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Solvency II – An illustration

by

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Summary of the thesis

This thesis focuses on Solvency II and the implications for life insurance. We first give an introduction to insurance and life insurance in general. Then we describe the balance sheet of a life insurance company. We also explain the need for a new framework as well as the participants behind it. Subsequently we focus on the solvency term. In the future the solvency assessment will be more closely related to the risk exposure of a company, thus we give a thorough description of the various risks facing life insurers. To illustrate the different aspects of the framework we have used the life insurance company Vital.

Contents

1 Introduction

Solvency II is the new EU regulatory framework in the insurance sector. The need for a new supervisory regime has been triggered by the rapid evolvement in the financial markets. New financial instruments have made investments more complex, and exposure to risk for insurance companies has been altered. This has not been fully reflected in today's regulatory regime. Solvency II will to a greater extent reflect the undertaking's real risk.

The purpose of our paper is to explain the new framework and give the reader an overall understanding of how the new regime will work and how it will affect the life insurance industry. Our thesis is to a large extent both explanatory and descriptive, but we have given a practical understanding of the new framework. Our thesis will focus on life insurance. This is due to personal preferences and the dynamic nature of that industry.

It is very difficult to get a full understanding of how comprehensive Solvency II is, and the scope of the thesis does not allow enough room to give an elaborate description of every element. The new framework encompasses many different fields and each item could be a thesis. We could have to a much greater extent focused on one area. However, we believe it is much more useful for us to get an understanding of the entire framework rather than focusing the thesis on one specific item. The problem of the thesis is:

We will explain Solvency II and outline how a given life insurance company can adapt to the different aspects of this new regulatory framework

Since we had prior knowledge that Solvency II was related to a capital requirement we have followed up with a subordinated question:

Will Solvency II lead to an increased capital requirement for a life insurer?

2 Introduction to insurance

The insurance sector carries significant importance in our western world. It is a considerable contributor to the economy, and a major institutional investor.

The idea behind insurance is to protect oneself from a random future event, providing cover against various risks facing the citizens, corporations and other organisations. The risk can be related to theft, health or damage to property. People buy insurance to eliminate this risk; hence they are risk averse. Risk aversion can be illustrated by a lottery which pays an amount; a risk averse person will prefer a certain amount to an uncertain amount which has the same expected payout.

In today's modern economy the risk is divided between an individual and an insurance company. Insurance allows for shifting of risk[1] by a payment of a premium. Insurance can therefore be regarded as a form of risk management primarily used to hedge (perfect) against the risk of a potential financial loss. In the case of an unfavorable event the claimant will receive a payout. The insurer will keep the premium if they do not receive a claim from the policyholder.

The premium should reflect the price of the risk that the insurer has accepted. However, it is up to each insurer to determine the price of that risk. If the insurance price is actuarially fair the discounted expected loss will be equal to the premium.

$$P = \frac{E[X]}{1 + r_f} \qquad \text{If} \qquad r_f \neq 0$$

Where:

P = Premium

$E[X]$ = Expected payout

[1] *Eeckhoudt, Gollier and Sclesinger (2005).*

r_f = Risk free interest rate

Adam Smith (Wealth of Nations) developed the standard formula for pricing an insurance contract:

$$P = E[X] + k + R$$

Where:

$E[X]$ = Expected payout

k = Cost

R = Risk premium (compensation to bear risk)

In principle, insurers can compete on costs and the risk premium. If the insurer consistently loses money it will not be able to meet its future obligations and the insurance contracts will be worthless.

Insurance contracts are not easily tradable and thus high transaction costs are present. There exists no developed market for trading contracts either. Normal futures and options contracts have basis risk[2], in contrast to insurance contracts that are perfect hedges.

Insurance is of great importance in today's world. Insurance allow the participators of the economy to produce goods and services without fearing that an incident could leave them unable to function. Non-life insurance allows victims of accidental loss to recover financially through the payment of claims for property damage and injury. The largest claimers are car repair shops, building contractors and health care. Life insurance helps households manage their finances in the face of death, disability or retirement. By providing financial security to individuals, life insurance products help stabilize the whole economy. Insurance companies also contribute to the economy by being very large employers and thus providing financial security for their employees.

[2] Basis risk is present when the value of a financial instrument does not move in line with the underlying asset *(Jorion 2002)*.

As the financial product spectre has eroded in number and complexity, so has the insurance business portfolio. Their investments range from stocks, corporate and government bonds, real estate to different types of options, foreign currency. Consequently the companies are exposed to different types of risks. These risks will be analyzed in later chapters.

To be certain that the insurance companies honour the contractual commitments they have made to the insured and to protect the insured from the undertaking's risk exposure, regulation and supervision is essential. Insurance companies should be financially able to meet their commitments at all times. The regulative framework will in the future be more closely related to the risk exposure of an undertaking.

The general features of life insurance will be explained in greater detail through the next chapters.

3 Life Insurance

In life insurance, insurers' obligations are related to the policyholders' health and/or life. Customers pay a premium for protection of some form against an unfavorable event. Unlike other savings plans, life insurance offer full economic protection against the risk of death. Payment of life insurance premiums can become a habit, thus it motivates increased savings. Life insurance companies accumulate large amounts of capital through premiums and these funds can be invested in the market place. The premiums though, do not belong to the insurance companies. They only invest them on behalf of the policyholders, but they might get a profit on the investment.

The specter of life insurance products can be divided into the following categories:

1) Life

a) Term life insurance - Provides death protection for a stated time period, or term. This is the most basic form of life insurance. It usually provides affordable protection, often with a guaranteed payout, for some period of time. If the insured should die while the policy is in force, the face amount is paid to the named beneficiary. At the end of the guarantee period, the insured can renew the coverage at a higher premium. The premium for term life insurance is initially lower than a comparable permanent insurance policy; however, it can increase at each renewal. This initial lower premium usually makes term insurance an ideal choice for individuals with a temporary need for life insurance protection.

b) Whole life insurance - Provides coverage for an individual's whole life, rather than a specified term. Premiums are fixed and must generally be paid as long as the policy is in force. It can include a fixed guaranteed rate of return.

c) Universal life insurance – A modified form of whole life insurance. Part of the premium buys insurance coverage that will be paid if the insured dies. The rest of it is invested in securities that are intended to increase the policy's cash

value. The premiums and payouts can vary. It often includes a fixed guaranteed rate of return.

d) Variable life insurance – An extreme version of universal life, where payout is fully dependent on the return of the invested premium given a chosen risk profile.

2) Pension

a) Non-participating – Payout after time n if death has not occurred or regular payouts from a certain time m to a time n which doesn't have to be specified.
b) Defined benefit pension plan – Same as above, but the size of the payouts is given in the contract.
c) Defined contribution based pension plan – Here, the size of the payouts depends on the return of the invested premiums. The size of the premiums is given in the contract.

Reasons for committing to a life insurance contract are many. First, individuals want to insure themselves to secure the future of those who are dependant on them. This is particularly the case if they are the family's main source of income. Second, life expectancies have gone up, while the active working period has decreased. Individuals who tend to live way beyond their earning years often get problems with increased costs of living. A pension plan can be the solution. It can suit their profile in terms of income, expected retirement age and expected expenses after retirement. Third, an individual can have a health problem that will cost him an amount beyond his financial capacity. Allowing the individual to surrender the insurance policy, might solve the individual's problems. Fourth, life insurance savings provide tax benefits in many countries. There are numerous different products available in the insurance market, and the number is increasing with the complexity of the financial instruments. This is not within the scope of the thesis, so we will leave the overview of the specific products here.

The insurance business is faced by different types of regulation. In Norway, the profit sharing level is regulated to a minimum of 65%, the guaranteed return maximum 2.75% and the amount of capital invested in equities maximum 30%. There are also restrictions

on the leverage ratio. We will in the following focus on a different type of regulation, namely the one that affects the size of solvent assets in an insurance company. This has become increasingly important over the past decade. The capital markets have evolved and grown rapidly. Money has been poured into the markets looking for high returns. The derivatives markets have expanded, making investments more complicated. Life insurers have put more money into equity markets as regulation has given them the possibility to increase their holdings. The minimum guaranteed rate of interest combined with the low interest rates has presented a challenge for life insurers as to how to meet the guaranteed returns. In many cases, risky equity investments have been the solution. However, the turbulence in the markets has left life insurers exposed, as became obvious with the collapse of Lloyds in England. The need for better risk management programs that reflect today's risk is essential. This is the cornerstone of the new regulatory framework.

4 Balance sheet

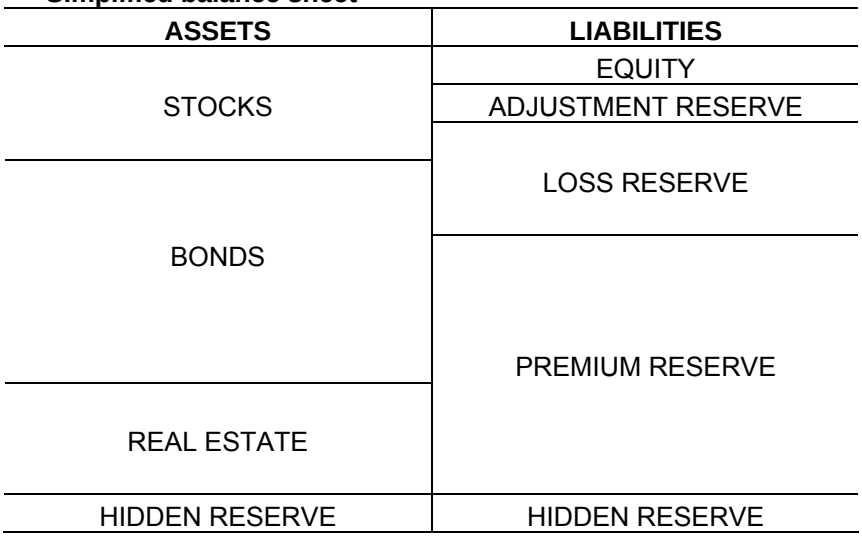
To understand the Solvency II framework we need to introduce the balance sheet of a life insurance company. In this chapter we will clarify the different parts of the balance sheet, explaining the main components of the assets and liabilities. For illustrative purposes we have simplified this balance sheet considerably, and have adapted it to Vital[3]**.** In chapter 8 we will use the balance sheet to illustrate an undertaking's risk.

The main components of the asset side of the balance sheet are stocks, bonds and real estate. The liability side of the balance sheet consists of equity, technical provisions and an adjustment reserve. Equity is the capital of the shareholders (we have disregarded mutual insurance companies). Technical provisions consist of the premium reserves and a loss reserve. The premium reserves are the property of the customers. It has a guaranteed return and is supposed to cover future claims. The loss reserve is supposed to be a buffer for years with an unfavorable investment return. It consists of additional statutory reserve and other technical reserves**.**

The technical provisions are an estimate of the size of the debt, which size depends upon actuarial assumptions i.e. morbidity, mortality and longevity in life. They are calculated based on a discounting rate which today is the guaranteed return. The adjustment reserve gives value to the unrealized gains on current assets. The hidden reserve comes either from market values which differ from their accounting values or a discrepancy in the accounting valuation of technical provisions and their valuation in the solvency framework. Figure 1 gives an illustration of the balance sheet.

[3] Vital is the market leader in the Norwegian pension market. They manage more than 200 billion NOK, have approximately 920 employees, and insure more than 900 000 persons.

Figure 1 **Simplified balance sheet**



We have analyzed the annual report (2005) for Vital and adapted the balance sheet to the simplified one. We know that the stock portfolio consists of a domestic part and an international part. The domestic portfolio is mainly invested in stocks listed on the Oslo Stock Exchange and has an overall risk comparable to Oslo Børs All-share Index. The international stock portfolio is invested according to the Morgan Stanley Developed World Index, with around 59 % in North-America, 28 % in Europe and 13 % in Asia. We assume the mutual funds have a similar structure as the stock portfolio. We have separated the different types of stocks in the balance sheet.

The bond portfolio consists of a domestic part and an international part. For the later calculations involving bonds we have used information from the annual report about duration and the yield to maturity. We have disregarded money market placements, real estate derivatives, other current and non-current assets, and in our simplified balance sheet we have kept them as "other assets" only for equilibrium purposes.
On the liability side we have included subordinated debt to the equity post. We have also put all relevant posts under technical provisions. The adjustment reserve is given in the original balance. The remaining posts we have added as other liabilities. As a consequence of our approach, the simplified balance sheet can be illustrated as follows:

Table 1 Simplified balance sheet of Vital (Numbers in Million NOK.)

ASSETS		LIABILITIES	
Stocks - Oslo Børs All-share Index	10 192	**Equity**	**9 654**
Stocks - DWI North America	13 198		
Stocks - DWI Europe	6 264	**Adjustment reserve**	**5 503**
Stocks - DWI Asia	2 908		
Domestic bonds	47 293	Premium reserve	158 299
International bonds	18 344	Loss reserve	10 867
Current assets	**98 167**	**Technical provisions**	**169 166**
Domestic bonds held to maturity	45 381		
International bonds held to maturity	5 865		
Non-current assets	**51 246**		
Real Estate	**22 872**		
Other assets	**15 651**	**Other liabilities**	**3 645**
Total Assets	**187 968**	**Total Liabilities**	**187 968**

All assets are valued at their market values, with the exception of bonds held to maturity (HTM)[4]. They are valued at cost value. However, CEIOPS[5] believes that assets should generally be accounted for at their market value and consequently we have used market values for the capital requirement calculations. This leads to a change in the value of the bonds held to maturity to 48148 for domestic bonds and 6366 for international bonds. It also affects the technical provisions, which we will elaborate on in chapter 6.

[4] Bonds not held to maturity are referred to as NHTM.
[5] CEIOPS is the Committee of European Insurance and Occupational Pensions Supervisors. It was established in 2003 to design the new EU solvency system.

5 Solvency II

5.1 The need for a new solvency regime

Insurance companies enter into commitments with their customers and the customers should be entitled to assume that the insurers will be able to meet these commitments. This is the motive behind the present legislation on Solvency rules.

The first EU solvency system (First Directive, 1973 for non-life and 1979 for life) were implemented as Norwegian Law as part of the EEA-agreement in 1994. This was the first definition of capital requirements exceeding insurance obligations. It was based on simple calculations for the premium reserves, premiums, compensations and uncovered risk. The focus was mainly on insurance risk. The system, introduced in the 1970s, has played a significant role in increasing the quality of supervision. However, general economic features as well as insurance practices have changed. The insurance industry has had to face increased competition, convergence between financial sectors as well as international dependence. At the same time insurance, asset, and risk management methods and techniques have been refined.

Shortly before the new millennium the system was put under significant pressure. Insurers were chasing volume by reducing premiums. Many insurers' reserves would prove insufficient for the volume of past liabilities, as well as allowing their capital position to erode. General insurers had invested a disproportionate amount of their assets in equities. Regulation was no longer suited to the insurance business. To eliminate these and other problems, the work to build a new and better Solvency regime, within the EU/EEA-members, had already started.

As a first step in reforming the existing solvency regime, the European Commission in 2000 launched Solvency I[6]. Here, the minimum risk-bearing capital was calculated as a fixed percentage of the technical provisions in life insurance and in non-life insurance as a percentage of premiums written. The absolute minimum requirement was also increased to 3 million euros and would be updated in line with EU consumer price inflation. In addition, the required solvency margin capital had to be met at all times rather than just at the date of the last balance sheet. Solvency I forced the EU/EEA-members to set more stringent capital requirement rules for the undertakings they authorize than the minimum requirements set in the first Directive. The different items eligible for inclusion in the solvency margin capital[7] have also been clarified and categorized according to their relative financial strength. We will discuss the solvency margin capital in depth in chapter 8.5. Here we will explain the calculation of the solvency margin capital as of today. All in all, Solvency I made the general insurance industry much more resilient. Investment portfolios are more balanced, and balance sheets are stronger.

While reforming the former Solvency regime, many EU/EEA Member States remarked that the changed business situation for insurance undertakings would call for a more fundamental review in which the whole EU insurance supervisory architecture should be examined. The work on the most controversial issues was postponed to Solvency II, a project also launched in 2000. Several of the risk factors that are an inherent part of the insurance business had not been fully reflected in the former solvency regime, even though these risk factors had often been the ultimate cause of company failure. This situation stressed the need for methods reflecting the entire risk exposure of an insurance company. Ideally, the capital requirement of an insurance company should reflect all risk factors that are relevant to the company in order to reflect a true and fair measure of the economic status of the companies. This reasoning is recognized in the present work of Solvency II. With the help of Solvency II there will be an increased consistency between the companies' real risk exposure and the solvency margin capital. There will be a harmonization of the regulatory regimes, which will result in increased transparency and

[6] Solvency I was implemented in 2003.
[7] Capital resources which should cover the capital requirement.

a better approach to the industry's risk management. The system should also include incentives for companies to assess and manage their risks. Furthermore, the system should be in line with the international developments in solvency, risk management, supervisory and accounting. As in Basel II, the new regulation will consist of advanced modeling, both internal and standardized, and a higher focus on the companies' internal control systems and risk management. We will elaborate on this in the following chapters.

5.2 The process and participants

The Solvency II project is seen as an integrated part of developments within solvency itself, insurance accounting and related fields such as risk management. The project can be divided into two phases. The first phase was concluded in 2003. Here Member States and the European Commission Services studied a number of areas in order to decide on the general design of a future EU solvency system. These include use of risk-based capital (RBC) systems, lessons to draw from Basel II and use of internal models. It also changed the EU regulatory architecture, and as a result CEIOPS was created.

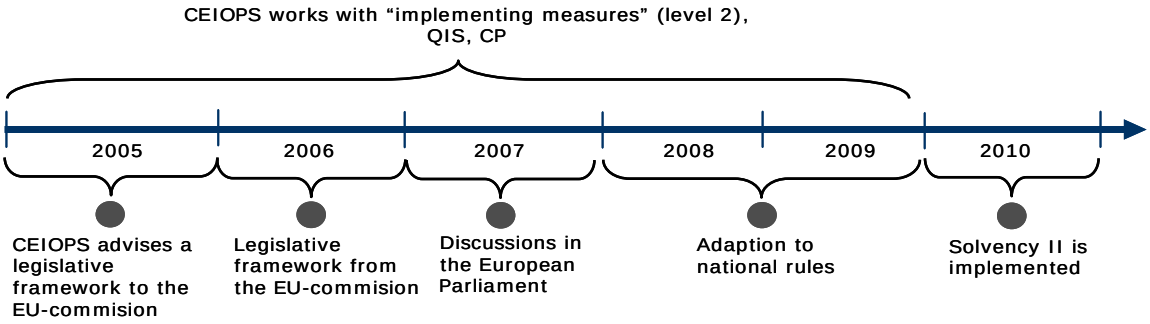
> The Committee of European Insurance and Occupational Pensions Supervisors (CEIOPS) was established pursuant to the European Commission Decision 2004/6/EC of 5 November 2003. CEIOPS is composed of high level representatives from the insurance and occupational pensions supervisory authorities of the European Union Member States. The authorities of the Member States of the European Economic Area and the present candidate countries, Bulgaria and Romania, as well as the European Commission, participate in CEIOPS' activities as observers. CEIOPS performs the functions of the level 3 Committee for the insurance and occupational pensions sectors. This role involves providing advice to the European Commission on the drafting of implementation measures for framework directives and regulations on insurance and occupational pensions ("Level 2 activities") and establishing supervisory standards, recommendations and guidelines to enhance convergent and effective application of the regulations and to facilitate cooperation between national supervisors ("Level 3 activities"). CEIOPS report regularly to the European Commission and the European Parliament.
>
> *Http://www.ceiops.org*

CEIOPS is the main organizer for the second phase of the Solvency II project. This phase concentrates on preparing legal EU texts as well as more detailed technical rules and guidance. To help fulfil its tasks CEIOPS has established multinational Working Groups. These large groups consist of specialists/economists/actuaries from the financial supervisory authorities of the affected countries. They give specialist input to the ongoing work. CEIOPS also ensures its accountability by cooperating closely with other EU Institutional bodies dealing with financial services, such as the Economic and Financial Committee (EFC), the Financial Services Committee (FSC) and the European Insurance and Occupational Pensions Committee (EIOPC). By doing this they hope to converge approaches on aspects of common interest. CEIOPS will also make use of IAIS[8] standards and guidance as basis for the future regulations, and will apply the new IASB[9] accounting rules as a cornerstone for Solvency II. Solvency II can also help with input to IASB.

The required harmonization across the EU/EEA can only be completed if it has strong political support. The creation of a robust regulatory framework for supervision and the adoption of effective supervisory practices are dependent upon a wide sharing of regulatory and supervisory policy. It is also dependent on a clear and complete knowledge of market situation and needs. CEIOPS therefore seeks input and inspiration during public consultation processes, from market participants, consumers, end users and any other interested external parties. This input helps to prepare its advice to the European Commission and the drafting of its own recommendations. Figure 2 illustrates the timeline of Solvency II.

[8] International Association of Insurance Supervisors
[9] International Accounting Standards Board

Figure 2 Timeline for Solvency II



5.3 The three Pillar framework

At this stage Pillars 1, 2 and 3 are still in the developing stages and the following chapters are based on the preliminary work. It is expected that CEIOPS will use 2 years on problems concerning the different pillars.

The new Solvency system will not only consist of formulas and indicators, but also cover several qualitative aspects like management, internal control and competitive situation. These aspects influence the risk profile of insurance undertakings. The new system will be more risk-based than the current one, and focus needs to be put on risk analysis and risk mitigation techniques. Increasing the accuracy of calculations (for example of solvency capital requirements) through internal models will be encouraged by the system. A similar approach has been used in the banking sector with the New Basel Accord (Basel II). The work on Solvency II is closely related to this three Pillar framework. We will discuss this in the following chapters.

Solvency II should be compatible with banking rules and as far as possible similar products should be supervised in the same way. Although this convergence between financial sectors hopefully is accelerated by Solvency II, it is important to remember to adjust the banking-inspired structure, to the different nature of insurance. The balance sheet is of particular interest.

6 Pillar 1

Pillar 1 explores the range of capital requirements in terms of financial strength, risks, internal models and minimum capital requirements.

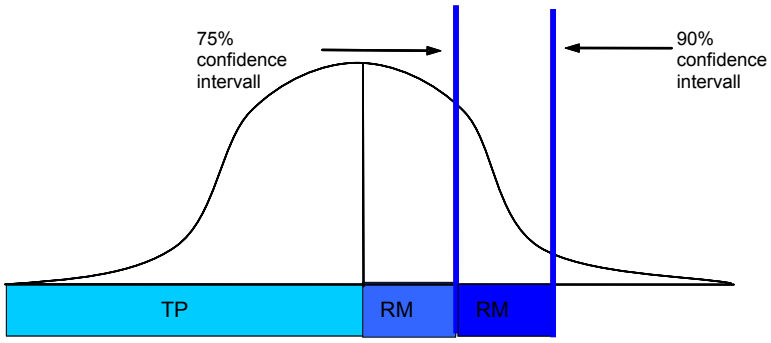
6.1 Calculation of the technical provisions

Insurance contracts are very complex products and include characteristics from both bonds and options. In the current Solvency regime, this is not fully recognized. In order to estimate the technical provisions properly, an important first step is to harmonize the interest rate parameter used in discounting the future cash flows. A second step is to have similar accounting standards; this means that liabilities are measured according to the same principles irrespective of jurisdiction. This need of harmonizing the methods is crucial. Comparisons are almost impossible when different methods are used.

Today's insurance directives require technical provisions to be cautiously estimated. The problem is though what the level of prudence should be. Today's directive does not give any detailed guidance concerning this problem and many countries have had a desire to establish a quantitative benchmark. One starting point when calculating the provisions can be to estimate expected values of a relevant distribution and later add risk margins. The desired level of prudence needs to be established. This can be based on regulations or market forces. Obvious problems are technical challenges, national differences and lack of supervision.

Future obligations in life insurance will reflect all payments made to policyholders. The premium reserve is calculated from the present value of the expected future payments. The risk margin of the premium reserves will be calculated based on a historical distribution given a confidence level of 75 % and 90 % which will be tested in Quantitative Impact Studies (see figure 2). The expected cash flows should be based on actuarial assumptions, for example mortality rates and claims frequency.

Figure 3 **Risk margin on the technical provisions**



To arrive at the present value of the cash flows they have to be discounted, and which discount rate shall be used is something that needs to be determined. IASB suggests using a risk-free market interest rate of relevant duration and currency, a so-called fair value approach. At present the average discount rate is 3.6% for the premium reserves. As an estimate of the risk free rate, we have used the interest rate on 10 year Norwegian government bonds. Currently the rate is approximately 4%, and in the near future it is more likely to rise than to fall. A fair valuation of the liabilities will then include an increase in the discount rate from 3.6% to at least 4%. The total duration[10] for the liabilities in the Norwegian life insurance market is approximately 15 years *(Kredittilsynet 2005)*. We will use the same duration for Vitals liabilities in our calculation. We can illustrate the change in the value of the premium reserves as follows:

$$\Delta MV_{PR} = \Delta_{discount} * MV_{PR} * D_{PR}$$

Where:

ΔMV_{PR} = Change in market value premium reserves

MV_{PR} = Market value premium reserves

$\Delta_{discount}$ = Change in discount rate (=change in risk free rate)

[10] Duration is the weighted average life of today's value of all future cash flows. The Macauley duration is the weighted-average term to maturity of the cash flows for the assets or liabilities. The modified duration also accounts for changing interest rates.

D_{PR} = Duration premium reserves

The new value of the premium reserves is given in table 2.

Table 2 Value of the premium reserve[11]

	Duration of liabilities		
Average discounting rate:	10 years	15 years	20 years
4%	157687	148801	145635
3.60%	158299	158299	158299

For the rest of our thesis, we will assume that the value of the premium reserve is given in the case of duration of 15 years and a discount rate of 4%.

Another important aspect in life insurance is how to value bonuses. The work of Solvency II leans towards well-defined profit-sharing rules between policyholders and insurance companies. IASB wants a clear distinction between capital and liabilities. After a bonus policy rule is defined, bonuses can be valued with the help of DCF supplemented by asset liability management (ALM) and option pricing methods. We will not discuss the valuation of guarantees, options and bonus', but we will elaborate on ALM when we discuss the market risk in the following chapter.

