATIONS

Following the examination of the embedded values and the market capitalisations of the four selected life assurance companies in the previous chapter, the following three questions are investigated further:

- Does a statistically significant relationship exist between the embedded value disclosed by a life assurance company and the life assurance company's market capitalisation?
- Is the discount of market capitalisation to embedded value a result of poor returns on life assurance companies' free assets as implied by Salmon's (2003) conjecture?
- Or does the discount of market capitalisation to embedded value arise from inappropriate risk discount rates used in calculating embedded values?

The first two questions are addressed by statistical hypothesis testing. For the third question, the Capital Asset Pricing Model (CAPM) is used to derive the risk discount rates expected by the shareholders, which are then compared with the risk discount rates used by the life assurance companies.

5.1 Research Hypothesis and Method

5.1.1 Market capitalisation and embedded value

The first question was addressed by testing the hypothesis that there is no relationship between the market capitalisation and the embedded value of a life assurance company. The null and alternative hypotheses were as follows:

$H_0: \rho = 0$

$H_1: \rho > 0$

Where ρ denotes the true correlation between the embedded value and the market capitalisation.

The hypothesis testing was carried out using a one-tailed test to see if the correlation is significantly greater than zero.

The relationship between the embedded value and the market capitalisation where both are measured on the embedded value reporting date was tested. Furthermore, it was observed that for companies listed on the JSE, their interim results are usually released between one to two months after the corresponding reporting dates, while the final results may be released between two to three months after the corresponding reporting dates. Therefore the relationship between the embedded value and the market capitalisation, where the market capitalisation lags the embedded value reporting date by one, two, three and four months, was also tested. This would check whether the correlation between the two measures changes during the months when embedded value information is released.

The procedure used to test the hypothesis was as follows:

<u>Step 1</u>: Calculate correlation coefficient

The correlation coefficient between the embedded value and the market capitalisation was calculated for each selected company and for different time lags between the two measures.

The correlation coefficient is a measure of the degree of linear relationship between two sets of measures. The correlation coefficient between n pairs of observations, whose values are (x_i, y_i) is defined as follows: (Clarke and Cooke, 1992)

$$r = \frac{\sum_{i=1}^{n} (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\left(\sum_{i=1}^{n} (x_i - \bar{x})^2\right)\left(\sum_{i=1}^{n} (y_i - \bar{y})^2\right)}}$$

where

$\bar{x}, \bar{y} =$ means of the x_i's and y_i's respectively

<u>Step 2</u>: Examine the significance of correlation coefficient

Clarke and Cooke (1992) have indicated that, a calculated value of correlation coefficient which is very close to 0 would indicate that no relationship exists between the two measures that are being looked at; while a correlation coefficient which is very close to +1 or -1 is an indication that there is a correlation.

For intermediate values, Clarke and Cooke (1992) suggest that the *t*-distribution can be used. The null hypothesis that correlation coefficient is equal to 0 can be tested by calculating the *t*-statistic as follows:

$$t = r \times \sqrt{\frac{n-2}{1-r^{2.}}}$$

where r = the calculated correlation coefficient

n = the number of paired observations

In this test the null hypothesis is rejected if the *t*-statistic exceeds the critical value based on the 5% significance level.

<u>Step 3</u>: Calculate average discount

Performing step 1 and step 2 above would check whether the correlation between the embedded value and the market capitalisation changes during those months when embedded value information is released. However, it could not check whether the discount of the market capitalisation to the embedded value narrows or widens during the months when embedded value information is released. Therefore in addition to calculating the correlation coefficient, the average discount of the market capitalisation to the embedded value over the period of the investigation was also calculated for each company. Again, separate calculations were performed for different time lags between the two measures.

5.1.2 Test of inefficient capital management

As discussed in Section 4.2.2, Salmon (2003) argues that the returns on the free assets of some life assurance companies in South Africa have been poor. This has led to his conclusion that an embedded value does not provide a reasonable basis for calculating the market price of a life assurance company in South Africa. If this is true, one would expect that the discount of a life assurance company's market capitalisation to its embedded value would be proportional to the company's net asset value expressed as a percentage of the company's embedded value.

Therefore if Salmon's (2003) conjecture is true, one would expect that there is a positive correlation between the ratio of the net asst value to the embedded value and the discount of the market capitalisation to the embedded value. Consequently the second question was addressed by testing the hypothesis that there is no positive correlation between the following two statistics:

- the ratio of the net asst value to the embedded value; and
- the discount of the market capitalisation to the embedded value.

For ease of reference the observed correlation coefficient for the above two statistics is denoted as *r'*.

The null hypothesis and alternative hypothesis were as follows:

$H_0: \rho = 0$

$H_1: \rho > 0$

Where ρ denotes the true value of *r'*.

The hypothesis testing was carried out using a one-tailed test to determine whether the correlation is significantly positive. The test was also carried out using different

time lags between the embedded value and the market capitalisation for the reasons given in Section 5.1.1. The procedure to test the hypothesis was as follows:

Step 1: Calculate the ratio of net asset value to embedded value

The ratio of the net asset value to the embedded value was calculated, where the net asset value of each company studied at each reporting date was obtained from the embedded value information supplied within the financial reports of the company. (These data are provided in the appendix.)

Step 2: Calculate correlation coefficient

The value of *r'* for each selected life assurance company was calculated. Again, separate calculations were performed for different time lags between the market capitalisation and the embedded value as in step 1 of Section 5.1.1.

Step 3: Examine the significance of correlation coefficient

The significance of correlation coefficients calculated in step 2 was examined as in step 2 of Section 5.1.1.

5.1.3 Level of risk discount rates

In order to examine whether the risk discount rates used by the four life assurance companies studied are appropriate, the following steps were followed:

Step 1: Calculate the risk discount rate that will equate the market capitalisation with the embedded value

The sensitivity information provided within the embedded value information was used to estimate the level of the risk discount rate that would equate a life assurance company's embedded value to its market capitalisation. In doing so it was assumed that there is a linear relationship between the level of the risk discount rate and the embedded value. The assumption should be a reasonable one if the discount of the market capitalisation to the embedded value is relatively small. However, in the case where the discount of the market capitalisation to the embedded value is substantial, the estimate of the risk discount rate would not be accurate.

<u>Step 2</u>: Calculate risk discount rate using Capital Asset Pricing Model (CAPM)

Using the CAPM, the return expected by the shareholders of each company may be calculated as follows (Elton and Gruber, 1995):

$R = R_f + Beta \times (R_m - R_f)$

Where R = return expected by the shareholders

R_f = risk-free rate of return

R_m = market rate of return

$Beta$ = the measure of a company's systematic risk

The 10 year government bond yields were used to approximate the risk-free rate to reflect the long-term nature of life assurance business.

$(R_m - R_f)$ is often referred to as a market risk premium. It represents the rewards expected by investors from the equity market over and above a risk-free rate of return. Firer and Bradfield (2002) reviewed some of the previous research on estimating the size of the market risk premium in South Africa. After performing their own analysis they have suggested that a market risk premium of the order of 7.0% to 7.5% is appropriate for use by the investment community in South Africa. A market risk premium of 7.5% as suggested by Firer and Bradfield (2002) has therefore been used.

The calculation of the risk discount rate here did not allow for the possibility that the capital of the life assurance company considered might include debt capital. This is because in South Africa life assurance companies are not allowed to raise debt capital unless specifically permitted, according to Section 34 of Long Term Insurance Act (South African Government, 1998).

The source of betas used in this investigation is given in Section 5.2.1.

***Step 3*: Calculate market risk premiums implied by the companies' risk discount rates**

In the last step, 7.5% was chosen as the market risk premium to be used in the CAPM model to derive the risk discount rates. This may differ from the life assurance companies' view as to the level of the market risk premium. Furthermore, Van der Linde (1998) suggested that most South African practitioners tend to use a market risk premium of 6%.

In order to assess what the companies' view of the level of the market risk premium might be, the companies' actual risk discount rates used, the betas of the companies and the risk free rates were substituted into the CAPM equation to solve for the market risk premiums that are consistent with the actual risk discount rates used by the companies.

Comparing the market risk premiums derived from the actual risk discount rates with the market risk premiums suggested by Firer and Bradfield (2002) and Van der Linde (1998) should provide a further indication as to the appropriateness of the risk discount rates used by the life assurance companies.

***Step 4*: Compare different risk discount rates**

Lastly, the actual risk discount rates used by the life assurance companies and other risk discount rates derived in the previous steps were compared against each other.

The dates on which the market capitalisation figures used in this investigation are measured would depend on the results of the first two investigations.

