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The impact from the Yield Curve on the four major Swedish Banks' Profitability

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Abstract

This thesis investigates the impact of short-term rates and the yield curve on the four major Swedish banks profitability. The paper also exploits possible differences from the impact of the yield curve between the each of the four banks. By using quarterly panel data between Q1 1998 and Q3 2023 in two regression models, the impact of short-term rates and the yield curve on return on equity and net interest margin is estimated. On an aggregated level, the results showed a significant and positive impact from the level of short-term rates on both profitability measures. The yield curve shows significant impact on net interest margin, although ambiguous whether the significance relates to the level or change. For return on equity, the yield curve did not show any significant impact on an aggregate level. On a bank specific level, the results suggest differences of the impact from the level of the yield curve between the four banks on both profitability measures. This possibly reveals differences in business models and interest rate risk carried on the balance sheet.

Key words: Bank Profitability; Yield curve; Short-term rates; Interest rate risk; Maturity mismatch

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1 Introduction

During 2022, the four major Swedish banks' have seen profits surge to record levels. The aggregated profit amounted to 109 billion SEK of which 33 billion where directly distributed to its owners through dividends (CapitalIQ, 2023). This coincides with rising interest rate in the presence of higher inflation. As a consequent, a debate regarding excess profits and subsequent regulation of these have occurred (Riksdagen, 2023). As a basis for this, there is a common perception of a relationship between interest rates and banks' profits. However, the debate regarding excess profits is ultimately about the banks' ability to use the interest rate level and the yield curve to take advantage of different maturities in its assets and liabilities (Alessandri & Nelson, 2015). Usually, banks hold longer duration assets such as mortgages on the asset side, while funding these in part by more short duration liabilities such as deposits (Di Tella & Kurlat, 2016). Profits are generated by earning a spread between these different assets and liabilities. Higher spreads between earning yields and funding costs result in higher profits. Hence, utilizing differences between short- and long-term market interest rates, i.e., the yield curve, may provide an opportunity for banks to increase profitability. Several other studies have been made on the relationship between the yield curve and both profits and profitability. Claessens et al. (2018) found that a steeper yield curve increased banks net interest income. Borio et al. (2015) found similar effects but framed it as a flatter yield curve seems to erode the profitability for banks. In a compressive study on UK banks, Alessandri & Nelson (2015) found that both the level of interest rate and the slope of the yield curve increase interest income and trading income in opposite direction, but the net effect on profitability seems to be positive. All these studies are either made on a cross-country or aggregated domestic level. However, there are limited studies of the yield curves impact on a bank specific level in general and on the four major Swedish banks in particular.

To provide deeper insights to the debate of excess profits and the driver behind banks profitability, this thesis aims to investigate how short-term rates and the yield curve impacts the four major Swedish banks profitability. The thesis also explores possible differences between the four banks utilization of the yield curve and its subsequent impact on profitability. This provides insights to possible difference between banks' business models and strategies, which might differ in efficiency in different rate environments. Some studies on Swedish banks have been made in recent years. For example, Karlsson & Karlsson (2022) investigated both bank specific factors and macro variables effect on Swedish banks

profitability before and after the Basel III requirements, however not considering the yield curve nor bank specific differences. This thesis takes a more micro-perspective of the four major Swedish banks, exploring the effects of short-term rates and the yield curve on profitability during the 21st century and accounting for possible effects from the Basel III requirements. This will bring deeper and new insights to the mechanism behind profitability, both accounting for short- and long-term effects of the yield curve.

Two different regression models are used to estimate the effect from short-term rates and the yield curve on profitability. The results suggests that profitability have an evident and positive relationship to short-term rates. Although more ambiguous, the results also suggest a positive impact from a steeper yield. There seems to be differences between the four banks in the effect from the level of yield curve on both profitability measures, suggesting disparity in business models and interest rate risk carried on the balance sheet. This possibly provides insights to the differences in volatility of profitability between the four banks during the 21st century.

In section 2, relevant theory and background of the banking business and the yield curve are presented together with a review of earlier literature on the subject. Section 3 describes the econometric framework, discussing the models and the potential problems, as well as presenting the data used. In section 4, the results of the models are presented and discussed. The overall conclusions and summary of the thesis is presented in section 5.

2 Theory

Interest rates play a significant role for commercial bank's operations and profitability. In the business of banking, interest rates operate and affect both the asset- and liability side of the balance sheet. Different maturities occur on each side, yielding a mismatch between assets and liabilities. This results in several dynamics on profitability from interest rates with different duration. Imposed regulations and different business models yield possible implications on the general dynamics.

2.1 Banks balance sheet and interest rate risk

The business of banking is by nature highly levered with low equity to assets ratios, as the core of the business model consists of earning a spread between the interest of the assets over the liabilities. Regarding the liabilities, banks finance themselves mainly through deposits and bond issues. These finance banks assets mostly consisting of loans, fixed asset securities and deposit at the central bank. The total assets consist of a wide verity of rate maturities, exposing banks for an inherent interest rate risk (Swedish Banker's Association, 2023). A common risk occurs when deposits, which can be withdrawn at any time, finances longer term assets. Another risk related to the duration of assets is the repricing of assets as interest rate changes. A rise in interest rates lowers the value of longer duration assets, possibly causing a repricing mismatch problem of the balance sheet as assets and liabilities do not reprice in a linear way (Neely & Neely, 2023). Some of this interest rate risk can be offset through different derivatives (Di Tella & Kurlat, 2016).

What the balance sheet contains and to which extent these risks are present depends in large part of the banks business model. For Swedish banks, deposit makes up approximately 40% of total liabilities, while mortgage-backed securities stand for 32%. The asset side consists of 62% lending to households and corporates (Eidestedt et al., 2020). The majority of deposits consists of short-term interest duration subject to withdrawals, while the lending part of the asset side is characterized by a mix of short- and long-term durations combined with slower changes. Mortgages are in large extend financed by covered bonds in which banks, to a high degree, matches the duration of assets to liabilities to mitigate interest rate risk. Although, the duration match between bonds and mortgage are not perfect. As mentioned, banks hedge part of this interest rate mismatch through derivates, however some interest rate risk remains on the balance sheet (Eidestedt et al., 2020).

2.2 Basel III requirements

The potential problems with the high leverage operations have been present for banks, where the financial crisis 2007-2009 exposed balance sheet risks and that existing regulations were not sufficient. The main concern presented by the Basel Committee was that banks had to little low-risk capital and insufficient liquidity risk management. High leverage left banks vulnerable to changes in asset values and outflows, leaving possible system critical banks insolvent with potential devasting consequences (Christiansen et al., 2020). To cope with these problems, the Basel III regulations implemented 2014, placed new requirements on banks. The main parts were risk-based capital requirements, capital requirements according to new floor level for risk weighted assets and leverage ratio requirements. The leverage ratio requirements impact the major banks through an increase in their minimum level of core equity. The implementation of Basel III to Swedish banks has led to a higher solvency ratio- and capital coverage cost for the assets held on the balance sheet. (Edlund, 2017).

These regulations have affected operations and efficiency for banks. For European area banks, the introduction of Basel III requirements has increased both efficiency and profitability for large- and medium sized banks, while smaller banks have experienced a decrease. The main driver behind this is said to be the heavy administrative and reporting burden. Beside this, the higher capital ratio requirements have generally increased the credit quality resulting in less losses and write-downs, yielding a more stable profitability overall (Grzeta et al., 2023).

2.3 Profitability and interest rates

Due to the inherent role of interest rates in banks operations, the link between rates and profitability is inevitable. Multiple studies about banks profitability and both the level of interest rate and the yield curve have been conducted during the last decades. By the nature of the banking business, with high leverage and a business model based on different dimensions of interest rate spreads, exploitation of these relationship is logical. A commonly occurring thought is that higher level of both short-term rates and the yield curve increase banks profitability. Net interest margin seems to be the profitability measure affected most, where evidence from several countries suggests that both higher short-term rates and a steeper yield curve increase net interest margin (Borio et al., 2015). One driver of the positive impact from higher rates and/or a steeper yield curve is that deposit rates generally are sticky, while lending rates tends to reprice faster. Since deposits are a core part of the financing side for

most banks, a steeper yield curve commonly increases margins through the repricing of assets (Classens et al., 2018). The magnitude of which short-term rates and the level of the yield curve affect net interest margin may be derived from the extent of maturity mismatch, the maturity gap, on banks' balance sheet. Banks with a higher maturity gap, i.e. a longer gap of the repricing schedule of the assets relative the liabilities, tend to react less to change in short-term rates while stronger to a change in the yield curve. This is due to the, all else equal, faster repricing of liabilities compared to banks with lower maturity mismatch (Coulier et al., 2023).