6.2 Capital requirements

The Solvency II system will have two binding levels of regulatory capital requirements, on top of the technical reserves (which will equal the technical provisions + risk margin). The two levels will be the minimum capital requirement (MCR) and the solvency capital requirement (SCR). The MCR is a part of the SCR. After a capital requirement is determined, regulation will decide what types of capital can cover the requirement. This will be discussed in chapter 6.3.

[11] This is dependent upon that life insurance companies can start with a fair valuation of the liabilities which is not the case currently.

6.2.1 Minimum Capital Requirement

The Minimum Capital Requirement (MCR) is a part of the SCR; it is supposed to be an absolute minimum of the capital level. A breach of the MCR will trigger ultimate supervisory action. The MCR should be calculated in a more simple way than the SCR, and could be an absolute floor. This would make it easier for small undertakings to adapt to the new rules. As the MCR and the SCR will have different calculations, a possible outcome is that the SCR could be lower than the MCR which would mean that the MCR is overstating the risk. The following are considered by CEIOPS for the level of the MCR; a calculation based on the existing Solvency I requirements, MCR as a margin over liabilities and a calculation based on the standard formula for the SCR. There is a general opinion among Member States that the MCR level should be calculated in a simple way. This is also the case in the current Solvency regime where minimum risk-bearing capital is calculated as a fixed percentage of the technical provisions in life insurance and in non-life insurance as a percentage of premiums written. A similar calculation can be used in Solvency II, with suitable adjustments.

6.2.2 Solvency Capital Requirement

We will elaborate on the solvency capital requirement in chapter 8.

6.3 Solvency Margin Capital

The solvency margin capital refers to the capital resources an insurance company, from the supervisors point of view, can use to cover the solvency capital requirement. Looking at Vitals financial report, we can see how today's rules are reflected in the calculation of solvency margin capital. From the net subordinated debt, 50% of additional statutory reserves and everything above the lower limit of 55% of security reserve is added. This is

to compare with the solvency margin requirement, which in general should be 8% of risk adjusted assets.

There is an ongoing discussion which resources to include in the solvency margin capital in Solvency II. Since the valuation of both assets and technical provisions will now be based on market values, and since the solvency capital requirement is supposed to cover all risks, the capital resources included in the solvency margin capital are expected to increase. A smaller part of the risk should be accounted for in the loss reserve and the risk margin. Possibly 100% of the additional statutory reserves and the security reserves should be added to the solvency margin capital. In addition to this the adjustment reserve as a whole should be added. One important aspect to consider when moving reserves meant to cover the premium reserves are to allocate these funds in such a way that they still belong to the customers and not the company.

Illustrating the possible change in solvency margin capital:

Table 3 Solvency margin capital (Numbers in Million NOK.)

Capital resources	Today	Solvency II
Net subordinated debt	9312	9312
Security reserve	90	201
Total additional statutory reserves	1894	3788
Adjustment reserve	0	5503
Solvency margin capital	11296	18804

The solvency margin capital will increase with more than 50% if this is the final regulative outcome. We will use the new outcome as a reference when approaching the solvency capital requirements in chapters 8 and 9.

7 Risk

The new Solvency II framework is based on a total risk approach. This chapter will give an overview of a suitable risk measure for the framework

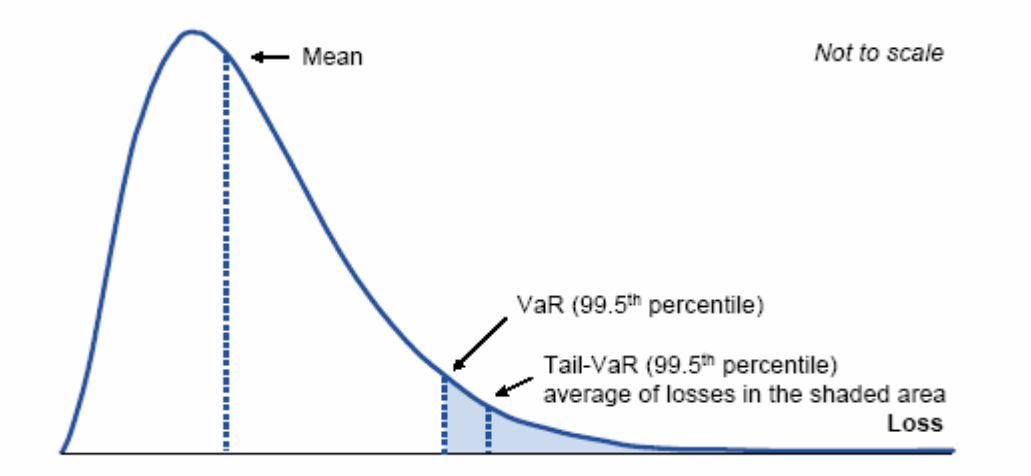
If we consider the balance sheet presented in chapter 4, we have equity as the solvent capital. The solvent capital is the excess of assets over liabilities. Liabilities consist of technical provisions and an adjustment reserve, which can be seen as a risk margin. Changes in the level of solvent capital will depend on the risks to which an undertaking is exposed and the development of assets and liabilities. Since this development is unknown, the future level of solvent capital will behave stochastically. It may be described by a probability distribution, which measures the likelihood of all possible outcomes.

CEIOPS is considering two different alternatives for the calculation of the capital at risk; Value at risk (VaR) and Tail-VaR. These risk measures are functions that assign an amount of capital to a risk distribution. A central part of these models is that they enable risks to be aggregated.

VaR models are popular for measuring market risk; it is the expected loss over a pre-determined horizon at a given degree of confidence. VaR became a key measure of market risk since the Basle Committee stated that banks should be able to cover losses on their trading portfolios over a ten-day horizon, 99 percent of the time. It is also quite normal to use VaR for internal risk control.

From a mathematical viewpoint, VaR measures the quantile of the projected distribution of gains and losses over a given time horizon. With confidence level α, VaR is the $1-\alpha$ lower-tail level.

Figure 4 Illustration of VaR and Tail-VaR



Source: CEIOPS

The time horizon, the frequency of the data, the cumulative distribution function of the price change of a given portfolio over the time horizon under consideration and the amount of the financial position need to be set, when estimating the VaR confidence level.

In two different papers, *Artzner et al. (1997, 1998)* have criticized VaR as a measure of market risk on two grounds. First they show that VaR is not necessarily subadditive. Subadditivity is a desirable feature of a risk measure. It implies that the aggregation of risks does not lead to an increase in overall risk[12]. They explain that this may cause problems if one bases a risk-management system of a financial institution on VaR-limits for different securities individually. VaR does not enjoy the property of being subadditive, except in the case of normally distributed risks.

Second, VaR gives only an upper bound on the losses that occur with a given frequency. VaR tells us nothing about the potential size of the loss given that the specified quantile is exceeded. In insurance business, undertakings are subject to infrequent, severe losses, i.e catastrophic events. In this case the risk distribution will feature a fat tail, compared to

[12] Formally it means that $\rho(A + B) \leq \rho(A) + \rho(B)$, where ρ is a risk measure and A,B represent any two portfolios.

the standard normal distribution. VaR might therefore not be the appropriate risk measure in insurance business.

To solve these two problems, *Artzner et al. (1997, 1998)* suggested using the so-called expected shortfall or tail conditional expectation (TailVar) instead of VaR. TailVaR is a subadditive risk measure which reflects severe and infrequent losses. The Tail-VaR will give a fat tail which might produce a better assessment of the risk. Using it can encourage an undertaking's stakeholders to consider the consequences of a potential default, not only the probability of insolvency. It can create an incentive for insurance undertakings to improve their treatment of low-frequency, high-severity risks. For these reasons, the IAA Insurer Solvency Assessment Working Party has suggested to use TailVaR when computing the solvency requirements.

The most important disadvantage using TailVaR is the scarcity of data, which could lead to increased modeling error. A formula based on TailVaR is difficult to generalize and might not provide a good fit for the majority of insurance undertakings. The tail data used for modeling is often individually related, and might not be representative. This is probably the reason why The Commission Services are proposing to CEIOPS the use of VaR as a general principle for calculating the SCR. Using an internal risk model can solve the problem of individuality and more advanced modeling techniques could be used. This includes the use of TailVaR.

VaR models require data to be gathered over a long period of time as the models are based on daily price movements and long time series. Another problem with VaR is that it does not deal with unexpected changes in historical correlations and default. A large change in the volatility will lead to a change in the portfolio VaR. VaR models may not always capture the true risk either and are also not a complete measure of risk. The accuracy of the models is strongly dependent on that the different risks to be aggregated are accurately modeled.

The main statistical challenge in implementing VaR or TailVaR as a risk measure is to make a good estimate for the tails of the profit and loss function of an underlying portfolio. Having these values makes it rather easy to compute both of them.

8 Solvency Capital Requirement

Refer to *CEIOPS consultation paper no. 7* and *Kredittilsynet 2005* for many of the formulas used in the calculation of the solvency capital requirement. However, we have made adjustments where necessary.

The second level of regulatory capital requirements and the main supervisory tool in the future Solvency II system will be the SCR. The definition of the SCR in the draft amended Framework for Consultation for Pillar I:

> The SCR should deliver a level of capital that enables an insurance undertaking to absorb significant unforeseen losses and gives reasonable assurance to policyholders that payments will be made to them as they fall due
>
> *www.ceiops.org*

In this chapter we have explored the different risks to be covered under Solvency II and how these will affect the SCR. Section 8.1 covers market risk. Section 8.2 gives an introduction to underwriting risk. Section 8.3 will look at credit risk. Section 8.4 will look at the operational risk. In section 8.5 the risks are aggregated. We have illustrated the risk based on Vital, and in a simplified way outlined the calculation, size and scope of the new regulatory capital requirement.

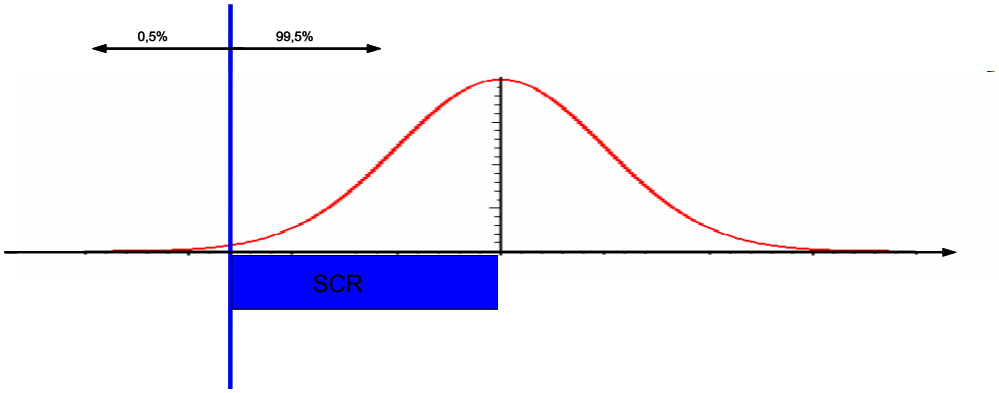
The starting point for SCR may be the so called 'economic capital', a statistical measure based on the loss distribution reflecting the necessary capital required to obtain a probability of default less than a certain value. Use of economic capital as a risk measure will in theory make insurance companies take prudent positions. Therefore, the expected restrictions on asset allocation from Solvency II might be unnecessary. The SCR will, when appropriate, be calculated through the value at risk (VaR) method, given a certain time horizon and confidence level. More concrete, the SCR should deliver the amount of capital necessary to ensure, within the chosen confidence level, that assets will exceed future obligations (in our case technical provisions) over a chosen time horizon.

The time horizon for the SCR should reflect the frequency for which results are produced and the ability of undertakings and supervisors to act, if or when necessary, e.g. when assets fall below technical provisions. Due to the one-year periodic nature of business, this seems like a natural time horizon to be applied for the SCR calculations. This does not prevent insurance companies from using internal models with different horizons that can describe the nature of their business more realistically. One problem with the one-year horizon occurs when an undertaking's liabilities extend beyond one year. At the end of the year assets may still exceed liabilities, but the VaR confidence level might be lower. The SCR should also reflect the capital needed at the end of the time horizon. This means that new businesses, which might change the undertaking's risk profile, generally should be reflected in the capital requirements.

The level of prudence or confidence for the SCR will need to be assessed using quantitative analysis. If the confidence level is raised, capital requirements are unlikely to increase in a linear manner. This means that raising the VaR level from 99% to 99.5% potentially could increase the SCR more than a move from 95% to 99%. The result of a given level of prudence does not consider e.g. domino-effects. A VaR-level of 99.5% does not necessarily mean that 1 out of 200 insurance undertakings will fail within a year, or that ruin will occur once every 200 years for an undertaking. It can also mean that 0 out of 200 companies will fail the next 199 years, but 200 out 200 might fail in exactly 200 years. Calculating the SCR at a certain level of prudence might also under- or overestimate the capital requirement, and an adjustment factor might be applied (as in Basel II). Moreover the SCR should reflect the capital level suitable to the insurers' level of risk. The SCR level should be met at all times.

$$SCR = VaR\ (99.5\%)$$

Figure 5 Level of prudence for the SCR



If a company cannot fulfil the target SCR, then this will trigger supervisory review and corrective actions.

The SCR should take all quantifiable risks into account and those are to be covered by the solvency margin capital. It is desirable to have most risks covered in Pillar 1 to ensure they are quantified and taken into account for the SCR calculation. If they are considered in Pillar 2 it might be difficult to give a proper assessment of the risk as this will be a qualitative assessment of the risks. However, the modeling approaches to be used in the SCR standard formula require considerable further analysis. The SCR should identify and quantify the risks the customer is exposed to; market risk, underwriting risk, credit risk and operational risk. We will elaborate on these risks in the following sections.

There is a fifth risk which will not be covered in the SCR at the moment, this is liquidity risk. Liquidity risk is a financial risk related to whether the firm has cash in hand to meet its obligations. If the insurer looks at its future net cash flows it can see whether there might be a problem related to meeting its obligations. If the life insurer has a large portfolio the law of large numbers will ensure that the cash flows should be reasonably predictable for a one year time horizon. The analysis should be supplemented by a stress test where it could be assumed counterparty defaults. This stress test should be covered under Pillar 2 and would ensure proper liquidity planning. With a proper ALM system in place the cash flows should be coordinated and thereby reducing the liquidity risk.

8.1 Market risk

Market risk is risk caused by fluctuations in prices on financial instruments, i.e. a change in a portfolio value caused by unfavourable market movements. The market movements could be changes in interest rates, equity prices, bond prices, real estate prices, exchange rates and changes in liquidity and volatility in the market. The main components of market risk are the interest rate risk (related to the guaranteed return[13] and the risk related to bonds), equity risk, real estate risk, currency risk and risk related to derivatives. Since an approach to calculating the currency risk[14] is not yet developed we have disregarded currency risk in our calculations. Moreover, previous stress tests[15] have also shown that the currency risk is low *(Kredittilsynet 2005)*. Furthermore, the currency risk can be assumed to be low due to the widespread use of derivatives. We will also disregard the risk related to derivatives for the various components of market risk.

Market risk can also be dependent upon the asset liability structure of the undertaking and can be considerable when the duration of the liabilities is longer than the assets. Assets and liabilities should be considered simultaneously when the fluctuations in market prices affect both of them. The asset liability management (ALM) will therefore be of great importance in the overall risk management. Life insurance is characterized by long term obligations and thus the duration of the obligations exceeds the average duration of the assets. The value of the assets and liabilities may not move together and this is where the risk lies. There are various techniques for analyzing the asset-liability risk; among them are duration analysis and gap analysis[16]. Both of these approaches work well if the assets and liabilities compromise fixed cash flows, however with options it is a little more challenging. Another problem with duration analysis in ALM is using adequate duration measures. The duration analysis should therefore be complemented by scenario analysis.

[13] It is not decided where the risk related to the guaranteed return should be placed, but for now it is considered in connection with market risk.
[14] CEIOPS is considering two different approaches to currency risk: a factor based approach or a scenario based approach.
[15] Stress tests are defined as shock-based changes in risk factors, reflected in a change of available capital.
[16] Gap analysis maps the cash flows according to when they mature and thereby checks if the cash flows net to 0.

Regarding Pillar I the focus should be on quantifying any mismatch between assets and liabilities, in the context of Pillar II it should cover all aspects of ALM which cannot be quantified and active management of the duration gap. ALM systems should be integrated with business strategies and assumptions on modeling of the factors which affect ALM need to be plausible (macroeconomic conditions, assets, liabilities, policyholder behaviour).

Market risk is important because the value of investments held to meet policyholder liabilities could be less than what is guaranteed. Most of the reduction in value will lead to a decrease in the amount distributed *(KPMG 2002)*. The advantage for life insurers is that since the nature of the business is over such a long period, market prices have the chance to recuperate and they will only be subject to a loss if prices remain depressed for a long period. Life insurers generally match their liabilities with low risk fixed income investments.

There are different theoretical approaches for measuring market risk. First, the insurance sector can make use of stress tests. This scenario-based approach may lead to practical difficulties, particularly with regard to the verification of the results. We believe that stress tests will mostly be used for supervisory purposes and for internal control. Therefore we have explained this approach in depth under Pillar 2 (chapter 9.3).

Second, as a practical alternative to a pre-specified stress test, a factor-based approach can be used. This direct calculation of the capital requirement is more likely to be used as the regulatory capital, and will therefore be the centre of attention of Pillar 1 and this chapter. A factor based model will replicate the effects of a pre-specified stress test for linear risks, while non-linear risks will be calculated as an approximate stress test. We can increase the quality of the approximations by adding risk factors, but there is a need for the standard formula to be easy to interpret and implement. This simplification causes the scenario-based and the factor-based approach to differ in value. In such circumstances an internal model may give a better reflection of an insurance company's individual risk profile than a standard factor-based model. CEIOPS wants to test pre-specified stress

tests and a factor-based approximation in the Quantitative Impact Studies before deciding how market risk should be reflected in the standard formula. We will elaborate some on the differences of these respective approaches in chapter 9.3.

We will now systematically assess the main components of market risk.

8.1.1 Equity risk

The equity risk is related to the fluctuations of equity prices. This is a major risk in most life insurance companies due to the size and risky nature of equity portfolios. We have, from a VaR approach calculated the capital requirement for the equity portfolio. We have used a variance-covariance approach. This approach assumes a particular distribution for the portfolio return, or for the underlying factors that drive returns, and uses that distribution to compute the appropriate quantile. The advantage of the variance-covariance approach is that it is relatively easy to implement for simple portfolios. However, it is a poor approximation for 'non-linear' portfolios and relies critically on the distributional assumption of normality. This approach might be oversimplifying somewhat as the size of the portfolio is large and the assumptions underlying this approach might be broken.

For the calculation of equity risk we have looked at the equity portfolio of Vital as of 31.12.2005. The equity portfolio is divided into four main regions. The Norwegian portfolio has an aggregated risk which is comparable to the total index of the Oslo stock exchange. The international portfolio is invested comparably to the Morgan Stanley Developed World Index, with 59% in North America, 28 % in Europe and 13 % in Asia. Hence, for the estimation of the VaR of the equity risk we have used the following indices; Morgan Stanley North America (MSCI North America), Morgan Stanley Europe (MSCI Europe), Morgan Stanley Far East (MSCI Far East) and the total benchmark index of the Oslo stock exchange.

Table 4 Portfolio of Vital

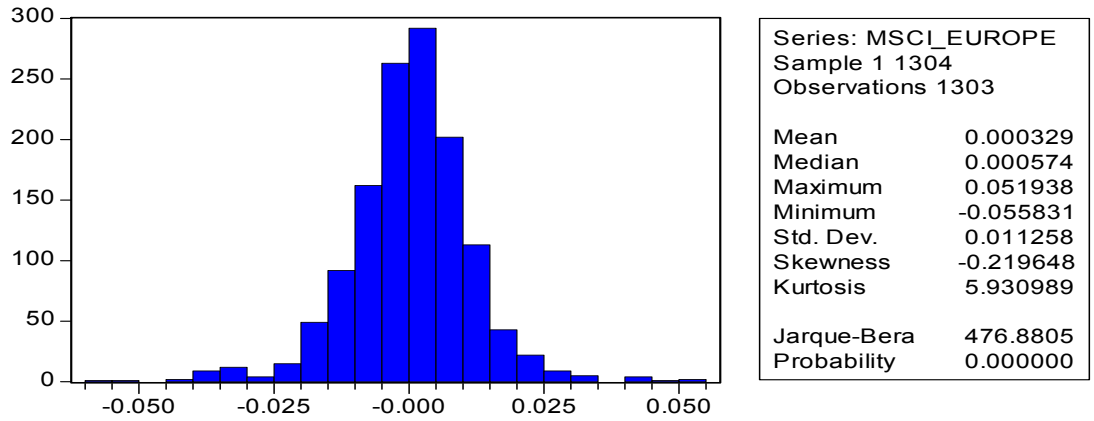
	Portfolio proportions
MSCI EUROPE	0.19
MSCI FAR EAST	0.09
MSCI North America	0.41
TOT OSLO	0.31

The time series we used for Oslo was based on the total benchmark index from Datastream, the international indices came from Morgan Stanley (for further information see appendix A). We had to make certain adjustments to the series in order to obtain an estimate as accurate as possible on the returns. The indices were adjusted for dividend payments and to USD. The indices should capture most of the equity risk which Vital is exposed to. However, since we have reduced the number of stocks we might have lost some information with our approach.

We estimated the mean, standard deviation and other statistics of daily returns using historical data necessary for our calculation. We checked to assure whether the assumptions of our model where adequate i.e. that the continuously compounded (log) daily returns of the indices were normally distributed. From figure 6 we see that the returns appear to be normally distributed and according to the Jarque-Bera[17] test the returns were normally distributed for MSCI Europe. We also obtained the same results for the other indices[18]. If a portfolio is made of normal distributed series, then the aggregated portfolio will also be normal distributed.

[17] The Jarque-Bera test tests for the null-hypothesis of normality. It is based on the skewness and kurtosis of the samples. For further information, see *Introductory Econometrics for Finance (Brooks 2003)*.
[18] For the tables of the remaining indices see Appendix B.

Figure 6 Distribution of the time series and Jarque-Bera test



The time series satisfied the criteria of our model, so we proceeded to calculate the descriptive statistics of the returns for the indices:

Table 5 Descriptive statistics of the indices

	MSCI_EUROPE	MSCI_FAR_EAST	MSCI_N.A.	TOT_OSLO
Mean	0.000329	0.000287	7.65E-05	0.000982
Std. Dev.	0.011258	0.01251	0.010467	0.012033
Skewness	-0.219648	-0.307896	0.15569	-0.72422
Kurtosis	5.930989	4.989092	5.953298	6.253667
Jarque-Bera	476.8805	235.3917	478.7942	688.6534
Probability	0	0	0	0
Sum	0.428247	0.373944	0.099714	1.279857
Sum Sq. Dev.	0.165018	0.203765	0.142651	0.18852
Observations	1303	1303	1303	1303

We then calculated the variance-covariance matrix for the returns of the different indices.

Table 6 Variance covariance matrix for returns[19]

	MSCI_EUROPE	MSCI_FAR_EAST	MSCI_N.A.	TOT_OSLO
MSCI_EUROPE	0.00012700	0.00003150	0.00005770	0.00000196
MSCI_FAR_EAST	0.00003150	0.00015600	0.00001660	0.00001890
MSCI_N.A.	0.00005770	0.00001660	0.00010900	-0.00000588
TOT_OSLO	0.00000196	0.00001890	-0.00000588	0.00014500

We used high frequency data i.e. daily returns, because it gives us more information; however we are interested in a longer horizon for our VaR calculation and the

[19] This is a symmetric matrix

distribution must be transformed accordingly. If the returns are independent and identically distributed or follow a random walk the transformation is easy. The efficient market hypothesis states that future prices cannot be anticipated and therefore must be uncorrelated over time *(Jorion 2001)*. Therefore to adjust returns and volatility for different time horizons we use the following:

$$\mu_T = \mu_t * T$$

$$\sigma_T = \sigma_t \sqrt{T}$$

Where:

μ_t = Expected return for time period t

σ_t = Standard deviation for time period t

T = Time period measured in days

To find the VaR for our time horizon of one year and at a given confidence level of 99.5%, we used the normal distribution. We calculated the annual (252 days) VaR from the one day VaR with the following formula:

$$VaR(T) = \sqrt{T} * VaR(1)$$

Where:

T = Time horizon in number of days

$VaR(1)$ = Value at risk for one day

Using the normal distribution, we needed to establish the expected return and the variance of the portfolio. This is found by:

$$E(R_p) = \begin{pmatrix} w_1 & w_2 & w_3 & w_4 \end{pmatrix} \begin{pmatrix} \mu_1 \\ \mu_2 \\ \mu_3 \\ \mu_4 \end{pmatrix}$$

Where:

$E(R_p)$ = Expected portfolio return

w_i = Share of the portfolio for index i

μ_i = Expected return index i

And

$$Var(R_p) = \begin{pmatrix} w_1 & w_2 & w_3 & w_4 \end{pmatrix} \begin{pmatrix} \sigma_{11} & \sigma_{12} & \sigma_{13} & \sigma_{14} \\ \sigma_{21} & \sigma_{22} & \sigma_{23} & \sigma_{24} \\ \sigma_{31} & \sigma_{32} & \sigma_{33} & \sigma_{34} \\ \sigma_{41} & \sigma_{42} & \sigma_{43} & \sigma_{44} \end{pmatrix} \begin{pmatrix} w_1 \\ w_2 \\ w_3 \\ w_4 \end{pmatrix}$$

Where:

$Var(R_p)$ = Variance of portfolio return

σ_{ij} = Covariance between index i and j

Based on the expected return of the portfolio and variance of the portfolio we calculated the diversified VaR for the portfolio which is the SCR, the result is shown in table 7.