5.2 Data Collection and Adjustments

5.2.1 Source of data

Market capitalisation

Market capitalisation data and South African ten year government bond yields were obtained from I-NET Bridge.

Beta

The betas used in the CAPM model are obtained from the Financial Risk Service, which uses the database in the Department of Statistical Science at the University of Cape Town to estimate betas every quarter for all shares that have been listed on the JSE for a minimum period (Financial Risk Service, unpublished).

The betas for Old Mutual and Sanlam were only available from the end of 2000, since these two companies only listed in July 1999 and November 1998 respectively. At the time of writing, the betas for the end of 2004 were not yet available so they were approximated by betas as at 30 June 2004. These approximations should be reasonable since the value of beta does not vary substantially from one period to the next. Furthermore, depending on when the shares were listed, the Financial Risk Service may use monthly returns data for up to the last five years to calculate the beta for each share.

Embedded value information

Embedded value information, including various components that make up embedded values and sensitivity information were manually captured from the interim and final reports of relevant periods for each selected life assurance company. These reports may be downloaded either from the company's website or by searching the SENS archive on the website of Moneyweb (www.moneyweb.co.za).

5.2.2 Adjustments made

In addition to adjustments made to the embedded values and the market capitalisations that have already been mentioned in Chapter 4, the following data adjustments were also made when carrying out the above investigations.

Metropolitan

As noted in Section 4.1.3, Metropolitan implemented a capital reduction program at the end of 2004. Therefore the value of Metropolitan's market capitalisation after the end of 2004 reflected the capital reduction and was not comparable with the embedded value as at 31 December 2004. As a result, when carrying out the first two investigations under which lagged market capitalisations were compared with the embedded values, the embedded value and the market capitalisation as at 31 December 2004 used for the investigations both allowed for the capital reduction to ensure consistency between the two measures.

Liberty

Similarly, as noted in Section 4.1.2, Liberty also implemented a capital reduction program at the end of March 2001, so its market capitalisation as at 30 April 2001 would reflect the capital reduction and was not comparable with the embedded value as at 31 December 2000. Therefore in order to ensure that market capitalisation and the embedded value were comparable, the market capitalisation as at 30 April 2001 was increased by assuming the share price at 30 April 2001 was increased by R10.50, which was the amount of capital reduction per share. The ratio of the share price plus R10.50 to the actual share price at 30 April 2001 was then multiplied by the market capitalisation as at 30 April 2001. This gave an estimate of the market capitalisation had the capital reduction program not taken place.

In deriving the level of the risk discount rate required to equate the embedded value of a life assurance company to its market capitalisation, the information on sensitivity of the embedded value to changes in risk discount rates is needed. It was noted that Liberty does not provide such sensitivity information in its interim reports.

Therefore it was assumed that the percentage change in Liberty's embedded value in respect of changes in the risk discount rate on the interim reporting date was the same as the average percentage change in its embedded value to changes in the risk discount rate at the reporting date that precedes and succeeds the interim reporting date.

Furthermore, as noted in Section 4.1.2, Liberty unbundled its Stanbic shares in 1999 so that shareholders holding Liberty shares on 23 September 1999 were entitled to receive Stanbic shares. The disclosed embedded value of Liberty as at 30 June 1999 was therefore not comparable with Liberty's capitalisation after 23 September 1999. As a result the embedded value as at 30 June 1999 was excluded from the data used by the first two investigations which compared the embedded values with lagged market capitalisations.

Old Mutual

It is also noted that Old Mutual's American business has increased substantially in 2001 to the extent that at the end of 2001, the value of its American in-force business amounted to approximately half of the value of its South African in-force business. As a result, Old Mutual has disclosed separate sensitivity information for its American business since the end of 2002.

It was found that the average risk discount rate used for American business has been at a level of about 67% of that of South African business since Old Mutual started to disclose separate sensitivity information for American business in the end of 2002. Therefore it was assumed that for every 1 % change in the South African risk discount rate, the corresponding change in the American risk discount rate would be 0.67 %.

5.2.3 Data check

The ratios of the market capitalisations to the embedded values were compared against the ratios of the share price to the embedded value per share for each company, where the share price is obtained from INET-Bridge and other measures are obtained from the sources as mentioned previously.

5.2.4 Other considerations

It was observed that occasionally financial statements or reports of a more recent reporting period may provide adjusted or restated numbers for an earlier reporting period. This may be due to some changes in the accounting method or other reasons. However, it would have been the financial results given in that earlier reporting period that would have influenced investors' valuation of the share price and therefore the market capitalisation of the company then. Therefore all the embedded value information used for a particular reporting period was obtained from the financial reports of that reporting period unless otherwise stated.

CHAPTER 6: ANALYSIS OF RESULTS

In this chapter, the results of each of the investigations discussed in the last chapter are presented and briefly discussed. An overall conclusion is drawn based on the results of all the investigations performed.

6.1 Relationship between Market Capitalisation and Embedded Value

The first test performed was the test of the hypothesis that there is no significant positive correlation between a life assurance company's embedded value and its market capitalisation. Separate tests were carried out using the market capitalisation measured on the embedded value reporting date as well as the market capitalisation that lags the embedded value reporting date by one, two, three and four months.

The results of these tests are tabulated below. In these tests the null hypothesis is rejected if the *t*-statistic exceeds the critical value based on the 5% significance level.

Liberty

	Same date	1 month lag	2 month lag	3 month lag	4 month lag
Correlation coefficient	0.6226	0.6690	0.8267	0.6834	0.8244
T value	2.5159	2.8460	4.6459	2.9599	4.6066
Critical t value	1.8125	1.8125	1.8125	1.8125	1.8125
Accept or reject null hypothesis	Reject	Reject	Reject	Reject	Reject

Table 6.1 Correlation coefficients between market capitalisation and embedded value of Liberty

Metropolitan

	Same date	1 month lag	2 month lag	3 month lag	4 month lag
Correlation coefficient	0.7932	0.7744	0.8503	0.8579	0.9058
T value	3.4458	3.2385	4.2750	4.4178	5.6558
Critical t value	1.8946	1.8946	1.8946	1.8946	1.8946
Accept or reject null hypothesis	Reject	Reject	Reject	Reject	Reject

Table 6.2 Correlation coefficients between market capitalisation and embedded value of Metropolitan

Old Mutual

	Same date	1 month lag	2 month lag	3 month lag	4 month lag
Correlation coefficient	0.9111	0.8027	0.7073	0.4669	0.6259
T value	6.6324	4.0372	3.0017	1.5842	2.4073
Critical t value	1.8331	1.8331	1.8331	1.8331	1.8331
Accept or reject null hypothesis	Reject	Reject	Reject	Accept	Reject

Table 6.3 Correlation coefficients between market capitalisation and embedded value of Old Mutual

Sanlam

	Same date	1 month lag	2 month lag	3 month lag	4 month lag
Correlation coefficient	0.8789	0.8489	0.8832	0.8169	0.8300
T value	6.1095	5.3267	6.2467	4.6979	4.9357
Critical t value	1.7959	1.7959	1.7959	1.7959	1.7959
Accept or reject null hypothesis	Reject	Reject	Reject	Reject	Reject

Table 6.4 Correlation coefficients between market capitalisation and embedded value of Sanlam

Average discount

	Same date	1 month lag	2 month lag	3 month lag	4 month lag
Liberty	-5.70 %	-4.64 %	-3.93 %	0.42 %	-3.38 %
Metropolitan	25.79 %	25.11 %	24.84 %	30.74 %	26.56 %
Old Mutual	6.62 %	6.11 %	6.01 %	8.55 %	6.38 %
Sanlam	18.26 %	19.68 %	20.63 %	21.99 %	20.47 %

Table 6.5 Average discount of market capitalisation to embedded value

These results show that significant positive correlations exist between the embedded values and the market capitalisations for all four life assurance companies. These positive correlations existed not only when the market capitalisations were measured on the reporting dates of the embedded values, but also when the market capitalisations lag embedded value reporting dates by one, two, three and four months.

There does not seem to be a consistent trend in the behaviour of the correlation when the time lag between the embedded values and the market capitalisations increases from no lag to four months' lag. For Liberty, the correlation coefficient is higher when the market capitalisation lags the embedded value by two and four months. For Old Mutual, the correlation coefficient is at its highest level when the market capitalisation is measured on the embedded value reporting date and decreases gradually as the time lag between the embedded value and the market capitalisation increases to up to three months. Then it increases again when the market capitalisation lags the embedded value by four months. For Metropolitan the correlation coefficient is at its highest level when the market capitalisation lags the embedded value by four months while for Sanlam there are no significant differences between correlations calculated using different lags between the market capitalisations and the embedded values.

