Annex:

Maturity and risk

In the guidelines for central government debt management for 2006, the Government requests an analysis of the prerequisites for a comprehensive maturity measure for the whole of the central government debt. A comprehensive maturity measure is intended to provide a holistic view of the trade-off between the expected cost and risk. A benchmark for the maturity of the whole debt increases the ability to balance increased risk-taking in one type of debt with a reduction of risk in another debt component.

In this memorandum, we analyse the risk/maturity aspect by quantifying the risk that central government debt is associated with for different choices of maturity. The aim is for the results to be able to provide guidance in the choice of the comprehensive maturity of central government debt. The appropriate choice of maturity for the aggregate central government debt depends on the state's cost and risk preferences. The goal for central government debt management is to minimise the long-term costs while taking into account the risk inherent in its management. The task of managing the central government debt can thus be described as a cost minimisation problem which is limited by the restriction on risk specified by the Government.

To analyse the risk in central government debt, we must have a clear definition of what is to be regarded as cost. Costs are defined in the Government Bill 1997/98:154 as the periodised interest expenditure. According to the guidelines for central government debt management, the costs of central government debt shall be measured in terms of the average running yield. The average running yield is a measure of the periodised interest expenditure in relation to the size of the debt. However, this definition is focused on the nominal krona debt. To quantify the risk associated with the inflation-linked and the foreign currency debt, and thus enable a calculation of the total risk in the debt, we must also take into account the effect of inflation and exchange rate changes.

In order to study the risk that different borrowing strategies give rise to, we have developed a simulation model. In this model, we simulate the dynamics of interest rates (for the krona debt as well as for the foreign currency debt), inflation and the exchange rate. We then calculate the nominal cost per debt unit for the various types of debt and produce a Running Yield at Risk (RYaR) for different borrowing strategies. RYaR is determined as the difference between the expected cost and the cost that we will not exceed with a 95 per cent probability in a particular year. More exactly, we define our risk measure as the difference between the median and the 95-per cent percentile in our simulated cost distribution.

The results show that the risk decreases with the maturity of the debt. The risk reduction decreases, however, quickly when the maturity is extended. The results also show that the risk depends on our time perspective. With an average maturity of three years, RYaR is 1.2 percentage points in one year's time and 1.7 percentage points in five year's time. Expressed in kronor, i.e. Cost at Risk, this corresponds to a risk of SEK 15 and 22 billon respectively.

1 Risk control

The risk we are interested in controlling is that the average running yield, adjusted for inflation and exchange rate changes, does not become too high. In order to do this, the Government specifies benchmarks for the maturity and composition of debt.

Alternatively, the Government could specify an acceptable risk, for instance, in terms of RYaR. The task of the Debt Office would then be to choose the debt composition and maturity that minimises cost given that the volatility in the cost (i.e. the risk) does not exceed that specified by the Government.

To study the risk contributed by the different types of debt, we make the following categorisation:

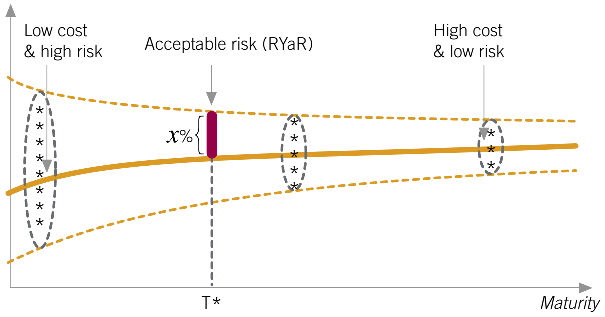
- RYaR in *the inflation-linked* krona debt depends on the volatility in the real interest rate and in inflation and on the average maturity.
- RYaR in *the nominal krona debt* depends on the volatility in the nominal interest rate and on the average maturity.
- RYaR in *the foreign currency debt* depends on the volatility in the foreign interest rate and in the exchange rate and on the average maturity.

1.1 Link between RYaR and maturity

A borrowing policy with short maturity generally gives rise to a more volatile average running yield than a borrowing policy with long maturity. This is because short-term loans need to be renewed often which increases exposure to interest rate fluctuations.

However, yield curves generally have a positive slope. This means that it is cheaper to borrow on short maturities than long. If we reduce short-term borrowing in favour of long-term borrowing, the expected costs thus increase. The choice of maturity is consequently a trade-off between low cost and high volatility for short-term borrowing and high cost and low volatility for long-term borrowing. Figure 1 shows a stylised picture of this relationship. The oval markings symbolise the spread of the average running yield for different maturities. As mentioned above, the spread is largest for short maturities and decreases when we increase the maturity.

Figure 1. AVERAGE ISSUE RATE, RYaR AND MATURITY
Average running yield



The confidence intervals are also shown in the figure. These are to be interpreted as the level within which the interest rate stays, at a particular probability. The distance between the interest rate curve and the confidence interval states the RYaR for different maturities in the debt. In the figure, a maturity of T* means a RYaR of x percentage points. The benchmark for the average interest rate refixing period can be regarded as an approximate value of short- and long-term borrowing which gives this risk.

1.2 Cost and risk for nominal debt, inflation-linked and foreign currency debt

In the normal case, inflation-linked borrowing and foreign currency borrowing are associated with greater risk than nominal krona borrowing. This is a result of our measuring the costs of central government debt in terms of nominal kronor. How much of the costs we lock in when we issue a bond depends then on the choice of debt.

When we issue a nominal krona bond, we undertake to pay a given nominal yield to the investor. The investor thus bears both the real interest rate risk and the inflation risk.

When we issue inflation-linked bonds, it is the state that carries the inflation risk. We undertake to pay a given real interest rate and to compensate the investor for inflation during the maturity of the inflation-linked bond. An inflation-linked bond may be seen as a combination of a bond that costs a particular amount corresponding to the real interest rate at the time of issue, and variable borrowing, the cost of which corresponds to realised inflation. Through our only locking in the real interest rate when we issue an inflation-linked bond, the risk is greater than if we issue a nominal bond, given the maturity.

To calculate the cost per unit of debt for the inflation-linked debt, we adjust the average running yield (r^{fx}) for inflation during the period $(\Delta p/p_t)$ and add the inflation adjustment of the debt. The cost of the inflation-linked debt for the period t to t+1 expressed in nominal terms is thus given by:

$$i^r = r^r(1+\Delta p/p_t)+\Delta p/p_t \,. \qquad (1)$$

When we borrow in foreign currency, we lock in the foreign nominal interest rate during the maturity of the loan. The cost expressed in kronor depends on exchange rate movements. The volatility of the exchange rate means that foreign exchange borrowing is associated with greater risk than nominal krona borrowing. We calculate the cost per unit of foreign currency debt by adjusting the average running yield (r^{fx}) by the change in the exchange rate $(\Delta fx/fx_t)$ and adding the change in market value caused by a changed exchange rate. The cost of the foreign currency debt for the period t to $t+1$ can thus be written as:

$$i^{fx} = r^{fx}(1+\Delta fx/fx_t)+\Delta fx/fx_t \,. \qquad (2)$$

The extent to which the stock effect, i.e. the effect of the exchange rate on the outstanding debt volumes, shall actually be included in the cost expression on which the risk analysis is based can be discussed, however. The risk is defined as the variability of the cost and if we study a longer time period, there is a lot that indicates that temporary variations in the exchange rate will eventually cancel one another out and thus not affect the long-term cost. We take this into consideration by also basing risk assessments on the following cost expression:

$$i^{fx} = r^{fx}(1+\Delta fx/fx_t) \cdot \qquad (4)$$

The cost of the inflation-linked debt is, of course, affected by inflation. Since the Riksbank has undertaken to keep inflation in the long-term at two per cent, it may, however, be of interest to study the risk in the inflation-linked debt if the inflation compensation on the principal is evenly distributed over the maturity of the bond. If we remove the variability from the stock effect, we obtain the following cost expression:

$$i^r = r^r(1+\Delta p/p_t)+\Delta \bar{p}/p \,. \qquad (3)$$

where $\Delta \bar{p}/p$ states the average inflation. Since this term is invariable, the risk is only generated by variations in the average running yield and the inflation compensation on the coupon payments.

2 Simulation model

The aim of this memorandum is to develop a model that provides guidance in the choice of the maturity for the aggregated debt. To achieve the goal, a model is needed which provides realistic estimates of future costs and volatilities in the different parts of the debt. In other words, we need a stochastic model for the interest rates (for the krona debt as well as the foreign currency debt), inflation and the exchange rate.

In the basic model, we opt to allow the variables to follow stationary stochastic processes which vary around long-term averages. Since it is extremely difficult over such a limited period of time as approximately 10 years (we have decided to estimate our models on data from the period we have complied with the present monetary policy regime) to distinguish the stochastics of many economic data series from purely random walks, we also let the interest rates and krona exchange rate follow random walk processes to see how this affects our conclusions as regards future cost and risk in the debt portfolio.

In the final parameterisation of our simulation model, we rely partly on estimated historical correlations but also on (hopefully realistic) assumptions about the future.

With the aid of the simulated values of our variables, we estimate the nominal cost of the inflation-linked debt and foreign currency debt with different maturities in accordance with equation (1) – (4) (the cost of the nominal krona debt coincides, of course, with the average simulated nominal interest rates). We are then finally in a position where we can study how the volatility of the costs (i.e. the risk) is affected by the choice of maturity.

