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The Impact of Higher Capital Requirements on Cost of Capital for DNB Bank ASA

Will increased capital requirements for Norway's largest bank increase interest rates charged to consumers?

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Summary

The financial crisis of 2007-2008 affected the financial sector worldwide. After the crisis, regulatory bodies and governments implemented stricter capital requirements for banks and financial institutions in order to cushion the impact of similar shocks in the future. In Norway the government aims to impose even stricter regulations than the Basel III-agreement require. In opposition to the new rules DNB, Norway's largest bank, claims the new rules will increase their capital cost and therefore increased their mortgage lending rates by 0,3 percentage points.

This paper aims at assessing the quantitative impact of higher primary capital in the capital structure of DNB Bank ASA. We intend to determine whether higher equity will lead to a higher cost of capital, which in turn will imply a higher interest rate on loans extended to customers. We will estimate DNBs capital structure under future Basel III standards and Norwegian legislation. We also estimate the effect of proposed Norwegian rules for stricter risk weighting of mortgages in DNBs assets. We apply the Capital Asset Pricing Model to calculate the regulations impact on the cost of capital for DNB Bank ASA under various scenarios.

We find that stricter capital requirements lead an increased cost of capital for DNB Bank ASA. Their cost of capital increases from 1.26 % under Basel III to 1.38 % if we introduce the new Norwegian RWA-rules and capital requirements. The effect of rising cost of capital for DNB Bank ASA is justified to lead to increased lending rates costs for consumers, but does not justify the magnitude of DNBs rate increase of 0.3 percentage points in March 2013.

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Abbreviations

ASF: Available Stable Funding

BCBS: Basel Committee of Banking Supervision

BIS: Bank for International Settlements

CAPM: Capital Asset Pricing Model

CET 1: Common Equity Tier 1

EBA: European Banking Authority

EC: European Commission

EU: European Union

IMF: International Monetary Fund

IRB: Internal Ratings Based

LCR: Liquidity Coverage Ratio

MRP: Market Risk Premium

NSFR: Net Stable Funding Ratio

OBX: Oslo Børs Stock Exchange Index

PSE: Public Sector Entities

RSF: Required Stable Funding

RWA: Risk Weighted Assets

WACC: Weighted Average Cost of Capital

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1. Introduction

The purpose of this paper is to quantify the effect on cost of capital of Norway's largest bank, DNB Bank ASA, due to higher capital requirements recommended by the Basel III standards (Basel Committee of Banking Supervision, 2010) proposed by the Basel Committee of Banking Supervision (BCBS) and Norway's Ministry of Finance. The intention behind quantifying the effect on cost of capital is to provide insight into the real impact of higher capital requirements on lending rates once banks adhere to these standards.

Prior to the financial crisis of 2007-2008, many large sized-banks were highly leveraged¹. Much of their financing came from short-term debt, high-risk funds such and exotic new financial instruments, including mortgage²-backed securities³, and other risky debt. The misallocation of investments (in particular towards real estate) and flawed internal controls in the financial sector (particularly in the United States), manifested itself in the form of global financial crisis. (Diamond & Rajan, 2009) The financial crisis revealed the negative externalities that are associated with highly leveraged banks, exposed by a decrease in asset values. These negative externalities included increased probability of bank failures, a significantly less-than robust financial system and impending taxpayer bailouts⁴. (Admati, et al., 2011) Even though these negative externalities are associated with high leverage, banks favour debt funding because of the unique nature of competition in the financial services industry. The nature of competition is such that banks tend to adopt leveraged funding in order to enjoy the competitive advantage of cheap funding. (Kashyap, et al., 2010)

This paper uses the Modigliani-Miller theorem and Capital Asset Pricing Model as building blocks. Modigliani-Miller showed that operating decisions of a firm are not affected by its capital structure⁵ and thus, a bank's lending rate should not be affected by its capital structure (Modigliani & Miller, 1958). However, the ideal assumptions postulated by Modigliani-Miller are often not applicable, especially for financial institutions. Proponents argue that the model still can be applied to banks by adjusting for the deviations from ideal assumptions. It

¹ A firm with significantly more debt (loan funds) than equity (own funds) is considered to be highly leveraged.

² An agreement to give up ownership of an asset (usually, a home) if one is unable to repay a loan (usually, a home loan)

³ It is a security that has a group of mortgages as an underlying.

⁴ Situations wherein governments offers money to a business to avoid negative consequences of the business's downfall.