Table 7 VaR for the aggregate portfolio based on a normal distribution (Numbers in Million NOK.)

Initial investment as of 31.12.2005	32 562
Mean return	0.000424125
Portfolio sigma	0.007013455
Mean investment value	32 576
Sigma of investment value	228
Cutoff	31 988
Cumulative PDF	0.005
VaR for aggregated portfolio at 0,50% level for 1 day	574
VaR for aggregated portfolio at 0,50% level for 1 year = SCR	9 119

To demonstrate the benefits of diversification we have calculated the undiversified VaR which is the sum of the individual VaRs in the portfolio. As we can see the benefits of diversification are substantial and illustrate the importance of accurately estimating the correlations between the different assets. The total benefit of diversification can be measured as the difference between the diversified VaR and the undiversified VaR.

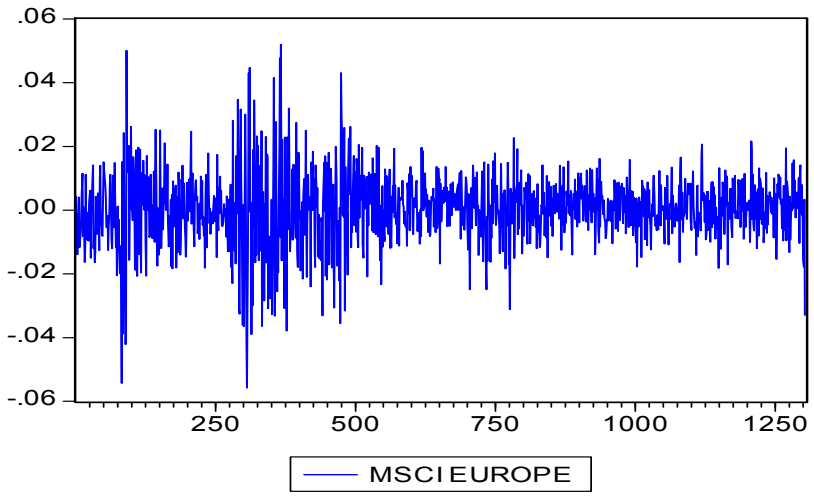
Table 8 Undiversified VaR (Numbers in Million NOK.)

VaR for Asia at 0.50% level for 1 day	103
VaR for Oslo at 0.50% level for 1 day	467
VaR for North America at 0.50% level for 1 day	425
VaR for Europe at 0.50% level for 1 day	232
Undiversified VaR for portfolio at 0.50% level for 1 day	1 228
Undiversified VaR for portfolio at 0.50% level for 1 year	19 486

We have disregarded the derivatives positions for Vital which would have reduced the equity risk, as these are meant to hedge the portfolio risk. As a consequence we have overestimated the risk of the equity portfolio. This means that SCR_{equity} with a value of 9119 Million NOK probably is too high. There are also other problems with our approach. We have used a model that relies critically on the assumption of normality. However, financial returns are characterized by several established facts:

1. They are characterized by volatility clustering which is illustrated in the time series MSCI Europe at 300-500.

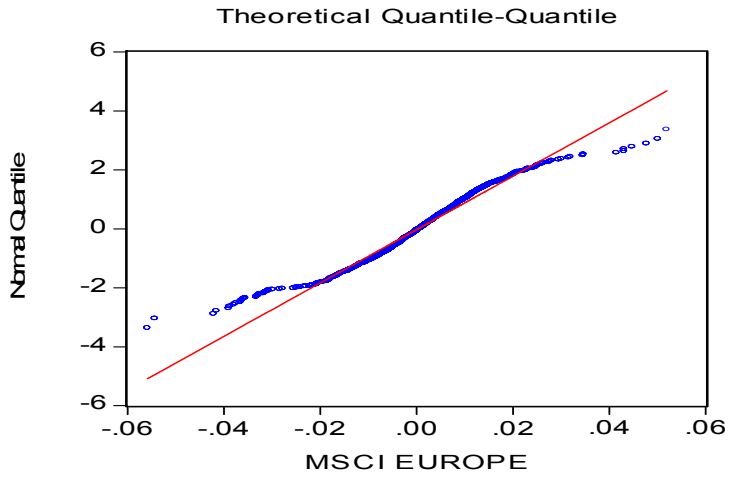
Figure 7 Volatility of MSCI Europe



A possibility to solve the problem of volatility clustering would be to incorporate varying volatility[20]. There could also be a problem with the series we have used. They are from 01.06.01 till present.

2. Financial returns are also not normally distributed; they have fatter tales which we can see from figure 8 They are also likely to have a higher peak.

Figure 8 **Quantile-quantile report of the series MSCI Europe**



The EVT approach is of use in estimating the probabilities of tail events. For normal confidence levels for example 90 and 95 the standard normal distribution can probably give decent results. However, for higher confidence levels it might be necessary to use an EVT distribution. However, the use of this distribution has to be tested for the firm. The t-distribution is a simple distribution for fatter tails that will describe the distribution of financial data fairly precisely.

There is also a problem with the correlations in financial data:

3. Correlations from our variance/covariance-matrices can also cause trouble, because our time series might only be correlated at extreme values.

[20] This could be a GARCH model. For further information see *Brooks (2003)*

Other approaches to finding the equity risk would be modeling based on simulation of the portfolio based on the historical distribution of the portfolio returns and Monte Carlo simulation. However, due to the scope of the thesis we will not elaborate on this.

8.1.2 Interest rate risk

Interest rate risk is related to all assets and liabilities whose values are sensitive to changes in interest rates. In life insurance it relates to bonds, some derivatives, insurance liabilities and financing instruments. We will not elaborate on effects related to derivatives or financing instruments.

For Solvency II there are two alternative measures for the total interest rate risk. A first approach is to model the value of the changes in the risk free interest rate with the Cox-Ingersoll-Ross[21] model. The parameters of the model would be set by the supervisory authorities with the help of historic time series and allowing for current market assessments.

Another approach is to use a factor based model. This approach is based on the modified duration for fixed income investments and for premium reserves. Two possible scenarios are considered, a rise in interest rates and a fall in interest rates. The risk capital for the change in interest rates is the maximum of the two possible outcomes. We have split the interest rate risk in two parts. The first is linked to the guaranteed return of the premium reserves; this is named the interest guarantee risk. The second is related to the value of the bond portfolio; we call this the interest rate risk. The size of both risks depends on how the market interest rate develops. We have assumed that the premium reserves are discounted by a risk-free market interest rate of relevant duration and currency. This is consistent with the calculation of the technical provisions in chapter 6.1. The change in

[21] Empirically interest rates appear to revert to a long run mean *(Sundaresan 2002)* this is known as mean reversion. The Cox-Ingersoll-Ross model incorporates mean reversion. The model is $dr = \kappa(\mu - r)dt + \sigma dW$, where μ is the long run mean of the short term interest rate, σ^2 the variance and k is the speed of adjustment of the short rate to the long run mean and W is a wiener process. For further information see *Sundaresan (2002)*.

the premium reserves' discount rate is equivalent to the change in the long term interest rate. On the other hand, and due to shorter duration, the change in interest rates affecting the value of the bonds is considered to be the medium term interest rate. This rate could differ between bonds due to different duration, but in our calculation we have assumed all bonds to be affected by the same medium term interest rate. Similar reasoning can be used for premium reserves. We have assumed that the change in long term interest rate generally is smaller than a change in the medium term interest rate. Finally the domestic interest rates are considered to be equal to the international rates.

The estimated effect on the premium reserves given a fall in the risk free rate can be expressed as:

$$CR_{PR} = MV_{PR}(r_{RF}^{long} + \Delta_{long}) - MV_{PR}(r_{RF}^{long}) \approx (-\Delta r_{RF}^{long}) * MV_{PR}(r_{RF}^{long}) * D_{PR}$$

Where:

CR_{PR} = Capital at risk for the premium reserves due to interest

r_{RF}^{long} = Long risk free rate at the time of consideration

Δ_{long} = Change in long term risk free interest rate

$MV_{PR}(r_{RF}^{long})$ = Market value premium reserves before change in interest rate

$MV_{PR}(r_{RF}^{long} + \Delta_{long})$ = Market value premium reserves after change in interest rate

D_{PR} = Average modified duration premium reserves

Due to the complexity of the liabilities we have not separated the different insurance contracts within premium reserves in the formula. The approximation in the formula holds for small changes in the interest rate. The size of the risk related to the guaranteed return depends upon the change of the interest rates in the market and the duration and size of the premium reserves.

The calculated positive effect on the premium reserves will be offset somewhat by the positive effect of the bond portfolio. The expected capital at risk for the bond portfolio can be expressed as:

$$CR_{FI} = \sum_{i=1}^{n} -\Delta_{RF_i}^{med} * MV_{FI}^{i} * D_{FI}^{i}$$

Where:

CR_{FI} = Capital at risk for the bond portfolio due to interest

$\Delta_{RF_i}^{med}$ = Change in medium risk free interest rate for bond i

MV_{FI}^{i} = Market value bond i

D_{FI}^{i} = Modified duration bond i

i = Represents bond i

The aggregated effect of the guarantee risk and interest rate risk related to the bond portfolio sum up to the total interest rate risk:

$$CR_{\text{int}} = CR_{PR} - CR_{FI}$$

Where:

CR_{int} = Capital at risk for the interest rate

If the discount rate equals the long term risk free rate for the premium reserves (as is intended in Solvency II and as we have assumed) and the change in interest rates are small[22], the approximated value for capital at risk for the premium reserves can be used in the aggregated formula given a fall in the interest rates.

:

$$CR_{\text{int}}^{fall} = (-\Delta r_{RF}^{long}) * MV_{PR}(r_{RF}^{long}) * D_{PR} - \sum_{i=1}^{n} -\Delta_{RF_i}^{med} * MV_{FI}^{i} * D_{FI}^{i})$$

[22] The reason this does not hold for larger changes is due to the bond price convexity, this means that the price of a bond does not change linearly with a change in yield. For further information see *Bodie, Kane and Marcus (2005)*.

Where:

CR_{int}^{fall} = Capital at risk for the interest rate given a fall in interest rates

A rise in interest rates is equivalent, except that the value for both the premium reserve and the bond portfolio will decrease. As a result, the insurer gets the positive contribution from the premium reserves, not the bond portfolio. The capital at risk for interest rate given a rise in interest rate and the same assumption as above can therefore be described as:

$$CR_{\text{int}}^{rise} = \sum_{i=1}^{n} \Delta_{RF_i}^{med} * MV_{FI}^{i} * D_{FI}^{i} - (\Delta r_{RF}^{long}) * MV_{PR}(r_{RF}^{long}) * D_{PR}$$

Where:

CR_{int}^{rise} = Capital at risk for the interest rate given a rise in interest rates

The solvency capital requirement for a rise in interest rates can be illustrated as follows:

$$SCR_{\text{int}}^{rise} = \max(0, CR_{\text{int}}^{rise}) = \max(0, \sum_{i=1}^{n} \Delta_{RF_i}^{med} * MV_{FI}^{i} * D_{FI}^{i} - (\Delta r_{RF}^{long}) * MV_{PR}(r_{RF}^{long}) * D_{PR})$$

Where:

SCR_{int}^{rise} = Solvency capital requirement for a rise in interest rates

The formula for a fall in interest rate is found equivalently:

$$SCR_{\text{int}}^{fall} = \max(0, CR_{\text{int}}^{fall}) = \max(0, (-\Delta r_{RF}^{long}) * MV_{PR}(r_{RF}^{long}) * D_{PR} - \sum_{i=1}^{n} -\Delta_{RF_i}^{med} * MV_{FI}^{i} * D_{FI}^{i})$$

Where:

SCR_{int}^{fall} = Solvency capital requirement for a fall in interest rates

The total solvency capital requirement due to interest rates risk, as explained earlier, will be the maximum of the two possible outcomes:

$$SCR_{\text{int}} = \max(SCR_{\text{int}}^{fall}, SCR_{\text{int}}^{rise})$$

Where:

SCR_{int} = Solvency capital requirement for interest rate risk

We have separated the fixed income portfolio of Vital according to the balance sheet outlined in chapter 4. We have assumed that the bonds have no coupons and that the durations and yields to maturity[23] match the values given in the annual report. The durations have been modified with respective yield to maturity, and we have obtained the Modified Duration. We have used market values for both types of bonds (HTM and NHTM). Since the yields to maturity for bonds HTM include weights of book valued bonds in its value, we obtain a small error in our calculation. Adjusting for this error would give a higher yield which decreases the value of modified duration. Then the change in the value of the bonds HTM given a change in interest rates will decrease, so that the bond part of the net interest rate risk will be of smaller relative value.

The capital requirement has been calculated so that the insurer is able to meet its obligations in the case of a permanent change of 0.7% for long term and 0.85% for medium term interest rates. In table 9 we have calculated the input values needed for the calculations of interest rate risk.

Table 9 Interest rate risk (Numbers in Million NOK.)

Bonds held to maturity	D	MD	YTM	MV	MV * MD
Norwegian	3.69	3.48	0.06	48 148	167594
Euro	5.94	5.6	0.06	6 366	35670
Bonds not held to maturity	D	MD	YTM	MV	MV * MD
Norwegian	3.68	3.6	0.02	47 293	170075
Euro	5.43	5.23	0.04	18 344	96008
Bonds - aggregation					469347
Premium reserve		MD		MV	MV * MD
		10		157 687	1576870
		15		148 801	2232015
		20		145 635	2912700

[23] A bonds yield to maturity is the interest rate that makes the present value of the future payments equal to the price of the bond *(Bode, Kane and Marcus 2005)*.

In table 10 we see how a fall in interest rates will affect the bond portfolio and the premium reserves of Vital.

Table 10 Calculated net interest rate risk for Vital with a fall in interest rates (Numbers in Million NOK.)

Interest rate fall 0,70% long term	Duration of liabilities		
Interest rate fall 0,85% med term	10 years	15 years	20 years
Increase in premium reserve	11 038	15 624	20 389
Increase in value of bonds	-3 989	-3 989	-3 989
Net interest rate risk	7 049	11 635	16 399
SCR(int.fall)	7 049	11 635	16 399

In table 11 we see how a rise in interest rates will affect the bond portfolio and the premium reserves of Vital.

Table 11 Calculated net interest rate risk for Vital with a rise in interest rates (Numbers in Million NOK.)

Interest rate rise 0,70% long term	Duration of liabilities		
Interest rate rise 0,85% med term	10 years	15 years	20 years
Increase in premium reserve	-11 038	-15 624	-20 389
Increase in value of bonds	3 989	3 989	3 989
Net interest rate risk	-7 049	-11 635	-16 399
SCR(int.rise)	0	0	0

The SCR equals the maximum of the rise and fall in interest rates. The SCR for the duration of 10 and 20 years is present for illustration purposes only. The SCR for the interest rate equals that of the duration of 15 years for the liabilities, in other words 11635 million NOK.

Table 12 Calculated net interest rate risk for Vital with a change in interest rates (Numbers in Million NOK.)

Duration of liabilities	10 years	15 years	20 years
Total SCR (interest rate risk)	7 049	11 635	16 399

The sensitivity to a fall in interest rates is high due to the high duration of the liabilities.

There is a considerable discrepancy between the value of the liabilities and bonds with a change in interest rates. This is caused by the low duration of the bond portfolio which is considerably smaller than the duration of the liabilities. This is a duration mismatch. We can see from our table that the capital requirement falls significantly with a decrease of

the duration of the liabilities. Another factor that influences the result is that the value of the bond portfolio is lower than that of the liabilities.

One possible source of error in our estimation of interest rate risk is related to the interest rate change. A change of the medium term interest rate of 0.85% does not automatically lead to a change in the long term rate of 0.7%. If we assume that the long rate change instead will be 0.5%, the solvency capital requirement decreases dramatically from 11635 to 7171 Million NOK. One actual source of error is that Vital has a considerable portfolio of interest rate swaps[24] which we have disregarded. Accounting for these, the interest rate risk would be reduced. Finally, lower interest rates decrease expected payments to the insured because of smaller expected bonuses. This means that we have overestimated the change in the market value of the premium reserves due to lower interest rates. In other words, we are overestimating the interest rate risk.

8.1.3 Real estate risk

CEIOPS is considering two different approaches for real estate risk; a factor based approach and a scenario based approach. In both of the approaches there will probably not be a distinction between direct real estate investments and indirect real estate investments. A factor-based approach for modeling the real estate risk capital could be done in a similar manner as the equity risk. The risk factors should then be calibrated according to a lognormal distribution and the parameters of yield and volatility can be derived from suitable market indices.

If we look at the balance sheet of Vital we can see that in addition to the real estate portfolio there are real estate derivatives. The total position in real estate should include these investments. We have disregarded these derivatives. Since the real estate portfolio

[24] An interest rate swap is a contract between two parties to make periodic payments to one another based on specific interest rates. The payment by one party can be based on a floating rate such as the NIBOR and the other party pays a fixed rate. Interest rate swaps are used by insurers to manage interest rate risk. For further information see *Sundaresan (2002)*.

of Vital consists of both international and domestic investments it was not possible to find a suitable real estate index to use for the portfolio as we did not know enough about the investments. Consequently we have used a scenario approach based on the value of the real estate portfolio given in the balance sheet. To find the solvency capital requirement we have used a fall in prices of 8%.

$$SCR_{RE} = (\Delta PI_{RE}) * MV_{RE}$$

Where:

SCR_{RE} = Capital at risk for real estate

ΔPI_{RE} = Change in the price index for real estate

MV_{RE} = Market value of the real estate portfolio

Table 13 Calculation of the real estate risk (Numbers in Million NOK.)

Market value real estate	22872
Change in price index	8%
SCR	1830

According to Vital the investments in real estate derivatives are hedging strategies. Consequently the capital at risk for the real estate portfolio will be lower than what we have calculated. However, we lack information regarding the derivatives and as a result we are not able to include these in our calculation.

8.1.4 Aggregation of market risk

We have now estimated the solvency capital requirement for the individual components of market risk. These will be used to calculate the aggregated solvency capital requirement for market risk. If all three risk elements are considered to be perfectly correlated, we can just sum up the individual parts to establish the aggregated one:

$$SCR_{market} = SCR_{equity} + SCR_{\text{int}} + SCR_{RE}$$

If the risk elements are considered to be uncorrelated the following aggregation will be correct.

$$SCR_{market} = (SCR_{equity}^2 + SCR_{\text{int}}^2 + SCR_{RE}^2)^{1/2}$$

If the different risk elements have a correlation that is not perfect, we need to specify the correlation matrix. If this cannot be done in an appropriate way we should assume perfect correlation.

$$SCR_{market} = \left\{ \begin{pmatrix} SCR_{equity} & SCR_{\text{int}} & SCR_{RE} \end{pmatrix} \begin{pmatrix} \rho_{ee} & \rho_{ei} & \rho_{eR} \\ \rho_{ie} & \rho_{ii} & \rho_{iR} \\ \rho_{\text{Re}} & \rho_{Ri} & \rho_{RR} \end{pmatrix} \begin{pmatrix} SCR_{equity} \\ SCR_{\text{int}} \\ SCR_{RE} \end{pmatrix} \right\}^{1/2}$$

The Dutch supervisory authorities assume a correlation between the interest rate risk and the sum of equity risk and real estate risk to be 0,8 for insurance companies *(Kredittilsynet 2005)*. They assume the other risks to be uncorrelated. Although the approach by the Dutch authorities cannot automatically be adapted to the individual correlations, we will assume interest rate risk and respectively equity risk and real estate risk to be correlated with a factor of 0.8. The correlation between equity risk and real estate risk is assumed to be the same. Hence our calculation is based on the following:

$$SCR_{market} = \left\{ \begin{pmatrix} 9,1 & 11,6 & 1,8 \end{pmatrix} \begin{pmatrix} 1 & 0,8 & 0,8 \\ 0,8 & 1 & 0,8 \\ 0,8 & 0,8 & 1 \end{pmatrix} \begin{pmatrix} 9,1 \\ 11,6 \\ 1,8 \end{pmatrix} \right\}^{1/2}$$

We get a solvency capital requirement for market risk of 21270 million NOK. The interval between uncorrelated and perfectly correlated risks is:

$$[14896, 22584]$$

We see that correlations have a significant impact on the aggregated number for the market risk.

8.2 Underwriting risk

In the insurance business there will always be a risk of the technical provisions not being large enough to meet the claims. This risk is called underwriting risk. In general, underwriting risk has its origin in one or more of the following four risk sources *(CEIOPS 2nd call of advice)*:

a) Volatility - Because of the stochastic nature of mortality, policy lapses and expenses, the actual future cash flows will fluctuate around their statistical mean value.

b) Catastrophe - Beyond normal random fluctuations in mortality, policy lapses and expenses extreme events may result in high positive deviations from the statistical mean value.

c) Level uncertainty - Caused by misestimating the assumptions for all future years.

d) Trend uncertainty - Arises from the difficulty in accurately assessing the future direction of assumptions (e.g. rising life expectancy) in future years.

Which sources to consider depends on how the technical provisions are valued. Some of the risk sources might be considered in the risk margin.

The capital requirement arising from underwriting risk is:

$$RC^{technical} = VaR_{1-\alpha}(UR^{technical})$$

Where:

$RC^{technical}$ = Capital requirement arising from underwriting risk

$VaR_{1-\alpha}$ = Risk measure with ruin probability α

$UR^{technical}$ = Technical/underwriting result of insurer

We can decompose underwriting risk into expense, lapse and mortality risk. As a result, the underwriting result can be split into three:

$$UR^{technical} = UR^{mortality} + UR^{lapse} + UR^{\exp ense}$$

There are different types of approaches to use when modeling underwriting risk. Given the heterogeneity of this type of risk, a scenario-based approach would be too complex, at least for a standard formula. CEIOPS recommends the use of factor-based models. They are easier to interpret and to generalize, but they are less able to predict catastrophic events. Since the impact of lapse risk on technical provisions may not be constant in time, a factor-based model might here lack ability of prediction. This risk should preferably be assessed by scenario techniques. We have outlined how to use a factor-based approach for expense and mortality risk, while lapse risk has been tackled somewhat differently. For the concrete solvency capital requirement calculation of Vital, we have not considered expense risk or lapse risk. As a consequence we have assumed that the underwriting result is fully related to mortality. The reasons behind this simplification will be explained later.

8.2.1 Lapse risk

Lapse risk occurs when an insurance undertaking experiences an unanticipated rate of policy lapses or terminations. The insurer has to pay the surrender value when a policy is terminated. In return the insured part of the technical provision is released. The insurer is at risk for both higher and lower lapse rates. Higher if the surrender value is higher than policy technical provisions, lower when the opposite occurs. When estimating the lapse risk, a factor-based model cannot easily be applied, especially not when lapse risk changes over the products life. A stress test is a better fit for the problem. The capital at risk can be estimated with the help of a specified factor greater or less than one. The factor is different for different types of policies. If lapses are doubled for policies in one class, the factor will be two. If they are reduced by one half, the factor will be one half.

Both higher and lower lapse rates need to be taken into account. Life contracts will therefore be divided in two; contracts where the technical provisions exceed the surrender values and of course the opposite case. As mentioned this will cover the risk of both lower and higher lapse rates. We also need to consider differences in types of policies:

$$CR_{low}^{lapse} = \sum_{i=1}^{n} j_i * (TP_0^i - S_0^i), TP_0^i > S_0^i$$

$$CR_{high}^{lapse} = \sum_{i=1}^{n} k_i * (S_0^i - TP_0^i), TP_0^i < S_0^i$$

Where:

CR^{lapse} = Capital requirement lapse risk

S_0 = Surrender value start of period

j_i = Appropriately chosen factor for policy i

k_i = Appropriately chosen factor for policy i

The scenario where $TP_0 < S_0$ is not relevant for Vital due to Norwegian law. The total capital at risk for lapse risk is:

$$CR_{total}^{lapse} = CR_{low}^{lapse} + CR_{high}^{lapse}$$

Where:

CR_{total}^{lapse} = Aggregated capital requirement lapse risk

The treatment of lapse risk in the SCR will be dependent on the structure of technical provisions. If surrender floors are considered in the calculation of the provisions, the lapse rate will not affect the remaining risk. We have assumed that this is the case of Vital, and that we do not need to include this capital at risk in our calculations of the total SCR. If this is not the case, CEIOPS recommends that unfavourable variations in lapse rates should be partly included in the risk margin. This also marginalizes the need for an explicit calculation of lapse risk. One problem with assuming the lapse risk as a part of

the risk margin is the future definition of solvency margin capital. This will include several of the former risk margin capitals. On the other hand, the new SCR shall take all risks into account.

Due to the above arguments, and because Kredittilsynet quotes that the lapse risk of Norwegian insurance companies probably is insignificant *(Kredittilsynet -Vedlegg 2005, page 117)*, we have not considered the lapse risk of Vital in our solvency capital requirement calculation.

8.2.2 Expense risk

The expense risk arises from the variation in the expenses related to administering the contractual obligations. In life insurance the contracts run for a long period, thus the expenses could be considerable. In general, with-profit businesses have lower expense risk. When determining the expense risk it is important to have a thorough understanding of an insurance undertakings expense structure. In general all future administrative costs[25] should be reflected when determining the expenses and expense risk. Life insurance companies differ in size and structure, as well as in their spectre of products. This poses a great challenge in establishing a standard model. There will be a need for industry wide factors that can be applied to the provisions in each segment. It follows that the capital at risk for the expense will be calculated directly from the insurers' expenses:

$$CR^{expense} = \sum_{i=1}^{n} t_i * E_i$$

Where:

$CR^{expense}$ = Capital at risk for expense

t_i = Appropriately chosen factor/provisions for industry i

E_i = Future expenses related to industry i

[25] Expenses related to premiums and for administering investments.

$$\sum_{i=1}^{n} E_i = E^{total} \quad = \text{Total expenses}$$

The factor t_i should be chosen so that the administrative work on the contracts of the i industries, receives its fair proportion of the total expenses.

Often, but dependent on the regulatory regime, the expenses related to administering the contractual obligations are charged to the policyholders. This is done through an increase in the margin on future premiums paid by the customer, or by reducing bonuses. We have assumed that Vital also charges policyholders for the expenses, and as a result we have not analyzed the expense risk for Vital.