2.1 Specification of the yield curves

In this work, we use a method developed by Diebold and Li to estimate the dynamics of the yield curves of the different types of debt.[1] Diebold and Li assume that the yield curves are of a Nelson-Siegel type and that they have the following function form:

$$r_t^j(\tau)=\beta_{1t}^j+\beta_{2t}^j\left(\frac{1-e^{-\tau\lambda_t}}{\tau\lambda_t}\right)+\beta_{3t}^j\left(\frac{1-e^{-\tau\lambda_t}}{\tau\lambda_t}-e^{-\tau\lambda_t}\right)+e_t^j \qquad (5)$$

The Nelson-Siegel curve gives an approximation of the interest rate, $r_t^j(\tau)$, on bonds and T-bills with different maturities (τ) in the three types of debt (j) at time t.

The parameters β_{1t}^j, β_{2t}^j, β_{3t}^j, are interpreted as three latent dynamic factors. β_{1t}^j is seen as a long-term factor since its weight is 1, a constant that does not move towards zero when maturity moves towards infinity. β_{2t}^j is regarded as a short-term factor since its weight, $\left(\frac{1-e^{-\tau\lambda_t}}{\tau\lambda_t}\right)$, is a monotonous decreasing function starting at 1 and relatively quickly moving towards zero. β_{3t}^j in turn is seen as a medium-term factor since its weight, $\left(\frac{1-e^{-\tau\lambda_t}}{\tau\lambda_t}-e^{-\tau\lambda_t}\right)$, starts at zero, increases with the maturity during an interval to subsequently decrease and move towards zero when the maturity increases.

[1] *Forecasting the Term Structure of Government Bond Yields (NBER 2003).*

The parameter λ_t in the weights on β_{2t}^j and β_{3t}^j controls how quickly the functions move towards zero. A small value of λ_t provides slowly decreasing functions and a better adaptation of the yield curve for long-term maturities, while a large lambda means the converse. λ_t also controls the maturity where the weight on β_{3t}^j reaches its maximum.

One important result that Diebold and Li point to in the aforesaid essay is that the three time-varying factors can be interpreted as the level, slope and curvature of the yield curve and that the dynamics of the factors (and thus the yield curve) can be estimated with time-series models.

The long-term factor β_{1t}^j, is highly related to the level of the curve. In order to see this, we allow the maturity to move towards infinity and find that $r_t(\infty)=\beta_{1t}^j$. Furthermore, we see that a change in β_{1t}^j parallel shifts the whole curve since the weight is identical (=1) regardless of the maturity.

The slope of the curve is linked to the short-term factor β_{2t}^j. This is seen by $-\beta_{2t}^j = r_t(\infty) - r_t(0)$. The fact that β_{2t}^j can be interpreted as the slope of the interest curve is understood intuitively since an increase in β_{2t}^j increases short-term interest rates more than long-term interest rates – the weight on β_{2t}^j is larger at the short end – which gives a flatter yield curve immediately.

Finally, Diebold and Li show that the medium-term factor, β_{3t}^j, is linked to the curvature of the yield curve. The reason is that an increase in β_{3t}^j has little effect on very short and very long interest rates, although it increases medium-long interest rates, which means an increased curvature.

2.2 Estimation of the yield curves

We use monthly data from January 1996 to March 2006 inclusive to estimate the yield curves monthly. For maturities less than a year, we use the interest rate on deposits and for maturities of a year and longer, we use swap rates, see Table 1 for descriptive statistics. To avoid estimating yield curves for each of the currencies included in the foreign currency debt, we have weighted together the interest rates in these currencies in accordance with the foreign currency benchmark. In this way, we create a time series with "foreign curves".

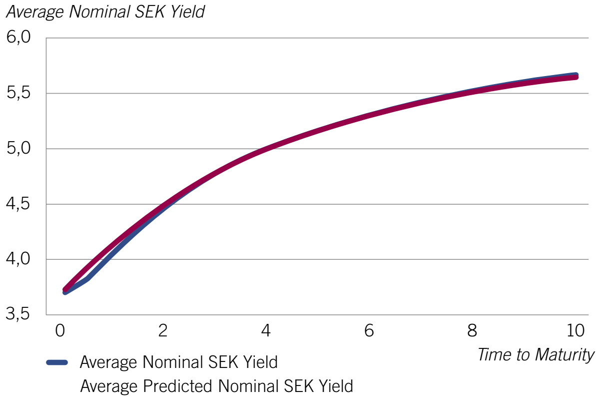
Since the state largely uses bonds for its long-term loans, it would be preferable if we could use (zero coupon) interest rates on central government bonds in the estimates. Swap rates tend to be both somewhat higher and more volatile than central government bond rates. Sufficiently long time series are, however, not available at present. Furthermore, information about benchmark rates are only available for the nominal krona debt and the foreign currency debt. Section 2.4 contains a discussion on how we solve the problem with interest rates on the inflation-linked debt.

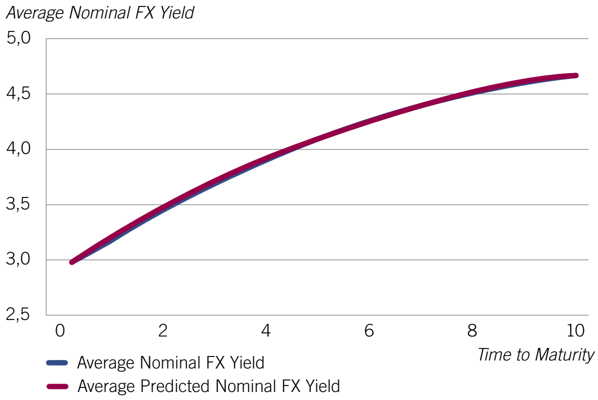
Table 1. Descriptive statistics, nominal interest rates, Jan 1996 – March 2006

Maturity, (months)	Swedish interest rates Average value, %	Swedish interest rates Standard deviation	Foreign interest rates Average value, %	Foreign interest rates Standard deviation
1	3.7	1.3	3.0	0.8
3	3.7	1.2	3.0	0.8
4	3.8	1.2	3.1	0.8
9	3.9	1.2	3.1	0.9
12	4.1	1.2	3.2	0.9
24	4.4	1.2	3.5	0.9
36	4.8	1.3	3.7	0.8
48	5.0	1.3	4.0	0.8
60	5.2	1.3	4.2	0.8
72	5.3	1.3	4.3	0.9
84	5.4	1.3	4.5	0.9
96	5.5	1.3	4.6	0.9
108	5.6	1.3	4.7	0.9
120	5.7	1.3	4.8	0.9

As regards the estimation of the parameters in equation (5), we follow usual practice and fix the value of lambda. This enables us to calculate the value of the regressors for each maturity and estimate the beta parameters by ordinary least squares for each month. Besides being much simpler, the estimations will also, according to Diebold and

Figure 2. ACTUAL AND PREDICTED YIELD CURVES, AVERAGE, JAN 1996-MARCH 2006





Li, be more reliable than if lambda is estimated as well. This is because we replace a number of instable numerical optimisations with robust OLS regressions.

Diebold and Li choose to set lambda at 0.0609. Lambda determines the maturity at which the weight of the medium-term factor, or curvature, is greatest. The US interest rate curve is generally considered to show the largest curvature at a 2-3 year maturity, the value of lambda which maximises the weight in the middle of the interval, i.e. at 30 months, is just 0.0609. If we apply this method to the time period and the markets we study in this memorandum, we see that the curvature of the Swedish nominal yield curve has had its maximum at a maturity of approximately 4 years while the hypothetical foreign curve shows its greatest curvature at around a maturity of 5 years. This produces a lambda of 0.037 in the Swedish market and a "foreign lambda" of 0.030.

After we locked the lambda parameters and estimated the equation (5) month for month for our interest-rate series, we obtain a time series with beta values. We show the average value and the standard deviation in Table 2 and we draw the average actual yield curves for the time period in Figure 2 and make a comparison with the results of the estimations.

Table 2. Estimation result, Jan 1996 – March 2006

Swedish curve	Average value	Standard deviation
β_1^n	6.3	1.5
β_2^n	–2.7	1.0
β_3^n	–0.2	1.9
Foreign curve		
β_1^{fx}	5.8	1.1
β_2^{fx}	–2.9	1.1
β_3^{fx}	–1.1	1.6

2.3 The dynamics of the yield curves, the exchange rate and inflation

In our main scenario, the variables – the beta parameters, inflation and the exchange rate – follow stationary stochastic processes (Ornstein-Uhlenbeck processes). The dynamics that we assume for these variables is:

$$dX = \alpha(\bar{X} - X)dt + \sigma dz. \qquad (6)$$

Where $\alpha(>0)$ is the speed at which the variable X returns to its "normal level" $\bar{X}$ from a certain realised value X. dz is an increment from a Wiener process with volatility σ. If we discretise the equation (6) we obtain:

$$\begin{aligned} X_{t+\Delta t} &= X_t + \alpha(\bar{X} - X_t)\Delta t + \sigma\sqrt{\Delta t}\varepsilon_{t+\Delta t}\,, \\ &= \alpha\bar{X}\Delta t + (1-\alpha\Delta t)X_t + \sigma\sqrt{\Delta t}\varepsilon_{t+\Delta t}\,, \\ &= a + bX_t + \eta_{t+\Delta t}\,. \end{aligned} \qquad (7)$$

An ordinary AR(1)-process where $\eta_{t+\Delta t}$ is normally distributed noise ($\varepsilon_{t+\Delta t}$ is "standard normal"). To "get hold of" the parameters in our basic model, we thus estimate equation (7) by OLS (for each of our eight variables) and then calculate:

$$\hat{\alpha} = \frac{1-b}{\Delta t}\ , \tag{8}$$

$$\hat{\bar{X}} = \frac{a}{1-b} \text{ and} \tag{9}$$

$$\hat{\sigma} = \sqrt{\frac{var\,(\eta_{t+\Delta t})}{\Delta t}}\ . \tag{10}$$

Since we use annualised monthly data in our estimates, we have $\Delta t = 1/12$. In the same way as for "foreign interest rates" the exchange rate dynamics is estimated on the basis of an index that describes how the krona relates to a weighted average of the currencies included in the foreign currency debt. In order not to overestimate the volatility of inflation and the exchange rate respectively, we use seasonally-adjusted data when we estimate these (12-months changes).