⁵ The composition of the sources of a firm's asset-base through a mix of debt and equity.

has been shown by Kashyap, et al. (2010) through their empirical analysis that Modigliani-Miller theorem does indeed apply to banks in this manner. Additionally, the quantitative models used by banks for risk management have the same underlying assumptions as the Modigliani-Miller theorem, indicating its practicality. (Admati, et al., 2011)

Banks themselves tend to favour as much debt as possible, given the apparent lower cost of debt compared to equity. The lower cost of debt is, among other things, caused by the favourable treatment of debt in our tax system. Interest⁶ paid to debt holders is a deductible expense for taxation purposes, while dividends⁷ to equity holders are not. While bank owners benefit from leverage in the form of lower taxes, as a whole, the public loses owing to the negative externalities of higher leverage. Thus, the social cost of banks' debt is higher than their private cost. This should be considered when deciding the optimal capital structure, but will not be evaluated in this paper. (Admati, et al., 2011)

Equity is considered to be costlier than debt. This is not only because of tax effects but also because of the perception that equity is more risky, as well as agency conflicts and other reasons. Markets usually perceive equity issuance as a negative signal, which forces companies to issue equity at a lower price than their current stock price. There is an information asymmetry between the better-informed management and the less-informed investors. Outsiders may perceive equity issuance as a signal implying that management believes the stock is overvalued. As a result, issuance of stock is often accompanied by a fall in the stock price.

Management anticipates this negative signal and is therefore apprehensive towards issuance of fresh equity. DNBs CFO has publically made this argument in the Norwegian debate. (Næss, 2013). Management prefers to build equity reserves through retained earnings, as DNB has done in past years. Thus, a "pecking order" of capital structure is formed. Firms that are inclined to have their capital structures more equity-heavy tend to build retained earnings. If they do not have sufficient levels of retained earnings, they tend to raise funds through debt instead of raising equity (Kashyap, et al., 2010). However, if the banks do not have discretion in issuance of equity, the associated negative signal can be reduced or removed. If regulatory authorities or governments dictate all banks to raise equity levels, the negative stigma associated with equity issuance can be curbed entirely. (Admati, et al., 2011)

⁶ Periodic payments made by a borrower to a lender as a consideration of funds

⁷ Periodic payments made by a company from its earned profits to its shareholders

To counter the negative externalities from elevated leverage, financial regulators and supervisors intend to set capital requirement standards to avoid future large-scale shocks seen in the crisis of 2007-2008. This paper focuses on the Basel III standards and Norwegian legislation for capital requirements, seen from the banks' perspective.

1.1 The Norwegian debate

At the beginning of 2013, DNB announced it was increasing its mortgage interest rate in response to the new capital requirements announced by the Norwegian authorities. In the wake of this interest rate increase, other banks soon followed. A debate erupted between DNB on one side and the Government, Statistics Norway and certain academics on the other. The debate concerned whether or not the increased capital demands would increase DNBs capital costs, and therefore justify DNB increasing their interest rate 0,3 percentage points (Lynum, 2013).

The national statistical bureau, Statistics Norway, and Professor Bernt Arne Ødegaard from the University of Bergen, both referenced the Modigliani-Miller theorem. They argued that the main tenets of M&M applied for DNB, and that DNB was unlikely to accrue added costs due to the increased capital requirements (Hungnes, 2013).

DNBs Chief Financial Officer responded by describing several ways in which DNBs scenario might deviate from M&M: depositor insurance making debt cheaper, due to lowered risk for lenders, and the Norwegian tax code favouring debt over equity. He claimed that deposit insurance and the Norwegian Government's implicit guarantee of Norwegian banks causes creditors to disregard financial institutions' leverage ratio. Since debt is not strongly affected by leverage, it is cheaper for banks to finance themselves with debt than M&M suggests (Næss, 2013).

The government issued a statement saying that the banks were at fault, and that they should accept lower dividends instead of increasing interest rates for consumers. DNB responded by lowering their dividend from 50 percent of profits to 25 percent of profits. Certain finance professors claimed that this was irrelevant, since shareholders would reap profits of retained earnings through increased share price (Ødegaard, 2013).

DNBs decision to increase interest rates to consumers and reduce dividends made analysts believe that DNB would be able to raise the required equity cheaply. (Editorial, 2013)

In this paper, I will analyze the implications of DNB changing its capital structure to see whether the increase in mortgage interest rates for consumers of 3 percentage points was justified.

2. Basel III Standards

2.1 Introduction

At its meeting held on September 12, 2010, the Group of Governors and Heads of Supervision, the oversight body of the Basel Committee on Banking Supervision (BCBS), announced new norms for capital requirement for banks (Bank for International Settlements, 2010).

As these norms are the third edition of standards issued by BCBS, they are called “Basel III standards”. The Basel I standards of 1988 aimed to build a general minimum base of own funds in every bank, the Basel II standards of 2004 prescribed more capital to manage higher risk. The objective of Basel III standards is to enable the banking sector to absorb shocks arising from financial and economic stress, thereby mitigating spillover risk on the real economy from the financial sector (Ministry of Finance, Norway, 2012).

2.2 Definition of Capital

Basel III has redefined capital as comprising of following elements:

- Tier 1 capital (Going concern capital)
 - Common Equity Tier 1 Capital (CET 1 capital): consists of capital instruments that meet the conditions laid down in Article 26 of EU Regulation. Includes share premium⁸ accounts related to capital instruments, retained earnings, accumulated other income, other real reserves and funds.
 - Additional Tier 1 Capital: consists of instruments that meet the conditions laid down in Article 49 of EU Regulation. Includes the share premium accounts related to these instruments, which are more lenient than article 26.
- Tier 2 capital (Going concern capital): consists of capital instruments that meet the conditions laid down in Article 60 of EU Regulation and the share premium accounts related to these capital instruments. This is relevant for institutions calculating Risk Weighted Exposure amounts in accordance with the “Standardized Approach”.