Several other studies, regardless of the magnitude of the effect, also share this view of higher rates and yield curve increases net interest margin on the longer term, however the short-term effects are not necessarily the same in all instances. As interest rates rise, some results suggests that the short-term effects on net interest margin are the opposite of the longer-term ones (Busch & Memmel, 2015). As interest rate rise, the maturity mismatch between the assets and liabilities in combination with the repricing mechanisms through changes in rates, may in the short term decrease net interest margin. However, when these effects occur, they tend to be fairly short lived (Alessandri & Nelson, 2015). The effect of changes in rates are not homogenous for all banks and time periods either. Due to the different maturities and the repricing mechanism, there is strong reasons to believe there is a lag between changes in rates and subsequent adjustments on the balance sheet (Flannery, 1983). Interestingly, some results also indicates that the sensitivity of the effect from changes in rates on net interest margin is higher in a lower interest environment (Classens et al., 2018), which to a great extent coincide with the Basel III regulations.

As there seems to be clear empirical data pointing to a positive relationship between the level of mostly short-term rates but also largely the yield curve and net interest margin, the relationship is more ambiguous regarding return on equity. The mechanisms effecting net interest margin are inevitably partially transmitted to return on equity. However, as the nominator in this measure incorporates other income and expenses besides pure interest once as well as accounting for more types of derivatives than net interest margin, this leaves the relationship more complicated. This yields a less evident impact from higher short-term rates and yield curve on return on equity (Alessandri & Nelson, 2015). Despite this, there are results suggesting similar effects from both the level and slope of short-term rates as well as the yield curve. Although showing signs of less sensitivity, return on equity exhibits a positive

relationship primarily to the level of short-term rates and the yield curve (Aydemir & Ovenc, 2016).

While the effects from short-term rates and the yield curve discussed are valid on an aggregated level, empirical results suggest there are differences between individual banks related to the business model and strategy applied. Some evidence, mainly from the US, points towards a shift to a more "retail" oriented model since the great financial crisis. This model focuses more on floating rate assets and interest sensitive funding. This in turn has led a to a positive impact on net interest margin in episodes of a flattening yield curve (B. King & Yu, 2018). When focusing on the major Swedish banks in particular, their business models seem to be relative resilient to shifts in interest rates. Despite the last decades trend of lower interest rates, both net interest margin and overall profitability has generally held up well. Even as Swedish banks seem to benefit from higher rates, low funding costs through good credit quality and non-interest deposits together with efficient organizations has enabled a stable profitability despite lower rates (Madaschi & Neuvo, 2017). The access to cheap and stable funding, despite the interest rate environment, is a key component of Swedish banks long lasting resilient profitability in different type of circumstances (Turk, 2016).

To summarize, banks' balance sheets consist of assets and liabilities with a variety of maturities creating a duration mismatch and an interest rate risk. Banks generate interest profits through earning a spread between rates received on assets and rates paid on liabilities. There is compelling evidence of a positive impact from short-term rates on both net interest margin and return on equity. The level of the yield curve seems to have positive effect on profitability, although a bit less evident. The short-term effects from changes in both short-term rates and the yield curve are more ambiguous, with some studies suggesting opposite effect on profitability from changes in rates due to repricing mechanisms. Depending on regulations and business model, the interest rate risk on the balance sheet may vary between banks and time periods.

3 Methodology

The effect from both short-term rates and the yield curve on banks profitability are estimated through an econometric study. Two different regression models are applied to produce efficient and unbiased estimates. Both return on equity and net interest margin are used as profitability measures. Various specification of the models allows examine the effect from Basel III requirements of the impact from the yield curve on an aggregate level. The specifications also allow for estimating possible differences between the four banks. The study includes quarterly data, ranging from 1999 to 2023, and consist of both bank specific- and macro variables.

3.1 Econometric framework

In the two regression models, return on equity and net interest margin are used as the dependent variables. Both bank specific- and macro variables are included, where the main emphasis is put on the yield curve. Specifications of the two general models also allows for comparisons between each of the four banks. The two general models are specified as:

$$y_{i,t} = \alpha + \beta X_{i,t-1} + \delta M_{t-1} + \varepsilon_{i,t}\,, \varepsilon = \eta_i + \nu_t \quad (1)$$

$$y_{i,t} = \alpha + \gamma y_{i,t-1} + \beta X_{i,t-1} + \delta M_{t-1} + \varepsilon_{i,t}\,, \varepsilon = \eta_i + \nu_t \quad (2)$$

In the models, i denotes the individual banks at each quarter, t. The dependent variable, $y_{i,t}$ represents the profitability measure (return on equity and net interest margin). In model (2), the lagged value of the depended variable, $y_{i,t-1}$ is included. $X_{i,t-1}$is a set of bank specific control variables consisting of the equity to asset ratio, asset growth and loan to deposit ratio. These variables are homogenous with earlier cross country- and country specific studies (Allessandri & Nelson, 2015, Karlsson & Karlsson, 2023 etc.). M_{t-1} represent a series of macro variables. These consist of GDP growth, which is included as a control variable for the overall economy. The 3-month government rate and the change from quarter to quarter in the 3-month rate is included as a measure of the effects of short-term rates. The yield curve (derived by the difference between the 10-year government bond and 3-month government bill rate) and the change in yield curve from quarter to quarter. The two yield curve variables are the major ones in the model where the emphasis of the analysis is focused, with the two 3-month yield variables also of strong interest due to the interaction with the yield curve. η_i represent bank effects and ν_t is an idiosyncratic disturbance.

By including both the level and the change of both the 3-month yield and the yield curve, both the long- and short-term effects are absorbed in the model. This enables a more dynamic approach in the assessment of the effect of the yield curve. The level represents the longer-term effect while the change allows for interpretations of the short-term repricing mechanisms. The 3-month yield represents a proxy of the current monetary policy since this is the predominate factor driving the yield (Fransson & Tyskling, 2016, pp.38). The yield curve provides the markets pricing of current short-term rates relative longer-term ones, which transmits to the banks maturity mismatch and balance sheet risks. As the yield curve is partly a function of the 3-month yield, including both variables in the same models could be seen as counter intuitive and potentially causing misfitting of the models. However, several other studies on the subject applies a similar approach when studying the relationship between profitability and the yield curve. More specifically, both Allessandri & Nelson (2015) and Aydemir & Ovenc (2016) incorporated short-term rates and the yield curve, derived using the same short-term rate, in the same model. Both also included level and change for both variables, which is consistent with the approached applied in these models.

Dummy variables for both Basel III requirements and bank specific effects are included in various specifications of the models. By examine the effect of Basel III, the models control for the possible implications of the extensive changes to banks operations. The bank specific specifications highlight the differences between the four banks degree of usage of the yield curve through incorporating an interaction term between the induvial banks and the level of the yield curve. This enables a comparison between each bank, giving insights to possible differences in business models and strategy. Due to the limitation of this thesis, the models are limited to only estimate possible difference between the banks and the effect from the level the yield curve.

The data consist of a balanced dynamic panel data, where each of the four banks constitutes each group. Dynamic models, in our case consisting of both static (GDP growth, 3-month yield and yield curve) and dynamic (bank specific variables) across panels also including both level- and first difference variables, may be associated with several statistical problems. In our model, one concern is possible endogeneity, which means that the independent variable(s) is correlated with the error term. Endogeneity can arise when an independent variable effect the dependent variable while the dependent variable effects the independent variable at the same

time. A possible solution to this is to lag the independent variables with one period in the model (Barros et al., 2020). In our models, this may be an issue for the bank specific- and the two different dependent variables. To mitigate this potential issue of endogeneity, all independent variables are lagged one period in both models. This also consider the probable occurrence of a time lag for rate changes to affect profitability. Current level and changes in rates effects banks operation in the future, as there is a time lag before rates is transmitted through the balance sheet (Flannery, 1983). The extent of these lags may be longer than what is captured in these models, as it only captures a lag of one quarter. This possibly effects the validity of the models and results. Another potential problem is persistence, i.e. the current value is closely related and dependent of the value in the period before. One way to handle this is to include the lagged value of the dependent variable in the model (Allessandri & Nelson, 2015). Hence, in model (2), the lagged dependent variable is included in the model together with the lagged independent variables.