8.2.3 Mortality risk

Mortality is related to the length of life. If a company has a large enough number of policyholders the mortality risk can be diversified under certain assumptions. The capital requirement for mortality can be calculated using two different variables; technical provisions (TP), if the risk of longevity is relevant, and loss reserves (LR). By using these measures we generate a capital at risk to handle an expected possible loss with probability of α given the values of today's safety capital in underwriting risk, namely TP and LR. The calculation is as follows:

$$CR^{mortality} = \max(\beta * TP_0, \gamma * LR_0)$$

Where:

$CR^{mortality}$	= Capital at risk for mortality
TP_0	= Technical provisions at start of period
LR_0	= Loss reserve at start of period
$\beta = VaR_{1-\alpha}(UR^{mortality} / TP_0)$	= Quantile of relative mortality result in % of TP_0
$\gamma = VaR_{1-\alpha}(UR^{mortality} / LR_0)$	= Quantile of relative mortality result in % of LR_0

To compute the mortality risk, we need to know the probability distribution of the relative mortality result in percentage of the volume measures (TP_0 and LR_0), the expected values, $\mu_{UR^{mortality}/TP_0}$ and $\mu_{UR^{mortality}/LR_0}$, and their variances, $\sigma^2_{UR^{mortality}/TP_0}$ and $\sigma^2_{UR^{mortality}/LR_0}$. Then we can easily compute the quantiles β and γ. There are different plausible approaches to this matter. First, the supervisor might set all three parameters. This will result in industry-wide factors for beta and gamma. Second, the two last parameters can be estimated by the insurer. The basis of this estimation can be a company specific value or historic data. As a third alternative, the distribution can be regarded as a function of the size of the portfolio. The function is provided by the supervisor, which means that there will be an objective assessment of the volatility to the different homogenous groups, which is independent of a single company. Diversification effects of mortality risk follow the size of the portfolio.

We have adapted the second approach to Vital, and used this to calculate the solvency capital requirement for mortality. As stated above, we have assumed that the underwriting result is fully related to mortality. We have also assumed that ($UR^{mortality}/TP_0$) and (SCR) follow a standard normal distribution. With these assumptions, and a probability of ruin equal 0.5%, the capital at risk for mortality is:

$$CR^{mortality} = \max(VaR_{99,5\%}(UR^{mortality}/TP_0)*TP_0, VaR_{99,5\%}(UR^{mortality}/LR_0)*LR_0)$$

From the annual report of Vital we found the loss reserve as the difference between premium reserves and technical provisions. The expected relative mortality result and their respective standard deviations have been estimated from the result of the last three years. Then we have simply calculated the VaR at 0.5% and multiplied with the respective factors. The calculation is illustrated in tables 14-17.

Table 14 **The historic relative mortality result and the expected relative mortality result (Numbers in Million NOK)**

	2003	2004	2005 t=0	2006
Loss Reserve	4594	5208	9089	10867
Technical provisions	126192	140701	149790	169166
Underwriting result	1873	1333	1276	NA
				Mean
UR/TP	0,014842	0,009474	0,008519	0,010945
UR/LR	0,407706	0,255952	0,140389	0,268016

Table 15 **Standard deviation, VaR and expected capital at risk using the relative mortality result wrt TP (Numbers in Million NOK)**

Standard deviation UR/TP	0.003409
Cutoff UR/TP	0.002164
Standard normal cumulative PDF	0.005
β = VaR at 0.5%	0.008781
β * TP	1315

Table 16 **Standard deviation, VaR and expected capital at risk using the relative mortality result wrt LR (Numbers in Million NOK)**

Standard deviation UR/LR	0,134066
Cutoff UR/LR	-0,07731
Standard normal cumulative PDF	0,005
γ = VaR at 0,5%	0,345331
γ * LR	3139

Table 17 **Solvency capital requirement due to mortality (Numbers in Million NOK)**

SCR = maks (β * TP,γ * LR)	3139

We see that the solvency capital requirement due to mortality $SCR^{mortality} = SCR_{UW}$ is 3139 Million NOK. The ruin probability might be too strict, so the necessary solvency capital can be too high. In general the mortality risk, as with other underwriting risks, is often accounted for in the technical provisions or the risk margin. Adding SCR_{UW} to our total capital requirement might therefore overestimate the need for solvent capital. As the formulas imply the reliability and practicality of the coefficients β and γ will also depend on the valuation of technical liabilities.

8.2.4 Aggregation of underwriting risk

Analyzing underwriting risk on the basis of these three homogenous segments of the portfolio can lead to a problem of how the risks should be aggregated. It would be easy just to add the individual capital at risks, but then we take no diversification effects between the different risk groups into consideration. If such effects are present, this may lead to an overestimation of the total required capital for underwriting risk. The approaches to solve this problem are equivalent to the discussion in chapter 8.1.5. Due to earlier illustrations, and since we have only considered mortality risk in our calculation, there is no need for an elaborate discussion on this matter here.

8.3 Credit risk

Credit risk is the possibility that borrowers or counterparties could default in a financial transaction. Since insurers are large holders of bonds they are exposed to default risk. On the other hand they have investment grade[26] strategies, meaning they hold bonds of a high credit rating thereby minimizing the default risk. There are several possible explanations as to why default could incur: macroeconomic factors, industry factors and company factors.

There are two sources of information to credit risk; rating agencies (the three major agencies are Moody's, Standard and Poor, and Fitch) and market prices for stocks and bonds. The rating agencies use historical data to produce their assessment of credit risk. The assessment is based on past default events. Rating agencies define default when a party fails to meet their contractual obligations.

Probability of default (PD) is the single most important factor in assessing credit risk. There are several different ways of estimating the probability of default; historical data, bond prices, yield spreads and Mertons model. The probability of default is generally

[26] The different rating classes and the definition of investment grade bonds are given in the appendix.

computed based on yield spreads and stock prices. Yield spreads give valuable information regarding the credit quality and are caused by different factors such as liquidity, taxes, contractual provisions and inflation risk. The yield spread is based on the difference between a given bond and a risk free bond which are presumed to be government bonds.

A possibility for calculating the credit risk is using the PD for determining a capital requirement. This capital requirement would be based on a credit portfolio risk model for example the risk factor model of Gordy. Credit risk is a challenge to quantify since there are many explanations as to why default could incur and data is much scarcer, unlike market risk where you have daily data. Thus credit risk has longer horizons and the data for correlations, default probabilities and recovery rates is less frequent.

CEIOPS does not expect insurers to develop credit rating models that will be implemented in the banking sector with the CRD[27]. As a result the approach for insurers will be relatively easy with the SCR standard formula and generalized assumptions about the input parameters.

CEIOPS has proposed two formulas for the calculation of the credit risk. The first formula for credit risk is to be calculated on the basis of credit ratings from the rating agencies and yield spreads on bonds. The expected capital at risk for the bond portfolio can be expressed as:

$$(1) \qquad CR_{credit} = \sum_{i=1}^{n} \sqrt{(CS_i)} * D_{FI}^{i} * l_i$$

The second formula is for cases where a credit rating does not exist. Then the calculation is based solely on credit spreads and the result will lead to a higher capital requirement.

[27] The new Basel Accord will be implemented in the Europe Union via the Capital Requirements Directive (CRD).

$$(2) \qquad CR_{credit} \approx \sum_{i=1}^{n} CS_i * D_{FI}^{i} * l_i$$

Where the following are defined for the two equations:

CR_{credit} = Capital requirement for bond portfolio due to credit risk

CS_i = Credit spread for bond class i

D_i = Duration for bond class i

l_i = Factor for the risk class i

A large part of the bond portfolio for Vital consists of bonds with little or no default probability. These are government bonds. If we look at the formulas that are proposed they will equal zero for government bonds as the credit spread for bonds is calculated as the difference between a given bond and government bonds. We have assumed that the risky part of the bond portfolio has the same relative weights of domestic and international bonds as the total bond portfolio. The bonds are split according to the balance sheet in chapter 4. Since most life insurers have investment grade strategies we have assumed that the bonds with credit risk are investment grade with a single A rating, and we have used a credit spread[28] of 1.4%. The factor we have set for the risk class is arbitrarily set on the basis of the example in Consultative paper 7. On the basis of formula (1) we have then calculated the capital requirement.

Table 18 Calculation of credit risk (Numbers in Million NOK.)

	N. HTM	E. HTM	N. HTM	E. NHTM
Market value of bonds	20588	2722	20450	7932
Factor	0.6	0.6	0.6	0.6
Duration	3.69	5.94	3.68	5.43
Credit spread in percent	0.014	0.014	0.014	0.014
Capital requirement percent of market value	0.031	0.050	0.031	0.046
Capital requirement	638	136	632	362
SCR	1768			

[28] The table for the credit spreads we have used is given in the appendix.

The solvency capital requirement for credit risk, SCR_{credit} , is 1768 Million NOK. This risk is relatively small compared to the market risk. Moreover, insurance companies are exposed to downgrades of bonds that affect fund volatility and asset values, and in recessions, bond ratings will be lowered and consequently credit spreads will increase. As a result the value of the assets covering the SCR will decline *(KPMG 2002)*.

A problem with the calculation of the credit risk is the availability of data regarding the bond portfolio of Vital. Therefore we had to make general assumptions about the bonds. If we had had more information about the bonds we could have used a VaR approach to find the capital at risk, which would have given us correlations and as a consequence the benefits of diversification (if there were any).

8.4 Operational risk

A proper definition of operational risk is in order to understand what needs to be measured. The following definition is from CEIOPS:

> Operational risk is the danger of losses resulting from inadequate or failed internal processes, people and systems, or from external events. Internal failures include management incompetence, fraud, criminal intentions and errors in systems and processes
>
> *www.ceiops.org*

Technical errors may be caused by computer failure or a process in the back-office. Operational risk can also be the source of market or credit risk. Human errors can be related to fraud or inadequate procedures or control.

The quantification of operational risk is still in its infancy. Hence there are no developed or established methods for quantifying the operational risk. A major problem with the quantifications is the availability of data. Unlike market and credit risk where the information needed for quantification is public information, operational risk is internal to

the firm. Firms are not in general interested in sharing the information on their failings and therefore it is hard to develop a general model. Firms need to establish and maintain large databases, and based on these establish loss distributions to calculate the relevant risk. Operational risk occurrences fall into two categories: frequent but modest losses and infrequent ones that incur substantial losses. As a consequence of this it will take time before a formal VaR model for operational risk charges.

Meanwhile, shortcuts have been developed where the charge for operational risk is a percentage of a relevant variable, this type of model is a factor model. The model needs to be based on a measure; the possibilities for Solvency II could be gross premiums, technical provisions or gross income. The measure should provide an assessment of the volume of business for the undertaking. Another issue is how many years to include in the calculation. If the business is rapidly evolving historical numbers may not be of much interest and will not reflect the current business. The operational risk may vary from the different business lines and therefore it might be necessary to treat the lines differently. This needs further analysis. The factor models may not be able to predict the operational risk related to extreme events.

For Basel II, the bank of international settlements (BIS) developed a framework for the operational risk which will be adapted to Solvency II. From the banking sector CEIOPS has suggested two possible factor based approaches that could be adapted: the basic indicator approach (BIA) or the standardized approach (TSA).

The simplest approach is the BIA where the capital requirement is calculated based on gross income[29] as the volume measure. The gross income has not yet been defined for insurance companies in Norway in connection with the new framework. We will use gross premiums written + net financial income as our volume measure. The capital

[29] For the definition of gross income for the banking sector in connection with Basel refer to paragraph §2-2 in *Forskrift om minstekrav til kapitaldekning for operasjonell risiko.*

charge is then simply calculated as a fixed percentage[30] of the average gross income over a specific number of years (historic numbers):

$$CR_{OP}^{BIA} = \frac{\alpha}{T}\sum_{i=1}^{T} GI_i$$

Where:

CR_{OP}^{BIA} = Capital charge under the BIA

GI_i = Annual gross income in year t

T = The number of years for which the gross income is positive

α = The industry wide level of the indicator set by the BIS at 15%

The second approach is the TSA. This approach takes into consideration eight different business lines and applies a factor to the different business lines. The factor is yet to be set for the insurance sector, for the banking sector[31] it varies from 12 to 18%. The TSA allows a negative gross income to offset positive income within the different business lines. The max operator limits the possible offset to operational risk.

$$CR_{OP}^{TSA} = \frac{\sum_{i=1}^{3}\left\{\max\left(0, \sum_{i=1}^{8} GI_{i,t}\beta_i\right)\right\}}{3}$$

Where:

CR_{OP}^{TSA} = The capital charge under the standardized approach;

$GI_{i,t}$ = Annual gross income for year t in business line i

β_i = The industry-wide level of the indicator for business line i,

The calculation of the operational risk is given in table 19.

[30] The percentage α needs to be set for the insurance sector. In the banking sector BIS has set it at 15%.
[31] The factor is set by the Basel Committee on Banking Supervision.

Table 19 Capital charge for Vital based on the basic indicator approach (Numbers in Million NOK.)

	2005	2004	2003
Premium income	22057	19096	14046
Net financial income	13888	10666	13080
Gross income	35945	29762	27126
A	15%		
T	3		
SCR	4642		

The solvency capital requirement for operational risk, $SCR_{operational}$, is 4642 Million NOK.

To compare the amount we can use the Basel framework as a reference. The BIS committee estimated at first that the operational risk should be roughly 20% of the total capital requirement for banks. However, after further research it was suggested it should be about 12%. The partial risk contribution of our calculations is given in table 20.

8.5 Aggregation of total risk

Aggregating total risk is equivalent to the aggregation of total market risk. Which method to use, depends on the correlation assumed between the different types of risks. In the Danish traffic light system the different risk categories are believed to perfectly correlated, while in the Swedish system they are assumed to be uncorrelated. The Dutch system assumes most risks to be uncorrelated. The exception is correlation between interest rate risk and the sum of equity and real estate risk. This correlation is estimated to be 0.8 for insurance companies. Since we have considered these correlations in the aggregation of market risk in 9.1, we leave them here. There is no point using correlations that are not estimated in a satisfying way. Probably the best choice of use for aggregating total risk is either to assume perfect correlations or no correlation at all:

Formula for perfect correlation:

$$SCR_{total} = SCR_{market} + SCR_{UW} + SCR_{credit} + + SCR_{operational}$$

Formula for no correlation:

$$SCR_{total} = \{ \; SCR_{market}^2 + SCR_{UW}^2 + SCR_{credit}^2 + SCR_{operational}^2 \; \}^{1/2}$$

We will assume perfect correlations between the different risk categories. This might give a capital requirement higher than what would be the true measure of risks. The total solvency capital requirement will be:

$$SCR_{market} = 21270$$

$$SCR_{total} = 21270 + 3139 + 1768 + 4642 = 30819$$

An illustration of the partial risk elements contribution to total risk is given in table 20.

Table 20 Overview of the different risks

Risk element	SCR	Risk contribution
Equity	9119	0.30
Interest rate	11635	0.38
Real estate	1830	0.06
Underwriting	3139	0.10
Credit	1768	0.06
Operational	4642	0.15
Total	30819	
New solvency margin capital	18804	

We see that the total aggregated solvency capital requirement greatly exceeds the new solvency margin capital. There are several explanations for this. First, as explained in this chapter, our simplifications generally overestimate the risks. Second, our approach is based on a standard type of model. An internal model might estimate the risk more accurately and result in a lower SCR. Also, the solvency of Vital might not satisfy the new requirement. To investigate this theory further, we will in chapter 10.3 use a scenario approach to estimate the risk of Vital.

8.6 Internal/partly internal/standard models

A central issue of Solvency II is the use of internal models in setting the SCR. The use of internal models forces the insurance companies to show more caution when determining their capital needs. This increases the need for transparency and requirements for disclosure. It also stresses the need for early warnings (as in stress tests – see Pillar 2). Internal models should also allow the determination of the marginal contribution of each risk to the total amount of risk. This helps separating the different investment areas and enhances more detailed risk management.

The overall goal of internal models is to give as accurate a picture as possible of a company's risk exposure. Though there are limitations to such models. Internal models are based on different theoretical risk models, such as the stochastic nature of interest rates and equity. Empirical behavior, on the other hand, often differs from the theoretically assumed nature of risk. One result can be that the probability of large losses is underestimated. This might indicate a more positive picture than the actual situation. A good way to compensate for this modeling failure can be a regular use of stress testing, both for insurers and supervisors. We will elaborate on this in the discussion of Pillar 2.

The idea is that where it is possible the undertaker will develop its own internal model which will be best suited to the undertakers risk profile. Subsequently they will have a capital requirement best suited to their level of risk and will be able to have a lower level of capital than what the standard model would produce. This of course will depend on the cost-benefit for the undertaker. The financial supervisory authority has to approve the model.

It is important that the same types of risk measures to calculate the Solvency capital requirement (SCR) can be used in both the standard formula and internal models. If this is not the case, there will be an incentive to move from the standard formula to internal models. A partial model will not necessarily be transparent. The use of TailVaR will

smooth the transition from the standard formula to internal models and make partial models more transparent.

9 Pillar 2

The key principles of Pillar 2 are supervisory review, risk management and internal control.

9.1 Supervisory review of capital adequacy

A challenge for the supervisory regime is the instability of financial markets. The developments after year 2000 made an entire sector face problems fulfilling the prudential requirements. This showed the harm of a pro-cyclical solvency capital requirement system and emphasized the need for coordinated supervisory action. Regulative actions have often been used too late, and solving this is of great importance in Solvency II. This can only be done if important aspects of the supervisory review process are harmonized among member countries.

The extreme complexity of insurance business and risk management techniques makes it difficult for any formula or model to completely estimate the risks and requirements. This emphasizes the need for a supervisory review process. The interaction from supervisors is intended to create an active dialogue between insurers and supervisors, and thereby harmonize the relationship between risks assumed and the financial strength of the insurer.

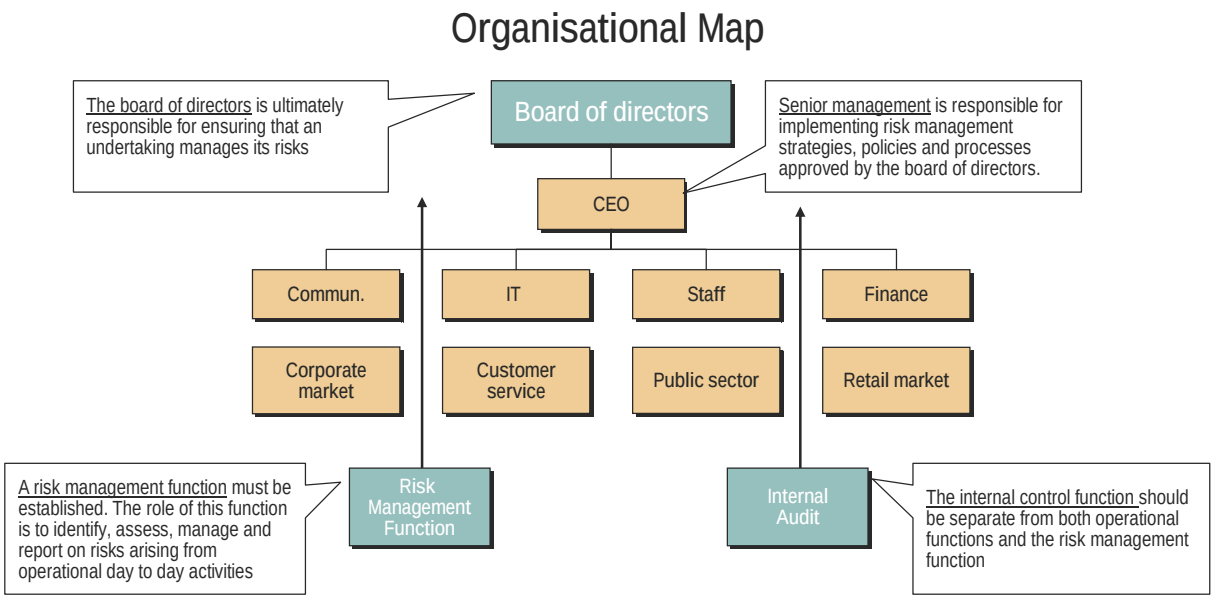
The supervisory review process of the new Solvency regime will encourage insurers to develop and apply or practice better risk management techniques in monitoring and managing their risks. Internal models are of great interest, but they should not only be used for the matter of measuring regulatory capital. An internal model should also be used in the day to day management and thereby help the decision making process.

9.2 Internal control

In many of today's insurance companies the risk management function is spread throughout the organization. The need for transparency of different risk functions within insurance undertaking increases, and as a result Solvency II will tie the ultimate responsibility at board level.

The range of insurance business has changed over the years. An insurer is responsible for setting up a control environment that fully reflects this range. Switching from a bond-equity portfolio to a derivatives-equity portfolio will increase the complexity of the back-office-function. This will also increase the need of an internal control function to reduce the operational risk.

Figure 9 Organisational setup for risk management



Source: Capgemini

9.3 Stress testing

Stress tests can be an important tool in assisting the supervisor and the insurer to manage risks and maintain enough capital. They are designed to estimate potential economic losses in extreme but plausible situations. This is different from most internal risk models that are probability based through advanced financial methods. Internal models are also based on a greater amount of data. The idea with stress tests is that they should pick up changes that are not captured in an internal, stochastic and more complex VaR model. Regulators have realized that a VaR number is not a sufficient measure for risk. Hence stress tests can be a necessary supplement to internal models in order to determine the consequences of extreme (tail) events. This is particularly important in consideration with market risk. The Basel Committee released a paper *"The application of Basel II to trading activities and the treatment of double default effects"* where it was stated that banks must have a system for stress-testing in place. The Basel Committee proposes stress testing for the crash in the equity market in 1987 where different markets were disturbed and the correlations across them changed (*Dimson and Marsh 1996*). Stress testing will also be of utmost importance for Solvency II.

There are different types of stress tests. One can be a sensitivity analysis to changes in economic variables; another one can analyze a scenario, for instance a catastrophe of some type. Stress testing is a widespread practice for gathering market risk information. It is normally conducted on a portfolio. The challenge is to perform a stress test on all portfolios and aggregate the potential losses and find the correlations among them. To perform a stress test there will have to be some guessing in order to find the potential catastrophes and it is difficult to imagine every possible scenario. A risk manager could run a large number of scenarios and then determine a capital requirement related to the scenario. However, an undertaking cannot hold a capital level for every plausible and implausible scenario. Therefore a probability should be attached to the different scenarios and then the firm decides which scenario it should take into account when determining the required level of capital. Stress testing is more difficult the larger the company is. The numbers of portfolios increases and different portfolios and risks have different time

horizons. Market risks materialize quickly (days or weeks). Credit risk takes more time to take effect (months or years).

When creating a stress test, it is important that it relates to the decision making process of the individual company. An important goal is to make risks more transparent. With the help of reference scenarios or early warning indicators, there is also a possibility to create a standard of stress tests that makes it possible to compare information from different insurance companies. The use of stress tests has increased the risk awareness of the life insurance industry.

In Solvency II, stress tests will most likely be used for supervision purposes and the result of the stress test will not be considered as a binding level of capital. The tests will in general lead to a more prudent capital requirement than the SCR. As long as a company satisfies the capital requirement of the stress test, it will be sufficient to report the stress test results to the financial supervisory authorities twice a year. If not, more frequent reporting can be demanded by the authorities. The frequency will depend on the size of mismatch between capital requirements and actual buffer capital. The supervisory action that will be taken when failing to satisfy the stress tests requirements still needs to be determined.

In Denmark and Sweden they have introduced the so-called traffic-light system. It is represented by two stress test scenarios, red and yellow, in order to assess the financial strength of the life insurance companies. In the Danish stress tests, the yellow scenario requires the life insurers to calculate the effects of more extreme, but plausible circumstances. It includes a drop in equity prices of 30%, a change in long term interest rates of 100 basis points and a decrease in real estate prices of 12%. The red scenario includes a drop in equity prices of 12 percent, a decrease in real estate prices of 8 percent and a change in the long, medium and short rates of 70, 85 and 100 basis points.

If the financial strength is not sufficient in the case of the yellow scenario and red scenario, the policyholders' interests are considered to be in danger. In addition if the firm

fails the yellow scenario it is required to report the calculations to the Financial Supervisory Authorities every third month. If the firm fails the red scenario the situation will be analyzed and if necessary the firm might be told to decrease its risk profile.

We have used the Danish stress test to assess the financial strength of Vital. The risks related to assets and liabilities are to be calculated based on a realistic or a fair valuation which corresponds to using market values. This we have outlined in previous chapters. The Danish system also uses an adjustment to the solvency margin capital. This adjustment is similar to the one we outlined in chapter 8.5, and we will use this new solvency margin capital when assessing the stress test results for Vital. Our approach is based on the red scenario and it is equivalent to a procedure used by Kredittilsynet[32].

As calculated under Pillar 1, an increase in the interest rates will not lead to an increased capital at risk for Vital. Therefore we have only considered a fall in the interest rates for the stress test. The premium reserves have duration of approximately 15 years and consequently we will use the long term interest rate change of 70 basis points. Table 21 shows the change in the value of the premium reserves based on a decrease in the discounting rate, from 4% to 3.3% (70 basis points). In addition the table shows the change in the value of the bonds based on a change of 85 basis points in the interest rates. The sum is the net interest rate risk.

Table 21 Calculated net interest rate risk for Vital (Numbers in Million NOK.)

	Duration of liabilities		
	10 years	15 years	20 years
Increase in premium reserve	11038	15624	20389
Increase in value of bonds	-3989	-3989	-3989
Net interest rate risk	7049	11635	16399

The explanation for the interest rate risk and the change in values of the bonds and premium reserves were given in chapter 8.1.2. The net interest rate risk is one of three components for the stress test. The other two are equity risk and real estate risk. These are calculated based on the changes in value as explained above. The effect of the three

[32] *Kredittilsynet 2005, page 44-67.*

components make up the stress test and the aggregated result of the red scenario is given in Table 22 below. We have disregarded any derivatives position as well as a risk contribution from credit and underwriting.