⁸ The amount paid by the shareholder above the cost of the share

Includes general credit risk adjustments, gross-of-tax effects of up to 1.25% of risk-weighted exposure. Also relevant for institutions calculating Risk Weighted Exposure amounts under the Internal Ratings Based approach (IRB), resulting from the calculation laid down in Article 154 and 155. May amount up to 0.6% of risk-weighted exposure calculated under the IRB approach.

The standards are broadly divided as: Capital Requirement Standards, Leverage Ratio standards and Liquidity Requirements.

2.3 Capital Requirement Standards

The following capital requirement standards were proposed as per Basel III standards:

- Common Equity Tier 1 capital will be raised from the existing 2% requirement to 4.5% (as a percentage of risk weighted assets⁹ (RWA))
- The Tier 1 capital requirement will be raised from the existing 4% requirement to 6% (thus, CET 1 capital shall be 4.5% and additional tier 1 capital shall be 1.5%).
- The total capital (total of Tier1 and Tier 2 capital) ratio is required to be 8%.

It was recommended that these minimum capital requirements be fulfilled by January 1, 2015.

The standards also introduced two new capital buffer requirements which were earlier absent in the Basel II standards. The buffer requirements are scheduled to be gradually fulfilled from 2016 to 2019. The buffer requirements are:

- Capital conservation buffer: It is intended to ensure that institutions are able to absorb losses in stress periods lasting for a number of years. It shall be maintained at 2.5% of RWA and is to be met by *CET 1 capital*. It has to be maintained at all times. Thus, including 4.5% of CET 1 capital and 2.5% of capital conservation buffer, the institutions must hold 7% CET 1 capital.
- Countercyclical buffer: is introduced to achieve the goal of protecting the banking sector and the real economy from risks stemming from the boom-bust cycles in aggregate credit growth. It shall be maintained from 0% to 2.5% of RWA and has to

⁹ The value of assets (loans advanced) of the bank as weighed by risk associated with them.

be met by CET 1 capital. The buffer is required during periods of excessive credit growth and it is released in an economic downturn. (Accenture Risk Management, 2012)

As expressed above, based on minimum CET 1 capital of 4.5% and capital conservation buffer of 2.5%, the combined CET 1 capital must be 7%. It is proposed that the individual banks must adhere to minimum capital conservation ratios at different levels of CET 1 capital (Basel Committee of Banking Supervision, 2010). A 100% capital conservation ratio implies no distribution of dividend, whereas a 0% capital conservation ratio implies no restriction on distribution of dividends (PwC, 2011).

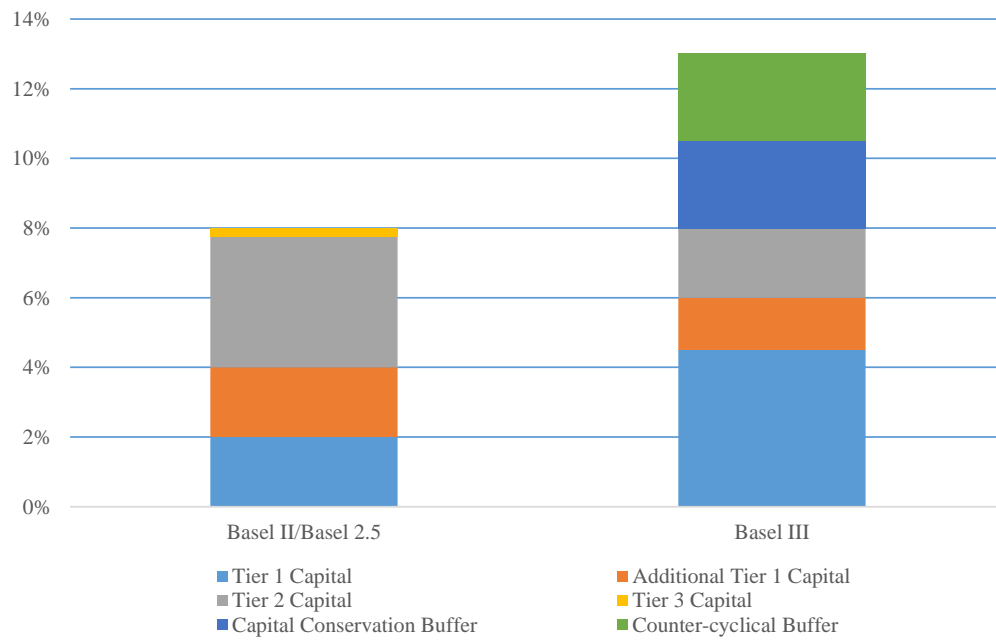
Table 1 outlines the minimum capital conservation ratios at different levels of CET 1 capital:

Table 1: Minimum Capital Conservation Ratios at different levels of CET 1 Capital

Common Equity Tier 1 Ratio	Minimum Capital Conservation Ratios (expressed as a percentage of earnings)
4.5% - 5.125%	100%
>5.125% - 5.75%	80%
>5.75% - 6.375%	60%
>6.375% - 7.0%	40%
> 7.0%	0%