As discussed previously, companies tend to release their financial results between one to three months after the reporting date, but the above results show no evidence that correlation coefficients are higher during those months when embedded value results are released. Furthermore, Table 6.5 also shows that the discount of the market capitalisation to the embedded value during those months when embedded value results are released does not seem to differ from that of other months either.

6.2 Test of Inefficient Capital Management

This tests the hypothesis that there is no significant positive correlation between the ratio of the net asset value to the embedded value and the discount of the market capitalisation to the embedded value. Separate tests were carried out using the market capitalisation measured on the embedded value reporting date as well as the market capitalisation that lags the embedded value reporting date by one, two, three and four months.

The results of these tests are tabulated below:

Liberty

	Same date	1 month lag	2 month lag	3 month lag	4 month lag
Correlation coefficient	0.0336	0.0312	0.0184	0.1172	-0.0606
T value	0.1063	0.0987	0.0583	0.3731	-0.1921
Critical t value	1.8125	1.8125	1.8125	1.8125	1.8125
Accept or reject null hypothesis	Accept	Accept	Accept	Accept	Accept

Table 6.6 Correlation coefficients between the ratio of net asset value to embedded value and the discount of market capitalisation to embedded value - Liberty

Metropolitan

	Same date	1 month lag	2 month lag	3 month lag	4 month lag
Correlation coefficient	- 0.8792	- 0.8860	- 0.8523	- 0.5251	- 0.5642
T value	- 4.8832	- 5.0566	- 4.3109	- 1.6324	- 1.8080
Critical t value	1.8946	1.8946	1.8946	1.8946	1.8946
Accept or reject null hypothesis	Accept	Accept	Accept	Accept	Accept

Table 6.7 Correlation coefficients between the ratio of net asset value to embedded value and the discount of market capitalisation to embedded value - Metropolitan

Old Mutual

	Same date	1 month lag	2 month lag	3 month lag	4 month lag
Correlation coefficient	- 0.8551	- 0.6496	- 0.4520	- 0.2375	- 0.2567
T value	- 4.9473	- 2.5634	- 1.5200	- 0.7335	- 0.7969
Critical t value	1.8331	1.8331	1.8331	1.8331	1.8331
Accept or reject null hypothesis	Accept	Accept	Accept	Accept	Accept

Table 6.8 Correlation coefficients between the ratio of net asset value to embedded value and the discount of market capitalisation to embedded value – Old Mutual

Sanlam

	Same date	1 month lag	2 month lag	3 month lag	4 month lag
Correlation coefficient	- 0.1039	- 0.0156	0.0206	0.3412	0.3335
T value	- 0.3465	- 0.0518	0.0685	1.2037	1.1735
Critical t value	1.7959	1.7959	1.7959	1.7959	1.7959
Accept or reject null hypothesis	Accept	Accept	Accept	Accept	Accept

Table 6.9 Correlation coefficients between the ratio of net asset value to embedded value and the discount of market capitalisation to embedded value – Sanlam

These results show that there is no significant positive correlation between the ratio of the net asset value to the embedded value and the discount of the market capitalisation to the embedded value, when the market capitalisations and the embedded values are measured on the same date, as well as when the market capitalisations lag the embedded value reporting dates by one, two, three and four months.

Therefore the results do not support Salmon's (2003) conjecture. In fact, for Metropolitan and Old Mutual, there are some relatively high negative correlation coefficients between the two statistics concerned when they are measured on the same date or one month apart. This indicates that when the net asset value as a proportion of the embedded value is higher, the discount of the market capitalisation to the embedded value is lower. This result contradicts Salmon's (2003) conjecture.

6.3 Investigation of Risk Discount Rate

Results in Section 6.1 show that allowing for time lags after the reporting dates does not materially affect the correlation between the embedded value and the market capitalisation, nor the extent of the discount of the market capitalisation to the embedded value. As a result, the market capitalisation figures used in this investigation were those measured on the reporting dates of the embedded values.

6.3.1 Risk discount rate required to equate market capitalisation with embedded value

The risk discount rates required to equate the embedded value of each of the four companies to its market capitalisation at each reporting date (referred to as "risk discount rate required") are given below.

Date	Liberty	Metro-politan	Old Mutual	Sanlam
1998/12/31	29.50 %	-	-	29.31 %
1999/06/30	12.64 %	-	-	28.42 %
1999/12/31	-	-	16.51 %	22.01 %
2000/06/30	5.53 %	-	20.27 %	24.19 %
2000/12/31	6.36 %	18.75 %	14.29 %	18.21 %
2001/06/30	5.60 %	20.88 %	13.57 %	13.26 %
2001/12/31	12.80 %	30.65 %	17.64 %	22.31 %
2002/06/30	15.07 %	37.31 %	18.54 %	22.54 %
2002/12/31	13.24 %	31.28 %	18.75 %	22.32 %
2003/06/30	13.16 %	29.79 %	17.16 %	23.15 %
2003/12/31	12.99 %	31.54 %	15.86 %	20.14 %
2004/06/30	15.38 %	23.91 %	16.30 %	21.68 %
2004/12/31	8.35 %	16.25 %	12.68 %	11.55 %

Table 6.10 Risk discount rates required to equate embedded value to market capitalisation

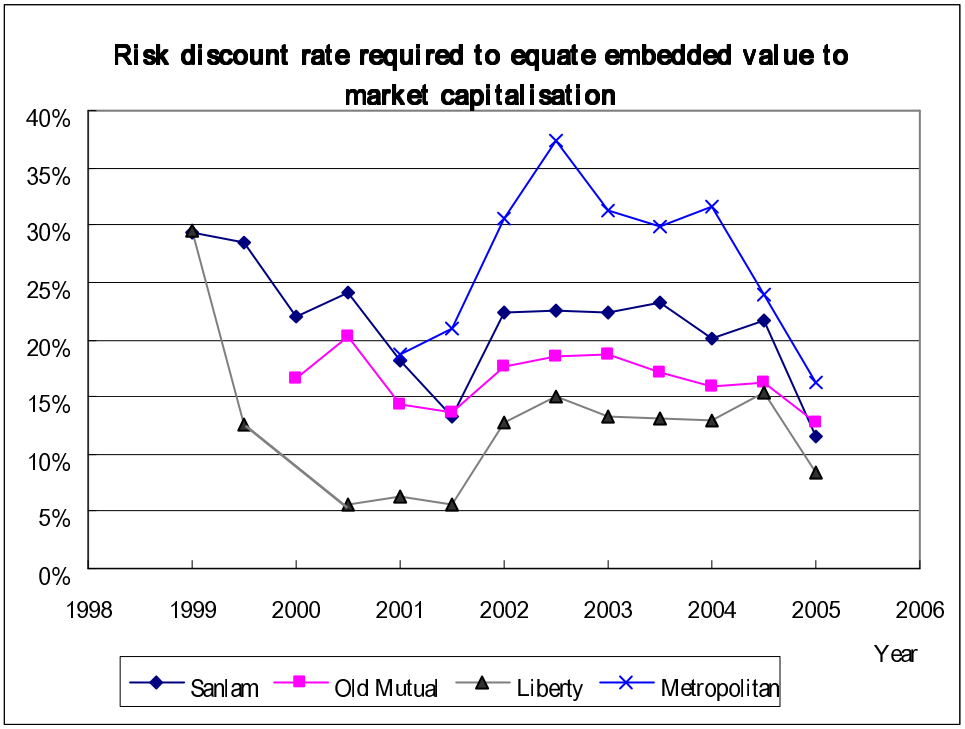

Figure 6.1 Risk discount rates required to equate embedded value to market capitalisation

Table 6.10 does not show the risk discount rate required for Liberty as at 31 December 1999, because on that date the market capitalisation was at a substantial premium to the company's embedded value. Using the method followed in this investigation would therefore produce a negative risk discount rate required at 31 December 1999, which is nonsensical. Other missing cells in the table are due to unavailable embedded value information on those dates because the companies had not started to publish their embedded value information.

Figure 6.1 shows that the risk discount rate required for Metropolitan is consistently the highest over the period. For Liberty, the risk discount rate required is consistently the lowest. This is as expected because all companies use more or less the same level of risk discount rates, but Metropolitan's market capitalisation has been at a higher discount to its embedded value than the other companies for most of the period under the investigation. Conversely, Liberty's market capitalisation has been at a lower discount (or even at a premium) to its embedded value than that of the other companies for most of the period under the investigation.