Table 22 Aggregate effect of the red scenario for the liabilities and assets (Numbers in Million NOK.)

	Duration of liabilities		
	10 years	15 years	20 years
Net interest rate risk	7049	11635	16399
Stock price risk	3907	3907	3907
Real estate risk	1830	1830	1830
Sum effect of stress test	12786	17372	22136

To adapt the aggregated effect of the red scenario on the solvency capital requirement, the Danish traffic light system suggests adjusting the solvency capital requirement value by 4% of the premium reserves. This is equivalent to the calculation of the solvency capital requirement under Solvency I. There is also a correction element and this is to avoid that the investment risk is calculated twice. We have calculated the investment risk fully in table 22, but this is claimed to be considered indirectly in the calculation of the solvency marginal capital with today's rules**.** How intuitive this formula is can be debated, but we will not elaborate on this matter. Table 23 takes the correction element into consideration. The existing solvency margin requirement for Vital is given in the annual report.

Table 23 The part of the solvency margin requirement after the scenario which is to be included in the capital requirement calculated in the red scenario (Numbers in Million NOK.)

	Duration of liabilities		
	10 years	15 years	20 years
Existing solvency margin requirement	7130	7130	7130
4% of the increase in PR	442	625	816
Solvency margin requirement after scenario	7572	7755	7946
3% of PR before scenario	4749	4749	4749
3% of interest rate guarantee	331	469	612
Correction element	5080	5218	5361
Part of solvency margin requirement after scenario to be calculated in stress test	2491	2537	2585

The values generated in table 23 are the part of the solvency capital requirement which is related to risk elements not considered in the stress test, given regulation as of today. Therefore we have added these numbers to the capital requirement calculated from the stress test. This has given us the total capital requirement of the red scenario stress test in table 24.

Table 24 Total solvency capital requirement of the red scenario for Vital (Numbers in Million NOK.)

	Duration of liabilities		
	10 years	15 years	20 years
Solvency margin capital before scenario	18804	18804	18804
Sum effect of stress test	12786	17372	22136
Part of solvency margin requirement after scenario to be calculated in stress test	2491	2537	2585
Solvency capital requirement after scenario	15278	19909	24721
Result of red scenario	3526	-1105	-5917

As we can see Vital would have problems meeting the capital requirement from the stress test if the three events took place at the same time given the realistic assumption of 15 years about the duration of liabilities. We see the importance of the duration of the liabilities for the stress test scenario. The solvency capital requirement calculated in the red scenario is much smaller than the one we got from our factor based approach in chapter 8. However, we have disregarded underwriting-, credit- and operational risk in the stress test.

10 Pillar 3

The Pillar 3 objective of public disclosure is a necessary and important complement to the minimum capital requirements (Pillar 1) and the supervisory review of capital adequacy (Pillar 2). This emphasis on public disclosure is a benefit not only to market participants and other traditional users of the public disclosures, but to supervisors as well. The reasoning behind this is that enhanced public disclosure itself strengthens supervision through increased market discipline - the companies that manage risk effectively are rewarded, while those that do not are penalized. Another advantage of the public disclosure is avoiding an increase in regulation that would come as insurance companies become more complex.

In practice, insurance undertakings will have to ensure that information required by Pillar 1 and 2 is available for supervisory purposes. This information will partly be publicly disclosed and partly made available for supervisor only. The result is increased transparency. Rating companies will be able to provide more accurate ratings for investors, and supervisory agencies will have an easier job to assess and control the risk in the insurance industry. The information will be retrospective, but also prospective, in terms of sensitivity analysis, and stress testing.

Another beneficial effect of the increased disclosure is that insurers' focus on the management of risk increases. The market will react to changes in risks at a very early stage and this will give an incentive for insures to focus on effective economic risk management by hedging the risks taken. High risks can place insurers under severe strain and it will be easier for the market to discover a deteriorated risk profile at an early stage.

The prospective part of the information, namely results of sensitivity analysis and stress tests (indicators) is important as they would enable market participants to evaluate and compare the risks taken on by insurers. This will strengthen both the market disciplining mechanism and the incentive for risk management.

The results of sensitivity analysis show the insurer's sensitivity to minor changes in important parameters. A stress test will paint the picture of the insurer's ability to deal with tail-events. It is easier to disclose the results of sensitivity analysis to the market because tail-events are more unrealistic than small changes in a parameter. In fact, market participants, analysts and other users of information should require the results of standardized sensitivity analysis to be disclosed, by doing this they can evaluate and compare the risks taken on by insurers. Disclosing these standardized parameters should however not prevent insurers from disclosing individually designed sensitivity analysis and stress tests to further describe their risk profile.

As a final point, the new Solvency II standards will be adapted to the new IASB rules. They will increase the level of information going out to the public. One difficult aspect then is the level of confidentiality.

11 Conclusion

We have explained Solvency II and outlined how a given life insurance company can adapt to the different aspects of this new regulatory framework. The framework is built around a three pillar structure and its ultimate goal is to make life insurers robust enough to face the future. We have provided a thorough explanation of possible outcomes given the new regulatory regime, and we have exemplified using Vital.

In Solvency II, the valuation of assets and liabilities should comply with a fair value approach. We used the modified balance of Vital in a risk based manner to estimate the solvency capital requirement. We also calculated a new solvency margin capital.

The Pillar 1 calculations were simple factor- and scenario based approaches. This resulted in a considerable increase in the capital requirement for Vital, even when comparing to the new solvency margin capital. This was to be expected, but the size of the difference was larger than predicted. We have found several reasons for the high numbers:

1. We have not considered that Vital has considerable derivatives related to hedging the interest and equity risk. Taking these into account would naturally entail a large reduction in the capital requirement.
2. Our approach is very comparable to a standard model. Insurance companies will have an incentive to develop tailored models for their undertaking. A reduction in the solvency capital requirement could be obtained with better modeling techniques as this would lead to more accurate assessments of risks. In addition, more realistic correlations could result in diversification effects. The more advanced approaches are not yet developed in detail but they will need considerable investigation.
3. The capital requirement is very interest rate sensitive. A reduction in the duration gap between bonds and premium reserves would lead to a significant reduction in the capital requirement. A solution to meeting the capital requirements of

Solvency II will be to change the composition of the bond portfolio by buying bonds with a higher duration. As a result there could be an incentive to change the asset structure of an insurance undertaking, and the demand for long term bonds might rise with the implementation of Solvency II.

4. The models we have used are still in a preliminary stage and will need further testing to be approved as sufficient measures. In general our approach overestimated the risks. This is discussed in further detail in chapter 8.

Even though the solvency capital requirement increased, this approach also emphasises an expansion of the solvency margin capital, involving an inclusion of the adjustment reserve and parts of the loss reserve. There still is no exact approach to use.

The discussion of Pillar 2 included testing the plausibility of our estimations under Pillar 1. We adapted a Danish stress test scenario to Vital. Vital still came out with red numbers.

We finished our discussion by emphasising the importance of the Pillar 3 objective of public disclosure.

Working with this thesis has revealed a spectre of interesting problems. There are many issues that would need to be studied in further depth and researched more thoroughly. We now feel we have a good understanding of the life insurance business and the Solvency II framework.

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Appendix A Time series

Source	Datastream	Morgan Stanley	Morgan Stanley	Morgan Stanley
Start	17.5.2001			
End	17.5.2006			
Frequency	Daily	Daily	Daily	Daily
Name	OSLO EXCHANGE ALL SHARE- TOT RETURN IND (~U$)	MSCI EUROPE - Gross Index	MSCI NORTH AMERICA - Gross Index	MSCI FAR EAST - Gross Index
Code	OSLOASH(RI)~U$			
CURRENCY	U$	USD	USD	USD
17.5.2001	20.65	3,980.17	3,961.55	4,209.51
18.5.2001	21.14	3,997.14	4,016.24	4,274.41
21.5.2001	21.45	3,989.38	4,007.97	4,278.06
22.5.2001	21.24	3,934.22	3,949.01	4,337.18
23.5.2001	21.02	3,924.86	3,963.19	4,320.08
24.5.2001	21.03	3,901.39	3,918.36	4,281.60
25.5.2001	21.25	3,917.21	3,918.70	4,242.50
28.5.2001	21.23	3,871.69	3,889.31	4,293.75
29.5.2001	20.89	3,834.55	3,831.99	4,208.88
30.5.2001	20.80	3,807.21	3,855.90	4,199.32
31.5.2001	20.52	3,795.32	3,874.39	4,189.36
1.6.2001	20.36	3,814.02	3,895.65	4,183.55
4.6.2001	20.38	3,858.23	3,940.15	4,153.86
5.6.2001	20.51	3,826.56	3,900.05	4,148.70
6.6.2001	20.54	3,830.58	3,918.81	4,172.04
7.6.2001	20.50	3,817.00	3,883.04	4,163.03
8.6.2001	20.53	3,754.99	3,855.34	4,100.00
11.6.2001	20.14	3,709.94	3,858.81	4,006.09
12.6.2001	19.79	3,751.61	3,818.80	4,003.59
13.6.2001	20.19	3,735.62	3,755.26	4,005.38
14.6.2001	20.01	3,718.00	3,732.88	3,961.61
15.6.2001	19.91	3,683.14	3,715.25	3,935.09
18.6.2001	19.94	3,680.60	3,728.09	3,923.49
19.6.2001	20.23	3,645.21	3,766.85	3,911.64
20.6.2001	20.01	3,652.52	3,806.87	3,965.36
21.6.2001	19.88	3,669.85	3,771.28	3,994.25
22.6.2001	19.93	3,692.57	3,749.43	3,970.33
25.6.2001	19.96	3,637.49	3,738.93	3,977.72
26.6.2001	19.68	3,632.31	3,722.93	3,950.79
27.6.2001	19.70	3,637.60	3,771.04	3,898.54
28.6.2001	19.40	3,665.05	3,765.34	3,961.18
29.6.2001	19.52	3,717.14	3,806.78	3,944.81
2.7.2001	19.46	3,672.62	3,799.45	3,955.32

3.7.2001	19.50	3,644.82	3,798.77	3,925.14
4.7.2001	19.45	3,585.31	3,749.75	3,881.79
5.7.2001	19.23	3,539.22	3,664.82	3,802.65
6.7.2001	19.26	3,554.18	3,693.97	3,783.23
9.7.2001	19.39	3,557.09	3,643.71	3,822.76
10.7.2001	19.29	3,530.54	3,640.03	3,792.70
11.7.2001	19.10	3,543.48	3,725.48	3,856.81
12.7.2001	19.04	3,562.45	3,748.94	3,818.80
13.7.2001	18.89	3,556.38	3,711.71	3,809.12
16.7.2001	18.78	3,511.80	3,750.08	3,764.46
17.7.2001	18.42	3,542.97	3,729.64	3,717.79
18.7.2001	18.67	3,592.77	3,751.27	3,724.73
19.7.2001	18.98	3,576.00	3,737.76	3,738.22
20.7.2001	19.00	3,571.52	3,676.39	3,624.13
23.7.2001	19.16	3,544.67	3,618.38	3,667.71
24.7.2001	19.06	3,516.00	3,674.40	3,705.68
25.7.2001	19.01	3,535.67	3,706.58	3,701.32
26.7.2001	19.14	3,589.50	3,713.34	3,687.06
27.7.2001	19.25	3,635.16	3,711.65	3,614.63
30.7.2001	19.39	3,674.58	3,730.92	3,696.15
31.7.2001	19.38	3,701.55	3,743.95	3,729.57
1.8.2001	19.57	3,715.23	3,759.91	3,828.87
2.8.2001	19.70	3,695.48	3,742.13	3,788.76
3.8.2001	19.61	3,675.38	3,700.93	3,779.42
6.8.2001	19.47	3,669.21	3,715.83	3,798.60
7.8.2001	19.30	3,623.45	3,652.13	3,786.60
8.8.2001	19.14	3,600.89	3,652.06	3,695.06
9.8.2001	19.27	3,598.68	3,671.59	3,718.45
10.8.2001	19.29	3,629.11	3,672.15	3,661.45
13.8.2001	19.30	3,669.85	3,655.17	3,770.51
14.8.2001	19.36	3,699.36	3,628.77	3,813.31
15.8.2001	19.47	3,666.29	3,641.60	3,750.15
16.8.2001	19.47	3,622.50	3,578.44	3,736.28
17.8.2001	19.36	3,609.96	3,606.22	3,684.82
20.8.2001	19.10	3,649.78	3,561.84	3,716.40
21.8.2001	19.26	3,669.89	3,586.30	3,748.84
22.8.2001	19.31	3,650.09	3,576.04	3,701.55
23.8.2001	19.00	3,704.67	3,646.33	3,692.74
24.8.2001	19.24	3,696.17	3,628.99	3,720.40
27.8.2001	19.14	3,653.18	3,574.51	3,696.18
28.8.2001	19.11	3,649.81	3,531.38	3,656.65
29.8.2001	18.98	3,575.73	3,469.53	3,602.46
30.8.2001	18.90	3,579.84	3,484.95	3,595.10
31.8.2001	18.75	3,534.74	3,484.82	3,516.66
3.9.2001	18.59	3,524.28	3,490.45	3,597.50
4.9.2001	18.62	3,468.33	3,489.87	3,525.73
5.9.2001	18.67	3,399.79	3,412.74	3,508.47

6.9.2001	18.60	3,361.74	3,348.94	3,499.28
7.9.2001	18.48	3,317.25	3,374.20	3,405.13
10.9.2001	17.97	3,141.86	3,368.36	3,471.61
11.9.2001	18.74	3,189.87	3,369.45	3,228.38
12.9.2001	17.68	3,231.80	3,369.70	3,269.87
13.9.2001	17.63	3,108.82	3,365.87	3,383.54
14.9.2001	17.55	3,185.06	3,201.20	3,231.76
17.9.2001	17.48	3,158.68	3,183.91	3,267.41
18.9.2001	17.33	3,111.98	3,134.29	3,349.65
19.9.2001	17.12	2,983.66	3,037.42	3,325.12
20.9.2001	16.38	2,873.65	2,983.82	3,208.35
21.9.2001	15.35	3,021.23	3,102.89	3,196.29
24.9.2001	15.74	3,082.52	3,127.93	3,229.61
25.9.2001	16.08	3,121.07	3,114.85	3,177.91
26.9.2001	16.07	3,158.16	3,147.27	3,160.22
27.9.2001	16.04	3,222.64	3,216.24	3,229.78
28.9.2001	16.23	3,172.44	3,211.35	3,263.59
1.10.2001	16.02	3,198.43	3,249.71	3,312.68
2.10.2001	15.97	3,223.83	3,312.10	3,258.61
3.10.2001	15.99	3,309.43	3,301.79	3,336.75
4.10.2001	16.06	3,309.53	3,306.61	3,338.19
5.10.2001	16.03	3,308.72	3,280.89	3,338.64
8.10.2001	15.92	3,298.14	3,261.43	3,270.93
9.10.2001	16.10	3,353.54	3,336.11	3,231.14
10.10.2001	16.20	3,365.02	3,387.01	3,305.16
11.10.2001	16.46	3,360.81	3,369.87	3,363.70
12.10.2001	16.46	3,298.39	3,365.15	3,334.16
15.10.2001	16.15	3,333.33	3,388.41	3,343.39
16.10.2001	16.26	3,396.66	3,324.55	3,383.24
17.10.2001	16.63	3,334.33	3,300.53	3,313.49
18.10.2001	16.27	3,265.94	3,316.41	3,314.63
19.10.2001	15.91	3,293.66	3,367.05	3,306.33
22.10.2001	16.03	3,358.96	3,350.92	3,354.65
23.10.2001	16.22	3,378.73	3,348.52	3,364.99
24.10.2001	16.36	3,332.13	3,390.48	3,390.00
25.10.2001	16.14	3,396.17	3,402.85	3,353.47
26.10.2001	16.36	3,366.56	3,320.82	3,307.99
29.10.2001	16.81	3,301.03	3,264.58	3,277.71
30.10.2001	16.85	3,324.85	3,261.68	3,232.89
31.10.2001	16.67	3,364.23	3,335.51	3,254.73
1.11.2001	16.67	3,369.73	3,342.73	3,253.11
2.11.2001	16.56	3,422.50	3,387.41	3,268.46
5.11.2001	16.87	3,422.69	3,438.18	3,310.85
6.11.2001	16.89	3,460.61	3,429.15	3,223.59
7.11.2001	17.03	3,497.92	3,440.47	3,274.07
8.11.2001	17.10	3,464.31	3,447.67	3,256.93
9.11.2001	17.32	3,393.41	3,440.24	3,222.23

12.11.2001	16.96	3,451.79	3,505.03	3,165.95
13.11.2001	17.26	3,455.78	3,517.18	3,173.54
14.11.2001	17.34	3,455.44	3,522.15	3,242.79
15.11.2001	16.92	3,491.62	3,511.65	3,254.27
16.11.2001	16.83	3,507.30	3,551.78	3,293.03
19.11.2001	16.68	3,477.57	3,524.28	3,297.26
20.11.2001	17.01	3,451.86	3,505.09	3,298.47
21.11.2001	16.79	3,490.57	3,506.42	3,286.13
22.11.2001	17.09	3,463.34	3,546.86	3,275.12
23.11.2001	16.81	3,469.09	3,567.27	3,341.93
26.11.2001	16.82	3,438.52	3,542.99	3,329.99
27.11.2001	16.94	3,414.05	3,480.34	3,266.57
28.11.2001	16.93	3,416.39	3,515.70	3,263.41
29.11.2001	17.01	3,458.37	3,514.93	3,304.24
30.11.2001	17.20	3,423.90	3,484.30	3,222.83
3.12.2001	17.06	3,470.49	3,529.95	3,220.64
4.12.2001	17.31	3,559.40	3,608.26	3,289.71
5.12.2001	17.50	3,583.81	3,600.18	3,309.76
6.12.2001	17.60	3,547.41	3,572.92	3,260.11
7.12.2001	17.53	3,485.84	3,516.07	3,185.65
10.12.2001	17.35	3,488.12	3,505.70	3,161.96
11.12.2001	17.41	3,478.80	3,509.10	3,235.08
12.12.2001	17.59	3,430.32	3,453.75	3,151.93
13.12.2001	17.29	3,418.43	3,463.43	3,127.84
14.12.2001	17.38	3,505.24	3,500.83	3,069.05
17.12.2001	17.27	3,497.59	3,526.37	3,086.15
18.12.2001	17.36	3,455.93	3,547.13	3,099.36
19.12.2001	17.18	3,431.66	3,517.98	3,122.39
20.12.2001	17.32	3,455.48	3,530.58	3,073.35
21.12.2001	17.27	3,434.50	3,527.36	3,066.07
24.12.2001	17.05	3,434.50	3,527.36	3,055.90
25.12.2001	17.05	3,442.60	3,541.45	3,027.98
26.12.2001	17.07	3,515.78	3,567.89	3,074.30
27.12.2001	17.72	3,523.01	3,578.89	3,126.88
28.12.2001	17.81	3,546.98	3,538.52	3,130.19
31.12.2001	17.94	3,546.98	3,538.52	3,130.19
1.1.2002	17.94	3,551.34	3,560.88	3,107.87
2.1.2002	18.18	3,602.94	3,597.42	3,120.13
3.1.2002	18.37	3,591.07	3,621.11	3,206.85
4.1.2002	18.38	3,550.04	3,598.50	3,214.74
7.1.2002	18.32	3,516.36	3,585.23	3,130.86
8.1.2002	18.16	3,510.13	3,568.17	3,109.46
9.1.2002	18.24	3,488.87	3,570.87	3,072.30
10.1.2002	18.21	3,500.35	3,538.56	3,054.41
11.1.2002	18.10	3,439.08	3,515.83	3,065.02
14.1.2002	18.02	3,455.98	3,541.87	3,009.81
15.1.2002	17.69	3,393.10	3,485.75	3,007.29

16.1.2002	17.40	3,424.08	3,520.87	2,995.62
17.1.2002	17.55	3,420.44	3,483.76	3,037.26
18.1.2002	17.49	3,402.59	3,483.19	3,036.91
21.1.2002	17.43	3,403.50	3,456.98	2,943.20
22.1.2002	17.52	3,426.96	3,483.46	2,921.01
23.1.2002	17.37	3,453.87	3,496.03	2,932.45
24.1.2002	17.56	3,392.01	3,499.80	2,956.72
25.1.2002	17.30	3,405.82	3,499.18	3,004.97
28.1.2002	17.45	3,360.83	3,403.12	2,950.04
29.1.2002	17.39	3,322.28	3,437.93	2,910.95
30.1.2002	17.16	3,361.99	3,489.53	2,925.26
31.1.2002	17.28	3,370.91	3,464.86	2,871.08
1.2.2002	17.34	3,352.69	3,379.10	2,853.07
4.2.2002	17.41	3,305.93	3,367.71	2,789.93
5.2.2002	17.28	3,273.70	3,348.43	2,787.11
6.2.2002	17.34	3,305.44	3,338.62	2,833.75
7.2.2002	17.33	3,314.23	3,389.64	2,842.85
8.2.2002	17.24	3,361.12	3,437.58	2,871.83
11.2.2002	17.42	3,352.18	3,423.14	2,943.93
12.2.2002	17.40	3,365.40	3,457.12	2,959.39
13.2.2002	17.52	3,394.06	3,451.93	2,981.24
14.2.2002	17.64	3,375.83	3,410.95	2,973.13
15.2.2002	17.70	3,346.17	3,411.81	2,975.12
18.2.2002	17.59	3,297.50	3,348.71	2,888.74
19.2.2002	17.48	3,269.62	3,392.39	2,874.04
20.2.2002	17.35	3,298.05	3,341.37	2,950.83
21.2.2002	17.48	3,287.17	3,368.56	2,961.89
22.2.2002	17.69	3,315.77	3,428.01	2,944.16
25.2.2002	17.68	3,330.18	3,427.53	2,922.70
26.2.2002	17.79	3,362.90	3,431.67	2,985.29
27.2.2002	18.04	3,361.44	3,422.60	3,015.06
28.2.2002	18.04	3,392.48	3,503.71	3,076.93
1.3.2002	18.15	3,477.15	3,574.22	3,251.32
4.3.2002	18.39	3,462.14	3,551.21	3,244.08
5.3.2002	18.58	3,491.59	3,602.49	3,261.96
6.3.2002	18.58	3,532.32	3,585.84	3,408.06
7.3.2002	19.12	3,536.92	3,605.11	3,414.85
8.3.2002	19.36	3,517.61	3,617.72	3,465.29
11.3.2002	19.15	3,477.55	3,608.37	3,369.24
12.3.2002	19.09	3,487.92	3,574.23	3,294.21
13.3.2002	19.04	3,517.48	3,569.09	3,339.90
14.3.2002	19.24	3,550.94	3,610.63	3,365.13
15.3.2002	19.32	3,561.97	3,609.71	3,286.92
18.3.2002	19.33	3,577.25	3,623.01	3,352.01
19.3.2002	19.59	3,551.21	3,566.21	3,305.95
20.3.2002	19.50	3,535.09	3,571.52	3,288.33
21.3.2002	19.66	3,541.74	3,557.98	3,215.97

22.3.2002	19.64	3,509.55	3,505.37	3,198.07
25.3.2002	19.57	3,517.12	3,524.08	3,193.56
26.3.2002	19.56	3,507.22	3,541.95	3,227.18
27.3.2002	19.64	3,544.68	3,550.08	3,253.66
28.3.2002	19.65	3,544.68	3,550.08	3,190.48
29.3.2002	19.65	3,577.49	3,547.65	3,158.05
1.4.2002	19.80	3,560.82	3,516.99	3,202.95
2.4.2002	20.07	3,553.21	3,483.92	3,255.22
3.4.2002	20.13	3,524.70	3,485.11	3,285.12
4.4.2002	19.82	3,516.29	3,474.35	3,276.83
5.4.2002	19.72	3,453.03	3,479.63	3,279.99
8.4.2002	19.64	3,465.53	3,455.15	3,234.69
9.4.2002	19.64	3,504.16	3,492.78	3,257.61
10.4.2002	19.60	3,463.23	3,408.21	3,226.56
11.4.2002	19.77	3,467.13	3,431.41	3,181.87
12.4.2002	19.66	3,496.52	3,404.73	3,224.52
15.4.2002	19.72	3,559.57	3,484.99	3,266.36
16.4.2002	19.95	3,581.53	3,478.94	3,317.26
17.4.2002	20.12	3,566.60	3,474.16	3,353.04
18.4.2002	20.26	3,568.33	3,477.67	3,325.03
19.4.2002	20.14	3,541.74	3,422.46	3,376.44
22.4.2002	20.00	3,531.38	3,398.18	3,385.97
23.4.2002	19.95	3,529.18	3,376.09	3,378.88
24.4.2002	20.01	3,518.50	3,373.21	3,407.31
25.4.2002	19.85	3,503.63	3,325.38	3,384.29
26.4.2002	19.89	3,504.67	3,290.87	3,376.63
29.4.2002	19.83	3,520.56	3,327.40	3,363.94
30.4.2002	19.97	3,529.31	3,358.45	3,397.74
1.5.2002	20.09	3,516.59	3,351.11	3,394.17
2.5.2002	20.45	3,529.86	3,314.90	3,416.83
3.5.2002	20.57	3,529.80	3,250.22	3,404.06
6.5.2002	20.48	3,478.04	3,239.00	3,363.31
7.5.2002	20.08	3,539.11	3,365.67	3,372.00
8.5.2002	20.40	3,527.24	3,315.73	3,395.40
9.5.2002	20.44	3,504.66	3,262.35	3,399.60
10.5.2002	20.68	3,529.73	3,323.09	3,372.03
13.5.2002	20.70	3,536.87	3,394.38	3,341.53
14.5.2002	20.78	3,574.39	3,378.66	3,415.73
15.5.2002	20.74	3,570.61	3,401.40	3,451.90
16.5.2002	21.02	3,592.60	3,428.28	3,520.10
17.5.2002	21.24	3,575.26	3,383.67	3,541.89
20.5.2002	21.30	3,557.10	3,346.16	3,565.49
21.5.2002	21.14	3,540.07	3,363.74	3,601.51
22.5.2002	21.12	3,527.02	3,399.91	3,584.64
23.5.2002	21.06	3,533.79	3,358.45	3,605.18
24.5.2002	21.06	3,527.44	3,358.49	3,581.65
27.5.2002	21.00	3,526.42	3,331.51	3,582.67