(Source: Basel Committee on Banking Supervision, 2011)

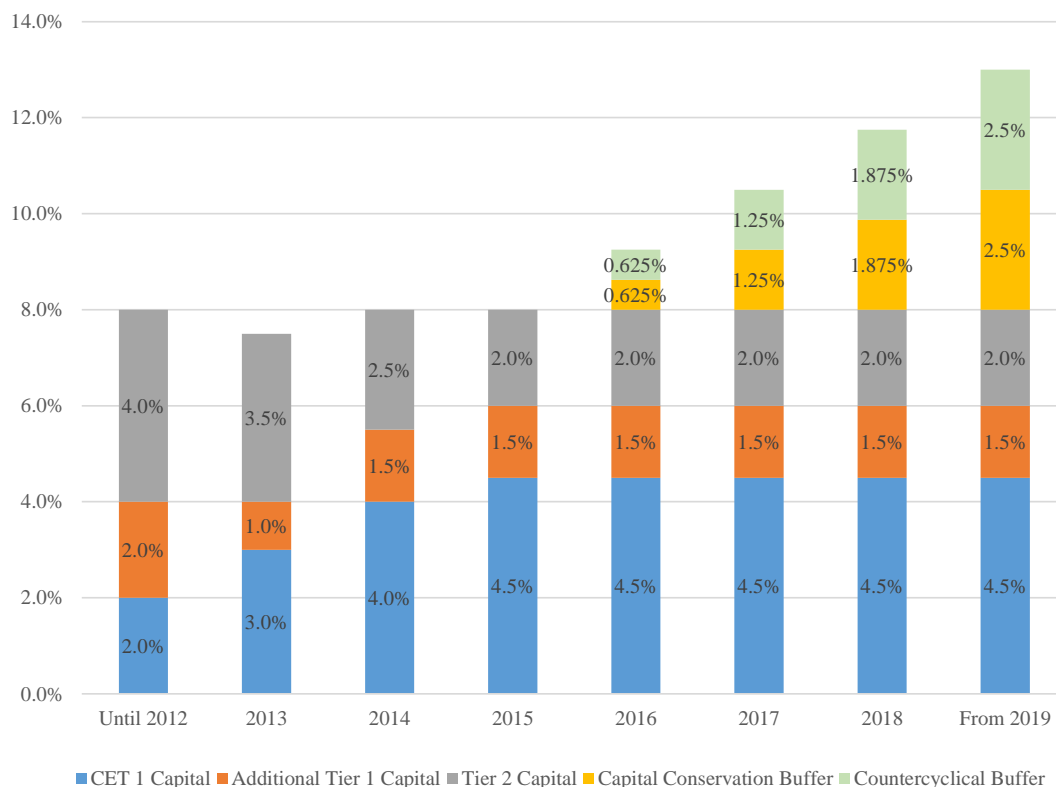
Figure 1 gives a comparison of Basel II/Basel 2.5 with Basel III capital requirements.

Figure 1: Capital Requirements Basel II/Basel 2.5 vs. Basel III

Source: Accenture Risk Management, 2010

Figure 2 details the phase-in arrangements for the Basel III capital requirements:

Figure 2: Phase-in arrangements for Basel III Capital Requirements



Source: Accenture Risk Management, 2012

Among the major standards proposed under the Basel III standards, the cost of capital of banks will be affected by capital requirement standards. These standards stipulate a minimum capital (majorly through maintenance of Tier 1 capital) as a percentage of risk-weighted assets that a bank must maintain. As banks have to infuse higher equity in their capital structure to meet the capital requirements, these capital requirement standards is expected to increase the cost of capital of the banks depending on their existing capital structure.

2.4 Leverage Ratio

Leverage Ratio is a new regulatory tool introduced by Basel III standards. Initially, it is not intended to be a binding instrument but as an additional feature that can be applied on individual banks at the discretion of supervisory authorities. It aims to “migrate” to a binding (‘Pillar one’) measure in 2018, after appropriate review and calibration.

Leverage Ratio has been defined as the ratio of Tier 1 Capital to Total Exposure expressed as a percentage.

Here, total exposure follows the accounting measure of exposure and includes on-balance sheet items (including repurchase agreements¹⁰, securities and derivatives¹¹) and off-balance sheet items (including commitments, unconditionally cancellable commitments, direct credit substitutes, acceptances, standby letters of credit¹², failed transactions and unsettled securities).

The basis of calculation is the average of the monthly leverage ratio over the quarter. BCBS will test a minimum Tier 1 leverage ratio of **3%** during the parallel run period from January 1, 2013 to January 1, 2017 (Basel Committee on Banking Supervision, 2011).

By October 31, 2016, the European Banking Authority (EBA) will report to the European Commission among others on whether 3% would be an appropriate level for a Tier 1 capital-based leverage ratio and whether the leverage ratio should be the same for all institutions or differ for various types of institutions. Based on the EBA report, final adjustments of the ratio would be made in the first half of 2017 (Accenture Risk Management, 2012).