The results from the exercises – which with some modification are to be used as input in the simulations – are shown in Table 3. The results from the AR(1) estimations, show that we have relatively large persistence in our variables, see Table 9 in the appendix. Dickey-Fuller tests also show that we cannot reject variables following random walks in most cases, which justifies our also testing a random walk approach, α is then set at zero in the equation (6).

Table 3. Parameter estimates, stationary processes, Jan 1996-March 2006

Swedish curve	α	$\bar{X}$	σ
β_1^n	0,32	4,69	0,84
β_2^n	0,67	–2,90	1,04
β_3^n	0,97	0,28	2,44
Foreign curve			
β_1^{fx}	0,31	4,39	0,58
β_2^{fx}	0,31	–1,72	0,73
β_3^{fx}	1,21	–0,61	2,34
Inflation (π)	0,74	0,94	1,18
Exchange rate (FX)	0,49	8,38	0,34

2.4 Calibration of the simulation model

The full simulation model consists of eleven equations. We have three equations for each of three types of debt that control how the yield curve in the respective type of debt develops over time, and one equation each for inflation and exchange rate development. In the preceding section, we only estimated eight equations, however, three equations for the inflation-linked interest rate curve are missing.

Since data on inflation-linked interest rates are not available, we have decided to calibrate the inflation-linked yield curve on the basis of the Swedish nominal curve. This means that the difference between the curves amounts on average to expected inflation (= The Riksbank's inflation target of two per cent). As regards the slope and curvature of the interest-linked curve, we assume that these comply on average with that of the nominal curve. The import of this is that in the model – on average – it is as expensive to borrow inflation-linked as nominally given a particular maturity. We have estimated the variance of the inflation-linked curve (the three beta factors) at half of the variance in the nominal curve by comparing the interest rate volatility of a synthetic 10-year inflation-linked bond with the 10-year nominal interest rate.

The simulated yield curves are parameterised so that they on average show the average Swedish curve from and including January 2000. In other words, we use the "Swedish" beta- and lambda values for the foreign yield curve as well. In the simulations we thus assume that the expected cost for borrowing in foreign currency accords with borrowing in SEK.

In the calibration of the model, we have moreover chosen to depart from the regression results in the previous section as regards the future inflation process. We scale down the estimated volatility by 20 per cent in the simulations. We consider that a scaling-down is justified due to the time period we are studying largely being directly after the decision on a new monetary policy regime. It is not inconceivable that a period of this kind is associated with greater uncertainty about inflation than when the new regime has settled in.

Table 4. Correlation matrix, input in the simulations

	β_1^n	β_2^n	β_3^n	β_1^r	β_2^r	β_3^r	β_1^{fx}	β_2^{fx}	β_3^{fx}	FX	π
β_1^n	1.00	–0.58	–0.38	0.71	–0.42	–0.25	0.97	–0.75	–0.34	–0.64	–0.10
β_2^n	–0.58	1.00	0.38	–0.41	0.71	0.26	–0.48	0.68	0.24	0.45	0.37
β_3^n	–0.38	0.38	1.00	–0.27	0.27	0.70	–0.37	0.59	0.87	0.06	0.15
β_1^r	0.71	–0.41	–0.27	1.00	–0.29	–0.17	0.68	–0.53	–0.24	–0.45	–0.07
β_2^r	–0.42	0.71	0.27	–0.29	1.00	0.19	–0.35	0.49	0.17	0.32	0.26
β_3^r	–0.25	0.26	0.70	–0.17	0.19	1.00	–0.24	0.41	0.60	0.04	0.11
β_1^{fx}	0.97	–0.48	–0.37	0.68	–0.35	–0.24	1.00	–0.72	–0.45	–0.57	–0.01
β_2^{fx}	–0.75	0.68	0.59	–0.53	0.49	0.41	–0.72	1.00	0.53	0.39	0.04
β_3^{fx}	–0.34	0.24	0.87	–0.24	0.17	0.60	–0.45	0.53	1.00	–0.06	0.01
FX	–0.64	0.45	0.06	–0.45	0.32	0.04	–0.57	0.39	–0.06	1.00	0.50
π	–0.10	0.37	0.15	–0.07	0.26	0.11	–0.01	0.04	0.01	0.50	1.00

The results in section 2.3, the scaling-down of the volatility in the inflation process, and the future average interest rate curves then give the following dynamics in the main scenario (we set the mean reversion parameters in the alternative scenario to zero):

$$\begin{bmatrix} \beta^n_{1t+1} \\ \beta^n_{2t+1} \\ \beta^n_{3t+1} \\ \beta^r_{1t+1} \\ \beta^r_{2t+1} \\ \beta^r_{3t+1} \\ \beta^{fx}_{1t+1} \\ \beta^{fx}_{2t+1} \\ \beta^{fx}_{3t+1} \\ \pi_{t+1} \\ FX_{t+1} \end{bmatrix} = \begin{bmatrix} \beta^n_{1t} \\ \beta^n_{2t} \\ \beta^n_{3t} \\ \beta^r_{1t} \\ \beta^r_{2t} \\ \beta^r_{3t} \\ \beta^{fx}_{1t} \\ \beta^{fx}_{2t} \\ \beta^{fx}_{3t} \\ \pi_t \\ FX_t \end{bmatrix} + \begin{bmatrix} 0,32 \\ 0,67 \\ 0,97 \\ 0,32 \\ 0,67 \\ 0,97 \\ 0,31 \\ 0,31 \\ 1,21 \\ 0,74 \\ 0,49 \end{bmatrix} \cdot \begin{bmatrix} (5,6-\beta^n_{1t}) \\ (-2,6-\beta^n_{2t}) \\ (0-\beta^n_{3t}) \\ (3,6-\beta^r_{1t}) \\ (-2,6-\beta^r_{2t}) \\ (0-\beta^r_{3t}) \\ (5,6-\beta^{fx}_{1t}) \\ (-2,6-\beta^{fx}_{2t}) \\ (0-\beta^{fx}_{3t}) \\ (2,0-\pi_t) \\ (8,21-fx_t) \end{bmatrix} + \begin{bmatrix} 0.84\varepsilon^n_{1t+1} \\ 1.04\varepsilon^n_{2t+1} \\ 2.44\varepsilon^n_{3t+1} \\ 0.60\varepsilon^r_{1t+1} \\ 0.74\varepsilon^r_{2t+1} \\ 1.73\varepsilon^r_{3t+1} \\ 0.57\varepsilon^{fx}_{1t+1} \\ 0.73\varepsilon^{fx}_{2t+1} \\ 2.35\varepsilon^{fx}_{3t+1} \\ 0.94\varepsilon^{\pi}_{t+1} \\ 0.34\varepsilon^{FX}_{t+1} \end{bmatrix} \quad (11)$$

We introduce stochastics in the simulation model by drawing, for each time step, a random number from a multivariate standard normal distribution without autocorrelation and where the correlation between two processes (i and j) is given by ρ_{ij}.

A realistic correlation structure in the model is important since it directly affects the diversification effect we make use of when we borrow on a number of markets and in several types of debt. In the estimations, we use the estimated historical correlations between the eight variables that we estimate. To obtain correlations between the inflation-linked curve and other variables, we use the real beta factors we have created on the basis of the factors of the nominal curve. The correlation between the real factors and the corresponding nominal factors has been set at 0.7. We then obtain the correlation matrix in Table 4.

3 Simulation results

We generate 20 000 paths for our stochastic variables in our simulations; the simulation horizon is 30 years. To obtain a measure of the average running yield right from year one, we need a "loan history" which is as long as our longest loan strategy. Volatility arises when a loan is renewed and the market rate at time t on instruments with a certain maturity replaces the interest rate on the instrument that matures. As a simplification, we have in the simulations assumed that the interest rate curves have been constant, and the same as the simulated average curve for the period between January 2000 – March 2006, under our "loan history".

Figure 5 in the appendix shows some of the simulated paths for five-year interest rates, the exchange rate and inflation. As a comparison, paths are shown for actual five-year rates, inflation and the exchange rate between January 1996 and March 2006. Since we are looking a relatively long way into the future – 30 years – we clearly see the effect of letting the variables follow the stationary and non-stationary processes. However, it is difficult on the basis of these figures, to establish which computer-generated process best captures reality; the history is only *one* – of an infinite quantity of possible – outcome of the true stochastic processes, and it seems as if the paths that reality has followed could have been generated by either of the two processes. To further clarify the extent to which we have succeeded in capturing (the historical) reality, we show in Table 10 – Table 12 of the appendix the correlations that our models give and compare these with the corresponding historical correlations. The models produce correlations that lie relatively close to the historical correlations– although the model correlations are in general a bit lower. Furthermore, Ornstein-Uhlenbeck processes seem to produce correlations more in line with history than pure random walks.