The graph also shows that the discount appears to widen (or, equivalently, the premium seems to lessen) during the period from end of 2001 to mid 2004. This suggests that there may have been factors that affected the valuation of the whole sector.

It should be noted that the validity of the results would depend on the validity of the assumption that there is a linear relationship between the level of the risk discount rate used and the embedded value. This assumption should be reasonable when the discount of the market capitalisation to the embedded value is relatively small. In the case of Metropolitan, where the discount of its market capitalisation to its embedded value is substantial for most of the period under the investigation, the risk discount rates required may possibly have been exaggerated. However, the comparison of the relative level of the risk discount rates required should still be valid as it reflects the extent of the discount of the market capitalisation to the embedded value.

6.3.2 Risk discount rate derived from the CAPM

The risk discount rates derived from the CAPM using 7.5% market risk premium (referred to as the "CAPM risk discount rates") for each of the four companies at each reporting date are given below:

Date	Liberty	Metro-politan	Old Mutual	Sanlam
1998/12/31	24.36 %	23.23 %	-	-
1999/06/30	23.59 %	22.69 %	-	-
1999/12/31	21.55 %	22.22 %	-	-
2000/06/30	21.94 %	23.06 %	-	-
2000/12/31	20.46 %	21.58 %	21.13 %	19.71 %
2001/06/30	18.11 %	19.38 %	17.73 %	16.53 %
2001/12/31	18.22 %	19.27 %	17.09 %	16.72 %
2002/06/30	18.06 %	18.96 %	17.16 %	16.49 %
2002/12/31	16.78 %	18.13 %	16.25 %	15.43 %
2003/06/30	13.06 %	16.66 %	14.71 %	14.26 %
2003/12/31	13.34 %	15.66 %	14.76 %	14.69 %
2004/06/30	14.31 %	16.63 %	15.66 %	15.21 %
2004/12/31	12.28 %	14.60 %	13.63 %	13.18 %

Table 6.11 Risk discount rates derived from the CAPM

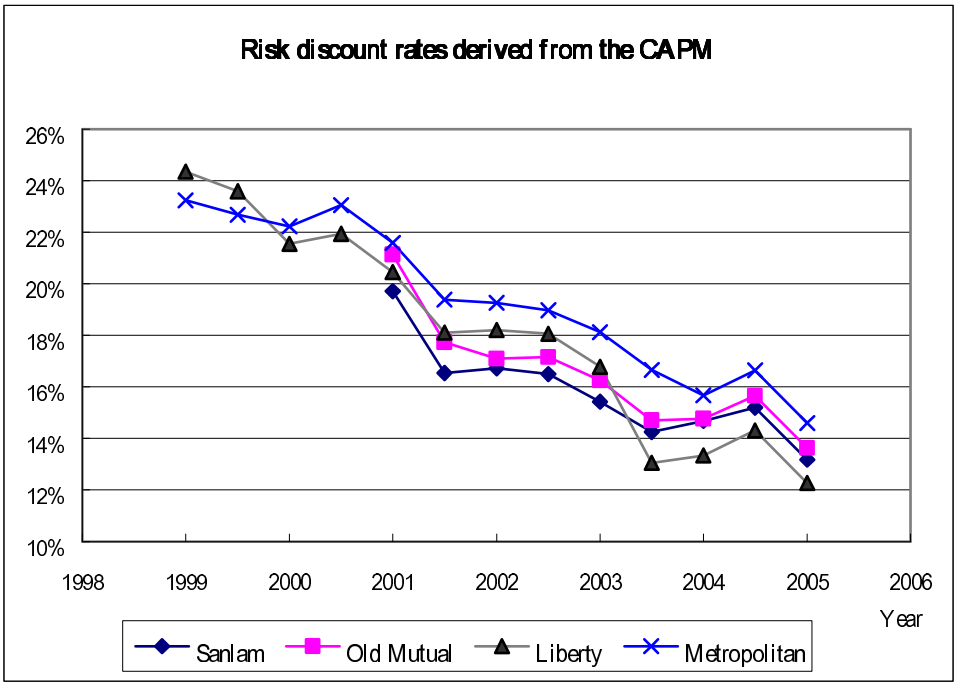

Figure 6.2 Risk discount rates derived from the CAPM

Figure 6.2 shows that Metropolitan has the highest CAPM risk discount rates for most of the period under the investigation. This is consistent with the previous result that the risk discount rate required for Metropolitan tends to be the highest. For Liberty, the CAPM risk discount rates at the last four reporting dates are the lowest amongst the four companies. The CAPM risk discount rates for Old Mutual are consistently higher than that of Sanlam, whereas the risk discount rates required to equate the market capitalisation to the embedded value for Sanlam are for the most of the period higher than that for Old Mutual. This reflects that fact that, although the discount of Sanlam's market capitalisation to its embedded value is larger than that of Old Mutual for most of the period, the beta of its shares has been consistently lower than that of Old Mutual.

Another notable difference between Figure 6.1 and Figure 6.2 is the general trend. Figure 6.2 shows a declining trend of the CAPM risk discount rates. This is consistent with declining interest rates in South Africa over the same period. However, as mentioned previously, the risk discount rates required persist at a very high level from the end of 2001 to the middle of 2004.

6.3.3 Implied market risk premium

The market risk premiums derived from each company's actual risk discount rates at each reporting date are given below:

Date	Liberty	Metro-politan	Old Mutual	Sanlam
1998/12/31	1.32 %	-	-	-
1999/06/30	1.44 %	-	-	-
1999/12/31	2.46 %	-	-	-
2000/06/30	2.47 %	-	-	-
2000/12/31	2.20 %	3.28 %	3.81 %	3.09 %
2001/06/30	2.49 %	3.48 %	2.90 %	3.64 %
2001/12/31	2.48 %	3.65 %	4.00 %	4.00 %
2002/06/30	3.16 %	4.14 %	4.41 %	4.57 %
2002/12/31	2.65 %	3.71 %	3.88 %	4.23 %
2003/06/30	4.45 %	4.11 %	3.66 %	3.99 %
2003/12/31	4.16 %	3.01 %	3.64 %	3.68 %
2004/06/30	4.22 %	3.28 %	3.73 %	4.06 %
2004/12/31	3.82 %	3.08 %	3.63 %	3.96 %

Table 6.12 Market risk premiums derived from the CAPM using actual risk discount rates used

The listing of Old Mutual and Sanlam's shares are more recent than the other two companies, so their results are only available from 30 June 2000 onwards as that is when their beta information is available from the Financial Risk Service. For Metropolitan, although earlier beta information is available, the embedded value information and hence the risk discount rates used are only available from 30 June 2000 onwards.

Table 6.12 shows that the market risk premiums derived from the risk discount rates actually used by the four companies are relatively low when compared to the 7.5 %

market risk premium suggested by Firer and Bradfield (2002), or when compared to the 6 % market risk premium suggested by Van der Linde (1998).

From the inspection of Table 6.12 it appears that calculating risk discount rates from the CAPM using a 4% market risk premium may provide a reasonable approximation to the risk discount rates actually used by the four companies studied. This is investigated further in the next section.

6.3.4 Comparison between different risk discount rates derived

Figure 6.3 to Figure 6.6 show the different risk discount rates derived for each company. The names of the series shown in each figure are explained as follows:

- actual RDR used: the actual risk discount rates used by the company
- RDR required: the risk discount rate required to equate the market capitalisation and the embedded value at each reporting date, or what this research refers to as the "risk discount rate required"
- CAPM 7.5%: the risk discount rates derived from the CAPM using 7.5% market risk premium, or what this research refers to as the "CAPM risk discount rates"
- CAPM 4%: the risk discount rates derived from the CAPM using 4% market risk premium.