The transitional arrangement for Leverage Ratio is as follows:

- January 1, 2011: Start supervisory monitoring period (development of templates)
- January 1, 2013 – Jan. 1, 2017: Parallel run (leverage ratio and its components will be tracked, including its behavior relative to the risk based requirement)
- January 1, 2015: Disclosure of the leverage ratio by banks
- First half of 2017: Final adjustments
- January 1, 2018: Migration to binding (Pillar 1) treatment

¹⁰ Short-term borrowings which a dealer sells to an investor and subsequently buys back.

¹¹ An instrument whose price is dependent on an underlying asset.

¹² A guarantee by a bank on behalf of a buyer that a payment shall be made to the seller. In case the buyer defaults on his payment, the bank pays to the seller on behalf of the buyer.

2.5 Global Liquidity Standard

During the early “liquidity¹³ phase” of the financial crises, many banks – despite adequate capital levels –experienced difficulties because they did not manage their liquidity in a prudent manner. The financial crisis underlined the importance of liquidity to the proper functioning of financial markets and the banking sector. In order to address short-term and long-term resilience, BCBS has formulated two new global liquidity standards.

2.5.1 Liquidity Coverage Ratio

The first objective is to promote short-term resilience of a bank’s liquidity risk profile by ensuring that it has sufficient high quality liquid resources to survive an acute stress scenario lasting for one month. BCBS developed the Liquidity Coverage Ratio (LCR) to achieve this objective (Basel Committee on Banking Supervision, 2011).

To meet the requirement, institutions shall “at all times hold liquid assets, the sum of the values of which equals, or is greater than, the liquidity outflows less the liquidity inflows under stressed conditions so as to ensure that institutions maintain levels of liquidity buffers which are adequate to face any possible imbalance between liquidity inflows and outflows under stressed conditions over a short period of time. Institutions shall not count double liquidity inflows and liquid assets.” (Accenture Risk Management, 2012)

$$\text{Thus, LCR} = \frac{\text{High Quality Liquid Assets}}{\text{Total Net Liquidity Outflows over a 30-day period}} \geq 100\%$$

High Quality Liquid Assets include:

- Level 1 assets include cash, transferable assets of extremely high liquidity and credit quality (minimum 60% of liquid assets)
- Level 2 assets include transferable assets that are of high liquidity and credit quality and maximum 40% of liquid assets

Total Net Liquidity Outflows over a 30-day period implies:

- Liquidity Outflows including retail deposits, other liabilities, collateral other than Level 1 assets, credit and liquid facilities *minus*

¹³ The ease of converting an asset into cash. Higher the ease, more liquid is the asset.

- Liquidity Inflows including cash due from non-financial customers, secured lending and capital market driven transactions, undrawn credit and liquidity facilities, specified payables and receivables expected over the 30 day horizon, liquid assets and new issuance of obligations

The LCR will be introduced by 2015 after an observation period to avoid possible unintended consequences. From 2013, there is a general requirement for banks to keep appropriate liquidity coverage. The reporting frequency for the LCR should not be less than monthly.

2.5.2 Net Stable Funding Ratio

The second objective is to promote resilience over a longer time horizon by creating additional incentives for a bank to fund its activities with more stable sources of funding on an ongoing structural basis. The Net Stable Funding Ratio (NSFR) has a time horizon of one year and has been developed to provide a sustainable maturity structure of assets and liabilities. The NSFR standard stipulates that the available amount of stable funding must be greater than required amount of stable funding. (Basel Committee of Banking Supervision, 2010)

$$\text{NSFR} = \frac{\text{Available Stable Funding}}{\text{Required Stable Funding}} > 100\%$$

The minimum requirement specified above is to be introduced by January 1, 2018. There is an observation period until then. The NSFR should be reported at least quarterly. The components of NSFR are as follows:

- Available Stable Funding (ASF): The available amount of stable funding is calculated by first assigning the carrying value of an institution's equity and liabilities to one of five categories as presented in Table 2 below. The amount assigned to each category is to be multiplied by an ASF factor and the total ASF is the sum of the weighted amounts.

Table 2: Components of Available Stable Funding and Associated ASF Factors

ASF Factor	Components of ASF
100%	<ul style="list-style-type: none"> • Tier 1 & Tier 2 capital • Preferred stock not included in Tier 2 capital with maturity \geq 1 year • Secured and unsecured borrowings and liabilities with effective remaining

	maturities \geq 1 year
90%	<ul style="list-style-type: none"> Stable non-maturity (demand) deposits and term deposits with residual maturity < 1 year
80%	<ul style="list-style-type: none"> Less stable non-maturity (demand) deposits and term deposits with residual maturity < 1 year
50%	<ul style="list-style-type: none"> Unsecured wholesale funding, non-maturity deposits and term deposits with residual maturity < 1 year provided by non-financial corporates, sovereigns, central banks, multilateral development banks and Public Sector Enterprises
0%	<ul style="list-style-type: none"> All other equities and liabilities not included in above categories

(Source: Basel Committee on Banking Supervision, 2011)

- Required Stable Funding (ASF): The required amount of stable funding is calculated as the sum of the value of the assets held and funded by the institution, multiplied by a specific Required Stable Funding (RSF) factor assigned to each particular asset type.