For model (1), a panel data regression with random effects is applied. As the model includes common time effects, a random effect model is suitable. It incorporates both time-invariant and time variant unobserved factors. The model allows for time-invariant individual effects affecting the dependent variable which are not included in the model. It acknowledges unobserved heterogeneity across entities and allows for the unobserved individual effects to vary over time which are absorbed by the error term (Schmidheiny, 2023). In model (2), a bias corrected method of moments model is applied. This model allows and adjust for possible endogeneity and cross sectional correlated errors between the lagged dependent- and bank specific variables (Breitung et al., 2021). Hence, by using both model (1) and (2) different solutions to the complexity of dynamic panel data models are examined. Earlier research of dynamic panel data (Allessandri & Nelson, 2015 etc.) suggest that large T contributes to less bias in the estimates and help correct the inherent difficulties. Data from 95 respectively 99 quarters are used in the models. This provides a relatively large number of time-different observations, which supports more efficient and less bias in the estimates.

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Other potential problems in our models are heteroskedasticity of the error terms and autocorrelation (which relates to previous discussion of persistence), which can lead to inefficient estimates. A test for autocorrelation for both models was performed to evaluate the models and data. As Stata lacks an efficient test for heteroskedasticity in random effect models, a plot of the residuals for one regression is presented in the appendix. Graph 4

suggests presents of heteroskedasticity. When evidence of presences of either autocorrelation and/or heteroskedasticity, robust standard errors are used to correct for the possible over- or underestimation by normal standard errors as suggested by Stock & Watson (pp.192, 2020).

Large outliers are in the data can influence and skew the results, possibly leaving estimations insufficient and misleading (Mielke, 2019). The residuals of the two base models regarding both return on equity and net interest margin were conducted and analyzed. In the appendix, both the residuals and models considering the period(s) of outliers are presented. This addresses the potential problems of outliers and provides results taking these outliers into account which can then be incorporated in the interpretation of the results for both profitability measures.

3.2 Data

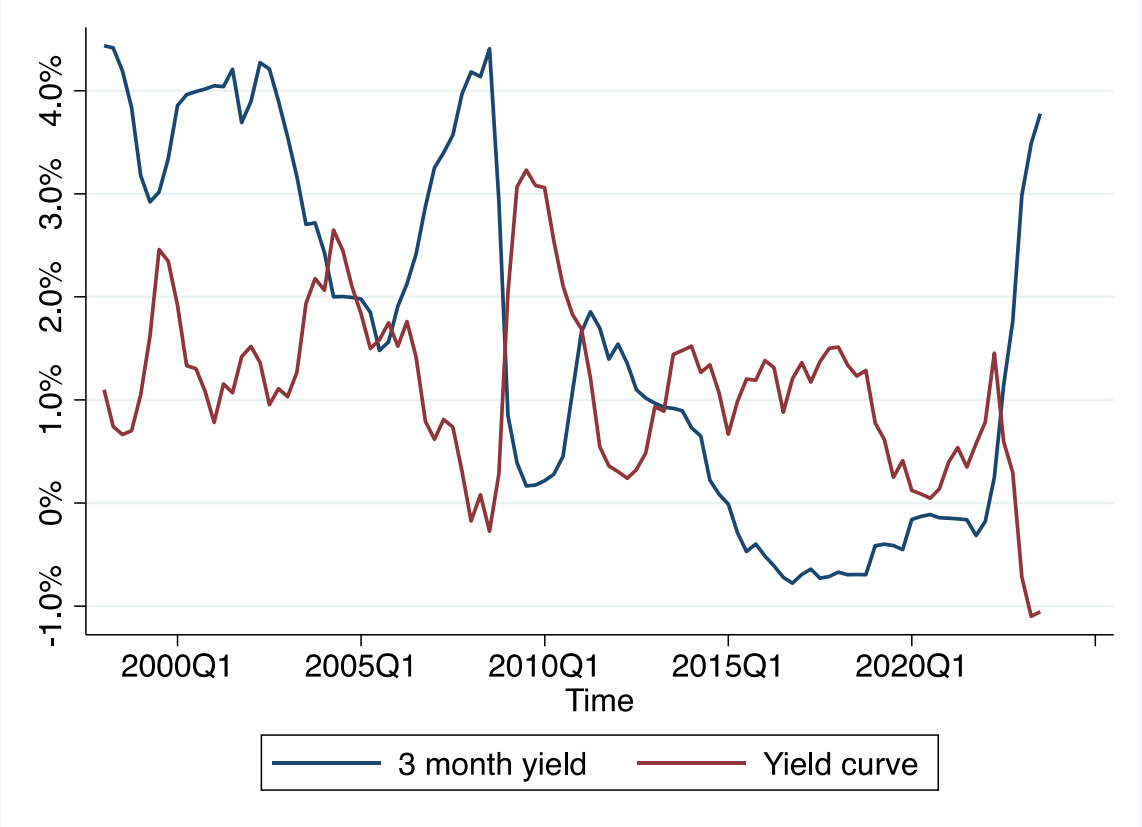
Bank specific data (return on equity, net interest margin, equity ratio, loan to deposit, asset growth) were collected from CapitalIQ (2023). Net interest margin was not included in the default ratios and was calculated by dividing rolling twelve months net interest income by total assets. Data for interest rate levels (three-month bill and ten-year government bond) were collected from Riksbanken (2023). The yield curve was calculated by taking the difference between the ten-year and three-month yield. The change in the three-month yield and the yield curve was calculated by taken the difference between the period t and t-1. GDP data was taken from OECDStat (2023).

Data for the four banks (Nordea, Handelsbanken, SEB and Swedbank) and the other variables range between Q1 1998 to Q3 2023. The model studies data between Q1 2000 and Q3 2023 for return on equity and between Q1 1999 and Q3 2023 for net interest margin. The data ranging from Q1 to Q4 1998 to is included for calculations of lagged values of the independent variables. Some variables have missing values for specific quarters due to missing data in the databases. The data for all variables are summarized in the table below.

Table 1: Descriptive statistics for data between Q1 1998 to Q3 2023

Variable	Obs	Mean	Std. dev.	Min	Max
ROE	380	.137	.060	-.168	.306
NIM	396	.010	.003	.004	.021
Equity to Assets	408	.045	.007	.029	.062
Asset growth	397	.072	.126	-.130	1.159
Loan to deposits	410	1.938	.753	.912	4.359
GDP growth	408	.006	.014	-.079	.072
3-month yield	412	.016	.017	-.008	.044
10-year yield	412	.027	.018	-.001	.058
Yield curve	412	.011	.008	-.011	.032
Change in 3-month yield	408	-.00006	.004	-.021	.012
Change in yield curve	408	-.0002	.004	-.010	.018

Graph 1, 3-month yield and the yield curve between Q1 1998 and Q3 2023.