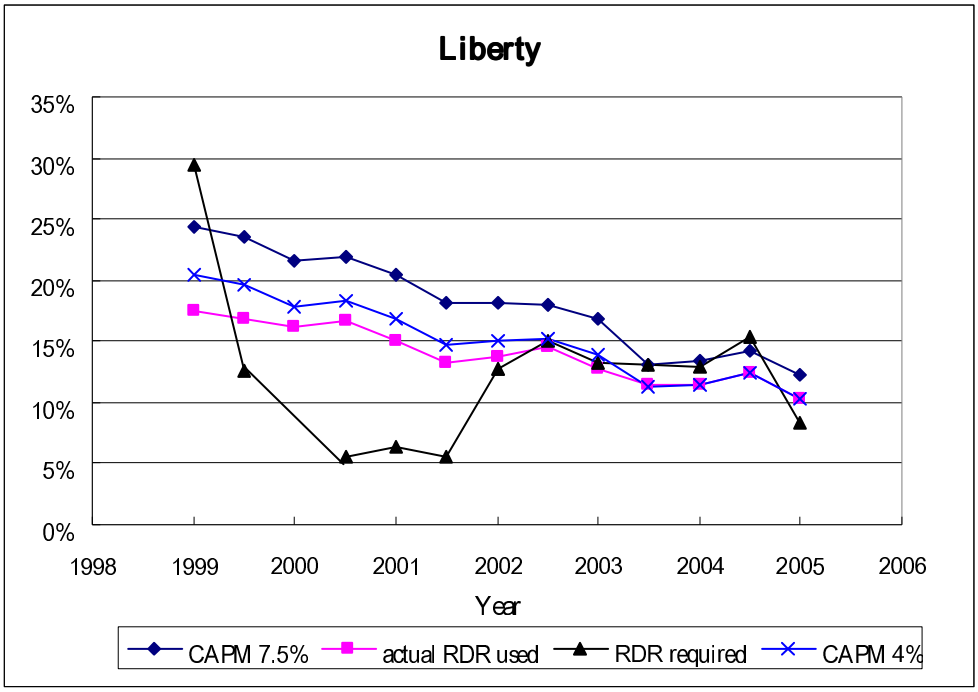

Figure 6.3 Various risk discount rates derived for Liberty

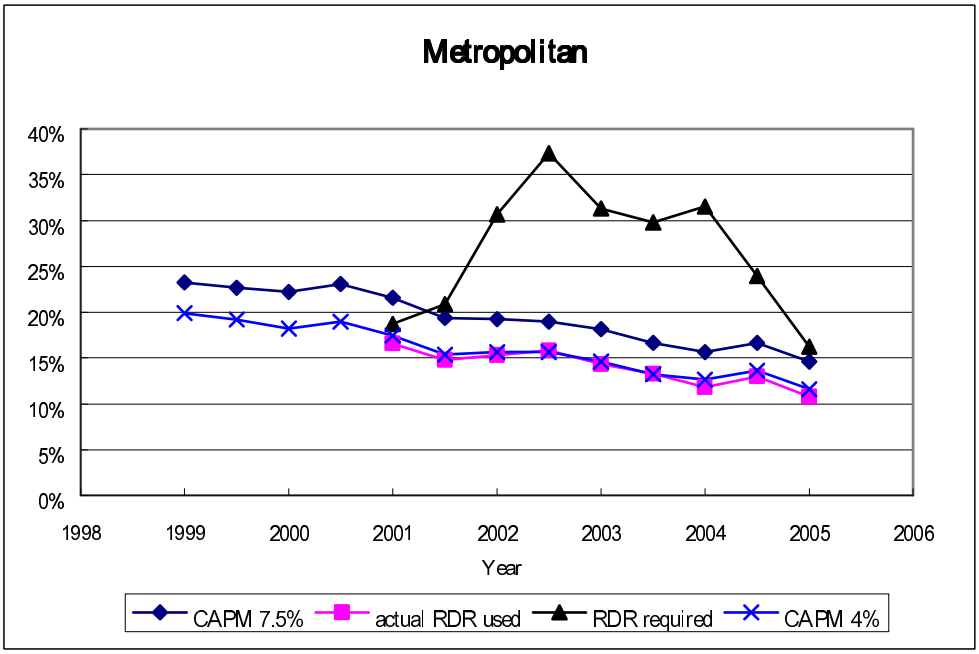

Figure 6.4 Various risk discount rates derived for Metropolitan

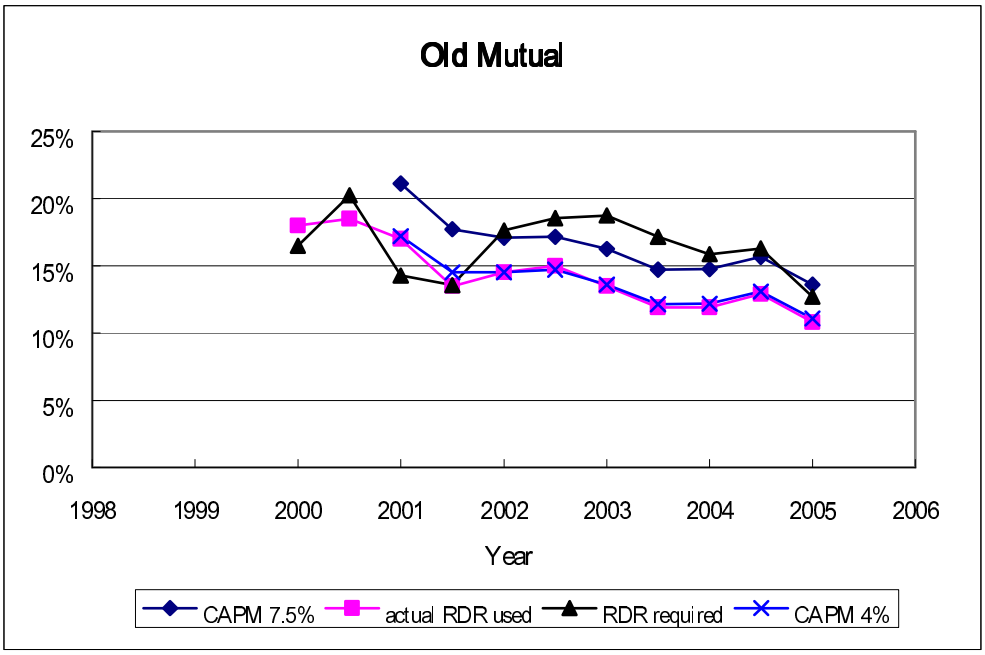

Figure 6.5 Various risk discount rates derived for Old Mutual

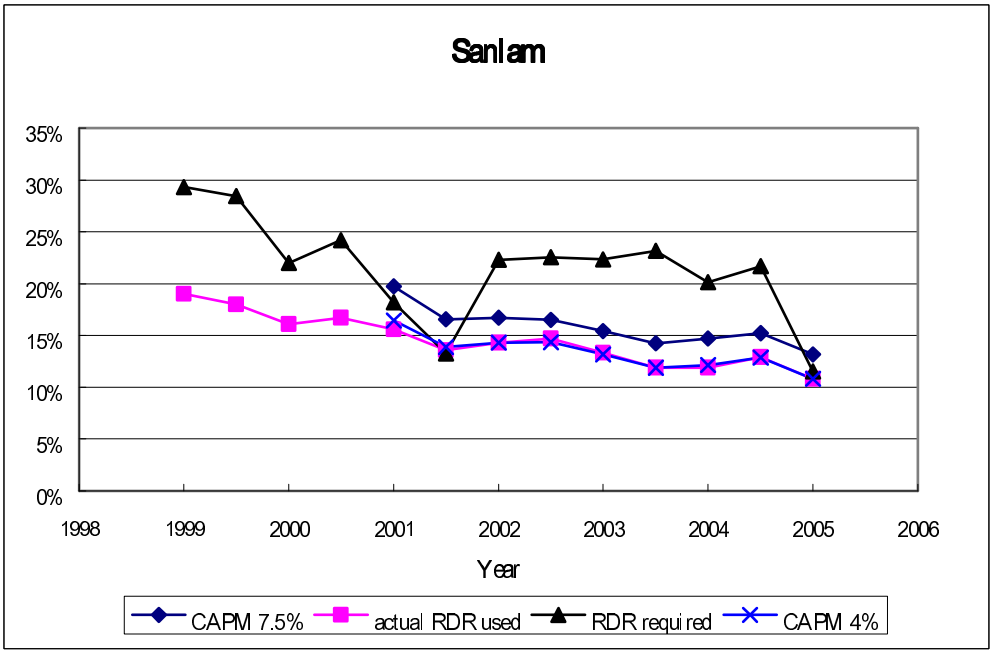

Figure 6.6 Various risk discount rates derived for Sanlam

Figure 6.3 to Figure 6.6 show that, except for Liberty, the risk discount rates required are generally higher than the risk discount rates actually used by the companies, reflecting the fact that the market capitalisations of these companies have been lower

than their embedded values for most of the period. The gap between the risk discount rates required and the risk discount rates actually used is particularly large for Sanlam and Old Mutual, reflecting the substantial discount of their market capitalisations to their embedded values.

It is also noted that the CAPM risk discount rates are higher than risk discount rates actually used. This is not surprising as it has been shown in Section 6.3.3 that risk discount rates actually used by the companies translate to a market risk premium of about 4% or less. From these graphs it can be seen that risk discount rates derived from the CAPM using 4% market risk premium do provide good approximations to risk discount rates actually used by the companies.