Table 3 outlines the components of RSF and RSF factor to be multiplied to each component:

Table 3: Components of Required Stable Funding and Associated RSF Factors

RSF Factor	Components of RSF
0%	<ul style="list-style-type: none"> Cash Unencumbered short-term unsecured instruments and transactions with outstanding maturities < 1 year Unencumbered securities with stated remaining maturities < 1 year with no embedded options Unencumbered securities held where the institution has an offsetting reverse repurchase transaction Unencumbered loans to financial entities with effective remaining maturities < 1 year that are not renewable and for which the lender has an irrevocable right to call
5%	<ul style="list-style-type: none"> Unencumbered marketable securities with residual maturities of one year or greater representing claims on or claims guaranteed by sovereigns, central banks, BIS, IMF, EC, non-central government PSEs or multilateral development banks that are assigned a 0% risk-weight under the Basel II standardized approach, provided that active repo or sale-markets exist for these securities
20%	<ul style="list-style-type: none"> Unencumbered corporate bonds or covered bonds rated AA- or higher with residual maturities \geq 1 year satisfying all of the conditions for Level 2 assets in the LCR

	<ul style="list-style-type: none"> • Unencumbered marketable securities with residual maturities ≥ 1 year representing claims on or claims guaranteed by sovereigns, central banks, non-central government PSEs that are assigned a 20% risk-weight under the Basel II standardized approach, provided that they meet all of the conditions for Level 2 assets in the LCR
50%	<ul style="list-style-type: none"> • Gold • Unencumbered equity securities, not issued by financial institutions or their affiliates, listed on a recognized exchange and included in a large cap market index • Unencumbered corporate bonds and covered bonds that are central bank eligible and are not issued by financial institutions
65%	<ul style="list-style-type: none"> • Unencumbered residential mortgages of any maturity that would qualify for the 35% or lower risk-weight under Basel II Standardized Approach • Other unencumbered loans, excluding loans to financial institutions, with a remaining maturity of one year or greater, that would qualify for the 35% or lower risk-weight under Basel II Standardized Approach for credit risk
85%	<ul style="list-style-type: none"> • Unencumbered loans to retail customers and SME (as defined in the LCR) having a remaining maturity < 1 year
100%	<ul style="list-style-type: none"> • All other assets not included in the above categories

(Source: Basel Committee on Banking Supervision, 2011)

2.6 Comparison of Capital Adequacy among Banks operating in Norway

Table 4 shows the capital adequacy ratios in three banks – DNB, Nordea and Danske that operate in Norway

Table 4: Capital Adequacy Ratios in Banks operating in Norway

	DNB Bank <i>(Million NOK)</i>	Nordea Bank <i>(Million EUR)</i>	Danske Bank <i>(Million DKK)</i>
	31-Mar-13	31-Mar-13	31-Mar-13
A. Common Equity Tier 1 Capital	99,976	17,215	120,397
B. Tier 1 Capital	103,065	19,243	156,439
C. Tier 2 Capital	13,679	4,712	16,070
D. Total Eligible Primary Capital (B+C)	116,744	23,955	172,509
E. Risk Weighted Assets	891,346	97,186	797,170

Capital Adequacy Ratios

Common Equity Tier 1 Capital Ratio (A/E)	11.4%	17.7%	15.1%
Tier 1 Capital Ratio (B/E)	11.7%	19.8%	19.6%
Capital Ratio (D/E)	13.2%	24.6%	21.6%

(Source: Respective Bank 2013 Quarter 1 Interim Results)

DNB Bank has not published its LCR, but it has been announced as 130 % in Nordea Bank and 126 % in Danske Bank for the first quarter of 2013.

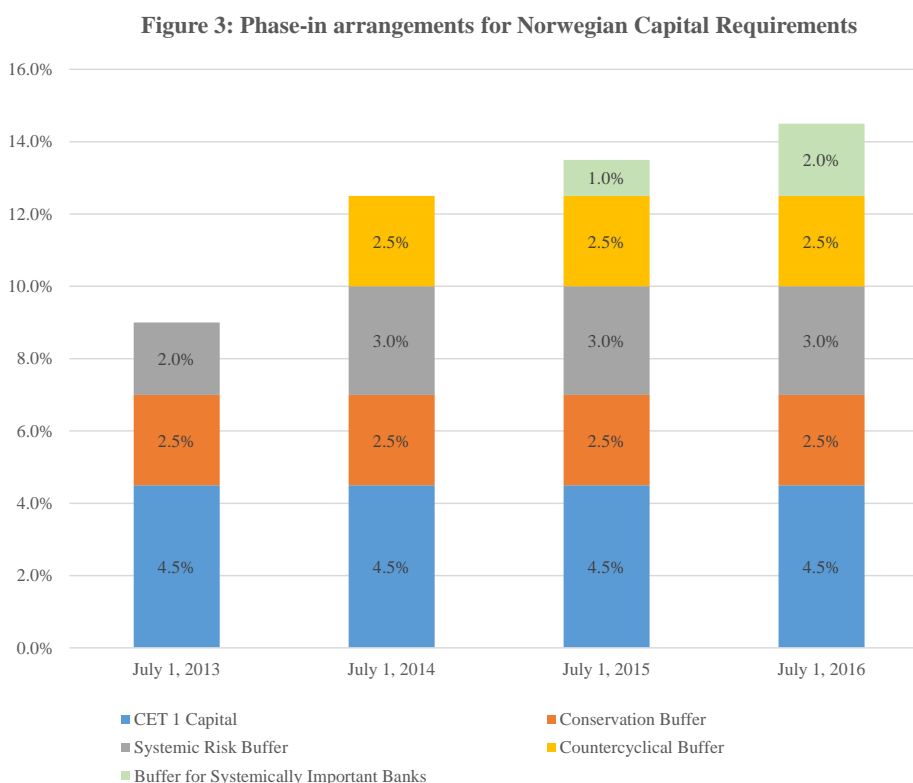
3. Norwegian Legislation Capital Requirements