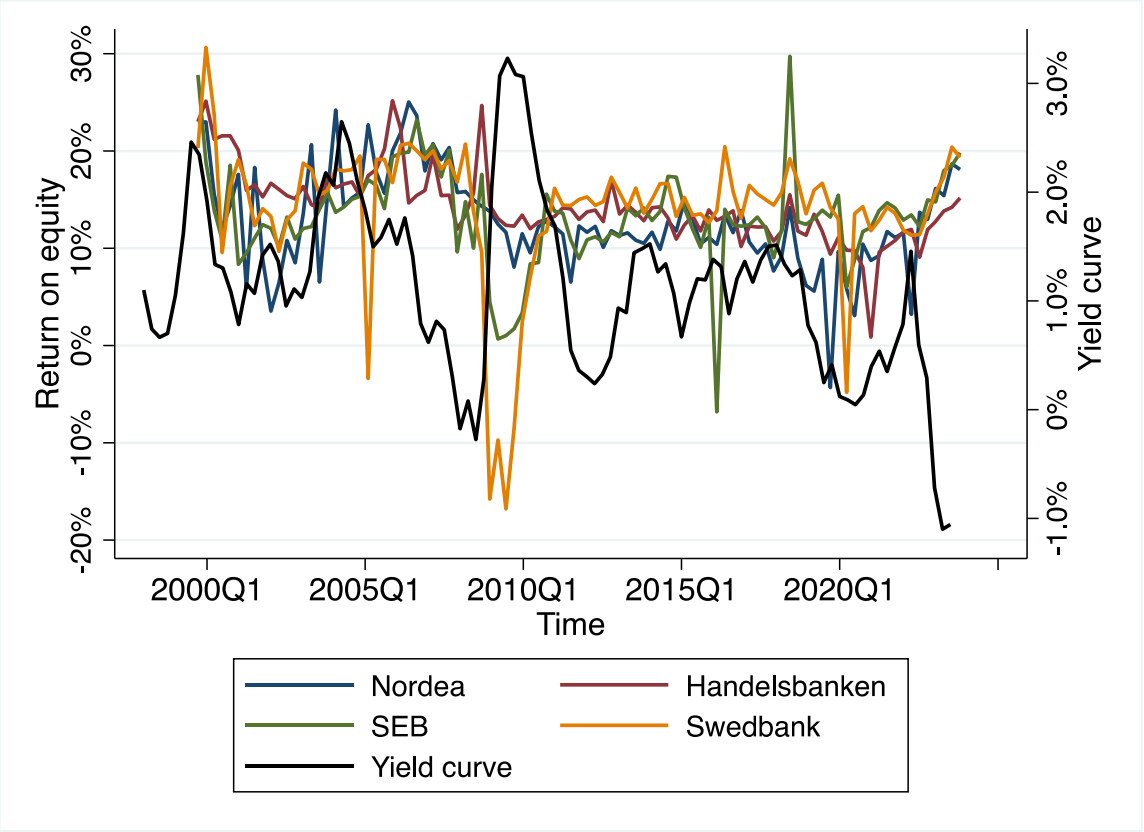
Starting with the interest variables in table 1, both the 3-month- and 10-year yield have experienced negative values during the period, both have on average been positive. This also applies on the relationship between the two yields, i.e. the yield curve. The average slope of the yield curve has been 1.1%, with the highest observation being positive spread of 3.2% and the lowest a negative one of 1.1%. Graph 1 shows the development during the entire period.

The 3-month yield experienced significant drawdowns in connection to the great financial crisis and later a more prolonged drawdown during the 2010's. During the last two years, the 3-month yield has risen significally while the yield curve has inverted. The change quarter to quarter for both the 3-month yield and the yield curve have on average been negative. GDP growth has been positive in average with a similar magnitude of the most positive and negative outcome. Looking at the bank specific variables, loans are on average twice the size of deposits for the banks. The leverage, measured as equity to total assets, ranges from 2.9% to 6.2% during the period. Asset growth has experienced negative quarters but has on average been positive with 7.2% growth.

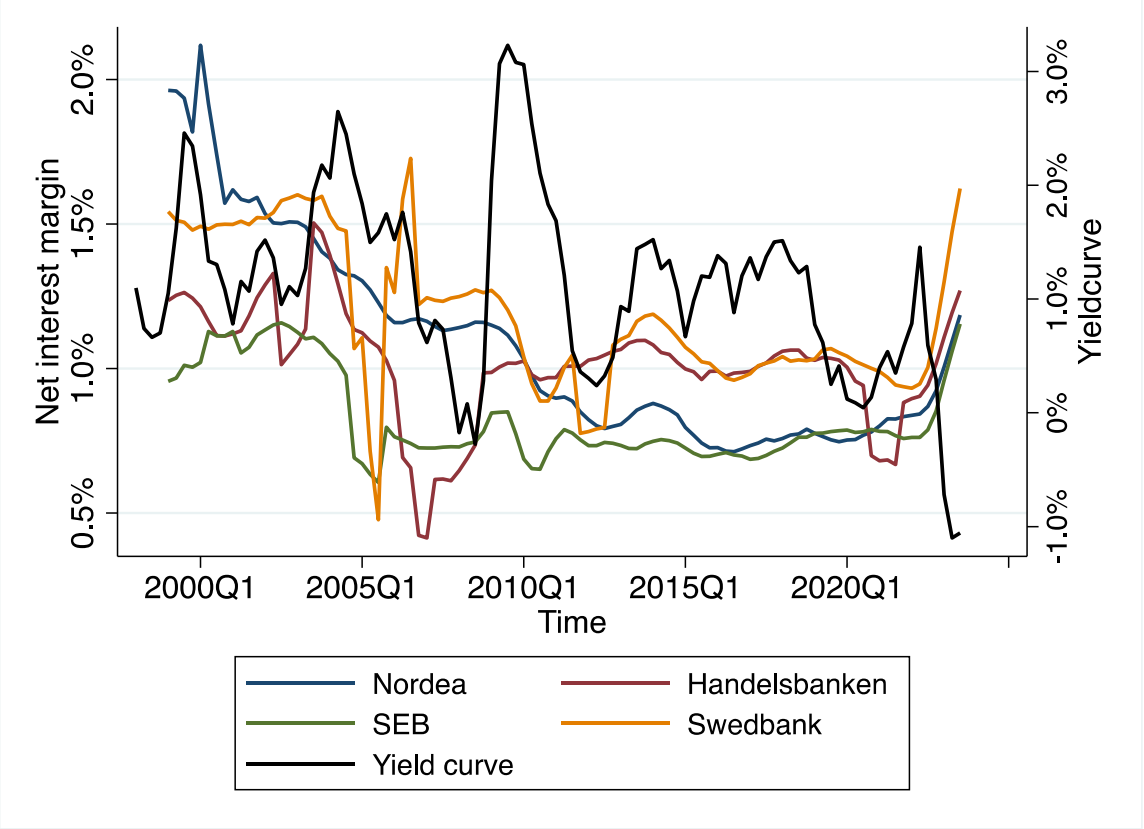
Table 2: Return on equity and net interest margin between Q1 2000/1999 and Q3 2023

Variable	Obs	Mean	Std. dev.	Min	Max
Return on equity					
Nordea	95	.128	.051	-.043	.250
Handelsbanken	95	.144	.035	.080	.251
SEB	95	.132	.051	-.068	.297
Swedbank	95	.143	.088	-.168	.306
Net interest margin					
Nordea	99	.011	.003	.007	.021
Handelsbanken	99	.010	.002	.004	.015
SEB	99	.008	.002	.006	.012
Swedbank	99	.012	.003	.005	.017

Graph 2, Return on equity and the yield curve between Q1 2000 and Q3 2023



Graph 3, Net interest margin and the yield curve between Q1 1999 and Q3 2023



Looking at the dependent variables, table 1 shows that return on equity has been 13.7% and net interest margin 1.0% on average across the four banks for the period. Table 2 break down the ratios for each individual bank. Handelsbanken have on average experienced highest return on equity, while Nordea the lowest. Swedbank has the single highest observation, with a return on equity exceeding 30%. All banks besides Handelsbanken have experienced negative returns. Looking at the stability of return on equity, table 2 suggests relatively large differences between the banks. Handelsbanken's return on equity have a standard deviation of 3.5%, while Swedbank's is more than twice as volatile with a standard deviation of 8.8%. This is shown in graph 2, where the left y-axis shows return on equity. Swedbank shows the highest volatility in profitability including several negative values while Handelsbanken's profitability are, relative the others, more stable. This implies, relative to the other banks, a more defensive approach from Handelsbanken showing no negative returns on a quarterly basis while also showing the (almost) shared lowest top profitability. On the other scope, Swedbank show both the single lowest and highest results, indicating a more aggressive approach. Based on these observations, there might be differences in the sensitivity to different factors between the banks.

The right y-axis in graph 2 shows the level of the yield curve. During some periods, return on equity and the yield curve exhibits similar developments, while during other periods the development shows wide divergence. This is especially true for the period around the great financial crisis. First the yield curve went down while return on equity where stable, then a sharpe rise in the yield curve and a subsequent drop in return on equity followed. Another clear divergence can be observed during the last quarters of the period, where the return on equity has risen for all banks while the yield curve has turned negative.

For the net interest margin, Swedbank have the highest and SEB the lowest average across the period. None of the banks have produced negative ratios, with Nordea showing the single highest quarter. In absolute levels, net interest margin is significantly lower then return on equity where the highest observation is 2.1%. As the denominator in net interest margin is total assets compared to equity in return in equity, the high leverage shown in table 1 with assets more than ten times the equity, a significantly lower net interest margin is logical. The volatility of net interest margin is more homogenous across the different banks as the standard deviation varies between 0.2-0.3%. However, since there are differences between the banks, this might imply differences in the sensitivity to different factors between the banks for net

interest margin as well. Looking at table 1 for the aggregated values for all banks, the standard deviation relative the mean value is lower for net interest margin (0.3) compared to return on equity (0.44). This implies a more stable development of net interest margin. This is illustrated in graph 3, where net interest margin is shown on the left y-axis. This shows a more stable development comrade to return on equity in graph 2. However, there are still fluctuations. Nordea shows a clear trend during the first 15 years of lower net interest margin. Swedbank, in line with their return on equity, shows significant drop in net interest margin during a couple of quarters. The right y-axis in graph 3 shows the level of the yield curve. The patterns are similar to the ones shown in graph 2, where there are two clear signs of divergence.