Altogether, we interpret the figures and correlation matrixes as meaning that we have succeeded in capturing the volatility of these variables well in the simulated processes and go on to calculate the risk associated with different maturities in the debt. We make some simplified assumptions as regards the strategies which we study. In the first place, we assume that borrowing in the different types of debt takes place with the same maturity, i.e. that we roll bonds with a particular maturity in a certain strategy. This means that, to achieve a maturity of, for instance, five years, we only issue 10-year bonds. In the second place, we assume that 20 per cent of the borrowing is inflation-linked krona borrowing, 15 per cent is foreign currency borrowing and the rest is borrowed in nominal kronor.

With these assumptions, it is simple – on the basis of the equations in section 1.2 and the simulated distributions – to calculate the cost, and its volatility, at different maturities and time horizons. In Figure 3 and Figure 4, we show RYaR in the aggregate debt with and without the so-called stock effect, when the processes are assumed to be stationary. A number of results are then compiled in Table 5 – Table 8 from the "stationary model". The appendix shows RYaR in the various debt components and the corresponding results from the "random walk model".

Figure 3. PORTFOLIO RUNNING YIELD AT RISK
Percentage points and years

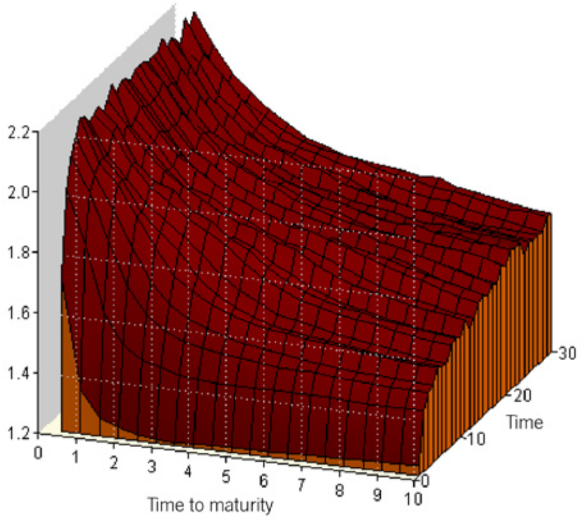
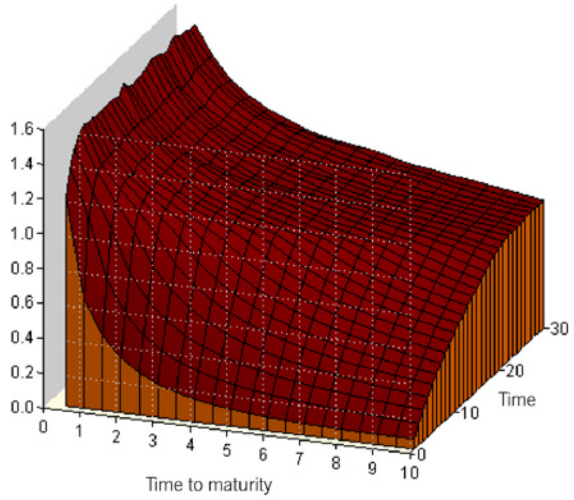


Figure 4. PORTFOLIO RUNNING YIELD AT RISK (without stock effects)
Percentage points and years



The figures show that the risk decreases with the maturity of the debt. The marginal risk reduction decreases rapidly, however, as the maturity is extended. The figures also show that the risk depends on our time perspective.

In the tables below, RYaR is presented – for the total debt and the various components – one and five-years ahead for different maturity strategies, and what this RYaR can be converted to in kronor and ören (Cost at Risk, CaR) given today's size of the debt (April 2006). With a maturity of, for instance, five years in the total debt, RYaR amounts – when the stock effects are included– to 1.25 percentage points in a year's time. This corresponds to a CaR of SEK 15.6 billion.

We also see clearly that the risk in the foreign currency debt and the inflation-linked debt is due to a great extent on whether we include the stock effects or not. With these included, the foreign currency debt is considerably more risk-filled than both the inflation-linked debt and the nominal domestic debt, and the inflation-linked debt in turn is more risky than the nominal krona debt. A risk ranking which markedly changes if we do not include these effects. Then, the foreign currency and the inflation-linked debt are instead, at least if we borrow short-term, less risky than nominal krona debt.

Altogether, the risk of having a relatively short maturity of the debt is very limited. A maturity in the debt portfolio of one year means, for instance, that CaR in a year's time will only be SEK 1.2 billion higher than in the case of a comprehensive maturity of the debt portfolio of seven years. We can reduce the maturity of the whole of central government debt without jeopardising central government finances. A proposal for a benchmark for the maturity of the aggregate debt must be based on what is operationally manageable; the results indicate, however, that we do not need for reasons of risk to "go further out on the curve" than this.

Table 5. RYaR and CaR, percentage points and SEK billion, stationary processes with stock effect, time horizon 1 year

Maturity	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7
RYaR														
Nom SEK RYaR	1.43	0.75	0.50	0.37	0.29	0.23	0.19	0.16	0.14	0.12	0.11	0.10	0.09	0.08
Real RYaR	2.23	1.81	1.72	1.67	1.65	1.63	1.62	1.61	1.61	1.61	1.61	1.60	1.60	1.60
FX RYaR	7.05	7.06	7.09	7.12	7.15	7.16	7.19	7.20	7.21	7.22	7.23	7.24	7.24	7.25
Portfolio RYaR	1.68	1.36	1.28	1.25	1.24	1.23	1.24	1.24	1.25	1.25	1.26	1.26	1.26	1.26
CaR														
Nom SEK CaR	10.6	5.5	3.7	2.7	2.1	1.7	1.4	1.2	1.0	0.9	0.8	0.7	0.7	0.6
Real CaR	4.7	3.8	3.6	3.5	3.5	3.5	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4
FX CaR	20.3	20.4	20.5	20.6	20.6	20.7	20.7	20.8	20.8	20.8	20.9	20.9	20.9	20.9
Sum nom CaR	31.0	25.9	24.2	23.3	22.8	22.4	22.2	22.0	21.9	21.7	21.7	21.6	21.6	21.5
Sum CaR	35.7	29.8	27.8	26.8	26.3	25.9	25.6	25.4	25.3	25.2	25.1	25.0	25.0	25.0
Portfolio CaR	20.9	16.9	15.9	15.6	15.4	15.3	15.4	15.4	15.5	15.6	15.6	15.6	15.6	15.7
Diversification	14.8	12.9	11.9	11.3	10.9	10.5	10.2	10.0	9.8	9.6	9.5	9.4	9.4	9.3

Table 6. RYaR and CaR, percentage points and SEK billion, stationary processes with stock effect, time horizon 5 years

Maturity	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7
RYaR														
Nom SEK RYaR	1.81	1.53	1.38	1.23	1.08	0.91	0.78	0.69	0.61	0.55	0.51	0.47	0.44	0.41
Real RYaR	2.47	2.22	2.10	2.01	1.94	1.85	1.81	1.77	1.75	1.74	1.73	1.72	1.71	1.70
FX RYaR	8.56	8.71	8.78	8.79	8.82	8.81	8.77	8.77	8.77	8.76	8.75	8.75	8.76	8.75
Portfolio RYaR	2.16	2.05	1.98	1.88	1.81	1.73	1.67	1.64	1.61	1.58	1.56	1.55	1.54	1.53
CaR														
Nom SEK CaR	13.4	11.4	10.2	9.1	8.0	6.8	5.8	5.1	4.6	4.1	3.8	3.5	3.2	3.0
Real CaR	5.2	4.7	4.5	4.3	4.1	3.9	3.8	3.8	3.7	3.7	3.7	3.6	3.6	3.6
FX CaR	24.7	25.2	25.4	25.4	25.5	25.4	25.3	25.3	25.3	25.3	25.3	25.3	25.3	25.3
Sum nom CaR	38.1	36.5	35.6	34.5	33.5	32.2	31.1	30.4	29.9	29.4	29.0	28.8	28.5	28.3
Sum CaR	43.4	41.3	40.0	38.8	37.6	36.1	35.0	34.2	33.6	33.1	32.7	32.4	32.2	31.9
Portfolio CaR	26.8	25.5	24.6	23.3	22.5	21.5	20.8	20.4	20.0	19.7	19.4	19.2	19.1	19.0
Diversification	16.5	15.7	15.5	15.5	15.1	14.6	14.2	13.8	13.6	13.4	13.3	13.2	13.0	12.9

Table 7. RYaR and CaR, percentage points and SEK billion, stationary processes without stock effect, time horizon 1 year

Maturity	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7
RYaR														
Nom SEK RYaR	1.43	0.75	0.50	0.37	0.29	0.23	0.19	0.16	0.14	0.12	0.11	0.10	0.09	0.08
Real RYaR	1.30	0.66	0.45	0.33	0.26	0.21	0.18	0.15	0.13	0.12	0.11	0.10	0.09	0.09
FX RYaR	1.02	0.61	0.45	0.37	0.33	0.31	0.30	0.30	0.30	0.31	0.31	0.32	0.32	0.32
Portfolio RYaR	1.20	0.63	0.42	0.31	0.24	0.19	0.15	0.13	0.11	0.09	0.08	0.08	0.07	0.06
CaR														
Nom SEK CaR	10.6	5.5	3.7	2.7	2.1	1.7	1.4	1.2	1.0	0.9	0.8	0.7	0.7	0.6
Real CaR	2.8	1.4	0.9	0.7	0.6	0.5	0.4	0.3	0.3	0.3	0.2	0.2	0.2	0.2
FX CaR	2.9	1.7	1.3	1.1	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Sum nom CaR	13.6	7.3	5.0	3.8	3.1	2.6	2.3	2.1	1.9	1.8	1.7	1.6	1.6	1.6
Sum CaR	16.3	8.7	5.9	4.5	3.6	3.1	2.7	2.4	2.2	2.1	1.9	1.9	1.8	1.8
Portfolio CaR	14.9	7.8	5.3	3.9	3.0	2.3	1.9	1.6	1.4	1.2	1.0	0.9	0.9	0.8
Diversification	1.5	0.9	0.7	0.6	0.7	0.7	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9