On March 22, 2013, the Ministry of Finance of Norway, put forward a legislative proposal on new capital requirements for credit institutions and investment firms. Norwegian authorities have supported the international efforts to strengthen credit institutions' capital base in general. It is proposed that the new rules will come into force on July 1, 2013, and that the requirements are gradually increased. The proposal includes a new minimum requirement on Common Equity Tier 1 capital (CET 1 capital), and four new buffer capital requirements, for credit institutions and parent companies of banking groups. The new requirements are as follows:

- CET 1 capital ratio of 4.5%
- Capital conservation buffer requirement of 2.5% to be met by CET 1 capital
- Systemic risk¹⁴ buffer requirement increased from the existing 2% to 3% from July 1, 2014 to be met by CET 1 capital. Thus, Total CET 1 Capital Ratio (including basic CET 1 capital ratio, capital conservation buffer and systemic risk buffer) has been increased from 9% to 10%
- Total capital ratio of 8.0% thereby implying an additional Tier 1 capital or Tier 2 capital of 3.5% in addition to the CET 1 Capital of 4.5%
- A separate capital buffer requirement for systemically important institutions of 1% CET 1 capital from July 1, 2015, increased to 2% CET 1 capital from July 1, 2016
- A statutory authority to issue rules on a counter-cyclical capital buffer requirement of between 0 and 2.5% of CET 1 capital (Ministry of Finance, Norway, 2013)

¹⁴ The risk associated with the entire market as opposed to risk of an individual business or a firm.

Figure 3 summarizes the phase-in arrangements for the Norwegian capital requirements:



The capital requirements proposed by the Norwegian government exceeds those set in Basel III to a substantial degree.

3.1 Stricter Norwegian rules for risk-weighting mortgages

The Norwegian government also recently announced new rules regarding how banks can risk-weight their mortgage loans. Banks employ risk weights based on either their internal risk models (the IRB approach) or as per standards set by authorities (standardized approach). Historically, banks have faced low losses on mortgage loans and hence, under the IRB approach, they set very low risk-weights (Ministry of Finance, Norway, 2012). The Ministry of Finance has suggested banks to employ a weight floor of 35 % of value on mortgage loans in order to reflect the high risk associated with rising household indebtedness and house prices (Bloomberg, 2013). We will also isolate the effect this has on DNBs cost of capital.

4. Analysis

We use the following methodology to assess the impact of higher capital requirements on cost of capital of DNB Bank ASA.

1. Find Levered Beta¹⁵ of Equity (β_{lev}) of DNB Bank ASA by comparing stock returns with Oslo Bors Stock Exchange Index (OBX) and Market Risk Premium¹⁶ (MRP) by comparing OBX returns with risk-free rate
2. Find Beta of debt (β_d) of DNB by comparing returns on its bond-fund Lang Obligasjon 20 with OBX.
3. Find unlevered beta¹⁷ (β_u) using DNB's debt (D) and equity (E)

$$\beta_u = \beta_{lev} \times \left[\frac{E}{E + (1-t)D} \right] + \beta_d \times \left[\frac{(1-t)D}{E + (1-t)D} \right]$$

4. Estimate new capital structure for DNB based on Basel III standards and Norwegian capital requirements
5. Levering the Beta based on debt and equity according to new capital structure norms

$$\beta_{lev} = \beta_u \times \left[1 + (1-t) \frac{D}{E} \right] - \beta_d \times \left[(1-t) \frac{D}{E} \right]$$

6. Find expected return on stock using Capital Asset Pricing Model (CAPM)

$$R_e = R_f + \beta_{lev} \times (R_m - R_f)$$

7. Find Post Tax Return on Debt issued by DNB

$$R_d = \text{Interest Rate} \times (1 - t)$$

8. Find Weighted Average Cost of Capital (WACC)

$$WACC = R_e \times \left[\frac{E}{E + D} \right] + R_d \times \left[\frac{D}{E + D} \right]$$

¹⁵ Volatility of returns of a stock compared to the market.