Although the CAPM risk discount rates may be considered theoretically more market-consistent, comparing them with risk discount rates required leads to mixed results. For Liberty, the CAPM risk discount rates are higher than the risk discount rates required at most reporting dates. For Metropolitan and Sanlam, the CAPM risk discount rates seem to be much lower than risk discount rates required, especially during the period from the end of 2001 to mid 2004. For Old Mutual though, the difference between the CAPM risk discount rates and risk discount rates required is less significant than that of Metropolitan and Sanlam.

6.4 Conclusion

The high positive correlation between the embedded value and the market capitalisation shows that there is indeed a statistically significant relationship between the two measures. It was also found that during those months when financial results and embedded value information are released, there were no apparent changes in either the extent of the correlation between the embedded value and the market capitalisation or the extent of the discount of the market capitalisation to the embedded value. This appears to suggest that the JSE is efficient in the sense that prior to the release of the financial results and hence the embedded value information,

investors have already taken into account changes in the embedded values when trading shares.

This may happen because prior to the release of the embedded value information, investors have already had access to information relating either directly or indirectly to changes in the embedded values. For example, a company's trading update or analysts forecast may provide investors with early indications on the financial performance of the company. These indications may be directly linked to the embedded value such as growth in new business volumes, or may be indirectly linked to the embedded value such as growth in headline earnings. However, despite the significant correlation that exists between the market capitalisation and the embedded value, it is evident from the examination of Table 6.5 that the market capitalisation does not fully reflect the embedded value disclosed by the companies studied. It was found that the market capitalisation was at a discount to the embedded value for most companies regardless of what time lag was between the embedded value and the market capitalisation.

The test of the relationship between the ratio of the net asset value to the embedded value and the discount of the market capitalisation to the embedded value finds no evidence to support Salmon's (2003) conjecture. The conjecture suggests that the embedded value of a life assurance company does not provide a reasonable basis for calculating the market price of the company, since life assurance companies are poor managers of their free assets. In fact, certain results (such as those for Metropolitan and Old Mutual) contradict Salmon's (2003) conjecture.

However, investigation on the risk discount rates used by the four life assurance companies did indicate that risk discount rates used by some companies may have been too low. It appears that, with the exception of Liberty, the discount of the market capitalisation to the embedded value of the other three companies can be explained at least partially by the level of the risk discount rates used in calculating the embedded values.

This result is expected. As noted in Section 4.2.1, all four companies use similar risk discount rates and it is unlikely that all four companies have similar risk profiles. Therefore some companies may have used risk discount rates that are either too low or too high when compared to their competitors. Given that the market capitalisations of most companies have been smaller than their embedded values, it is not surprising that the results of the investigation suggest that the risk discount rates might have been too low, rather than the opposite.

Even though it was found that the risk discount rates used by some companies may have been too low, this alone still cannot fully explain the substantial discount of the market capitalisation to the embedded value observed in companies such as Metropolitan and Sanlam. For these two companies, there was a substantial difference between the risk discount rate required and the CAPM risk discount rates for most of the period under the investigation. This calls into question the assumption that the market capitalisation is a good estimate of the economic value of a company, and whether investors may have underestimated the economic values of these companies. In particular, it was shown in Figure 6.1 that the risk discount rates required for all four companies have persisted at relatively high levels from the end of 2001 to mid 2004, despite the fact that interest rates in South Africa have been declining over the period.

Two recent examples of life assurance company acquisition in South Africa could perhaps shed some light on how the market capitalisation of a life insurance company in South Africa compares with its underlying economic value.

Liberty announced its intention to make a bid to acquire all the shares in the issued ordinary share capital of Capital Alliance Holdings Limited ("Capital Alliance") on 1 December 2004 (the bid was successfully concluded in 2005). The offer from Liberty was R17.5 a share in cash. This together with a final dividend of R1 a share amounted to R18.5 a share, which represented a 37.44% ***premium*** to Capital Alliance's volume weighted average price of R13.46 for the 30 days up to and

including 11 November 2004, which was the last trading day preceding the publication of the first Capital Alliance cautionary announcement. It also represented a 14.98% premium to Capital Alliance's embedded value per share of R16.09 as indicated in its interim results for the six months ended 30 September 2004. (Liberty Life and Capital Alliance, 2004; Capital Alliance, 2004)

More recently, Momentum Group Limited ("Momentum") made an offer to acquire the entire issued share capital of Sage Group Limited ("Sage"). In its announcement on 20 May 2005, Momentum offered a consideration equating to 175 cents per Sage share. In the same announcement it was indicated that the embedded value of Sage was about 218 cents per share after taking into account of future group corporate expenses. This was the same as the embedded value per share as at 31 December 2004 disclosed by Sage in its final repost for financial year 2004. Therefore the price at which Momentum proposed to pay for Sage represented about a 20% discount to the embedded value of Sage. The Sage share price closed at 173 cents per share on 19 May 2005. (Momentum and Sage, 2005; Sage, 2005)

It should be noted that, as suggested by Burrows and Whitehead (1987), buyers of a life assurance company might be prepared to pay a control premium over and above the perceived economic value of the life assurance company in order to gain effective control of the company. Burrows and Whitehead (1987) suggest that a reasonable level of control premium should be in the range of 10% to 20% of the actuarial appraisal value.

As already discussed, the offer of Liberty represented approximately a 15% premium to the embedded value of Capital Alliance. It is therefore very likely that after one subtracts the control premium from the price at which Liberty prepared to pay for Capital Alliance, the balance may then be close to the embedded value of Capital Alliance. While if one subtracts the control premium from the price at which Momentum was prepared to pay for Sage, the balance would then be less than 80% of

the embedded value of Sage. This appears to suggest that from Momentum's point of view Sage was worth significantly less than its disclosed embedded value.

The final price for which a life assurance company is purchased in an acquisition situation is likely to be influenced by the individual circumstances of the company concerned. As described by Burrows and Whitehead (1987), the ultimate price of such transaction is "a complex interplay of the definable and determinate forces with the various undefinable and indeterminate forces at work within the market place". Nevertheless, one would still expect that the price of acquiring a life assurance company should at least be close to the embedded value of the company if not more, since the embedded value represents what the company is intrinsically worth without taking into account the goodwill or future new business.

However, the above two examples illustrate that this may not necessarily be the case in South Africa. One of the examples illustrated shows that in South Africa, a company may acquire another life assurance company by paying a substantial discount to the embedded value of the company acquired. This suggests the possibility that the price agreed by the seller may be too little, or the embedded value may be overstated and does not reflect the underlying economic value of the company acquired. The latter possibility appears to be reinforced by the results of the previous investigations which showed that the risk discount rates used by some companies in calculating their embedded values may have been too low.

Furthermore, an embedded value may appear to be a too complicated measure or an unfamiliar concept to most investors, especially given that major life assurance companies listed on the JSE only started to disclose their embedded values since late 1990s. Therefore it is quite possible that investors may adopt a cautious view about the embedded values disclosed by the life assurance companies, which in turn may lead to the discount of the market capitalisation to the embedded value.

It appears that a more market consistent approach may need to be considered by the life assurance companies in South Africa when calculating embedded values, as this should help narrow or eliminate the differences between market capitalisations and embedded values observed in the market. Furthermore, as suggested by Sheldon and Smith (2004), a more market consistent approach can also improve the understanding of the behaviour of a company's share price and reduce the need for subjective judgement. A better disclosure that details the methods and techniques as well as the rationale behind the choice of key assumptions used in calculating the embedded value may also be needed. This may impose the discipline necessary on those that choose the risk discount rate assumptions and should also improve investors' understanding and therefore confidence in the embedded value disclosed.

CHAPTER 7: SUMMARY OF FINDINGS

In this research report the embedded value concept and other important developments relating to it are reviewed and discussed. It was found that the embedded value methodology offers significant advantages over traditional valuation techniques or accounting numbers. In particular, it allows a more accurate and transparent assessment of the value and financial performance of life assurance companies. This in turn leads to other advantages for the different stakeholders in life assurance companies such as management, shareholders and security analysts.

However, the use of embedded value is not without criticism. Among the shortcomings of the embedded value concept the following three are the most often cited by its critics:

- The subjectivity involved in determining the risk discount rate used in embedded value calculations
- The inadequate allowance for the cost of options and guarantees embedded in life assurance contracts
- Mismatching profits that arise from investing in riskier assets

The three recent developments that relate to the embedded value concept have all attempted to address these three problems one way or another. These developments are fair value accounting, market-consistent embedded value and the European Embedded Value Principle. It also appears that these developments all point to a more market-consistent basis of valuing life assurance business. This confirms Sheldon and Smith's (2004) view that there has been a trend towards using market consistent valuation in the institutions for which actuaries normally work.