4 Results

To estimate the effect of short-term rates and the yield curve on return on equity and net interest margin, both models are runed in three different variations on the aggregated data. The two different specifications of the models control for the possible effect from Basel III requirements. When controlling for bank specific effects from the level of the yield curve, both models are only estimated using the base model for both profitability measures. A total of 20 regressions are performed, consisting of 10 each of the two models.

Table 3: Return on equity regression.

Variable	(1) ROE	(2) ROE	(3) ROE	(4) ROE	(5) ROE	(6) ROE
Level of 3-month yield	0.928***	0.458***	1.313***	0.589***	1.318***	0.593***
	(0.252)	(0.130)	(0.232)	(0.114)	(0.234)	(0.119)
Change in 3-month yield	2.008	1.209	1.985	1.252	1.879	1.151
	(1.317)	(1.053)	(1.386)	(1.089)	(1.318)	(1.039)
Level of yield curve	-0.505	-0.0524	-0.614	-0.164	-0.572	-0.119
	(0.748)	(0.226)	(1.008)	(0.234)	(0.991)	(0.234)
Change in yield curve	-0.394	-0.598	-0.461	-0.604	-0.786	-0.935
	(0.693)	(0.636)	(0.694)	(0.630)	(0.670)	(0.517)
ROE		0.530***		0.519***		0.520***
		(0.056)		(0.051)		(0.052)
Equity/Assets	-0.377	-0.202	-0.475	-0.201	-0.498	-0.228
	(0.286)	(0.353)	(0.504)	(0.488)	(0.517)	(0.498)
Asset growth	-0.002	-0.015	-0.005	-0.016	-0.005	-0.016
	(0.0243)	(0.0115)	(0.0271)	(0.0128)	(0.0270)	(0.0126)
Loan to Deposits	0.007	-0.002	0.007	-0.003	0.007	-0.002
	(0.004)	(0.006)	(0.004)	(0.006)	(0.003)	(0.006)
GDP growth	0.502**	0.267*	0.425***	0.241*	0.437***	0.254*
	(0.158)	(0.119)	(0.117)	(0.108)	(0.124)	(0.111)
Basel III			0.0001	-0.0029	0.0028	0.0001
			(0.014)	(0.007)	(0.013)	(0.007)
YC dummy			1.793	0.783	1.591	0.572
			(1.695)	(0.608)	(1.609)	(0.540)
dYC dummy					1.006	1.028
					(0.653)	(0.592)
Constant	0.129***	0.070*	0.124***	0.070*	0.124***	0.070*
	(0.017)	(0.030)	(0.018)	(0.031)	(0.018)	(0.032)
N	380	376	380	376	380	376
Wooldright	4,50	9,95	4,82	10,05	4,85	10,40
(p-value)	(0.124)	(0.049)	(0.116)	(0.049)	(0.115)	(0.048)

(1), (3) and (5) is model 1 panel data regression with random effects, (2), (4) and (6) is model 2 bias correct method of moments regression. () under each estimate is standard robust errors. *, **, *** denotes significance at 10-,5- respectively 1% level. Basel III is a dummy separating introduction of requirements. YC- and dYC is interaction variables between level- and change of yield curve and the Basel III dummy. Wooldright tests for autocorrelation in the variables used. All variables are lagged one quarter.

The results in table 3 shows the panel data regression for return on equity for the period Q1 2000 to Q3 2023. Each parameter in the models can be interpretated as the effect on return on equity, holding all else equal, from a one percent change in the specific variable. Hence, the results can be interpretated as the direct effect from a change in each variable. The results are the aggregated for the four banks, later the effects from the yield curve will be examined on a bank specific level. In the random effect base model in column (1), the two significant variables are GDP growth and the 3-month yield at 5- respectively 1% significant level. The level of short-term rates is estimated to an almost 1:1 relationship to return on equity. The inclusion of the lagged dependent variable in column (2) shows a statistically significant impact by the variable itself. The effect of GDP growth and 3-month yield are still significant, however the impact in percentage terms is approximately halved for both variables. Neither the level nor change in yield curve has significant impact on the return on equity in the two different models. As shown in the appendix graph 5, the last quarters of 2008 and the year of 2009, which coincides with the Great financial crisis, shows outliers in the residuals. A control for the impact of these outliers is conducted in appendix table 7. As the results shows, the separation of these quarters only makes insignificant changes the original results. This strengthens the reliability of the results presented in table 3.

In column (3) and (4), the dummy variable separating the period before and after Basel III requirements and an interaction variable between the Basel dummy and the yield curve is included in both models. Results shows that there is no significant impact, neither on return on equity overall nor from the yield curve, when separating for Basel III. In column (5) and (6) the interactions variable between Basel III and the change in yield curve is included as well. Inclusion of this variables yields similar results as previous, showing no significant effect of either the level- or change in the yield curve. This suggests that the introduction of Basel III did not change the effect from the yield curve. As

Across all three different specifications of the two models, the level of 3-month yield and GDP growth shows significant and positive impact on return on equity. By including the lagged value of the dependent variable, the effect from both variables is dampened but remains significant. Model (2) shows significance at 5% level for autocorrelation, which can be a factor to consider when evaluating the differences when including the lagged dependent variable. The strong impact of the level of short-term rates is in line with Aydemir & Ovenc (2016) showing a positive longer-term effect on banks return on equity from higher short-term

rates. However, these results oppose Allesandri & Nelson's (2015) findings of a non-significant impact from the level of short-term rates on return on equity. As return on equity includes a nominator consisting of other types of income than interest, the evident and direct impact from rates and especially the yield curve is somewhat ambiguous. This is shown in the variables of the yield curve in both models, as the results show no significant impact of neither the level nor change in the yield curve, without the Basel III requirements changing this. One possible interpretation of this is that derivatives and other instruments used on an aggregated level of the four banks offset the effect from the maturity mismatch and repricing on the balance sheet from a change in the yield curve. Other types of incomes are also included in the numerator, which might erode the effect from the yield curve. One should also consider the possible longer lasting lag mechanisms behind repricing of different assets and liabilities to a change in rates as described by Flannery (1983). As the models have incorporated a one quarter lag into the model, some of these mechanisms are captured. However, extended lags could impact different components constituting to the overall profitability, leaving possible effects outside of this model.

Overall, one should be careful drawing major overall conclusions of the impact from the yield curve on return on equity. Partly due to the complex nature of the model and partly since ROE is a measure derived using the results including hedging activities and other income etc., which might be a possible explanation to the limited impact on profitability of both the level and change of the yield curve.

Table 4: Net interest margin regression.

Variable	(1) NIM	(2) NIM	(3) NIM	(4) NIM	(5) NIM	(6) NIM
Level of 3-month yield	0.124**	0.019*	0.138***	0.024*	0.137**	0.023*
	(0.041)	(0.008)	(0.042)	(0.011)	(0.042)	(0.011)
Change 3-month yield	-0.097*	0.027	-0.128***	0.018	-0.122***	0.024
	(0.047)	(0.017)	(0.026)	(0.013)	(0.025)	(0.014)
Level of yield curve	0.114**	-0.004	0.155***	0.009	0.151***	0.005
	(0.041)	(0.007)	(0.032)	(0.012)	(0.0314)	(0.011)
Change in yield curve	0.028	0.059**	0.012	0.055**	0.035	0.077**
	(0.039)	(0.020)	(0.028)	(0.018)	(0.110)	(0.025)
NIM		0.888***		0.870***		0.871***
		(0.047)		(0.061)		(0.057)
Equity/Assets	0.239***	0.022***	0.213***	0.015**	0.214***	0.017***
	(0.030)	(0.006)	(0.05)	(0.006)	(0.046)	(0.005)
Asset growth	0.002*	-0.001	0.002**	-0.001	0.002**	-0.001
	(0.001)	(0.000)	(0.001)	(0.001)	(0.00)	(0.000)
Loan to Deposits	0.001	-0.0001	0.001	-0.0001	0.001	-0.0001
	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)
GDP growth	0.010**	0.004***	0.010*	0.005***	0.009*	0.004***
	(0.003)	(0.001)	(0.004)	(0.001)	(0.004)	(0.001)
Basel III			0.002	0.001*	0.002	0.001
			(0.001)	(0.0002)	(0.001)	(0.0001)
YC dummy			-0.075***	-0.023**	-0.060***	-0.007
			(0.013)	(0.007)	(0.015)	(0.007)
dYC dummy					-0.076*	-0.074**
					(0.032)	(0.024)
Constant	-0.005**	0.001	-0.006**	0.001	-0.006**	0.001
	(0.002)	(0.0002)	(0.002)	(0.0002)	(0.002)	(0.0002)
N	396	390	396	390	296	390
Wooldright	25,25	26,51	23,44	26,68	22,01	26,22
(p-value)	(0.015)	(0.014)	(0.017)	(0.014)	(0.018)	(0.014)