28.5.2002	21.18	3,528.00	3,308.68	3,566.28
29.5.2002	20.75	3,498.56	3,300.62	3,583.20
30.5.2002	20.62	3,514.06	3,306.51	3,534.30
31.5.2002	20.40	3,499.54	3,224.17	3,577.36
3.6.2002	20.48	3,454.10	3,224.68	3,528.30
4.6.2002	20.08	3,413.32	3,251.34	3,505.14
5.6.2002	19.95	3,425.12	3,187.60	3,492.59
6.6.2002	20.22	3,380.87	3,180.31	3,465.08
7.6.2002	19.69	3,385.49	3,189.35	3,445.74
10.6.2002	19.79	3,412.98	3,133.45	3,437.03
11.6.2002	20.09	3,352.43	3,155.35	3,414.26
12.6.2002	20.23	3,310.68	3,124.23	3,371.89
13.6.2002	20.27	3,235.53	3,117.18	3,325.98
14.6.2002	19.71	3,327.56	3,205.63	3,239.99
17.6.2002	20.07	3,325.50	3,208.25	3,282.83
18.6.2002	20.17	3,295.61	3,156.12	3,206.16
19.6.2002	20.27	3,253.97	3,110.85	3,252.09
20.6.2002	19.91	3,261.69	3,056.28	3,230.88
21.6.2002	19.87	3,207.40	3,068.44	3,263.33
24.6.2002	19.52	3,262.56	3,016.77	3,259.34
25.6.2002	19.57	3,258.75	3,006.73	3,221.05
26.6.2002	19.05	3,277.94	3,058.46	3,244.65
27.6.2002	19.49	3,393.52	3,057.03	3,347.08
28.6.2002	19.84	3,402.84	2,989.54	3,341.50
1.7.2002	19.95	3,297.67	2,927.63	3,340.05
2.7.2002	19.92	3,191.87	2,945.33	3,395.52
3.7.2002	19.59	3,251.55	2,945.41	3,362.04
4.7.2002	19.61	3,355.92	3,053.16	3,394.31
5.7.2002	19.98	3,385.79	3,016.65	3,409.09
8.7.2002	20.27	3,368.36	2,942.26	3,472.08
9.7.2002	20.31	3,248.95	2,847.55	3,428.61
10.7.2002	20.02	3,134.38	2,870.05	3,394.78
11.7.2002	19.84	3,139.47	2,853.14	3,408.90
12.7.2002	19.51	3,026.97	2,842.70	3,370.47
15.7.2002	19.66	3,037.24	2,796.19	3,319.94
16.7.2002	19.53	3,129.86	2,814.88	3,314.17
17.7.2002	19.76	3,176.09	2,738.43	3,366.80
18.7.2002	19.83	3,046.92	2,638.08	3,321.17
19.7.2002	19.60	2,881.47	2,550.49	3,300.05
22.7.2002	18.65	2,791.33	2,477.57	3,289.26
23.7.2002	17.62	2,756.92	2,618.89	3,247.20
24.7.2002	16.60	2,878.20	2,601.08	3,208.22
25.7.2002	17.47	2,876.78	2,647.80	3,073.70
26.7.2002	17.40	3,008.41	2,791.33	3,074.12
29.7.2002	17.65	3,017.97	2,804.62	3,150.59
30.7.2002	18.05	3,016.28	2,832.44	3,126.24
31.7.2002	18.29	2,900.94	2,747.93	3,114.16

1.8.2002	18.25	2,907.64	2,686.86	3,104.24
2.8.2002	18.02	2,821.84	2,596.95	3,100.87
5.8.2002	17.49	2,875.63	2,671.83	3,003.69
6.8.2002	17.43	2,860.50	2,724.77	3,102.34
7.8.2002	17.70	2,961.01	2,815.26	3,090.85
8.8.2002	17.95	3,013.10	2,826.15	3,157.72
9.8.2002	18.03	2,963.93	2,810.98	3,125.10
12.8.2002	17.92	2,995.00	2,749.94	3,113.13
13.8.2002	18.10	2,952.91	2,857.90	3,162.13
14.8.2002	18.10	3,022.20	2,889.36	3,173.18
15.8.2002	18.25	3,046.63	2,886.71	3,173.33
16.8.2002	18.34	3,108.92	2,954.20	3,098.22
19.8.2002	18.26	3,060.14	2,913.46	3,095.70
20.8.2002	18.30	3,102.83	2,951.96	3,117.19
21.8.2002	18.43	3,138.48	2,993.77	3,133.91
22.8.2002	18.44	3,098.66	2,924.60	3,143.39
23.8.2002	18.33	3,075.23	2,947.79	3,195.61
26.8.2002	18.25	3,152.56	2,905.59	3,170.54
27.8.2002	18.44	3,039.82	2,853.19	3,134.26
28.8.2002	18.14	2,999.13	2,852.49	3,089.37
29.8.2002	17.78	3,016.47	2,846.76	3,086.12
30.8.2002	17.98	2,974.78	2,847.07	3,059.50
2.9.2002	17.89	2,891.33	2,727.95	3,000.58
3.9.2002	17.61	2,897.02	2,775.33	2,932.36
4.9.2002	17.41	2,877.62	2,730.62	2,975.09
5.9.2002	17.10	2,944.55	2,775.75	2,940.94
6.9.2002	17.37	2,896.38	2,802.90	2,974.16
9.9.2002	17.17	2,947.70	2,822.76	2,971.18
10.9.2002	17.08	2,996.68	2,823.94	2,971.07
11.9.2002	17.20	2,905.66	2,753.47	2,986.03
12.9.2002	17.10	2,857.00	2,760.27	2,928.40
13.9.2002	16.84	2,833.77	2,765.22	2,900.04
16.9.2002	16.65	2,801.16	2,710.32	2,967.01
17.9.2002	16.56	2,724.33	2,696.40	2,970.54
18.9.2002	16.23	2,689.50	2,615.20	3,027.53
19.9.2002	15.90	2,698.43	2,619.83	2,923.76
20.9.2002	15.90	2,611.47	2,583.75	2,910.70
23.9.2002	15.81	2,565.59	2,539.54	2,877.02
24.9.2002	15.27	2,599.52	2,603.67	2,851.31
25.9.2002	15.39	2,709.71	2,649.19	2,904.01
26.9.2002	15.65	2,708.24	2,563.71	2,959.28
27.9.2002	15.60	2,619.71	2,529.03	2,937.14
30.9.2002	15.60	2,648.31	2,629.24	2,867.21
1.10.2002	15.50	2,722.76	2,568.35	2,827.17
2.10.2002	15.66	2,693.79	2,539.83	2,795.66
3.10.2002	15.87	2,625.76	2,482.58	2,818.76
4.10.2002	15.87	2,593.16	2,435.36	2,705.63

7.10.2002	15.76	2,542.85	2,474.41	2,711.94
8.10.2002	15.69	2,543.34	2,408.09	2,675.60
9.10.2002	15.65	2,596.33	2,492.96	2,650.18
10.10.2002	15.63	2,723.20	2,590.84	2,678.54
11.10.2002	16.31	2,700.25	2,609.47	2,677.02
14.10.2002	16.38	2,844.20	2,735.10	2,757.25
15.10.2002	16.76	2,799.49	2,669.53	2,782.88
16.10.2002	16.53	2,862.30	2,731.24	2,788.67
17.10.2002	16.51	2,846.38	2,747.20	2,807.14
18.10.2002	16.24	2,856.27	2,793.40	2,794.01
21.10.2002	16.27	2,839.36	2,764.70	2,714.29
22.10.2002	16.01	2,753.34	2,782.49	2,745.78
23.10.2002	15.91	2,817.04	2,741.57	2,725.45
24.10.2002	15.98	2,811.60	2,787.36	2,767.61
25.10.2002	15.98	2,856.34	2,766.61	2,776.95
28.10.2002	16.05	2,750.16	2,738.47	2,771.12
29.10.2002	15.76	2,813.94	2,767.37	2,786.25
30.10.2002	15.84	2,873.06	2,752.80	2,768.76
31.10.2002	16.21	2,855.75	2,800.71	2,782.13
1.11.2002	16.20	2,948.45	2,827.05	2,784.67
4.11.2002	16.58	2,973.26	2,849.74	2,851.53
5.11.2002	16.57	2,934.71	2,876.22	2,845.12
6.11.2002	16.56	2,910.96	2,811.34	2,851.36
7.11.2002	16.70	2,891.55	2,786.00	2,825.46
8.11.2002	16.58	2,869.11	2,726.85	2,760.66
11.11.2002	16.53	2,906.41	2,748.38	2,752.47
12.11.2002	16.50	2,879.34	2,745.61	2,736.49
13.11.2002	16.59	2,920.98	2,812.87	2,700.58
14.11.2002	16.54	2,944.83	2,830.22	2,756.78
15.11.2002	16.62	2,977.58	2,802.99	2,697.00
18.11.2002	16.72	2,970.23	2,791.64	2,682.33
19.11.2002	16.56	2,944.27	2,845.96	2,696.19
20.11.2002	16.27	3,026.23	2,908.98	2,745.74
21.11.2002	16.55	3,027.19	2,898.38	2,777.26
22.11.2002	16.58	2,986.53	2,907.61	2,821.70
25.11.2002	16.49	2,933.50	2,845.97	2,804.92
26.11.2002	16.37	2,986.81	2,926.01	2,816.81
27.11.2002	16.65	3,022.88	2,926.53	2,875.77
28.11.2002	16.95	3,014.19	2,918.35	2,875.42
29.11.2002	17.19	3,013.54	2,915.48	2,830.06
2.12.2002	17.50	2,956.83	2,872.89	2,834.41
3.12.2002	17.14	2,951.51	2,862.55	2,773.23
4.12.2002	17.30	2,920.05	2,828.14	2,738.86
5.12.2002	17.12	2,927.58	2,846.09	2,754.48
6.12.2002	16.69	2,865.25	2,783.17	2,742.22
9.12.2002	16.72	2,877.80	2,823.03	2,742.63
10.12.2002	16.73	2,906.24	2,825.62	2,733.13

11.12.2002	16.56	2,883.63	2,816.93	2,737.04
12.12.2002	16.65	2,863.00	2,780.68	2,737.91
13.12.2002	16.71	2,935.42	2,845.21	2,709.79
16.12.2002	16.67	2,919.10	2,821.33	2,729.82
17.12.2002	16.85	2,858.51	2,783.87	2,671.35
18.12.2002	17.01	2,846.36	2,763.35	2,700.96
19.12.2002	17.06	2,878.32	2,797.92	2,698.81
20.12.2002	17.17	2,885.06	2,805.07	2,705.54
23.12.2002	17.02	2,896.99	2,789.26	2,730.84
24.12.2002	17.10	2,896.99	2,789.26	2,722.91
25.12.2002	17.10	2,900.89	2,779.54	2,766.82
26.12.2002	17.11	2,831.97	2,735.45	2,782.36
27.12.2002	17.22	2,874.87	2,745.85	2,792.19
30.12.2002	17.29	2,905.19	2,747.84	2,791.51
31.12.2002	17.37	2,905.19	2,747.84	2,791.51
1.1.2003	17.37	2,959.08	2,839.44	2,767.28
2.1.2003	17.40	2,985.83	2,839.63	2,772.47
3.1.2003	17.77	3,015.11	2,904.14	2,837.75
6.1.2003	17.82	2,978.69	2,885.87	2,790.34
7.1.2003	17.72	2,925.80	2,844.73	2,751.14
8.1.2003	17.32	2,967.21	2,899.14	2,759.61
9.1.2003	17.43	2,989.46	2,901.58	2,755.78
10.1.2003	17.66	2,992.33	2,898.43	2,773.43
13.1.2003	17.67	3,013.20	2,916.68	2,814.61
14.1.2003	17.65	2,969.65	2,876.48	2,848.08
15.1.2003	17.76	2,965.50	2,865.31	2,846.21
16.1.2003	17.89	2,920.96	2,824.83	2,853.67
17.1.2003	17.82	2,884.43	2,824.59	2,819.11
20.1.2003	17.84	2,856.58	2,781.83	2,842.96
21.1.2003	17.61	2,811.56	2,755.73	2,822.33
22.1.2003	17.38	2,804.68	2,784.16	2,879.00
23.1.2003	17.27	2,793.64	2,705.01	2,853.86
24.1.2003	17.26	2,702.64	2,660.06	2,790.53
27.1.2003	16.72	2,708.35	2,693.34	2,773.78
28.1.2003	16.56	2,727.75	2,712.61	2,733.12
29.1.2003	16.42	2,768.77	2,652.59	2,710.79
30.1.2003	16.59	2,768.04	2,687.12	2,686.88
31.1.2003	16.49	2,815.52	2,701.90	2,720.48
3.2.2003	16.37	2,757.94	2,664.04	2,748.05
4.2.2003	16.33	2,799.41	2,650.00	2,749.13
5.2.2003	16.24	2,738.87	2,634.29	2,733.83
6.2.2003	16.15	2,709.97	2,608.42	2,721.54
7.2.2003	16.26	2,682.48	2,626.58	2,714.46
10.2.2003	16.04	2,731.22	2,605.71	2,707.28
11.2.2003	16.12	2,684.84	2,573.64	2,752.89
12.2.2003	16.07	2,693.25	2,570.26	2,745.98
13.2.2003	15.89	2,725.37	2,623.41	2,764.56

14.2.2003	15.86	2,761.15	2,624.81	2,786.11
17.2.2003	15.79	2,774.79	2,676.65	2,792.05
18.2.2003	15.83	2,725.07	2,659.11	2,795.19
19.2.2003	15.67	2,727.50	2,635.62	2,789.46
20.2.2003	15.55	2,749.57	2,669.13	2,752.38
21.2.2003	15.51	2,706.27	2,622.47	2,773.93
24.2.2003	15.27	2,624.58	2,640.18	2,720.15
25.2.2003	14.93	2,616.73	2,608.04	2,721.93
26.2.2003	15.01	2,624.93	2,639.27	2,710.33
27.2.2003	14.82	2,677.78	2,651.82	2,697.81
28.2.2003	15.22	2,703.93	2,632.08	2,726.18
3.3.2003	15.50	2,657.13	2,593.63	2,729.08
4.3.2003	15.37	2,648.52	2,619.78	2,728.24
5.3.2003	15.49	2,627.77	2,595.53	2,696.39
6.3.2003	15.24	2,588.45	2,617.33	2,651.57
7.3.2003	14.99	2,531.80	2,550.93	2,615.52
10.3.2003	15.03	2,533.87	2,530.89	2,563.12
11.3.2003	15.11	2,445.41	2,540.07	2,593.68
12.3.2003	15.28	2,553.04	2,624.20	2,553.21
13.3.2003	15.33	2,629.46	2,628.47	2,582.55
14.3.2003	15.33	2,695.06	2,720.30	2,557.46
17.3.2003	15.08	2,690.74	2,732.42	2,575.33
18.3.2003	14.84	2,717.18	2,754.56	2,585.88
19.3.2003	15.08	2,711.29	2,761.56	2,628.36
20.3.2003	15.02	2,782.15	2,822.10	2,603.86
21.3.2003	15.18	2,695.65	2,723.98	2,686.36
24.3.2003	15.04	2,732.58	2,756.06	2,636.57
25.3.2003	15.30	2,733.18	2,741.02	2,674.33
26.3.2003	15.25	2,695.38	2,737.23	2,680.17
27.3.2003	15.23	2,693.41	2,722.31	2,649.54
28.3.2003	15.20	2,639.30	2,674.00	2,580.04
31.3.2003	15.24	2,671.77	2,705.24	2,588.23
1.4.2003	15.29	2,732.59	2,774.82	2,600.76
2.4.2003	15.39	2,746.22	2,761.55	2,578.12
3.4.2003	15.44	2,770.66	2,769.11	2,575.56
4.4.2003	15.56	2,844.18	2,773.27	2,619.38
7.4.2003	16.00	2,811.12	2,770.21	2,591.88
8.4.2003	15.91	2,815.93	2,732.50	2,565.18
9.4.2003	16.07	2,796.33	2,749.87	2,561.51
10.4.2003	15.93	2,803.85	2,740.73	2,503.85
11.4.2003	15.95	2,839.57	2,792.55	2,482.37
14.4.2003	16.04	2,888.42	2,809.12	2,519.06
15.4.2003	16.25	2,874.78	2,776.79	2,516.11
16.4.2003	16.46	2,909.38	2,819.49	2,527.92
17.4.2003	16.50	2,909.38	2,819.49	2,531.87
18.4.2003	16.50	2,889.53	2,815.83	2,536.29
21.4.2003	16.49	2,936.36	2,875.37	2,509.96

22.4.2003	16.55	2,973.52	2,900.23	2,501.54
23.4.2003	16.86	2,948.30	2,876.20	2,527.74
24.4.2003	16.88	2,913.99	2,837.04	2,476.31
25.4.2003	16.96	2,974.34	2,886.77	2,453.46
28.4.2003	16.97	2,967.07	2,895.66	2,466.82
29.4.2003	17.34	2,999.52	2,895.18	2,562.62
30.4.2003	17.45	3,012.77	2,895.64	2,579.99
1.5.2003	17.56	3,022.27	2,937.46	2,588.01
2.5.2003	17.50	3,057.28	2,928.47	2,598.51
5.5.2003	17.68	3,117.81	2,952.88	2,662.45
6.5.2003	18.02	3,084.73	2,939.23	2,697.52
7.5.2003	18.19	3,038.81	2,911.53	2,667.48
8.5.2003	18.25	3,072.28	2,953.40	2,683.05
9.5.2003	18.45	3,090.08	2,990.75	2,710.29
12.5.2003	18.57	3,091.29	2,981.98	2,713.24
13.5.2003	18.53	3,093.85	2,976.87	2,729.31
14.5.2003	18.65	3,122.25	2,999.98	2,696.89
15.5.2003	18.84	3,155.45	2,993.96	2,688.87
16.5.2003	19.23	3,090.47	2,923.03	2,653.76
19.5.2003	18.99	3,096.52	2,919.87	2,658.56
20.5.2003	19.06	3,081.58	2,931.97	2,632.83
21.5.2003	18.98	3,118.34	2,957.98	2,653.05
22.5.2003	19.19	3,124.98	2,961.80	2,702.90
23.5.2003	19.35	3,130.74	2,962.23	2,712.08
26.5.2003	19.32	3,151.02	3,019.07	2,674.46
27.5.2003	19.17	3,186.72	3,022.76	2,666.29
28.5.2003	19.52	3,218.44	3,012.57	2,707.06
29.5.2003	19.66	3,197.64	3,054.39	2,697.44
30.5.2003	19.57	3,250.36	3,066.21	2,752.77
2.6.2003	19.85	3,227.72	3,079.06	2,752.84
3.6.2003	19.67	3,250.04	3,127.30	2,760.58
4.6.2003	19.93	3,273.06	3,141.47	2,815.15
5.6.2003	19.82	3,310.68	3,133.45	2,821.57
6.6.2003	20.06	3,285.66	3,094.74	2,855.15
9.6.2003	20.10	3,278.03	3,122.54	2,849.04
10.6.2003	19.81	3,344.87	3,164.31	2,865.21
11.6.2003	20.14	3,363.14	3,167.03	2,871.23
12.6.2003	19.96	3,335.53	3,135.74	2,890.84
13.6.2003	19.80	3,401.81	3,204.20	2,857.30
16.6.2003	19.91	3,428.36	3,207.59	2,897.62
17.6.2003	20.01	3,413.07	3,202.28	2,910.02
18.6.2003	19.76	3,359.45	3,154.82	2,914.48
19.6.2003	20.20	3,364.41	3,157.01	2,926.33
20.6.2003	19.89	3,286.80	3,112.65	2,949.50
23.6.2003	19.86	3,266.46	3,116.48	2,877.35
24.6.2003	19.72	3,291.35	3,095.21	2,882.84
25.6.2003	19.57	3,253.64	3,128.28	2,856.26

26.6.2003	19.38	3,253.50	3,099.40	2,899.38
27.6.2003	19.50	3,230.51	3,094.11	2,883.35
30.6.2003	19.43	3,199.13	3,117.85	2,944.14
1.7.2003	19.48	3,240.69	3,153.63	3,042.37
2.7.2003	19.69	3,261.42	3,130.43	3,101.15
3.7.2003	19.61	3,244.78	3,130.10	3,078.55
4.7.2003	19.51	3,279.84	3,188.37	3,142.50
7.7.2003	19.52	3,263.28	3,198.90	3,170.43
8.7.2003	19.35	3,244.87	3,182.19	3,200.59
9.7.2003	19.12	3,220.46	3,138.89	3,174.75
10.7.2003	18.96	3,245.25	3,168.55	3,086.87
11.7.2003	19.21	3,287.03	3,188.74	3,125.06
14.7.2003	19.42	3,248.06	3,177.35	3,131.12
15.7.2003	19.51	3,222.94	3,157.11	3,099.55
16.7.2003	19.69	3,185.37	3,119.42	3,021.54
17.7.2003	19.42	3,199.23	3,153.85	3,029.39
18.7.2003	19.43	3,197.14	3,110.20	3,038.00
21.7.2003	19.58	3,221.28	3,138.53	3,010.61
22.7.2003	19.61	3,244.01	3,141.63	3,049.69
23.7.2003	20.06	3,307.23	3,121.10	3,060.66
24.7.2003	20.44	3,299.39	3,174.62	3,071.02
25.7.2003	20.73	3,325.45	3,168.55	3,096.16
28.7.2003	20.67	3,314.85	3,146.84	3,091.28
29.7.2003	20.77	3,299.90	3,139.92	3,018.11
30.7.2003	20.63	3,296.79	3,149.56	3,008.24
31.7.2003	20.75	3,262.31	3,118.99	3,030.17
1.8.2003	20.81	3,264.40	3,126.19	2,992.27
4.8.2003	20.87	3,287.51	3,071.92	2,974.80
5.8.2003	20.89	3,250.89	3,075.14	2,952.23
6.8.2003	20.89	3,264.24	3,099.37	2,964.98
7.8.2003	20.96	3,274.19	3,111.13	2,966.53
8.8.2003	21.17	3,285.20	3,123.55	3,020.60
11.8.2003	20.95	3,296.84	3,153.54	3,038.75
12.8.2003	20.97	3,309.20	3,135.38	3,080.56
13.8.2003	20.90	3,339.99	3,154.81	3,132.41
14.8.2003	20.81	3,345.09	3,156.35	3,127.31
15.8.2003	20.93	3,349.55	3,184.96	3,160.71
18.8.2003	20.82	3,335.22	3,192.75	3,203.12
19.8.2003	20.73	3,333.85	3,187.06	3,266.48
20.8.2003	20.67	3,319.70	3,195.71	3,308.19
21.8.2003	20.64	3,302.33	3,163.68	3,307.69
22.8.2003	20.50	3,288.82	3,165.60	3,288.95
25.8.2003	20.41	3,251.95	3,175.27	3,292.89
26.8.2003	20.21	3,279.81	3,176.61	3,282.79
27.8.2003	20.28	3,295.18	3,196.32	3,270.70
28.8.2003	20.53	3,291.04	3,213.10	3,321.53
29.8.2003	20.89	3,328.65	3,213.67	3,406.86

1.9.2003	21.10	3,307.40	3,256.22	3,423.59
2.9.2003	20.93	3,352.74	3,270.23	3,451.91
3.9.2003	21.05	3,367.06	3,277.61	3,420.58
4.9.2003	21.39	3,388.75	3,258.30	3,418.31
5.9.2003	21.42	3,425.44	3,291.28	3,424.77
8.9.2003	21.66	3,409.80	3,264.22	3,484.50
9.9.2003	21.71	3,384.03	3,224.92	3,448.53
10.9.2003	21.40	3,388.23	3,242.57	3,386.92
11.9.2003	21.24	3,401.15	3,249.61	3,437.05
12.9.2003	21.26	3,412.33	3,236.15	3,436.72
15.9.2003	21.39	3,415.43	3,281.29	3,525.74
16.9.2003	21.37	3,442.15	3,271.16	3,562.42
17.9.2003	21.67	3,474.15	3,313.13	3,604.15
18.9.2003	21.66	3,469.21	3,304.32	3,610.12
19.9.2003	21.71	3,446.10	3,263.16	3,567.72
22.9.2003	21.40	3,435.93	3,283.16	3,585.86
23.9.2003	21.55	3,433.15	3,222.40	3,598.71
24.9.2003	21.84	3,421.27	3,202.53	3,526.88
25.9.2003	21.50	3,385.21	3,181.26	3,525.14
26.9.2003	20.96	3,386.08	3,212.09	3,509.22
29.9.2003	21.21	3,358.05	3,180.04	3,515.68
30.9.2003	20.95	3,424.60	3,249.54	3,585.96
1.10.2003	21.41	3,436.04	3,257.29	3,677.74
2.10.2003	21.60	3,500.53	3,286.19	3,717.08
3.10.2003	21.77	3,500.09	3,300.27	3,723.84
6.10.2003	21.93	3,502.38	3,316.83	3,781.48
7.10.2003	21.89	3,508.53	3,301.86	3,704.19
8.10.2003	22.09	3,549.59	3,316.49	3,730.47
9.10.2003	22.06	3,554.16	3,317.07	3,805.37
10.10.2003	22.42	3,577.52	3,339.29	3,794.51
13.10.2003	22.38	3,570.06	3,354.03	3,824.29
14.10.2003	22.47	3,587.62	3,345.54	3,794.54
15.10.2003	22.61	3,591.05	3,357.90	3,842.39
16.10.2003	22.66	3,566.19	3,323.68	3,843.38
17.10.2003	22.64	3,577.26	3,339.25	3,852.35
20.10.2003	22.50	3,586.85	3,345.70	3,847.15
21.10.2003	22.61	3,557.53	3,297.59	3,800.61
22.10.2003	22.78	3,529.86	3,306.80	3,601.45
23.10.2003	22.50	3,537.72	3,292.62	3,631.22
24.10.2003	22.67	3,552.74	3,300.05	3,683.95
27.10.2003	22.82	3,563.77	3,349.95	3,731.05
28.10.2003	22.79	3,577.56	3,354.67	3,785.95
29.10.2003	22.88	3,601.83	3,352.08	3,762.39
30.10.2003	23.33	3,582.93	3,363.04	3,677.52
31.10.2003	23.26	3,595.99	3,388.94	3,643.88
3.11.2003	23.23	3,588.80	3,371.11	3,788.64
4.11.2003	23.27	3,563.79	3,368.51	3,758.23