In this research the embedded values disclosed by four major South African life assurance companies were examined and compared with these companies' market capitalisations. These companies were Liberty Group Limited, Metropolitan Holdings

Limited, Old Mutual plc and Sanlam Limited. An investigation into the relationship between the embedded values and the market capitalisations of these companies found that there exists a strong positive correlation between the two measures. Furthermore, it appears that the extent of this correlation prior to the release of the embedded value information is as strong as that after the release of the embedded value information, indicating that information released may have already been incorporated into the share price. This in turn suggests a high level of efficiency of the JSE.

It was also found that, with the exception of Liberty Group Limited, the market capitalisations of the other three companies have been smaller than their embedded values for most of the period since they started publishing their embedded values. An investigation was performed to test Salmon's (2003) conjecture that the embedded value of a life assurance company does not provide a reasonable basis for calculating the market price of the company, because life assurance companies are poor managers of their free assets. However, the results of this investigation found no evidence to support the conjecture.

Further investigations on the risk discount rates used by the four life assurance companies suggest that the risk discount rates used by some companies may have been too low. It appears that some companies might have selected their risk discount rates based on the rates other companies use instead of basing this decision on their own risk profiles.

Although the level of the risk discount rate used may explain why the market capitalisations of some companies have been smaller than their embedded values, this effect alone does not seem to be able to justify the magnitude of the discount observed for some companies. This leads one to consider whether investors may have underestimated the underlying economic values of some South African life assurance companies. In order to check this, two recent examples of acquisition in South African life assurance industry were examined.

The examination gave two conflicting results. In the case of Liberty's takeover of Capital Alliance, Liberty made an offer that was in excess of both the market capitalisation and the embedded value of Capital Alliance. However, in the case of Momentum's takeover of Sage, Momentum made an offer that represented a substantial discount to the embedded value of Sage.

An embedded value may still be an unfamiliar concept for most investors in South Africa, so it is likely that investors may adopt a cautious view on embedded values disclosed by life assurance companies. Nevertheless, the adoption of the embedded value concept and the disclosure of embedded value information in South Africa still represent a significant step forward as far as valuation of life assurance business is concerned. With a more market consistent approach and better disclosure, it should be possible to narrow or eliminate the discount of the market capitalisation to the embedded value observed in the market.

REFERENCES

Abbink, M. and Saker, M. (2002), Getting to grips with fair value, Paper presented to the Staple Inn Actuarial Society.

Actuarial Society of South Africa Life Assurance Committee. (unpublished), PGN107: Embedded values and value of new business, Actuarial Society of South Africa.

Affleck, A. and Schreiber, S. (1998), Use of embedded values, *Woodrow Milliman Insurance International*, Spring 1998, pp.1-3.

Arabeyre, V. and Hardwick, S. (2001), From embedded value to share price, *Tillinghast-Towers Perrin Emphasis on Financial Management*, January 2001, pp.14-17.

Asher, A. (2002), What actuaries might learn about life, *South African Actuarial Journal*, vol.2, pp.53-68.

Benfield, B.C. (2004), *Life Insurance Company Management*, South African edition, Primary Asset Administrative Services, Johannesburg.

Blight, P., Kapel, A. and Bice, A. (2003), Market-consistent economic valuations for the wealth management industry, Paper presented to the Institute of Actuaries of Australia.

Briggs, D. and Bennett, N.E. (2002), Embedded value, *Valuation Actuary Symposium Proceedings*, September 2002, Society of Actuaries.

Burrows, R.P. and Whitehead, G.H. (1987), The determination of life office appraisal values, *Journal of the Institute of Actuaries*, vol.114, pp.411-465.

Capital Alliance (2004), Interim results for the six months ended 30 September 2004, Capital Alliance, South Africa.

CFO Forum (2004a), European embedded value principles, downloadable from http://www.cfoforum.nl/eev.html

CFO Forum (2004b), Basis for conclusions European embedded value principles, downloadable from http://www.cfoforum.nl/eev.html

Clarke, G.M. and Cooke, D. (1992), *A Basic Course in Statistics*, 3rd ed. Edward Arnold, London.

Dardis, A. (2002), Risk position reporting in the South African life insurance industry, *South African Actuarial Journal*, vol.2, pp.1-28.

Elton, E. and Gruber, M. (1995), *Modern portfolio theory and investment analysis*, 5th ed. John Wiley & Sons, New York.

Financial Risk Service (unpublished), http://web.uct.ac.za/depts/stats/frs/frstitle.htm.

Firer, C. and Bradfield, D (2002), On the market risk premium, *Journal for Studies in Economics and Econometrics*, vol.26, pp.69-80.

Hairs, C.J., Belsham, D.J., Bryson, N.M., George, C.M., Hare, D.J.P., Smith, D.A. and Thompson, S. (2002), Fair valuation of liabilities, *British Actuarial Journal*, vol.8, no.36, pp.203-340.

Horbatt, W.R. (2004), European CFO embedded value guidelines, *The Financial Reporter*, no.59, pp.1-7.

Jay, B., Lasorella, K. and Mueller, H. (2002), Embedded value/fair value – different approaches, same goal, *Record of the Society of Actuaries*, vol.28, no.1.

Liberty Life and Capital Alliance (2004). Financial effects of the proposed scheme of arrangement and withdrawal of cautionary announcement, Liberty Group Limited, South Africa.

McLean, C., Dixon, S., Symons, M., Brown, D., Silverman, T., Waites, C., Wilson, C., Lewin, C., Massey, C., Pemberton, J., Pike, M. and Sheard, M. (2001), Do actuaries know how to measure value? Paper presented to the Staple Inn Actuarial Society.

Momentum and Sage (2005), Offer to acquire Sage and withdrawal of cautionary announcements, Momentum Group Limited, South Africa.

Mueller, H. (2003), Uncovering value, *Best's Review*, no.104, pp.61-65.

News24 (2003), Metropolitan soon back on JSE,
http://www.news24.com/Finance/Companies/0,,1518-24_1440285,00.html

O'Keeffe, P.J.L., Desai, A.J., Foroughi, K., Hibbett, G.J., Maxwell, A.F., Sharp, A.C., Taverner, N.H., Ward, M.B. and Willis, F.J.P. (2005), Current developments in embedded value reporting, Paper presented to the Institute of Actuaries

Old Mutual Plc (unpublished), Company history,
http://www2.oldmutual.com/About/history/index.jsp

Rappaport, A. (1986), *Creating Shareholder Value: The New Standard for Business Performance,* The Free Press, New York.

Rider, S. (2001), Valuation criteria, *Merrill Lynch In-depth Report*, November 2001.

Sage (2005), Provisional report for the year ended 31 December 2004 and renewal of cautionary announcement, Sage Group Limited, South Africa.

Salmon, M. (2003), Life assurance the emperor's new clothes, Research report of the Investec Securities Limited, no. F103/38.

Sanlam (unpublished), History, http://www.sanlam.co.za/eng/aboutus/companyinformation/history/sanlams+history.htm

Sheard, M., Gentry, L., Howell, D., Mason, A., Mehta, S., Purves, B., Stevens, A. and Wilson, C. (2001), Summary and comparison of approaches used to measure life office values, Paper presented to the Staple Inn Actuarial Society.

Sheldon, T.J. and Smith, A.D. (2004), Market consistent valuation of life assurance business, *British Actuarial Journal*, vol.10, no.47, pp.543-626.

Sherlock, E.B.O., Froggatt, H.W., Gillott, N.R., Harvey, R.M., Jenkins, J.A., Keeler, D.J., Pickford, M.A. and Taylor, N.H. (1994), Life insurance company takeovers, *Journal of the Institute of Actuaries*, vol.121, pp.199-258.

South African Government (1998), Long Term Insurance Act, *Government Gazette* 19276, Notice No.1190.

Stewart III, G. (1991), *The quest for value: a guide for senior managers,* Harper Business Publishing, New York.

Van der Linde J.H. (1998), Measuring, managing and building life company shareholder value, *Transactions of the Actuarial Society of South Africa*, vol.XII(I), pp.365-399.

Wessels, H. (2001), Embedded value: the "true" value of a life insurance company? *The Southern African Financial Services Journal,* PricewaterhouseCoopers, November 2001, pp.28-32.

APPENDIX

Data and information that have been used in this research are given in this appendix. Some of the data that have already been given in Chapter 4 are not repeated.