Table 8. RYaR och CaR, percentage points and SEK billion, stationary processes without stock effect, time horizon 5 years

Maturity	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7
RYaR														
Nom SEK RYaR	1.81	1.53	1.38	1.23	1.08	0.91	0.78	0.69	0.61	0.55	0.51	0.47	0.44	0.41
Real RYaR	1.59	1.34	1.18	1.06	0.93	0.77	0.65	0.57	0.50	0.45	0.41	0.38	0.35	0.33
FX RYaR	1.26	1.12	1.03	0.94	0.86	0.75	0.69	0.64	0.61	0.59	0.57	0.56	0.55	0.54
Portfolio RYaR	1.52	1.30	1.17	1.06	0.93	0.78	0.68	0.60	0.54	0.49	0.45	0.42	0.39	0.37
CaR														
Nom SEK CaR	13.4	11.4	10.2	9.1	8.0	6.8	5.8	5.1	4.6	4.1	3.8	3.5	3.2	3.0
Real CaR	3.4	2.9	2.5	2.3	2.0	1.6	1.4	1.2	1.1	1.0	0.9	0.8	0.7	0.7
FX CaR	3.6	3.2	3.0	2.7	2.5	2.2	2.0	1.8	1.8	1.7	1.7	1.6	1.6	1.6
Sum nom CaR	17.1	14.6	13.2	11.9	10.5	8.9	7.8	7.0	6.3	5.8	5.4	5.1	4.8	4.6
Sum CaR	20.4	17.4	15.7	14.1	12.5	10.6	9.2	8.2	7.4	6.8	6.3	5.9	5.6	5.3
Porfolio CaR	18.9	16.1	14.6	13.2	11.5	9.7	8.4	7.4	6.7	6.1	5.6	5.2	4.8	4.6
Diversification	1.6	1.3	1.1	1.0	0.9	0.9	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7

4 Appendix

Table 9. Parameter estimates, AR(1)

Swedish curve	*a*	*b*	var(η)
β_1^n	0,12	0,97	0,06
β_2^n	–0,16	0,94	0,09
β_3^n	0,02	0,91	0,50
Foreign curve			
β_1^{fx}	0,11	0,97	0,03
β_2^{fx}	–0,04	0,97	0,04
β_3^{fx}	–0,06	0,90	0,46
Inflation	0,06	0,94	0,12
FX	0,34	0,96	0,01

Table 10. Correlation matrix, stationary processes

	n1	*n5*	*n10*	*fx1*	*fx5*	*fx10*	*r1*	*r5*	*r10*	*FX*	*infl*
n1	1.00	0.91	0.81	0.60	0.66	0.71	0.58	0.55	0.50	–0.22	0.27
n5	0.91	1.00	0.95	0.65	0.82	0.88	0.53	0.61	0.59	–0.39	0.16
n10	0.81	0.95	1.00	0.52	0.74	0.90	0.47	0.58	0.62	–0.52	0.08
fx1	0.60	0.65	0.52	1.00	0.87	0.73	0.35	0.40	0.33	–0.19	0.03
fx5	0.66	0.82	0.74	0.87	1.00	0.94	0.38	0.50	0.46	–0.35	0.01
fx10	0.71	0.88	0.90	0.73	0.94	1.00	0.41	0.54	0.55	–0.49	0.00
r1	0.58	0.53	0.47	0.35	0.38	0.41	1.00	0.92	0.86	–0.13	0.16
r5	0.55	0.61	0.58	0.40	0.50	0.54	0.92	1.00	0.97	–0.23	0.10
r10	0.50	0.59	0.62	0.33	0.46	0.55	0.86	0.97	1.00	–0.32	0.05
FX	–0.22	–0.39	–0.52	–0.19	–0.35	–0.49	–0.13	–0.23	–0.32	1.00	0.47
infl	0.27	0.16	0.08	0.03	0.01	0.00	0.16	0.10	0.05	0.47	1.00

Note: n1 stands for the Swedish one-year interest rate, r1 for the one year real interest rate and fx1 for the one-year "foreign interest rate".

Table 11. Correlation matrix, non-stationary processes (random walk)

	n1	*n5*	*n10*	*fx1*	*fx5*	*fx10*	*r1*	*r5*	*r10*	*FX*	*infl*
n1	1.00	0.85	0.71	0.61	0.57	0.60	0.51	0.47	0.40	–0.14	0.11
n5	0.85	1.00	0.91	0.71	0.80	0.86	0.45	0.54	0.50	–0.32	0.07
n10	0.71	0.91	1.00	0.55	0.69	0.88	0.39	0.50	0.54	–0.49	0.04
fx1	0.61	0.71	0.55	1.00	0.89	0.75	0.34	0.41	0.32	–0.18	0.01
fx5	0.57	0.80	0.69	0.89	1.00	0.91	0.32	0.45	0.39	–0.32	0.00
fx10	0.60	0.86	0.88	0.75	0.91	1.00	0.33	0.48	0.49	–0.49	0.00
r1	0.51	0.45	0.39	0.34	0.32	0.33	1.00	0.87	0.80	–0.08	0.06
r5	0.47	0.54	0.50	0.41	0.45	0.48	0.87	1.00	0.95	–0.18	0.04
r10	0.40	0.50	0.54	0.32	0.39	0.49	0.80	0.95	1.00	–0.28	0.02
FX	–0.14	–0.32	–0.49	–0.18	–0.32	–0.49	–0.08	–0.18	–0.28	1.00	0.17
infl	0.11	0.07	0.04	0.01	0.00	0.00	0.06	0.04	0.02	0.17	1.00

Note: n1 stands for the Swedish one-year interest rate, r1 for the one year real interest rate and fx1 for the one-year "foreign interest rate".

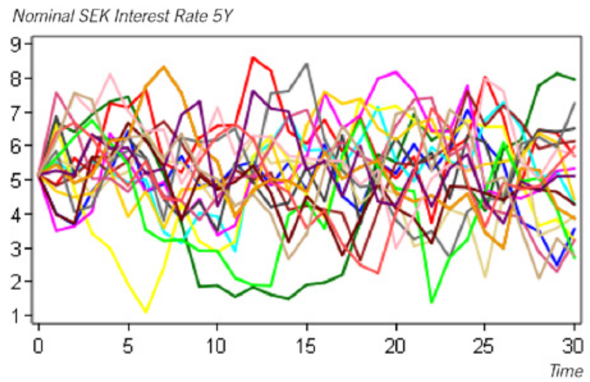
Table 12. Correlation matrix, January 1996 – March 2006

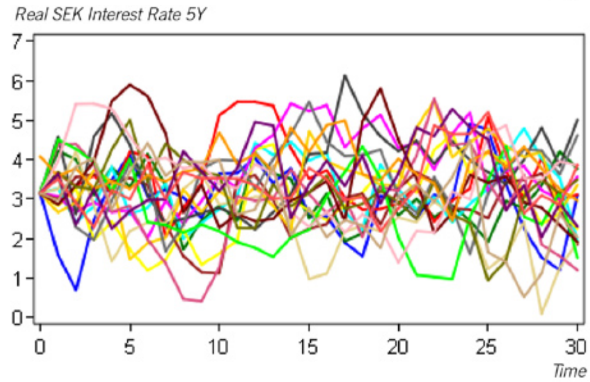
	n1	*n5*	*n10*	*fx1*	*fx5*	*fx10*	*FX*	*infl*
n1	1.00	0.94	0.90	0.66	0.86	0.89	–0.47	0.18
n5	0.94	1.00	0.99	0.61	0.90	0.96	–0.60	0.06
n10	0.90	0.99	1.00	0.53	0.86	0.95	–0.64	0.00
fx1	0.66	0.61	0.53	1.00	0.87	0.76	–0.33	0.00
fx5	0.86	0.90	0.86	0.87	1.00	0.97	–0.55	0.02
fx10	0.89	0.96	0.95	0.76	0.97	1.00	–0.63	–0.01
FX	–0.47	–0.60	–0.64	–0.33	–0.55	–0.63	1.00	0.50
Infl	0.18	0.06	0.00	0.00	0.02	–0.01	0.50	1.00

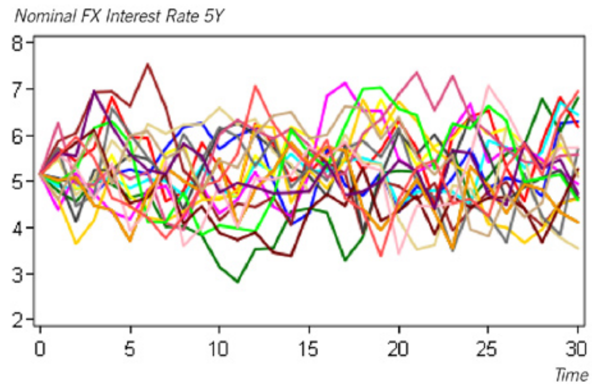
Note: n1 stands for the Swedish one-year interest rate and fx1 for the one-year "foreign interest rate".