(1), (3) and (5) is model 1 panel data regression with random effects, (2), (4) and (6) is model 2 bias correct method of moments regression. () under each estimate is standard robust errors. *, **, *** denotes significance at 10-,5- respectively 1% level. Basel III is a dummy separating introduction of requirements. YC- and dYC is interaction variables between level- and change of yield curve and the Basel III dummy. Wooldright tests for autocorrelation in the variables used. All variables are lagged one quarter.

The results under in table 4 shows the panel data regression for net interest margin for the period Q1 1999 to Q3 2023 on an aggregated level. The two models and the various specifications are set up the same way as in table 3. Column (1) implies a positive impact at 1- respectivly 10% significant level from the equity to asset ratio and asset growth on net interest margin, where equity to asset ratio has a substantially greater impact. GDP growth is significant and positive on 5% level, however with relatively modest impact level vice. Both level and change of the 3-month yield have significant impact at 5- and 10% level, where the level effect is positive while the change is negative. The residuals, shown in the appendix

graph 6, do show more widespread outliers compared the return on equity. However, to take the Great financial crisis into consideration, the model is tested separating these quarters. The results in table 8, where the quarters showing outliers have been considered, shows no significant difference to the original base models in table 4. Hence, the results seem to be prudent after account for the outliers related to the Great financial crisis, which strengthens the validity of the results in table 4.

As in table 3, column (3) and (4) includes the dummy variable separating the period before and after Basel III requirements and an interaction variable between the Basel dummy and the yield curve is included in both models. A similar pattern occurs with the relative values of the independent variables between model (1) and (2) as in column (1) and (2). However, both models suggest a significant and negative impact of the interaction variable between the Basel III dummy and the yield curve. In column (5) and (6), where the interaction variable of the change in yield is included as well, the same differences as in the basic models occurs, where model (1) shows significance for the level of yield curve while model (2) for the change in yield curve. Column (5) suggests a highly significant and positive effect from the level effect of the yield curve Basel III, i.e. higher sensitivity of net interest margin to the level of the yield curve, and a less significant and negative effect of the change in the yield curve. The level effect is present and significant before Basel III as well, but with less impact on net interest margin. One can interpret this as the net interest margin benefits from a steeper yield curve and the effect has slightly increased after Basel III. For column (6), the significance is gone for the level, but present and significant at 5% level for the change. These results suggest a positive effect on net interest margin from a steepening of the yield curve before Basel III and a less noticeable effect after (almost none). The regulations enforced on banks may dampened the possibility to utilize the level- and/or the change of the yield curve. Grzeta et al. (2023) noted that the higher capital requirements generally have improved banks credit quality resulting in less credit losses and overall more stable profitability. This could possibly be one explanation of the estimated less evident impact from the yield curve on net interest margin after the Basel III requirements.

The results are in line with both Allessandri & Nelson (2015) and Aydemir & Ovenc (2016), where opposite effects were found for the level respectively change of the short-term rates. One interpretation of this can be that the short-term repricing mechanism due to the change in short term rates. Through this, a rise in short-term rates yields a temporary decrease in net

interest margin, as suggested by model (1). For the yield curve, the level is significant and positive while the change in yield curve is not. By including the lagged value of net interest margin in model (2), the lagged value shows strong significance and impact. The inclusion also lowers the impact on net interest of significant variables compared to model (1) quite drastically. The level of yield curve has lost it significance, however the change in yield curve is now significant and positive.

Overall, the results unambiguous suggests a significant and positive effect to net interest margin from the equity to asset ratio, GDP growth and the level of 3-month yield. The inclusion of the lagged dependent variable dampens the impact of the variables substantially, however still effecting the net interest margin. The results regarding the yield curve are more ambiguous as model (1) shows clear significance for the level while model (2) for the change. Both results, a positive effect of the level and the change respectively, can be related to earlier studies. Classens et al. (2017) highlighted the effect on the level of the yield curve while Allessandri & Nelson (2015) and Aydemir & Ovenc (2016) provided results showing significance in the change of the yield curve. However, both these studies found a negative impact from a steepening of the curve while our model (2) suggest a positive impact. Hence, the results imply that, rather than a negative temporary effect from the repricing mechanism, a steepening of the yield curve increase net interest margin. Despite whether the significance occur on the level or the change of the yield curve, the four major Swedish banks on aggregate seems to benefit from a steeper yield curve.

The strong evidence of the presents of autocorrelation in all models' specifications could be a source of the unambiguous results regarding the yield curve. The inclusion of the lagged value of net interest margin coincides with the shift in significance from the level to the change. Despite the ambiguous results whether the significant effect is related to the level- or change of the yield curve, both models imply a smaller impact after Basel III. Hence, the results suggest an evident impact from the yield curve on net interest margin, contrarily to the aggregated results for return on equity. As net interest margin only is a pure function of interest income and expenses, it is intuitively the impact from the yield curve is more evident on an aggregated level.

Table 5: Return on equity & net interest margin regression bank specific effects.

Variable	(1) ROE	(2) ROE	(3) NIM	(4) NIM
Level of yield curve	-0.183	0.588***	0.152***	0.001
	(0.437)	(0.149)	(0.025)	(0.009)
SEB level of yield curve	-0.559**	-1.241***	-0.130***	-0.011*
	(0.192)	(0.136)	(0.009)	(0.005)
SHB level of yield curve	0.649	-0.115	-0.029	0.001
	(0.361)	(0.119)	(0.052)	(0.002)
SWB level of yield curve	-0.866**	-1.579***	0.005	-0.008**
	(0.260)	(0.038)	(0.003)	(0.327)
Level of 3-month yield	1.028***	0.451**	0.123**	0.019*
	(0.266)	(0.140)	(0.039)	(0.008)
Change in 3-month yield	1.834	1.313	-0.091	0.027
	(1.520)	(1.083)	(0.047)	(0.017)
Change in yield curve	-0.464	-0.553	0.028	0.059**
	(0.817)	(0.644)	(0.038)	(0.021)
ROE/NIM		0.492***		0.883***
		(0.058)		(0.049)
Equity/Assets	-0.142	-0.322	0.193***	0.022***
	(0.720)	(0.367)	(0.033)	(0.006)
Asset growth	-0.005	-0.015	0.002**	-0.001
	(0.021)	(0.011)	(0.001)	(0.001)
Loan to Deposits	0.004	-0.001	0.001	-0.0001
	(0.004)	(0.005)	(0.001)	(0.000)
GDP growth	0.504**	0.279*	0.001**	0.004***
	(0.168)	(0.118)	(0.003)	(0.001)
Constant	0.121***	0.079**	-0.002	0.0001
	(0.034)	(0.029)	(0.002)	(0.0001)
N	380	376	396	392
Wooldright	6,81	13,61	28,62	30,45
(p-value)	(0.079)	(0.035)	(0.013)	(0.011)

(1) and (3) is model 1 panel data regression with random effects, (2) and (4) is model 2 bias correct method of moments regression. () under each estimate is standard robust errors. *, **, *** denotes significance at 10-,5- respectively 1% level. SEB-, SHB and SWB yield curve denotes interaction variable between the level of yield curve and dummy variable for each bank. Wooldright tests for autocorrelation in the variables used. All variables are lagged one quarter.