1. Market Capitalisation

Market capitalisations that lag the embedded value reporting dates by one to four months are given below for each of the four companies. In the case of Liberty the market capitalisations lagging the embedded value reporting date of 30 June 1999 are not given here. This is because these market capitalisations were excluded from the data used by the first two investigations for the reasons given in Section 5.2.2.

Embedded value reporting date	Market Cap with 1 month lag (R'million)	Market Cap with 2 months lag (R'million)	Market Cap with 3 months lag (R'million)	Market Cap with 4 months lag (R'million)
1998/12/31	21,665	22,843	20,460	23,486
1999/12/31	18,538	16,647	16,890	17,160
2000/06/30	16,386	17,604	17,144	15,675
2000/12/31	19,071	16,898	16,572	17,132
2001/06/30	15,419	15,446	14,195	14,602
2001/12/31	15,310	15,746	14,711	17,723
2002/06/30	15,019	14,555	14,227	14,871
2002/12/31	14,502	14,775	12,641	12,866
2003/06/30	14,221	13,606	12,812	14,585
2003/12/31	14,860	15,107	14,173	14,620
2004/06/30	14,151	15,172	15,999	15,766
2004/12/31	17,992	18,034	17,932	17,233

Table A.1 Market capitalisation of Liberty

Embedded value reporting date	Market Cap with 1 month lag (R'million)	Market Cap with 2 months lag (R'million)	Market Cap with 3 months lag (R'million)	Market Cap with 4 months lag (R'million)
2000/12/31	7,336	7,030	6,054	6,090
2001/06/30	7,015	7,234	6,107	6,179
2001/12/31	5,740	5,215	4,165	5,306
2002/06/30	3,609	3,448	3,709	3,876
2002/12/31	4,164	4,094	3,608	3,643
2003/06/30	4,304	4,234	3,887	4,651
2003/12/31	5,161	5,444	5,090	5,267
2004/06/30	4,950	5,083	5,847	5,880
2004/12/31	7,468	8,356	7,653	7,942

Table A.2 Market capitalisation of Metropolitan

Embedded value reporting date	Market Cap with 1 month lag (R'million)	Market Cap with 2 months lag (R'million)	Market Cap with 3 months lag (R'million)	Market Cap with 4 months lag (R'million)
1999/12/31	54,425	50,980	53,219	52,531
2000/06/30	53,392	60,109	59,592	58,407
2000/12/31	69,608	65,524	59,841	60,729
2001/06/30	62,875	60,388	53,106	56,330
2001/12/31	57,828	56,143	60,448	63,816
2002/06/30	48,452	51,591	43,686	47,431
2002/12/31	43,799	39,300	36,749	40,926
2003/06/30	43,266	42,346	40,622	45,221
2003/12/31	46,960	45,119	44,850	45,771
2004/06/30	45,618	48,802	50,951	49,689
2004/12/31	54,892	60,821	60,667	56,581

Table A.3 Market capitalisation of Old Mutual

Embedded value reporting date	Market Cap with 1 month lag (R'million)	Market Cap with 2 months lag (R'million)	Market Cap with 3 months lag (R'million)	Market Cap with 4 months lag (R'million)
1998/12/31	13,273	11,733	14,175	15,848
1999/06/30	18,980	19,246	17,387	18,715
1999/12/31	23,493	21,237	22,059	21,369
2000/06/30	22,166	22,298	22,033	20,838
2000/12/31	25,882	24,794	24,157	25,617
2001/06/30	28,404	28,404	24,926	23,360
2001/12/31	22,803	21,369	19,644	23,626
2002/06/30	20,573	21,821	19,909	20,042
2002/12/31	19,511	18,847	16,140	16,007
2003/06/30	19,883	19,246	20,254	22,564
2003/12/31	23,360	24,289	24,422	24,244
2004/06/30	24,216	24,825	30,333	29,834
2004/12/31	34,899	36,947	33,598	31,799

Table A.4 Market capitalisation of Sanlam

2. Value of Net Assets

The net asset values at each embedded value reporting date for the four companies studied are given below.

Embedded value reporting date	Liberty (R'million)	Metropolitan (R'million)	Old Mutual (R'million)	Sanlam (R'million)
1998/12/31	20,659	-	-	16,731
1999/06/30	-*	-	-	20,539
1999/12/31	9,093	-	45,791	20,463
2000/06/30	9,860	-	45,737	19,739
2000/12/31	10,642	4,987	53,517	20,512
2001/06/30	8,478	5,357	54,723	22,185
2001/12/31	9,656	5,130	45,716	23,796
2002/06/30	9,971	4,389	45,163	21,905
2002/12/31	9,426	4,164	39,222	20,347
2003/06/30	8,977	4,106	34,953	20,186
2003/12/31	9,323	5,057	34,028	22,318
2004/06/30	9,608	4,746	34,977	23,075
2004/12/31	9,260	6,138 **	40,887	28,017

* The net asset value of Liberty at this date was excluded from the data used by the investigations for the reasons given in Secion 5.2.2.

** This is after capital reduction of 100 cents per share

Table A.5 Value of net asset

3. Sensitivity Information

The sensitivity of the value of in-force business to the changes in the risk discount rate at each embedded value reporting date for each of the four companies is given below. Some of the values shown in this section are estimates and some have allowed for certain adjustments. The reasons for the estimates or adjustments and the methods of estimates or adjustments are given in Section 5.2.2.

Table A.6 shows the value of each company's in-force business when the risk discount rate is increased by 1%. However, for Sanlam the value of in-force business from 31 December 1998 to 31 December 2002 shown in table A.6 are in respect of a 1.5% increase in the risk discount rate, as that was what Sanlam has provided in its financial results for that period.

Similarly, Table A.7 shows the value of each company's in-force business when the risk discount rate is decreased by 1% except for Sanlam, for which the value of in-force business from 31 December 1998 to 31 December 2002 shown in table A.7 is in respect of a 1.5% decrease in risk discount rates,

Embedded value reporting date	Liberty (R'million)	Metropolitan (R'million)	Old Mutual (R'million)	Sanlam (R'million)
1998/12/31	4,420	-	-	4,265
1999/06/30	4,549	-	-	4,700
1999/12/31	4,464	-	6,881	5,221
2000/06/30	4,109	-	6,763	5,160
2000/12/31	4,490	2,136	8,267	5,655
2001/06/30	4,655	2,261	8,737	5,521
2001/12/31	4,829	2,296	14,043	5,753
2002/06/30	5,181	2,259	13,033	5,689
2002/12/31	5,343	2,036	13,389	5,591
2003/06/30	5,182	2,082	13,763	5,921
2003/12/31	5,835	2,356	13,551	6,579
2004/06/30	5,649	2,295	13,115	7,084
2004/12/31	6,851	2,597	15,628	7,728

Table A.6 Value of in-force business when risk discount rates are increased by 1%

Embedded value reporting date	Liberty (R'million)	Metropolitan (R'million)	Old Mutual (R'million)	Sanlam (R'million)
1998/12/31	5,036	-	-	6,307
1999/06/30	5,163	-	-	6,950
1999/12/31	5,048	-	9,234	7,337
2000/06/30	4,681	-	9,072	7,163
2000/12/31	5,155	2,391	10,502	7,989
2001/06/30	5,271	2,532	11,382	8,094
2001/12/31	5,395	2,560	17,454	8,329
2002/06/30	5,831	2,509	16,324	8,237
2002/12/31	6,058	2,276	16,908	8,103
2003/06/30	6,126	2,330	16,944	7,487
2003/12/31	7,192	2,638	17,144	8,208
2004/06/30	6,955	2,762	16,219	8,665
2004/12/31	8,426	3,269	19,071	9,697

Table A.7 Value of in-force business when risk discount rates are decreased by 1%

4. Beta

The value of beta at each embedded value reporting date for each of the four companies is given below.

Embedded value reporting date	Liberty	Metropolitan	Old Mutual	Sanlam
1998/12/31	1.11	0.96	-	-
1999/06/30	1.12	1.00	-	-
1999/12/31	1.05	1.14	-	-
2000/06/30	1.03	1.18	-	-
2000/12/31	1.03	1.18	1.12	0.93
2001/06/30	0.97	1.14	0.92	0.76
2001/12/31	0.89	1.03	0.74	0.69
2002/06/30	0.82	0.94	0.70	0.61
2002/12/31	0.83	1.01	0.76	0.65
2003/06/30	0.51	0.99	0.73	0.67
2003/12/31	0.55	0.86	0.74	0.73
2004/06/30	0.55	0.86	0.73	0.67

Table A.8 Value of beta