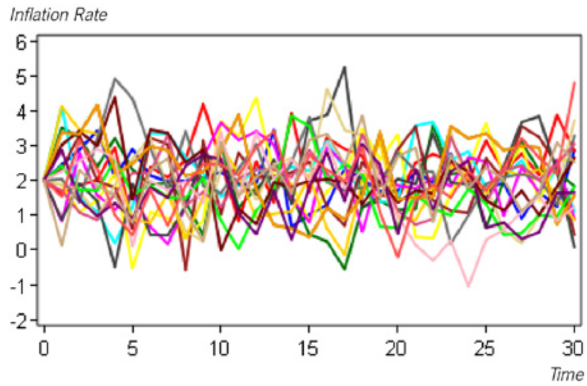
4.1 Stationary processes

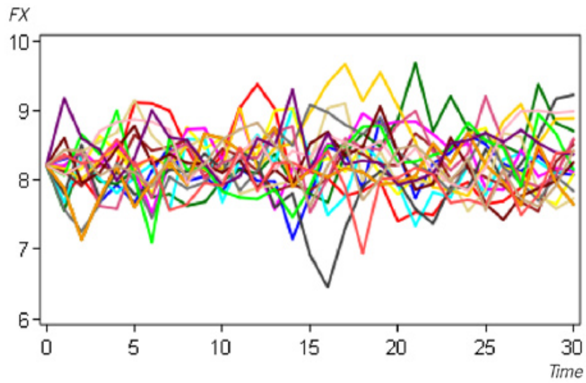
Figure 5. SIMULATED INTEREST RATES, INFLATION AND EXCHANGE RATE, STATIONARY PROCESSES