5.11.2003	23.02	3,564.00	3,387.70	3,659.83
6.11.2003	23.25	3,613.05	3,374.40	3,710.69
7.11.2003	23.62	3,592.31	3,356.15	3,713.84
10.11.2003	23.63	3,582.03	3,352.88	3,606.00
11.11.2003	23.50	3,629.24	3,393.54	3,597.25
12.11.2003	23.90	3,660.98	3,393.68	3,663.74
13.11.2003	24.00	3,697.27	3,369.35	3,621.81
14.11.2003	24.05	3,635.44	3,348.84	3,491.83
17.11.2003	23.79	3,665.94	3,319.91	3,524.05
18.11.2003	23.92	3,652.67	3,347.64	3,424.84
19.11.2003	23.85	3,643.56	3,321.02	3,491.18
20.11.2003	23.87	3,658.13	3,325.82	3,493.57
21.11.2003	24.10	3,680.27	3,375.81	3,481.36
24.11.2003	24.10	3,688.36	3,382.10	3,512.14
25.11.2003	24.20	3,714.83	3,398.82	3,578.08
26.11.2003	24.30	3,724.81	3,398.75	3,590.50
27.11.2003	24.32	3,735.51	3,398.66	3,573.40
28.11.2003	24.46	3,786.74	3,436.12	3,649.19
1.12.2003	24.57	3,805.93	3,427.55	3,676.48
2.12.2003	24.94	3,833.38	3,422.09	3,672.56
3.12.2003	25.13	3,813.73	3,436.68	3,700.63
4.12.2003	24.99	3,812.32	3,411.87	3,693.52
5.12.2003	25.22	3,818.93	3,436.49	3,626.78
8.12.2003	25.35	3,841.88	3,405.98	3,634.55
9.12.2003	25.79	3,822.79	3,402.29	3,553.39
10.12.2003	25.68	3,815.81	3,438.88	3,593.33
11.12.2003	25.41	3,847.19	3,449.23	3,638.51
12.12.2003	25.56	3,864.01	3,430.22	3,723.13
15.12.2003	25.75	3,857.66	3,452.32	3,656.87
16.12.2003	25.71	3,876.30	3,456.61	3,613.36
17.12.2003	25.54	3,910.55	3,498.33	3,608.69
18.12.2003	25.80	3,914.18	3,496.24	3,660.02
19.12.2003	25.94	3,919.70	3,509.99	3,700.34
22.12.2003	26.15	3,940.04	3,520.44	3,702.21
23.12.2003	26.21	3,958.13	3,516.04	3,698.62
24.12.2003	26.14	3,958.13	3,516.04	3,701.30
25.12.2003	26.14	3,957.97	3,522.36	3,722.05
26.12.2003	26.11	3,980.23	3,567.17	3,749.95
29.12.2003	26.36	4,009.42	3,566.69	3,811.85
30.12.2003	26.50	4,042.33	3,575.70	3,806.15
31.12.2003	26.76	4,042.33	3,575.70	3,806.15
1.1.2004	26.76	4,077.09	3,568.20	3,816.88
2.1.2004	27.08	4,125.04	3,613.00	3,905.73
5.1.2004	27.45	4,148.13	3,616.95	3,895.26
6.1.2004	27.50	4,110.81	3,624.78	3,881.88
7.1.2004	27.07	4,161.86	3,642.92	3,894.00
8.1.2004	27.00	4,179.77	3,613.07	3,923.77

9.1.2004	27.33	4,160.23	3,629.83	3,923.47
12.1.2004	27.72	4,162.89	3,611.25	3,906.43
13.1.2004	27.93	4,167.34	3,637.37	3,918.90
14.1.2004	28.02	4,141.92	3,641.27	3,868.51
15.1.2004	27.45	4,116.37	3,667.67	3,895.53
16.1.2004	27.19	4,120.01	3,668.96	3,928.81
19.1.2004	27.35	4,162.91	3,668.48	3,948.97
20.1.2004	27.98	4,201.48	3,694.24	3,954.12
21.1.2004	28.32	4,229.97	3,682.54	3,979.08
22.1.2004	28.85	4,214.59	3,674.34	4,001.04
23.1.2004	28.48	4,162.48	3,716.44	3,972.74
26.1.2004	28.11	4,183.80	3,681.08	3,975.54
27.1.2004	28.20	4,198.18	3,630.78	3,953.32
28.1.2004	27.60	4,094.84	3,645.14	3,910.97
29.1.2004	26.98	4,089.99	3,639.27	3,899.63
30.1.2004	27.27	4,103.39	3,652.62	3,906.57
2.2.2004	27.25	4,132.30	3,654.23	3,887.63
3.2.2004	27.26	4,108.59	3,623.04	3,811.32
4.2.2004	27.47	4,129.40	3,628.44	3,824.44
5.2.2004	27.59	4,187.96	3,674.33	3,844.26
6.2.2004	27.71	4,229.20	3,667.01	3,830.77
9.2.2004	28.25	4,236.92	3,685.34	3,832.69
10.2.2004	27.92	4,239.34	3,724.02	3,831.92
11.2.2004	27.97	4,283.10	3,707.45	3,859.27
12.2.2004	28.55	4,262.40	3,688.47	3,893.79
13.2.2004	28.20	4,272.79	3,689.14	3,899.24
16.2.2004	28.14	4,323.95	3,723.02	3,923.48
17.2.2004	28.68	4,326.53	3,706.21	3,899.76
18.2.2004	29.00	4,332.69	3,687.50	3,891.11
19.2.2004	29.22	4,271.92	3,675.96	3,838.06
20.2.2004	29.25	4,272.80	3,666.49	3,888.01
23.2.2004	29.45	4,267.17	3,662.30	3,826.93
24.2.2004	29.36	4,246.47	3,677.29	3,797.58
25.2.2004	29.11	4,211.03	3,684.06	3,811.48
26.2.2004	29.12	4,210.34	3,685.07	3,900.16
27.2.2004	29.59	4,262.14	3,719.92	3,990.41
1.3.2004	30.34	4,236.68	3,696.84	3,976.99
2.3.2004	30.24	4,168.77	3,702.77	3,968.86
3.3.2004	29.82	4,208.25	3,714.91	3,955.48
4.3.2004	29.90	4,272.29	3,725.27	3,986.46
5.3.2004	30.67	4,266.59	3,693.80	3,955.34
8.3.2004	30.84	4,240.55	3,672.60	3,993.03
9.3.2004	30.54	4,171.34	3,617.65	3,962.94
10.3.2004	29.49	4,068.62	3,566.08	3,931.37
11.3.2004	29.23	4,060.40	3,608.78	3,879.56
12.3.2004	29.40	3,995.80	3,556.74	3,942.33
15.3.2004	28.93	4,053.71	3,578.67	3,982.07

16.3.2004	29.58	4,070.14	3,618.27	4,069.27
17.3.2004	29.35	4,064.99	3,613.67	4,146.10
18.3.2004	29.66	4,071.63	3,575.34	4,109.52
19.3.2004	29.70	4,005.78	3,529.44	4,076.96
22.3.2004	29.14	3,995.16	3,524.70	4,087.28
23.3.2004	29.26	3,960.23	3,514.05	4,155.78
24.3.2004	29.10	3,998.75	3,572.40	4,209.47
25.3.2004	28.95	3,982.10	3,569.23	4,286.55
26.3.2004	28.88	4,043.92	3,616.74	4,296.18
29.3.2004	29.43	4,053.57	3,632.56	4,282.69
30.3.2004	28.98	4,080.45	3,628.49	4,348.68
31.3.2004	29.42	4,154.25	3,649.16	4,346.76
1.4.2004	29.54	4,151.64	3,681.12	4,350.91
2.4.2004	29.74	4,132.61	3,709.35	4,373.62
5.4.2004	29.91	4,128.35	3,701.08	4,380.50
6.4.2004	29.83	4,160.22	3,676.30	4,405.90
7.4.2004	30.44	4,157.48	3,672.57	4,393.77
8.4.2004	30.31	4,157.48	3,672.57	4,335.30
9.4.2004	30.31	4,150.17	3,691.21	4,381.34
12.4.2004	30.05	4,127.89	3,639.94	4,373.96
13.4.2004	30.38	4,071.83	3,632.06	4,305.31
14.4.2004	29.98	4,073.81	3,634.40	4,220.17
15.4.2004	30.22	4,133.37	3,652.80	4,235.96
16.4.2004	30.50	4,142.39	3,657.85	4,186.19
19.4.2004	30.35	4,131.41	3,600.68	4,272.41
20.4.2004	30.20	4,077.95	3,618.92	4,226.92
21.4.2004	29.88	4,099.48	3,670.12	4,215.33
22.4.2004	29.66	4,104.23	3,671.31	4,262.77
23.4.2004	29.78	4,130.15	3,657.14	4,282.07
26.4.2004	29.61	4,145.63	3,663.57	4,221.40
27.4.2004	29.72	4,069.93	3,607.96	4,216.92
28.4.2004	29.27	4,071.83	3,581.52	4,201.83
29.4.2004	28.87	4,051.55	3,561.28	4,119.78
30.4.2004	28.68	4,066.41	3,593.69	4,118.15
3.5.2004	28.54	4,127.60	3,604.61	4,142.91
4.5.2004	29.23	4,162.11	3,610.66	4,182.60
5.5.2004	29.89	4,091.64	3,587.24	4,084.25
6.5.2004	29.78	4,038.36	3,536.99	3,963.75
7.5.2004	28.93	3,914.37	3,496.78	3,720.02
10.5.2004	27.72	3,940.82	3,525.39	3,732.92
11.5.2004	27.77	3,931.96	3,531.65	3,851.06
12.5.2004	28.19	3,953.90	3,527.64	3,725.38
13.5.2004	28.45	3,936.89	3,525.04	3,711.63
14.5.2004	28.53	3,926.53	3,488.99	3,603.13
17.5.2004	28.65	3,944.52	3,511.98	3,667.97
18.5.2004	28.38	4,034.94	3,506.38	3,813.95
19.5.2004	28.58	3,974.54	3,508.18	3,779.92

20.5.2004	28.40	4,000.07	3,522.61	3,889.92
21.5.2004	28.68	4,009.95	3,529.08	3,893.62
24.5.2004	28.74	4,035.44	3,585.68	3,852.23
25.5.2004	29.31	4,067.51	3,591.74	3,911.23
26.5.2004	29.63	4,146.52	3,613.03	3,946.19
27.5.2004	30.03	4,115.23	3,609.37	3,990.54
28.5.2004	29.96	4,122.73	3,610.83	3,987.62
31.5.2004	29.96	4,098.63	3,612.02	4,014.29
1.6.2004	30.26	4,134.33	3,624.54	3,984.11
2.6.2004	30.40	4,140.47	3,597.05	3,894.34
3.6.2004	30.13	4,168.73	3,616.40	3,902.35
4.6.2004	30.20	4,221.51	3,673.77	4,054.68
7.6.2004	30.61	4,217.75	3,678.65	4,078.42
8.6.2004	30.66	4,160.41	3,642.70	4,071.62
9.6.2004	30.22	4,166.82	3,658.66	4,097.46
10.6.2004	29.92	4,135.05	3,657.41	4,063.80
11.6.2004	29.77	4,101.84	3,621.59	4,021.30
14.6.2004	29.67	4,130.85	3,644.93	4,029.77
15.6.2004	29.79	4,149.15	3,651.20	4,088.27
16.6.2004	29.70	4,164.17	3,647.98	4,095.69
17.6.2004	29.99	4,200.48	3,657.72	4,057.03
18.6.2004	30.56	4,187.26	3,642.70	4,117.86
21.6.2004	30.34	4,143.01	3,657.89	4,091.90
22.6.2004	30.22	4,156.98	3,688.90	4,092.61
23.6.2004	30.49	4,204.52	3,680.74	4,195.83
24.6.2004	30.86	4,190.35	3,659.28	4,185.30
25.6.2004	31.28	4,235.83	3,657.13	4,221.07
28.6.2004	31.16	4,191.49	3,666.53	4,202.57
29.6.2004	30.90	4,179.83	3,682.93	4,184.01
30.6.2004	30.82	4,165.37	3,647.48	4,213.24
1.7.2004	30.87	4,186.75	3,636.49	4,153.21
2.7.2004	30.70	4,175.05	3,636.37	4,080.21
5.7.2004	30.90	4,154.87	3,607.29	4,063.57
6.7.2004	31.09	4,179.26	3,616.05	4,060.74
7.7.2004	30.85	4,204.49	3,586.97	4,031.83
8.7.2004	30.87	4,197.95	3,600.00	4,083.62
9.7.2004	30.98	4,185.98	3,602.63	4,131.22
12.7.2004	30.92	4,163.70	3,605.11	4,116.13
13.7.2004	30.68	4,179.05	3,594.60	4,065.41
14.7.2004	30.64	4,129.01	3,578.67	4,059.23
15.7.2004	30.62	4,163.01	3,563.61	4,087.65
16.7.2004	30.86	4,134.61	3,564.02	4,104.66
19.7.2004	30.56	4,128.37	3,587.41	4,062.08
20.7.2004	30.35	4,117.79	3,540.08	4,054.01
21.7.2004	30.19	4,070.10	3,550.02	4,033.78
22.7.2004	30.05	4,027.18	3,515.17	3,976.11
23.7.2004	29.73	4,002.64	3,504.66	3,964.67

26.7.2004	29.67	4,008.95	3,535.58	3,901.84
27.7.2004	29.46	4,012.73	3,539.28	3,923.85
28.7.2004	29.74	4,069.96	3,559.14	3,891.33
29.7.2004	30.16	4,065.44	3,563.48	3,965.03
30.7.2004	30.28	4,060.35	3,578.57	3,975.22
2.8.2004	30.44	4,082.76	3,559.72	3,959.78
3.8.2004	30.76	4,050.07	3,555.31	3,899.11
4.8.2004	30.73	4,053.41	3,498.73	3,905.19
5.8.2004	30.51	4,031.43	3,447.21	3,919.42
6.8.2004	30.46	3,996.89	3,450.40	3,886.24
9.8.2004	30.36	4,040.14	3,494.21	3,881.45
10.8.2004	30.64	3,980.34	3,483.23	3,920.36
11.8.2004	30.11	3,980.48	3,442.35	3,904.34
12.8.2004	30.44	4,005.99	3,450.34	3,848.22
13.8.2004	31.07	4,041.64	3,496.60	3,808.92
16.8.2004	31.31	4,042.19	3,505.17	3,850.73
17.8.2004	31.36	4,034.44	3,547.57	3,881.95
18.8.2004	31.07	4,064.23	3,537.92	3,935.29
19.8.2004	31.62	4,043.96	3,562.16	3,943.00
20.8.2004	31.80	4,058.70	3,551.92	3,953.08
23.8.2004	31.70	4,025.78	3,554.17	3,967.21
24.8.2004	31.24	4,030.77	3,582.53	3,989.38
25.8.2004	31.12	4,061.91	3,581.75	4,015.94
26.8.2004	31.14	4,075.21	3,591.07	4,039.11
27.8.2004	31.07	4,070.98	3,562.88	4,025.90
30.8.2004	31.11	4,068.51	3,580.96	4,011.93
31.8.2004	31.11	4,102.09	3,590.65	4,039.73
1.9.2004	31.50	4,112.31	3,628.76	4,050.50
2.9.2004	32.10	4,110.20	3,612.45	3,974.55
3.9.2004	31.98	4,132.02	3,612.92	4,046.80
6.9.2004	31.92	4,129.76	3,638.38	4,079.92
7.9.2004	31.77	4,144.93	3,622.95	4,080.85
8.9.2004	31.79	4,133.51	3,630.87	4,026.11
9.9.2004	32.09	4,191.58	3,647.11	4,020.56
10.9.2004	32.41	4,209.74	3,656.38	4,040.29
13.9.2004	32.18	4,207.99	3,663.87	4,069.30
14.9.2004	32.24	4,155.71	3,637.09	4,005.59
15.9.2004	31.96	4,170.30	3,649.52	4,004.33
16.9.2004	32.18	4,202.74	3,663.50	3,974.93
17.9.2004	32.58	4,182.95	3,646.26	3,980.00
20.9.2004	32.53	4,240.06	3,672.37	3,974.56
21.9.2004	33.04	4,210.33	3,624.18	3,949.30
22.9.2004	33.11	4,198.43	3,608.73	3,957.18
23.9.2004	33.57	4,200.85	3,614.27	3,900.50
24.9.2004	33.67	4,184.02	3,591.90	3,876.46
27.9.2004	33.95	4,208.80	3,614.11	3,855.43
28.9.2004	34.35	4,225.05	3,630.72	3,867.49

29.9.2004	34.13	4,231.78	3,631.36	3,939.31
30.9.2004	34.43	4,297.14	3,686.57	3,978.73
1.10.2004	35.24	4,292.57	3,698.28	4,036.89
4.10.2004	35.34	4,312.79	3,697.08	4,039.05
5.10.2004	35.61	4,308.04	3,723.25	4,059.35
6.10.2004	35.60	4,300.48	3,686.90	4,041.03
7.10.2004	36.09	4,326.44	3,662.05	4,086.12
8.10.2004	36.28	4,311.79	3,668.71	4,102.89
11.10.2004	36.27	4,251.74	3,659.84	4,037.54
12.10.2004	35.66	4,250.47	3,633.47	4,021.15
13.10.2004	35.23	4,263.80	3,604.19	3,987.33
14.10.2004	35.22	4,285.91	3,618.98	3,990.49
15.10.2004	35.05	4,286.22	3,637.23	3,970.24
18.10.2004	35.38	4,327.74	3,603.07	4,021.66
19.10.2004	35.42	4,315.41	3,607.91	3,978.26
20.10.2004	35.19	4,341.07	3,618.02	3,977.27
21.10.2004	35.86	4,346.67	3,583.47	3,993.58
22.10.2004	36.24	4,323.90	3,581.25	3,966.52
25.10.2004	35.93	4,334.91	3,632.98	3,965.52
26.10.2004	35.51	4,385.70	3,677.19	3,980.92
27.10.2004	35.78	4,401.89	3,684.60	4,052.46
28.10.2004	35.31	4,384.75	3,695.68	4,031.74
29.10.2004	35.31	4,429.97	3,695.95	4,012.21
1.11.2004	35.67	4,454.80	3,694.87	4,071.58
2.11.2004	35.34	4,506.88	3,737.65	4,079.29
3.11.2004	36.00	4,522.89	3,795.92	4,106.49
4.11.2004	36.17	4,558.25	3,810.44	4,156.01
5.11.2004	36.49	4,567.67	3,806.51	4,132.07
8.11.2004	36.52	4,552.21	3,804.39	4,115.99
9.11.2004	36.48	4,564.37	3,801.26	4,079.17
10.11.2004	36.28	4,599.18	3,834.79	4,052.13
11.11.2004	36.48	4,628.65	3,870.69	4,139.67
12.11.2004	36.86	4,626.16	3,869.31	4,210.65
15.11.2004	37.06	4,609.08	3,846.66	4,203.67
16.11.2004	37.05	4,667.00	3,868.98	4,228.57
17.11.2004	37.40	4,654.83	3,871.19	4,211.13
18.11.2004	37.63	4,643.35	3,831.63	4,259.78
19.11.2004	38.08	4,614.17	3,856.41	4,176.53
22.11.2004	37.87	4,636.85	3,854.70	4,171.22
23.11.2004	38.56	4,660.58	3,871.29	4,200.97
24.11.2004	39.02	4,722.08	3,872.86	4,227.43
25.11.2004	39.63	4,721.63	3,876.59	4,209.01
26.11.2004	39.74	4,725.80	3,864.36	4,262.91
29.11.2004	40.20	4,707.43	3,847.68	4,235.50
30.11.2004	40.02	4,767.33	3,904.80	4,193.59
1.12.2004	40.06	4,774.26	3,899.69	4,251.50
2.12.2004	38.94	4,799.24	3,900.59	4,296.12

3.12.2004	38.90	4,796.55	3,897.85	4,262.71
6.12.2004	39.36	4,814.75	3,853.13	4,220.91
7.12.2004	39.74	4,748.24	3,869.58	4,173.71
8.12.2004	38.21	4,710.42	3,890.03	4,118.55
9.12.2004	38.29	4,716.28	3,884.96	4,081.25
10.12.2004	38.45	4,778.89	3,918.01	4,124.93
13.12.2004	38.52	4,779.42	3,933.52	4,146.93
14.12.2004	38.60	4,825.85	3,945.76	4,209.69
15.12.2004	39.24	4,794.67	3,935.68	4,199.28
16.12.2004	39.36	4,745.79	3,909.96	4,231.70
17.12.2004	38.86	4,822.87	3,913.33	4,245.42
20.12.2004	39.87	4,797.64	3,949.07	4,240.40
21.12.2004	39.99	4,828.66	3,962.59	4,276.01
22.12.2004	40.04	4,871.71	3,964.94	4,296.27
23.12.2004	40.44	4,889.93	3,967.51	4,340.56
24.12.2004	40.52	4,912.04	3,952.62	4,358.51
27.12.2004	40.96	4,909.86	3,979.84	4,376.61
28.12.2004	40.57	4,903.20	3,979.72	4,337.38
29.12.2004	40.55	4,918.69	3,983.36	4,417.26
30.12.2004	40.88	4,906.92	3,979.30	4,441.56
31.12.2004	40.88	4,888.25	3,944.75	4,425.27
3.1.2005	40.72	4,845.12	3,897.35	4,376.03
4.1.2005	39.61	4,806.85	3,880.14	4,352.76
5.1.2005	39.13	4,792.78	3,893.22	4,321.51
6.1.2005	39.09	4,778.59	3,887.25	4,311.81
7.1.2005	39.18	4,795.24	3,902.57	4,326.41
10.1.2005	39.75	4,779.46	3,880.67	4,384.01
11.1.2005	39.88	4,791.22	3,899.81	4,407.56
12.1.2005	40.14	4,780.03	3,867.37	4,378.47
13.1.2005	40.32	4,764.82	3,888.46	4,385.73
14.1.2005	40.24	4,779.52	3,888.71	4,417.30
17.1.2005	40.70	4,762.16	3,924.40	4,378.39
18.1.2005	40.77	4,774.84	3,887.69	4,379.80
19.1.2005	40.65	4,725.27	3,859.11	4,309.82
20.1.2005	39.77	4,737.70	3,836.98	4,298.95
21.1.2005	40.22	4,751.60	3,824.95	4,335.65
24.1.2005	40.34	4,750.89	3,836.37	4,283.17
25.1.2005	40.35	4,796.16	3,857.73	4,358.49
26.1.2005	40.42	4,804.11	3,857.12	4,329.72
27.1.2005	40.46	4,775.70	3,845.49	4,318.42
28.1.2005	40.23	4,816.48	3,877.66	4,338.88
31.1.2005	40.23	4,845.25	3,903.47	4,313.53
1.2.2005	40.59	4,870.54	3,916.82	4,332.59
2.2.2005	41.27	4,838.37	3,905.97	4,291.41
3.2.2005	40.92	4,880.73	3,948.78	4,318.66
4.2.2005	41.22	4,864.70	3,943.65	4,321.93
7.2.2005	41.07	4,848.99	3,948.09	4,277.87

8.2.2005	40.35	4,850.90	3,917.01	4,286.74
9.2.2005	40.45	4,885.45	3,936.40	4,311.60
10.2.2005	40.71	4,923.43	3,964.56	4,309.06
11.2.2005	41.12	4,964.53	3,969.42	4,364.21
14.2.2005	41.56	4,986.01	3,980.90	4,380.89
15.2.2005	41.84	4,965.11	3,982.19	4,344.77
16.2.2005	41.80	5,000.26	3,954.17	4,329.27
17.2.2005	42.44	5,006.88	3,958.48	4,345.59
18.2.2005	42.63	5,003.75	3,958.37	4,356.82
21.2.2005	42.88	5,026.17	3,903.12	4,388.60
22.2.2005	43.29	4,989.57	3,922.80	4,316.79
23.2.2005	43.24	4,991.76	3,952.32	4,319.88
24.2.2005	43.74	5,043.53	3,992.22	4,362.40
25.2.2005	44.02	5,058.08	3,967.29	4,430.18
28.2.2005	44.94	5,061.93	3,987.24	4,428.11
1.3.2005	44.67	5,034.83	3,989.68	4,429.14
2.3.2005	43.98	5,040.83	3,990.54	4,435.87
3.3.2005	44.52	5,121.21	4,031.81	4,460.70
4.3.2005	45.46	5,096.35	4,042.11	4,458.45
7.3.2005	45.42	5,127.35	4,028.14	4,475.13
8.3.2005	45.80	5,104.94	3,987.94	4,521.40
9.3.2005	45.76	5,081.10	3,992.76	4,488.09
10.3.2005	45.41	5,111.14	3,966.31	4,507.80
11.3.2005	45.77	5,070.43	3,990.18	4,450.14
14.3.2005	45.36	5,090.42	3,962.41	4,459.18
15.3.2005	45.28	5,071.15	3,931.33	4,491.83
16.3.2005	45.25	5,053.11	3,939.71	4,449.36
17.3.2005	46.12	5,029.43	3,936.70	4,469.34
18.3.2005	45.80	4,978.74	3,917.34	4,463.73
21.3.2005	45.39	4,997.39	3,881.55	4,462.48
22.3.2005	45.09	4,909.10	3,878.92	4,398.98
23.3.2005	43.74	4,920.73	3,876.35	4,358.78
24.3.2005	43.45	4,920.73	3,876.35	4,378.22
25.3.2005	43.45	4,895.01	3,883.24	4,381.64
28.3.2005	43.11	4,914.77	3,856.92	4,298.04
29.3.2005	43.10	4,919.47	3,908.68	4,283.80
30.3.2005	42.93	4,932.26	3,910.42	4,338.66
31.3.2005	43.46	4,942.46	3,886.40	4,341.17
1.4.2005	43.85	4,870.01	3,894.19	4,297.47
4.4.2005	44.00	4,915.65	3,910.66	4,318.53
5.4.2005	44.12	4,939.36	3,920.76	4,335.27
6.4.2005	44.33	4,976.44	3,943.17	4,351.21
7.4.2005	44.97	4,966.24	3,910.07	4,355.18
8.4.2005	44.76	4,999.53	3,909.32	4,345.89
11.4.2005	44.73	4,953.81	3,929.63	4,295.89
12.4.2005	44.70	4,982.68	3,883.54	4,320.95
13.4.2005	44.49	4,937.25	3,844.26	4,264.72