Table 5 presents a modification of the models where interaction variables between each individual bank and the yield curve is included. Since Nordea is the only bank not included as an interacted dummy variable, their effect is represented by the variable "Level of yield curve". Column (1) and (2) exhibits similar values and significance as in table 3 for the control variables. Focusing on the yield curve and the difference between each bank, column (1) does not show statically significance in the use of the yield curve for either Nordea or Handelsbanken. However, the values for both SEB and Swedbank are significant and negative. In column (2), as the lagged dependent variable is included, the variable for Nordea is significant and positive. SEB and Swedbank are still significant and negative, but with greater effect (approximately twice times). This leaves the results relatively ambiguous. There

seems to be evidence from both models that SEB- and Swedbank's return on equity suffers from a higher level of the yield curve, i.e. are disadvantaged by a steeper curve and conversely benefitting from a flatter curve one. For Nordea, model (1) does not show any statistical significance while model (2) shows a significant and positive value. The later implies that Nordea's return on equity benefits from a steeper yield curve, the opposite of Swedbank and SEB. Since the difference in significance between Nordea's yield curve variable is large between the two models, the effect from (or their ability to use) the yield curve is associated with more uncertainty. However, model (2) implies abnormal large impact on return on equity for SEB and Swedbank compared to the other results, which should imply more caution in the interpretation. Looking at graph 2, both SEB and Swedbank exhibits the larges deviant from its average, which possibly could cause the results to be somewhat exaggerated.

In column (3) and (4) the two models are estimated the same way, only changing the dependent variable to net interest margin. As for the return on equity models, the results for the control variables exhibits similar significance and values. For the yield curve, the interaction variable in column (3) is significant and positive for Nordea and significant but negative for SEB. In model (2) in column (4), the significance for Nordea is no longer present while Swedbank now is and with negative value. SEB is still significant and negative, although the impact is dramatically dampened. The results for net interest margin are similar to the dynamics in table 4, where model (1) showed significance for the level of yield curve while model (2) for the change. However, the level of yield curve is significant for SEB and Swedbank at 10- respectively 5% level. Due to the differences between the two models, the results are somewhat ambiguous. Both models suggest a significant and negative impact of the yield curve for SEB on net interest margin, i.e. benefitting from (or are able to utilize) a flatter curve. For Nordea and Swedbank, the results are not one sided. However, in case of significance, a positive effect from a steeper yield curve is excepted for Nordea and the opposite for Swedbank.

Overall, table 5 suggests that there are significant differences between the four banks in the effect from (or utilization of) the yield curve regarding both return on equity and net interest margin. There are other studies pointing towards different sensitivity of the yield curve due to differences in balance sheet construction. As Coulier et al. (2023) highlighted, that a higher maturity gap results in a higher sensitivity to the yield curve relative short-term rates. The

most significant results across both measures and models are shown for SEB, who seems to benefit from a flatter yield curve and be disadvantage from a steeper one. As B. King & Yu (2018) highlighted, a balance sheet consisting of a relatively large part floating rate assets and interest sensitive funding tends to experience a positive effect from a flatter yield curve. Applying this interpretation, this should mean SEB focuses on shorter maturities overall, yielding a positive impact on both return on equity and net interest margin. This is easiest interpretated to net interest margin, as the denominator only consist of interest income relative interest expense while return on equity incorporations several other types of income and expenses as well. However, the results suggest a significant impact on both measures. These interpretations apply to Swedbank as well, although with slightly less confidence as they show significance in three out of the four regressions. At the other spectrum, Handelsbanken is the only bank showing no significant in neither model nor measure. From the models, this imply that the level of the yield curve does not have a significant effect on the profitability of Handelsbanken. An interpretation of this can be that the interest rate risk on the balance sheet is as sufficiently hedge and matched to the extent of which the yield curve does not affect neither return on equity nor net interest margin. Out of the four banks, Nordea is the one showing most signs of benefiting from a steeper yield curve. One interpretation can be as for SEB and Swedbank, but reverse, i.e. relaying relatively more on longer maturity assets and less interest sensitive liabilities, which in turn benefits from a steeper yield curve.

The divergence in the results possibly reveals differences in the business models. The results point towards a more defensive approach from Handelsbanken, where not much interest rate risk is carried on the balance sheet. This can be a possible explanation to Handelsbanken's, relative the others, more stable profitability illustrated in graph 2 and 3. On the same not, these results possible provides factors behind the more volatile development of Swedbank's and in part SEB's profitability displayed in the same two graphs. This might suggest a heavier carry of interest rate risk on the balance sheet, which can work both ways for profitability. One thing to consider is the causality of the relationship. It is not necessarily only differences in business model and interest rate risk on the balance sheet that direct yields differences in the impact from the yield curve on profitability between each of the four banks. A lot of other factors may influence this and in several directs, where differences in business models possibly serves as one.

5 Summary

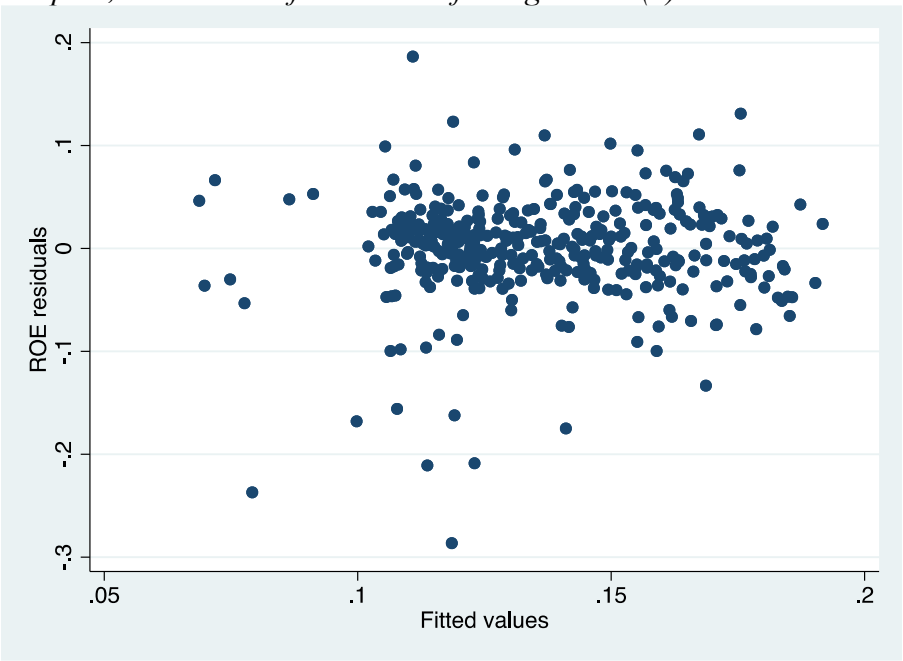
The recent surges in profits from the major Swedish banks and subsequent debate about excess profits is ultimately about banks' ability to use the level of interest rate and the yield curve to take advantage of different maturity mismatches and repricing mechanisms on their balance sheets. The regressions, estimated for return on equity and net interest margin on an aggregated level of the four banks, shows an evident and positive relationship between the level of short-term rates and both profitability measures, which is in line with earlier studies. However, the change in short-term rates do possible have a temporarily negative effect on net interest margin. Regarding the yield curve, no aggregated effect could be seen from neither the level nor change on return on equity. For net interest margin, the results suggest a positive and significant impact from the yield curve. Whether the effect relates to the level or the change are more ambiguous. The introduction of Basel III requirements seems to, on an aggregated level, dampen the effect from the yield curve on net interest margin, while not significally impacting return on equity. The explicit intention of the introduction of Basel III was not to dampen the effect from the yield curve on banks operations, but rather to ensure more stable and crisis resistant banks. However, as the yield curve seems to effect net interest margin and that the volatility of net interest margin effect the stability of banks, a consequence of the Basel III requirements seems to be a dampened effect from the yield curve on an aggregated level. Due to the statistical complexity behind the models and the possible effect from longer lasting lags from rate changes to profitability, one should interpretate the overall results and interpretations with caution.