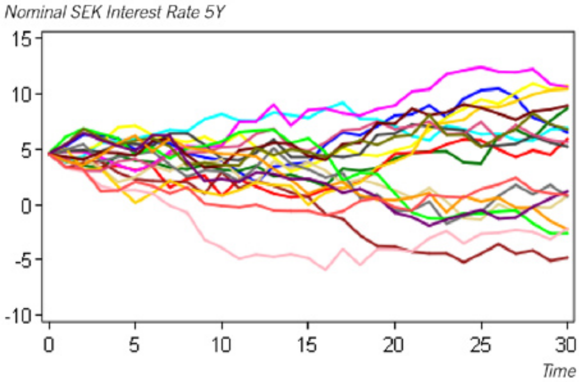


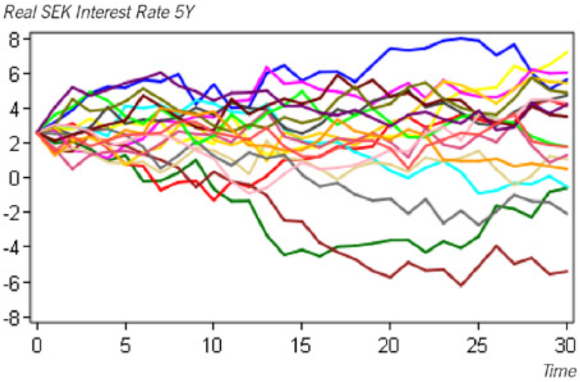


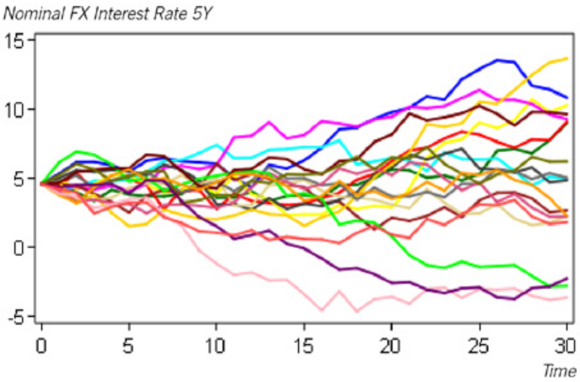


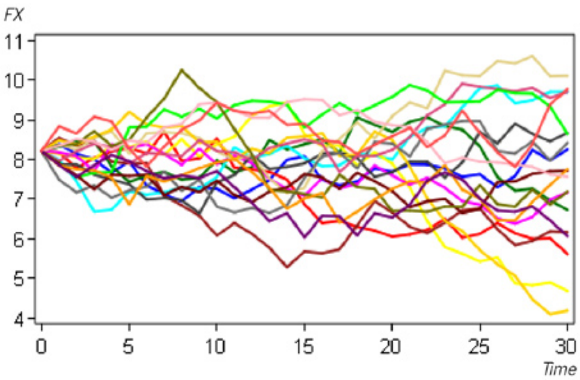


4.2 Non-stationary processes (random walk)

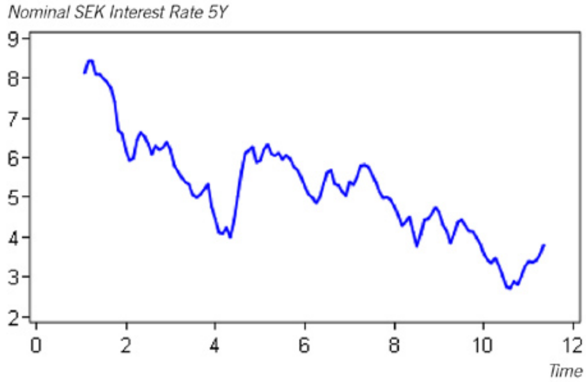


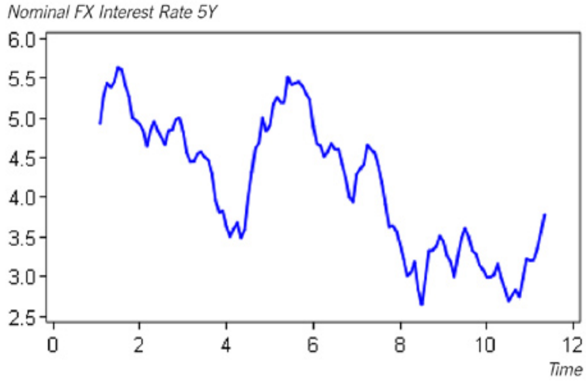


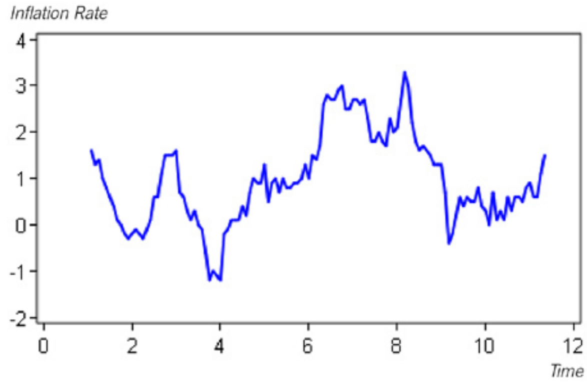


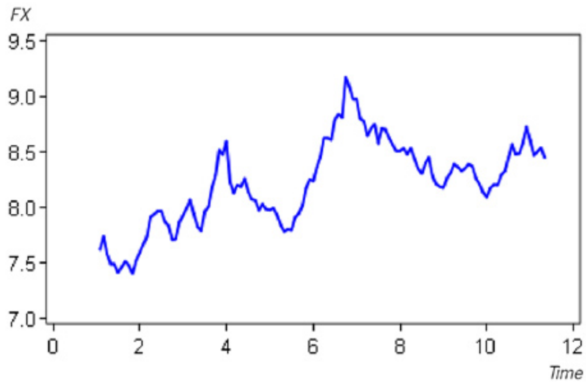


4.3 Reality, January 1996 - March 2006









4.4 RYaR stationary processes

Figure 6. NOMINAL SEK, RUNNING YIELD AT RISK
Percentage points and years

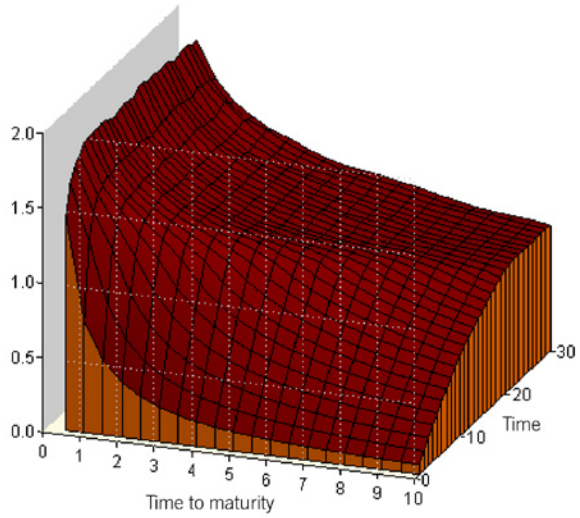


Figure 7. REAL SEK, RUNNING YIELD AT RISK
Percentage points and years

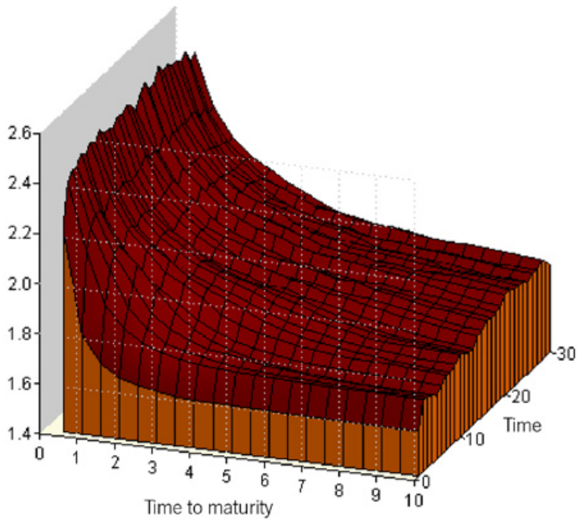


Figure 8. FX, RUNNING YIELD AT RISK
Percentage points and years

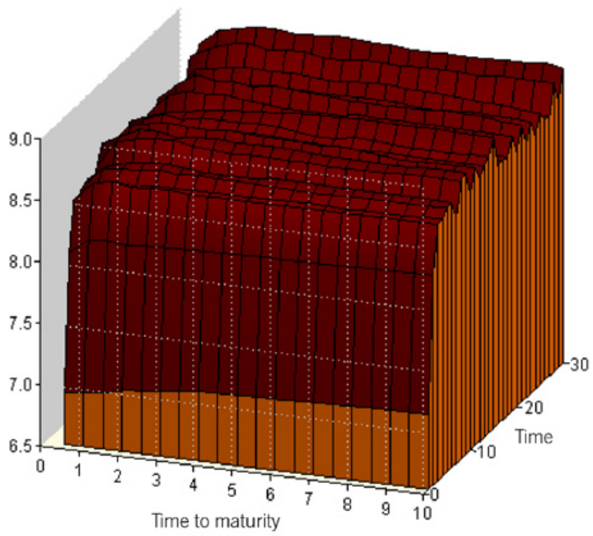


Figure 9. REAL SEK, RUNNING YIELD AT RISK (without stock effects)
Percentage points and years

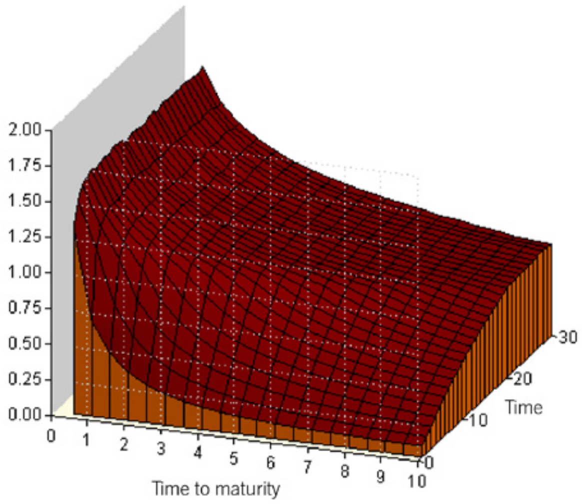
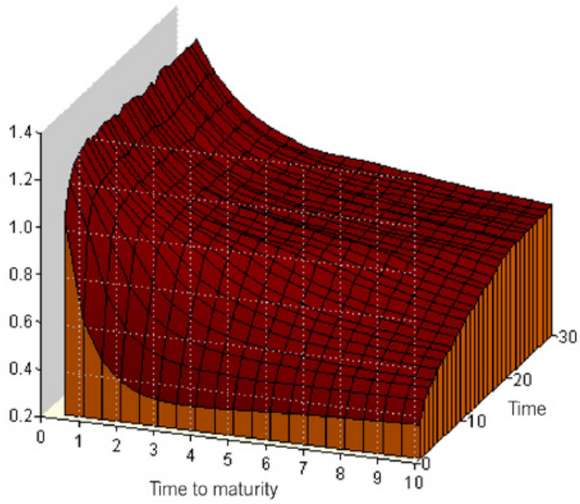


Figure 10. FX, RUNNING YIELD AT RISK (without stock effects)
Percentage points and years



4.5 RYaR, non-stationary processes (random walk)

Figure 11. NOMINAL SEK, RUNNING YIELD AT RISK
Percentage points and years

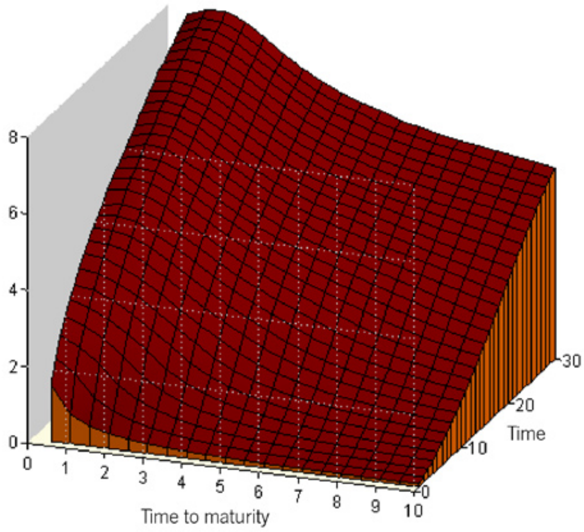


Figure 12. REAL SEK, RUNNING YIELD AT RISK
Percentage points and years

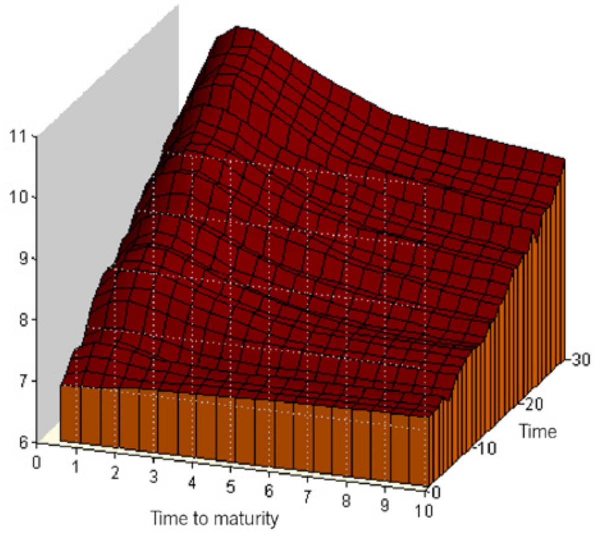


Figure 13. FX, RUNNING YIELD AT RISK
Percentage points and years

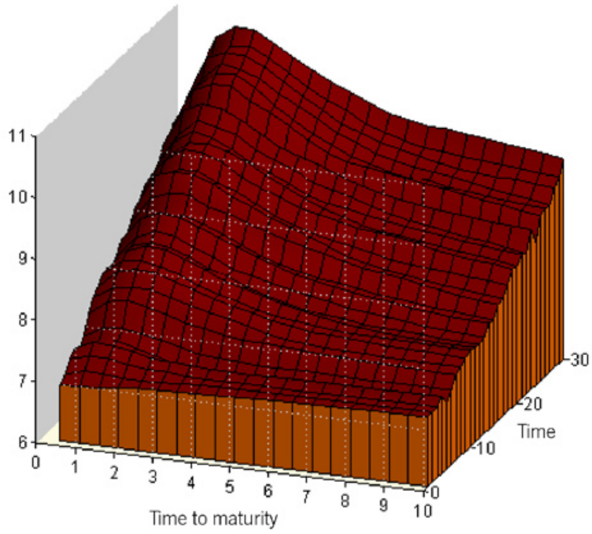


Figure 14. REAL SEK, RUNNING YIELD AT RISK (without stock effects)
Percentage points and years

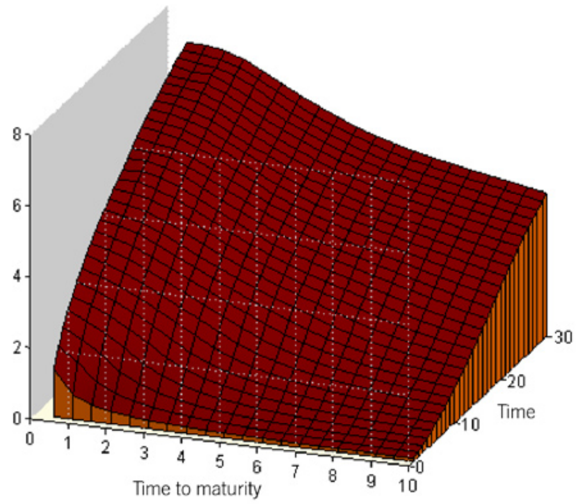


Figure 15. FX, RUNNING YIELD AT RISK (without stock effects)
Percentage points and years

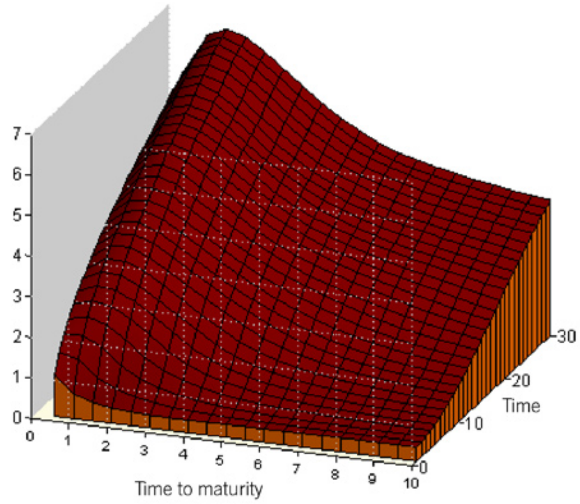


Figure 16. PORTFOLIO RUNNING YIELD AT RISK
Percentage points and years

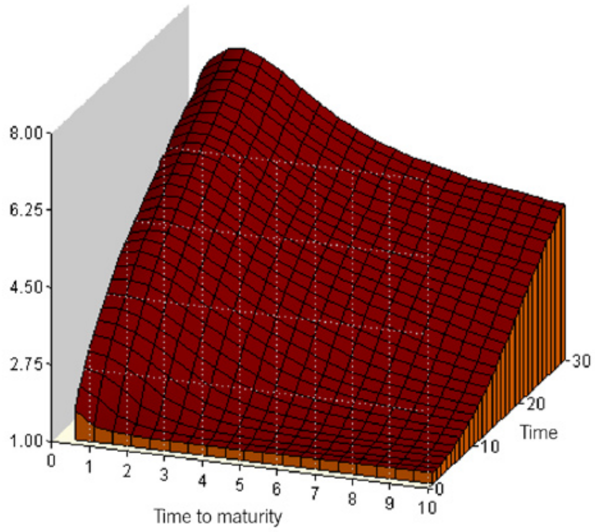


Figure 17. PORTFOLIO YIELD AT RISK (without stock effects)
Percentage points and years