14.4.2005	43.85	4,908.72	3,783.47	4,229.47
15.4.2005	43.52	4,854.69	3,794.10	4,092.34
18.4.2005	42.54	4,897.66	3,818.92	4,159.01
19.4.2005	43.03	4,886.24	3,771.71	4,181.21
20.4.2005	43.40	4,895.37	3,842.47	4,151.87
21.4.2005	43.77	4,926.66	3,817.93	4,210.99
22.4.2005	44.14	4,911.06	3,849.02	4,229.94
25.4.2005	44.22	4,885.97	3,817.23	4,210.82
26.4.2005	43.58	4,825.84	3,829.72	4,211.81
27.4.2005	42.62	4,805.74	3,787.60	4,213.63
28.4.2005	41.76	4,815.04	3,831.95	4,251.46
29.4.2005	42.13	4,805.74	3,850.22	4,248.12
2.5.2005	42.03	4,845.35	3,846.50	4,248.97
3.5.2005	42.52	4,898.30	3,896.53	4,282.69
4.5.2005	42.71	4,920.21	3,888.21	4,279.36
5.5.2005	42.66	4,907.94	3,885.69	4,335.95
6.5.2005	43.37	4,883.66	3,911.00	4,303.51
9.5.2005	43.57	4,868.05	3,871.60	4,295.70
10.5.2005	43.74	4,837.05	3,884.81	4,276.53
11.5.2005	43.69	4,829.55	3,846.49	4,229.19
12.5.2005	43.22	4,806.68	3,827.50	4,193.56
13.5.2005	42.24	4,777.54	3,864.14	4,158.19
16.5.2005	42.12	4,787.69	3,891.66	4,125.03
17.5.2005	42.14	4,847.27	3,930.98	4,114.28
18.5.2005	42.60	4,864.56	3,950.23	4,176.02
19.5.2005	42.68	4,840.70	3,944.49	4,152.36
20.5.2005	42.68	4,878.93	3,960.10	4,197.17
23.5.2005	42.73	4,878.28	3,961.55	4,203.00
24.5.2005	43.10	4,880.03	3,947.10	4,156.64
25.5.2005	43.40	4,886.55	3,972.69	4,140.64
26.5.2005	44.15	4,891.80	3,978.76	4,177.28
27.5.2005	44.38	4,890.28	3,980.94	4,213.48
30.5.2005	44.41	4,838.96	3,955.08	4,218.60
31.5.2005	43.91	4,873.25	3,992.67	4,217.30
1.6.2005	44.27	4,880.93	3,999.44	4,214.56
2.6.2005	44.52	4,867.22	3,975.32	4,239.01
3.6.2005	44.63	4,855.12	3,980.53	4,261.86
6.6.2005	44.99	4,908.11	3,978.87	4,246.31
7.6.2005	45.13	4,921.38	3,972.55	4,265.85
8.6.2005	45.62	4,868.09	3,992.17	4,200.79
9.6.2005	45.26	4,869.32	3,984.88	4,209.30
10.6.2005	45.96	4,854.55	3,994.29	4,171.07
13.6.2005	45.41	4,864.53	4,003.22	4,184.03
14.6.2005	45.79	4,871.27	4,015.19	4,207.92
15.6.2005	45.85	4,887.06	4,032.82	4,221.48
16.6.2005	46.24	4,953.12	4,051.13	4,267.39
17.6.2005	46.92	4,916.99	4,051.00	4,241.17

20.6.2005	46.91	4,939.77	4,041.62	4,273.12
21.6.2005	46.92	4,945.47	4,044.56	4,278.39
22.6.2005	46.64	4,933.00	4,003.67	4,284.19
23.6.2005	46.51	4,907.14	3,975.67	4,264.25
24.6.2005	47.14	4,889.89	3,974.13	4,223.66
27.6.2005	47.06	4,897.99	4,010.17	4,233.51
28.6.2005	47.40	4,908.43	4,005.73	4,239.23
29.6.2005	47.74	4,907.61	3,977.29	4,228.34
30.6.2005	48.05	4,890.69	3,985.03	4,212.42
1.7.2005	48.12	4,877.85	3,985.60	4,227.26
4.7.2005	48.70	4,868.02	4,020.99	4,215.67
5.7.2005	48.47	4,906.28	3,994.68	4,212.13
6.7.2005	49.40	4,826.42	4,005.26	4,194.17
7.7.2005	48.56	4,885.25	4,053.00	4,177.98
8.7.2005	50.07	4,966.99	4,078.63	4,219.49
11.7.2005	50.28	5,000.61	4,089.03	4,253.62
12.7.2005	50.51	4,985.71	4,091.28	4,210.94
13.7.2005	50.32	5,013.41	4,097.63	4,238.64
14.7.2005	50.21	4,978.86	4,102.03	4,244.07
15.7.2005	49.23	4,973.37	4,081.58	4,263.80
18.7.2005	48.87	4,964.22	4,111.34	4,219.24
19.7.2005	48.51	4,960.58	4,130.56	4,213.67
20.7.2005	48.56	5,009.83	4,104.51	4,313.38
21.7.2005	48.92	5,010.08	4,126.59	4,282.70
22.7.2005	49.61	5,011.83	4,109.80	4,261.90
25.7.2005	50.29	4,997.56	4,115.76	4,235.51
26.7.2005	50.20	5,019.38	4,135.73	4,265.05
27.7.2005	50.04	5,061.49	4,158.89	4,271.47
28.7.2005	50.39	5,086.80	4,130.60	4,295.27
29.7.2005	51.41	5,118.71	4,137.42	4,315.65
1.8.2005	51.82	5,158.53	4,169.79	4,343.53
2.8.2005	52.52	5,202.03	4,171.19	4,364.03
3.8.2005	53.49	5,184.86	4,143.68	4,332.74
4.8.2005	53.14	5,152.32	4,108.42	4,260.93
5.8.2005	52.64	5,195.41	4,098.57	4,279.96
8.8.2005	53.44	5,219.49	4,123.34	4,308.29
9.8.2005	53.91	5,283.90	4,120.49	4,433.17
10.8.2005	54.14	5,292.72	4,151.64	4,508.64
11.8.2005	54.88	5,277.69	4,130.98	4,531.99
12.8.2005	54.83	5,248.02	4,140.02	4,540.68
15.8.2005	54.37	5,219.31	4,092.72	4,560.13
16.8.2005	53.42	5,199.83	4,093.78	4,539.82
17.8.2005	53.13	5,126.88	4,084.55	4,511.71
18.8.2005	52.49	5,163.22	4,090.82	4,495.32
19.8.2005	52.92	5,203.37	4,099.80	4,597.44
22.8.2005	54.12	5,160.28	4,088.17	4,589.97
23.8.2005	54.19	5,156.45	4,065.55	4,588.99

24.8.2005	54.00	5,135.87	4,076.88	4,575.52
25.8.2005	54.35	5,120.37	4,050.86	4,607.11
26.8.2005	54.59	5,109.14	4,076.08	4,522.10
29.8.2005	54.83	5,076.18	4,065.32	4,543.60
30.8.2005	54.60	5,163.78	4,108.38	4,550.34
31.8.2005	56.00	5,271.75	4,115.14	4,619.79
1.9.2005	57.85	5,301.76	4,102.67	4,655.80
2.9.2005	58.02	5,317.72	4,102.36	4,704.10
5.9.2005	57.41	5,346.44	4,151.25	4,668.79
6.9.2005	57.83	5,351.41	4,162.49	4,653.75
7.9.2005	57.56	5,330.93	4,147.18	4,617.67
8.9.2005	56.91	5,354.98	4,182.71	4,701.75
9.9.2005	57.41	5,305.67	4,178.59	4,752.46
12.9.2005	57.14	5,266.01	4,150.74	4,729.41
13.9.2005	56.43	5,296.82	4,139.37	4,743.32
14.9.2005	56.93	5,262.99	4,140.90	4,780.27
15.9.2005	57.16	5,293.50	4,174.15	4,743.21
16.9.2005	57.20	5,277.52	4,156.49	4,744.87
19.9.2005	57.67	5,293.31	4,125.49	4,822.04
20.9.2005	58.09	5,263.57	4,091.16	4,852.27
21.9.2005	58.43	5,211.18	4,103.10	4,826.96
22.9.2005	58.38	5,202.01	4,105.51	4,801.52
23.9.2005	57.30	5,247.87	4,110.02	4,894.24
26.9.2005	56.40	5,219.61	4,109.43	4,845.18
27.9.2005	56.39	5,266.01	4,111.62	4,934.99
28.9.2005	56.96	5,250.56	4,147.38	5,043.28
29.9.2005	57.43	5,289.23	4,156.46	4,984.47
30.9.2005	57.17	5,265.87	4,152.98	4,942.37
3.10.2005	56.72	5,290.79	4,108.54	4,982.28
4.10.2005	56.32	5,243.28	4,044.97	4,955.23
5.10.2005	55.55	5,248.19	4,023.86	4,834.98
6.10.2005	53.74	5,217.16	4,041.04	4,828.94
7.10.2005	53.55	5,200.45	4,014.03	4,814.08
10.10.2005	53.36	5,190.06	4,006.10	4,920.90
11.10.2005	53.86	5,166.63	3,979.18	4,907.16
12.10.2005	54.05	5,073.61	3,972.98	4,888.04
13.10.2005	51.31	5,141.25	4,005.05	4,887.76
14.10.2005	51.21	5,122.72	4,019.65	4,842.88
17.10.2005	51.74	5,069.06	3,974.89	4,808.57
18.10.2005	49.71	5,007.36	4,034.97	4,763.93
19.10.2005	48.35	5,026.94	3,974.05	4,777.93
20.10.2005	49.95	5,017.81	3,984.59	4,776.46
21.10.2005	49.63	5,062.14	4,048.40	4,754.62
24.10.2005	50.61	5,097.67	4,041.24	4,833.78
25.10.2005	51.23	5,108.89	4,022.96	4,833.84
26.10.2005	52.23	5,070.57	3,981.91	4,897.26
27.10.2005	51.88	5,059.40	4,043.61	4,852.14

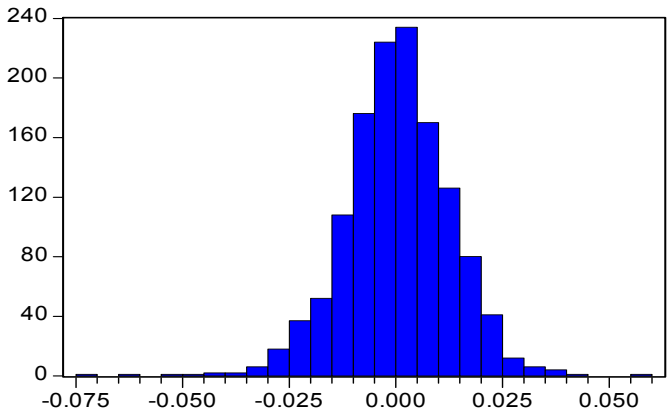
28.10.2005	51.14	5,123.14	4,073.62	4,902.96
31.10.2005	52.56	5,130.23	4,061.01	4,987.53
1.11.2005	52.12	5,185.24	4,107.39	4,992.54
2.11.2005	52.76	5,236.64	4,128.97	4,981.54
3.11.2005	54.33	5,147.84	4,130.69	5,006.58
4.11.2005	53.37	5,160.53	4,136.57	5,025.04
7.11.2005	53.10	5,147.56	4,122.65	5,046.70
8.11.2005	52.58	5,132.88	4,130.01	5,020.48
9.11.2005	53.00	5,139.96	4,161.40	4,987.14
10.11.2005	52.53	5,174.90	4,175.94	5,019.10
11.11.2005	51.72	5,174.29	4,173.13	4,940.85
14.11.2005	52.05	5,145.70	4,157.79	4,910.00
15.11.2005	51.40	5,101.68	4,169.23	4,946.59
16.11.2005	50.67	5,153.05	4,209.19	5,052.16
17.11.2005	51.74	5,176.11	4,225.58	5,102.99
18.11.2005	51.58	5,206.23	4,251.68	5,124.23
21.11.2005	51.85	5,201.18	4,275.77	5,094.05
22.11.2005	52.87	5,257.81	4,292.45	5,121.83
23.11.2005	52.86	5,244.60	4,296.15	5,098.43
24.11.2005	52.54	5,235.40	4,303.92	5,098.39
25.11.2005	52.97	5,226.40	4,267.17	5,165.06
28.11.2005	52.75	5,224.73	4,267.56	5,143.75
29.11.2005	52.39	5,210.85	4,241.62	5,107.81
30.11.2005	52.49	5,260.77	4,294.96	5,149.65
1.12.2005	53.02	5,291.62	4,298.55	5,219.04
2.12.2005	53.92	5,301.56	4,289.02	5,243.32
5.12.2005	54.79	5,337.58	4,295.83	5,217.64
6.12.2005	54.55	5,309.17	4,276.91	5,250.86
7.12.2005	55.25	5,359.25	4,274.96	5,168.49
8.12.2005	55.35	5,360.11	4,284.95	5,241.95
9.12.2005	55.75	5,412.95	4,291.11	5,342.82
12.12.2005	56.15	5,411.01	4,315.60	5,368.67
13.12.2005	56.55	5,439.17	4,331.25	5,413.33
14.12.2005	57.10	5,390.15	4,323.66	5,369.71
15.12.2005	55.90	5,452.24	4,313.33	5,390.70
16.12.2005	55.40	5,440.62	4,286.80	5,415.24
19.12.2005	54.46	5,411.77	4,285.34	5,453.08
20.12.2005	54.47	5,405.34	4,296.73	5,502.12
21.12.2005	54.26	5,418.12	4,315.78	5,543.52
22.12.2005	54.90	5,421.23	4,318.20	5,559.22
23.12.2005	54.92	5,421.23	4,318.20	5,588.75
26.12.2005	54.92	5,433.72	4,278.10	5,519.34
27.12.2005	55.12	5,450.58	4,287.35	5,558.45
28.12.2005	55.56	5,448.89	4,275.90	5,568.75
29.12.2005	55.61	5,394.29	4,255.25	5,514.60
30.12.2005	55.64	5,413.90	4,255.25	5,514.60
2.1.2006	55.78	5,532.51	4,328.31	5,577.53

3.1.2006	57.48	5,637.71	4,347.54	5,675.33
4.1.2006	58.59	5,621.38	4,345.78	5,733.35
5.1.2006	58.55	5,684.71	4,388.45	5,786.45
6.1.2006	59.29	5,660.78	4,401.33	5,806.87
9.1.2006	59.10	5,624.10	4,403.13	5,711.24
10.1.2006	58.22	5,668.68	4,418.88	5,766.48
11.1.2006	57.90	5,660.57	4,390.53	5,811.08
12.1.2006	58.26	5,645.04	4,395.74	5,789.48
13.1.2006	58.15	5,676.70	4,399.30	5,715.04
16.1.2006	58.86	5,608.74	4,381.78	5,561.60
17.1.2006	58.18	5,576.80	4,360.32	5,429.39
18.1.2006	57.12	5,613.97	4,387.40	5,569.36
19.1.2006	58.53	5,568.66	4,311.79	5,585.23
20.1.2006	59.64	5,642.51	4,324.51	5,508.04
23.1.2006	60.06	5,626.29	4,334.33	5,576.14
24.1.2006	60.70	5,682.83	4,326.49	5,542.71
25.1.2006	60.82	5,730.33	4,357.91	5,605.83
26.1.2006	60.71	5,744.79	4,391.97	5,731.62
27.1.2006	61.37	5,719.67	4,400.22	5,743.57
30.1.2006	61.66	5,747.29	4,387.52	5,794.92
31.1.2006	61.63	5,787.07	4,393.80	5,711.11
1.2.2006	62.29	5,728.40	4,355.74	5,736.51
2.2.2006	62.07	5,688.68	4,333.36	5,683.96
3.2.2006	61.00	5,684.69	4,341.21	5,709.20
6.2.2006	61.93	5,651.88	4,300.04	5,737.83
7.2.2006	60.69	5,644.61	4,332.26	5,580.81
8.2.2006	60.11	5,710.93	4,326.69	5,622.27
9.2.2006	60.93	5,669.90	4,333.72	5,596.46
10.2.2006	60.24	5,695.21	4,314.99	5,477.42
13.2.2006	59.11	5,669.39	4,357.66	5,556.70
14.2.2006	57.78	5,689.18	4,371.72	5,517.31
15.2.2006	58.97	5,713.26	4,404.53	5,541.11
16.2.2006	59.35	5,745.83	4,400.76	5,443.11
17.2.2006	60.51	5,772.37	4,404.00	5,365.40
20.2.2006	61.61	5,768.17	4,390.12	5,456.70
21.2.2006	61.90	5,791.19	4,419.58	5,453.80
22.2.2006	60.89	5,800.47	4,404.08	5,616.59
23.2.2006	61.72	5,792.75	4,412.21	5,648.33
24.2.2006	62.31	5,802.62	4,428.91	5,735.76
27.2.2006	62.22	5,752.41	4,386.46	5,755.50
28.2.2006	61.68	5,810.59	4,424.56	5,669.44
1.3.2006	62.72	5,782.87	4,423.06	5,658.13
2.3.2006	63.28	5,797.56	4,417.73	5,578.86
3.3.2006	64.42	5,828.33	4,385.81	5,579.75
6.3.2006	64.16	5,739.28	4,373.11	5,534.50
7.3.2006	62.88	5,718.37	4,376.78	5,493.99
8.3.2006	62.10	5,764.93	4,355.09	5,609.10

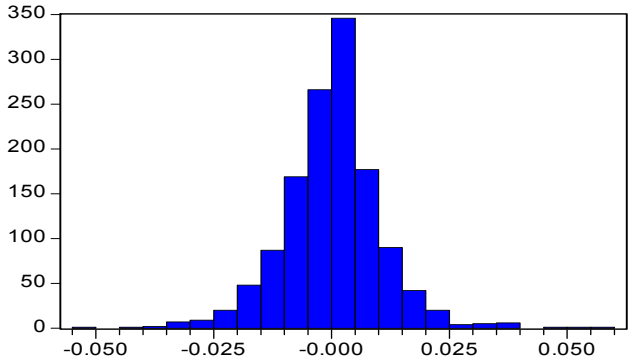
9.3.2006	62.34	5,789.97	4,384.55	5,560.30
10.3.2006	62.33	5,855.17	4,395.20	5,643.11
13.3.2006	63.06	5,909.77	4,442.15	5,682.55
14.3.2006	63.82	5,930.67	4,463.28	5,689.57
15.3.2006	64.23	5,992.51	4,470.19	5,644.16
16.3.2006	65.09	6,004.44	4,473.81	5,747.55
17.3.2006	65.94	6,017.96	4,464.66	5,821.28
20.3.2006	66.19	5,983.54	4,439.35	5,784.96
21.3.2006	64.83	6,003.79	4,463.65	5,775.72
22.3.2006	65.63	5,946.46	4,455.03	5,720.47
23.3.2006	65.67	5,992.20	4,463.73	5,751.66
24.3.2006	66.59	5,953.97	4,456.47	5,821.66
27.3.2006	67.08	5,946.14	4,430.22	5,834.83
28.3.2006	67.67	5,919.94	4,466.59	5,831.94
29.3.2006	67.83	6,036.13	4,462.43	5,921.04
30.3.2006	69.34	5,978.67	4,443.52	5,898.48
31.3.2006	68.92	6,033.19	4,452.62	5,982.85
3.4.2006	70.11	6,075.54	4,478.72	5,988.57
4.4.2006	69.97	6,102.64	4,501.24	5,980.00
5.4.2006	70.52	6,099.08	4,497.19	6,083.06
6.4.2006	71.40	6,018.86	4,454.51	6,094.78
7.4.2006	70.48	6,044.86	4,458.32	6,055.49
10.4.2006	71.66	5,989.14	4,424.52	6,022.02
11.4.2006	71.78	5,970.76	4,427.44	5,942.16
12.4.2006	70.76	5,983.70	4,431.97	5,949.61
13.4.2006	70.53	5,983.70	4,431.97	5,952.15
14.4.2006	70.53	6,072.52	4,423.44	5,916.69
17.4.2006	71.69	6,075.47	4,497.96	5,986.77
18.4.2006	73.11	6,171.99	4,508.94	6,009.54
19.4.2006	74.38	6,178.44	4,508.35	6,035.17
20.4.2006	75.70	6,236.88	4,510.06	6,096.36
21.4.2006	75.66	6,221.84	4,498.64	6,046.54
24.4.2006	76.52	6,236.77	4,481.10	6,069.64
25.4.2006	76.16	6,271.85	4,493.71	6,077.21
26.4.2006	77.36	6,287.63	4,508.45	6,140.98
27.4.2006	75.63	6,290.60	4,512.36	6,085.73
28.4.2006	76.01	6,318.60	4,496.79	6,151.01
1.5.2006	76.20	6,382.80	4,523.66	6,215.55
2.5.2006	77.58	6,317.02	4,505.72	6,200.56
3.5.2006	78.12	6,389.47	4,519.68	6,202.86
4.5.2006	79.49	6,480.33	4,568.08	6,263.03
5.5.2006	79.67	6,474.63	4,565.22	6,375.09
8.5.2006	78.61	6,526.39	4,570.11	6,363.48
9.5.2006	79.58	6,515.11	4,563.90	6,317.21
10.5.2006	80.37	6,505.51	4,506.70	6,265.76
11.5.2006	81.01	6,404.68	4,454.22	6,195.45
12.5.2006	79.47	6,291.21	4,457.43	6,167.66

15.5.2006	74.46	6,312.26	4,450.22	6,051.14
16.5.2006	74.26	6,107.83	4,376.94	6,118.34
17.5.2006	74.09			5,973.75

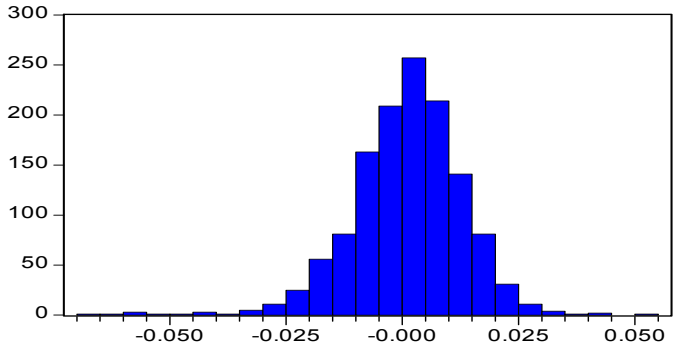
Appendix B Distribution of returns



Series: MSCI_FAR_EAST	
Sample 1 1304	
Observations 1304	
Mean	0.000268
Median	0.000370
Maximum	0.055131
Minimum	-0.072639
Std. Dev.	0.012523
Skewness	-0.307786
Kurtosis	4.973236
Jarque-Bera	232.1439
Probability	0.000000



Series: MSCI_NORTH_AMERICA	
Sample 1 1304	
Observations 1303	
Mean	7.65e-05
Median	0.000325
Maximum	0.055473
Minimum	-0.050160
Std. Dev.	0.010467
Skewness	0.155690
Kurtosis	5.953298
Jarque-Bera	478.7942
Probability	0.000000



Series: TOT_OSLO	
Sample 1 1304	
Observations 1304	
Mean	0.000980
Median	0.001375
Maximum	0.051082
Minimum	-0.065118
Std. Dev.	0.012029
Skewness	-0.723826
Kurtosis	6.257155
Jarque-Bera	690.2914
Probability	0.000000

Appendix C Credit spread

Source: Lecture notes Corporate finance (fall 2004) Thore Johnsen

Credit-spread vs default history

(S&P, Moody's, Pareto Sec)

	% yearly default*	% yield spread over Treasury			
		1990 - 98	<11.sep.01	8.okt.01	aug.03
AAA	**0,000**	0,6	0,5	0,5	**0,75**
AA	**0,005**	0,7	0,8	1,0	**1,0**
A	**0,01**	0,9	1,4	1,6	**1,8**
BBB	**0,16**	1,3	2,0	2,3	**2,3**
BB	**1,5**	3,0	4,3	5,9	**3,0**
B	**7,1**	5,4	7,2	9,4	**4,8-8,0**
CCC	**26,2**		20	23	**10**

* % of outstanding amount; avg. 1980-98

Rating classes for bonds

S & P	Moody's	Explanation
'Investment Grade'		
AAA	**Aaa**	'Prime', 'Gilt edge': maximum proctection
AA	**Aa**	'High grade': very strong ability to pay
A	**A**	'Upper medium grade': strong ability to pay
BBB	**Baa**	'Lower medium grade': sufficient ability to pay
'Speculative Grade' ('high-yield', 'junk')		
BB	**Ba**	'Low grade': speculative characteristics
B	**B**	'Highly speculative': may have payment
CCC, CC, C	**Caa, Ca, C**	Default is likely, or has occurred
D	**D**	Default

- Within each class, use **+/-** (S&P) or **1-2-3** (Moody's) for finer grading

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