When comparing the impact from the level of the yield curve on a bank specific level, the results show divergence between the four. Both Swedbank and SEB exhibits a negative impact from a steeper yield curve on both profitability measures, while Nordea exhibits a positive. Handelsbanken does not show any significance at either measure from the impact of the yield curve. A caution interpretation should be applied as Nordea and Swedbank did not show significance at all measures and models. Overall, the results suggest differences between the banks which possibly can be attribute to the business model and strategy. As profitability have been more stable for Handelsbanken compared to the other, while Swedbank have experienced most volatility, the estimated effect from the yield curve coincides with the development of profitability. The effect from the yield curve possibly highlights the extent of which interest rate risk is carried on the balance sheet and the

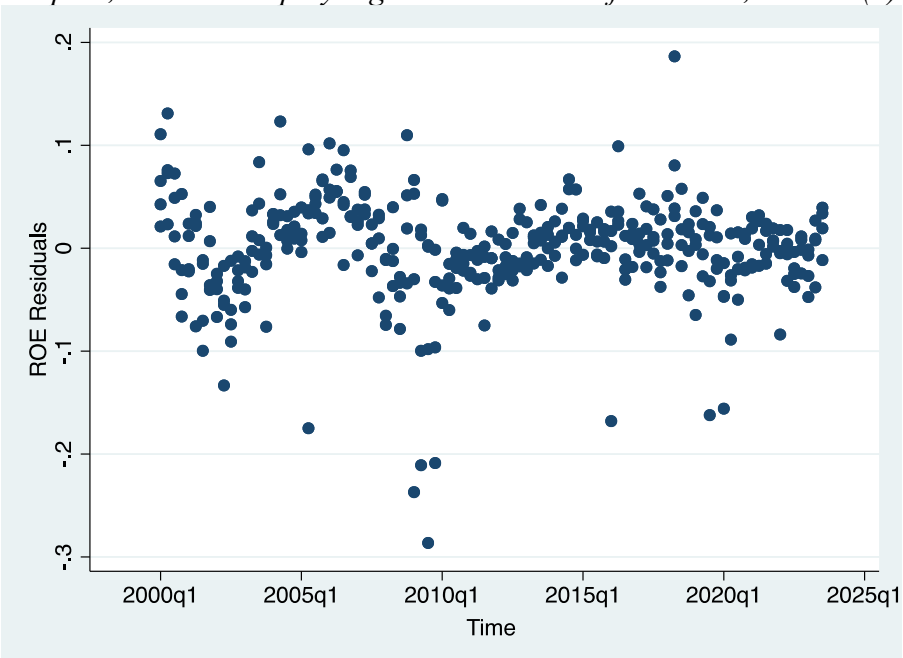
sensitivity to repricing mechanisms from changes in rates. This serves as one, of many other possible, factors that explains differences in performance and profitability between the four major banks. Due to their different niches and attributes, the profitability might differ between banks depending on the rate environment and the slope of the yield curve. This also opens for a future discussion about possible different policies and regulations between individual banks. As differences in business models and strategy seems to yield differences in the effect from the yield curve on profitability, this might imply a rationality for regulators to impose more individual requirements to ensure overall higher stability in the financial system.

Appendix

Graph 4, Residuals vs fitted values for regression (1) in table 3.



Graph 5, Return on equity regression residuals for table 3, column (1)



Graph 6, Net interest margin regression residuals for table 4, column (1).

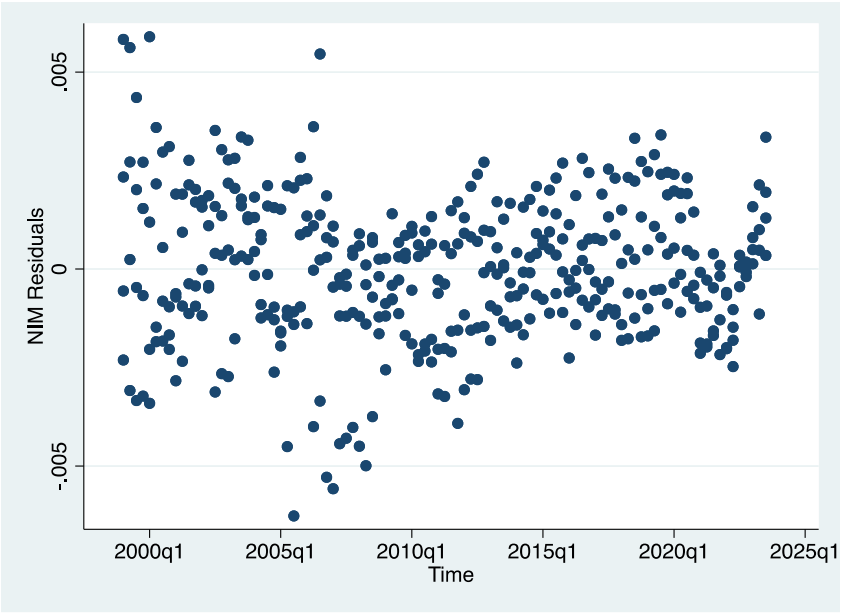


Table 7: Return on equity regression.

Variable	(1) ROE	(2) ROE	(3) ROE	(4) ROE
3-month yield	0.928***	0.969***	0.458***	0.534***
	(0.252)	(0.224)	(0.130)	(0.122)
Change 3-month yield	2.008	0.600	1.209	0.323
	(1.317)	(0.700)	(1.053)	(0.558)
Yield curve	-0.505	-0.244	-0.052	0.081
	(0.748)	(0.581)	(0.226)	(0.213)
Change in yield curve	-0.394	0.091	-0.598	-0.284
	(0.693)	(0.702)	(0.636)	(0.661)
ROE			0.530***	0.481***
			(0.056)	(0.053)
Equity/Assets	-0.377	-0.623**	-0.202	-0.477
	(0.286)	(0.240)	(0.353)	(0.360)
Asset growth	-0.002	0.001	-0.015	-0.012
	(0.024)	(0.016)	(0.012)	(0.008)
Loan to Deposits	0.007	0.006	-0.002	-0.003
	(0.004)	(0.003)	(0.006)	(0.007)
GDP growth	0.502**	0.590**	0.267*	0.335*
	(0.158)	(0.211)	(0.119)	(0.159)
GFC dummy		-0.069		-0.045
		(0.042)		(0.024)
Constant	0.129***	0.142***	0.0703*	0.0922**
	(0.017)	(0.016)	(0.029)	(0.033)
N	380	380	376	376
Wooldright	4.50	6.31	9.95	11.25
(p-value)	(0.124)	(0.087)	(0.049)	(0.044)

(1), (3) and (5) is model 1 panel data regression with random effects, (2), (4) and (6) is model 2 bias correct method of moments regression. () under each estimate is standard robust errors. *,**,*** denotes significance at 10-,5- respectively 1% level. Basel III is a dummy separating introduction of requirements. YC- and dYC is interaction variables between level- and change of yield curve and the Basel III dummy. Wooldright tests for autocorrelation in the variables used. All variables are lagged one quarter.

Table 8: Net interest margin regression.

Variable	(1) NIM	(2) NIM	(3) NIM	(4) NIM
3-month yield	0.124**	0.124**	0.0188*	0.0181*
	(0.041)	(0.041)	(0.008)	(0.009)
Change 3-month yield	-0.097*	-0.110*	0.027	0.033*
	(0.046)	(0.047)	(0.017)	(0.015)
Yield curve	0.114**	0.116**	-0.004	-0.006
	(0.041)	(0.041)	(0.007)	(0.008)
Change in yield curve	0.027	0.030	0.059**	0.058**
	(0.038)	(0.038)	(0.020)	(0.020)
NIM			0.888***	0.892***
			(0.047)	(0.050)
Equity/Assets	0.239***	0.236***	0.022***	0.022***
	(0.029)	(0.030)	(0.005)	(0.005)
Asset growth	0.002*	0.002*	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Loan to Deposits	0.0001	0.0001	-0.0001	-0.0001
	(0.0006)	(0.0006)	(0.0001)	(0.0001)
GDP growth	0.010*	0.012**	0.001***	0.001***
	(0.003)	(0.003)	(0.001)	(0.001)
GFC dummy		-0.001		0.0001*
		(0.001)		(0.0001)
Constant	-0.005**	-0.005*	0.0001	0.0001
	(0.002)	(0.002)	(0.0001)	(0.0001)
N	396	396	392	392
Wooldright	25.25	27.17	26.51	28.91
(p-value)	(0.015)	(0.014)	(0.014)	(0.013)

(1), (3) and (5) is model 1 panel data regression with random effects, (2), (4) and (6) is model 2 bias correct method of moments regression. () under each estimate is standard robust errors. *,**,*** denotes significance at 10-,5- respectively 1% level. Basel III is a dummy separating introduction of requirements. YC- and dYC is interaction variables between level- and change of yield curve and the Basel III dummy. Wooldright tests for autocorrelation in the variables used.

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