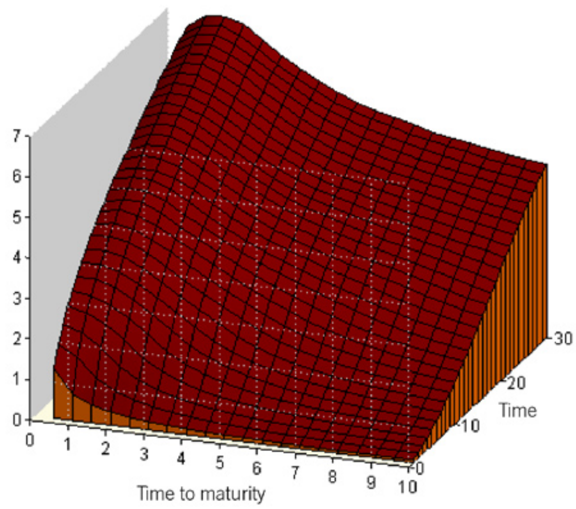


Table 13. RYaR and CaR, percentage points and SEK billion, non-stationary processes with stock effect, time horizon 1 year

Maturity	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7
RYaR														
Nom SEK RYaR	1.46	0.75	0.50	0.37	0.29	0.23	0.19	0.16	0.14	0.12	0.11	0.10	0.09	0.09
Real RYaR	2.24	1.82	1.71	1.68	1.66	1.65	1.64	1.63	1.63	1.62	1.62	1.62	1.61	1.61
FX RYaR	6.90	6.92	6.93	6.98	7.00	7.01	7.02	7.03	7.04	7.05	7.07	7.08	7.09	7.09
Portfolio RYaR	1.66	1.34	1.27	1.24	1.23	1.22	1.22	1.22	1.22	1.22	1.22	1.23	1.23	1.23
CaR														
Nom SEK CaR	10.8	5.6	3.7	2.8	2.1	1.7	1.4	1.2	1.0	0.9	0.8	0.7	0.7	0.6
Real CaR	4.8	3.9	3.6	3.6	3.5	3.5	3.5	3.5	3.5	3.4	3.4	3.4	3.4	3.4
FX CaR	19.9	20.0	20.0	20.2	20.2	20.2	20.3	20.3	20.3	20.4	20.4	20.4	20.5	20.5
Sum nom. CaR	30.7	25.5	23.7	22.9	22.4	21.9	21.7	21.5	21.4	21.3	21.2	21.2	21.1	21.1
Sum CaR	35.5	29.4	27.4	26.5	25.9	25.4	25.2	24.9	24.8	24.7	24.7	24.6	24.6	24.5
Portfolio CaR	20.6	16.7	15.7	15.4	15.2	15.2	15.2	15.1	15.2	15.2	15.2	15.2	15.3	15.3
Diversification	14.8	12.7	11.6	11.0	10.7	10.3	10.0	9.8	9.7	9.5	9.5	9.4	9.3	9.2

Table 14. RYaR and CaR, percentage points and SEK billion, non-stationary processes with stock effect, time horizon 5 years

Maturity	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7
RYaR														
Nom SEK RYaR	3.22	3.07	2.83	2.51	2.14	1.71	1.42	1.20	1.04	0.92	0.82	0.74	0.68	0.63
Real RYaR	3.54	3.29	3.08	2.81	2.54	2.28	2.11	1.99	1.91	1.87	1.83	1.79	1.77	1.75
FX RYaR	7.19	7.35	7.40	7.33	7.24	7.14	7.10	7.09	7.08	7.08	7.08	7.07	7.06	7.05
Portfolio RYaR	2.98	2.92	2.76	2.52	2.24	1.96	1.75	1.62	1.54	1.48	1.43	1.40	1.38	1.37
CaR														
Nom SEK CaR	23.9	22.8	21.0	18.6	15.9	12.7	10.5	8.9	7.7	6.8	6.1	5.5	5.1	4.7
Real CaR	7.5	7.0	6.6	6.0	5.4	4.8	4.5	4.2	4.1	4.0	3.9	3.8	3.8	3.7
FX CaR	20.7	21.2	21.4	21.1	20.9	20.6	20.5	20.5	20.4	20.4	20.4	20.4	20.4	20.4
Sum nom. CaR	44.6	44.0	42.4	39.8	36.8	33.3	31.0	29.4	28.1	27.2	26.5	25.9	25.4	25.0
Sum CaR	52.2	51.0	48.9	45.7	42.2	38.2	35.5	33.6	32.2	31.2	30.4	29.7	29.2	28.7
Portfolio CaR	37.1	36.3	34.3	31.3	27.9	24.4	21.8	20.2	19.1	18.4	17.8	17.4	17.2	17.1
Diversification	15.1	14.6	14.6	14.4	14.3	13.7	13.7	13.4	13.1	12.8	12.6	12.3	12.0	11.7

Table 15. RYaR and CaR, percentage points and SEK billion, non-stationary processes without stock effect, time horizon 1 year

Maturity	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7
RYaR														
Nom SEK RYaR	1.46	0.75	0.50	0.37	0.29	0.23	0.19	0.16	0.14	0.12	0.11	0.10	0.09	0.09
Real RYaR	1.33	0.67	0.45	0.33	0.26	0.21	0.18	0.15	0.14	0.12	0.11	0.10	0.10	0.09
FX RYaR	1.02	0.59	0.44	0.36	0.32	0.30	0.30	0.30	0.30	0.30	0.31	0.31	0.32	0.32
Portfolio RYaR	1.21	0.63	0.43	0.31	0.24	0.19	0.15	0.13	0.11	0.09	0.08	0.08	0.07	0.06
CaR														
Nom SEK CaR	10.8	5.6	3.7	2.8	2.1	1.7	1.4	1.2	1.0	0.9	0.8	0.7	0.7	0.6
Real CaR	2.8	1.4	0.9	0.7	0.6	0.5	0.4	0.3	0.3	0.3	0.2	0.2	0.2	0.2
FX CaR	2.9	1.7	1.3	1.0	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Sum nom. CaR	13.7	7.3	5.0	3.8	3.1	2.6	2.3	2.1	1.9	1.8	1.7	1.6	1.6	1.6
Sum CaR	16.5	8.7	5.9	4.5	3.6	3.0	2.7	2.4	2.2	2.0	1.9	1.9	1.8	1.7
Porfolio CaR	15.0	7.9	5.3	3.9	3.0	2.3	1.9	1.6	1.3	1.2	1.0	0.9	0.9	0.8
Diversification	1.5	0.8	0.7	0.6	0.6	0.7	0.7	0.8	0.8	0.9	0.9	0.9	0.9	0.9

Table 16. RYaR and CaR, percentage points and SEK billion, non-stationary processes without stock effect, time horizon 5 years

Maturity	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7
RYaR														
Nom SEK RYaR	3.22	3.07	2.83	2.51	2.14	1.71	1.42	1.20	1.04	0.92	0.82	0.74	0.68	0.63
Real RYaR	2.88	2.70	2.46	2.16	1.84	1.48	1.22	1.04	0.90	0.79	0.71	0.64	0.58	0.54
FX RYaR	2.31	2.46	2.38	2.13	1.81	1.44	1.18	0.99	0.85	0.76	0.68	0.63	0.59	0.56
Portfolio RYaR	2.69	2.64	2.46	2.19	1.86	1.49	1.23	1.04	0.90	0.79	0.71	0.64	0.59	0.54
CaR														
Nom SEK CaR	23.9	22.8	21.0	18.6	15.9	12.7	10.5	8.9	7.7	6.8	6.1	5.5	5.1	4.7
Real CaR	6.1	5.7	5.2	4.6	3.9	3.1	2.6	2.2	1.9	1.7	1.5	1.4	1.2	1.1
FX CaR	6.7	7.1	6.9	6.1	5.2	4.2	3.4	2.9	2.5	2.2	2.0	1.8	1.7	1.6
Sum nom. CaR	30.6	29.8	27.9	24.8	21.1	16.9	13.9	11.7	10.2	9.0	8.1	7.3	6.7	6.3
Sum CaR	36.7	35.6	33.1	29.3	25.1	20.0	16.5	14.0	12.1	10.7	9.6	8.7	8.0	7.4
Portfolio CaR	33.5	32.9	30.6	27.2	23.1	18.6	15.3	13.0	11.2	9.9	8.8	8.0	7.3	6.7
Diversification	3.2	2.7	2.5	2.1	1.9	1.4	1.2	1.0	0.9	0.8	0.7	0.7	0.7	0.7