¹⁶ The excess of returns obtained from the market compared to the risk-free rate of return

¹⁷ The beta of a company without any debt

4.1 Levered Equity Beta of DNB Bank ASA and Market Risk Premium

The levered equity beta of DNB Bank ASA was found by benchmarking the monthly returns on its stock with monthly returns of Oslo Bors Stock Exchange Benchmark Index (OBX). Monthly returns of DNB Bank ASA and OBX were compared with the monthly risk-free rate (see Table A.1 in the Appendix). The monthly risk-free rate pertaining to respective periods were obtained from the average annual yield of the 10-year Norwegian Government Bond (refer Table A.2 in Appendix). Data for the last 20-years, 15-years and 10-years was analysed and compared to find the sensitivity of DNB Bank ASA with OBX. The following scatter plots were obtained based on the analysis:

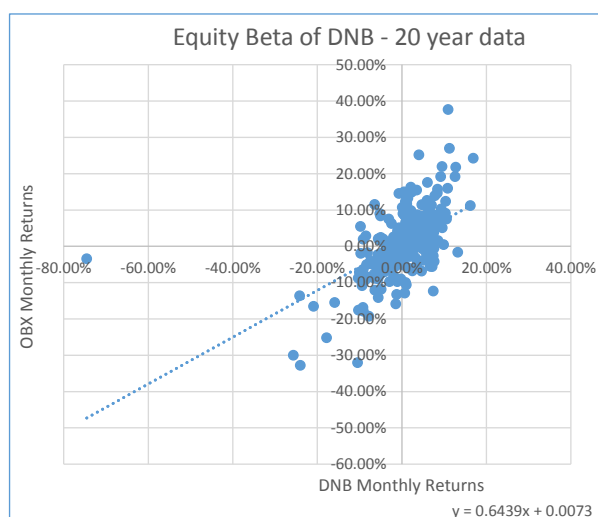


Figure 4: Equity Beta of DNB Bank ASA based on 20-year data

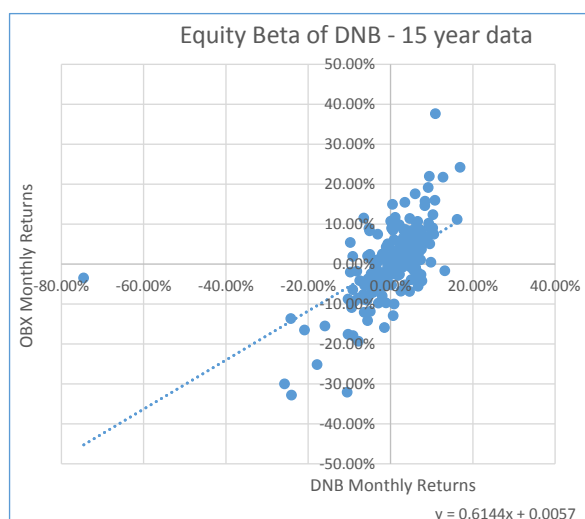


Figure 5: Equity Beta of DNB Bank ASA based on 15-year data

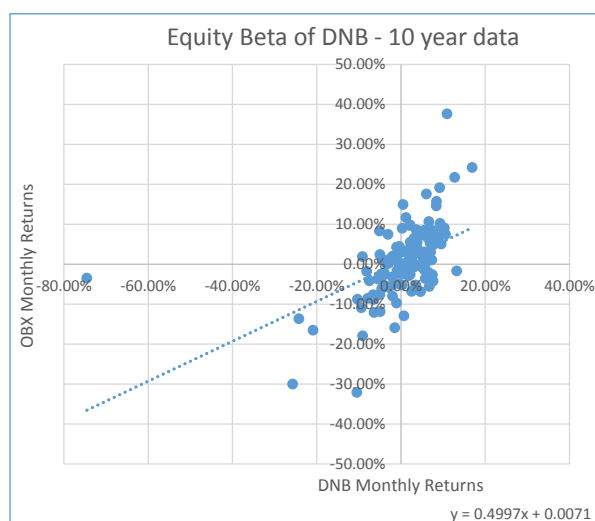


Figure 6: Equity Beta of DNB Bank ASA based on 10-year data

The slopes of the trend-lines of the scatter plot depict the levered equity beta of DNB Bank ASA.

The monthly Market Risk Premium (MRP) was calculated from the excess of monthly returns of OBX over the risk-free rate. The monthly MRP was annualised to get Annual MRP based on 10-year data. The Market Risk Premium was found to be **5.14%**. This is in accordance with both median (5,00 %) and average (5,50 %) for what Norwegian analysts and academics use (Fernandez, et al., 2011).

The value of levered equity beta for DNB Bank ASA and Annual MRP based on analysis of different years' data of returns of DNB Bank ASA and OBX are presented below:

Equity Beta of DNB Bank ASA	20-year data	15-year data	10-year data
Correlation coefficient ¹⁸ between returns of DNB Bank ASA and OBX	0.56	0.58	0.52
Standard Deviation ¹⁹ of Returns of DNB Bank ASA	0.09	0.10	0.09
Standard Deviation of Returns of OBX	0.08	0.09	0.10
Leveraged Equity Beta of DNB Bank ASA	0.64	0.61	0.50

¹⁸ A measure of linear relationship between two variables.

¹⁹ A measure of how much a data set is spread from its mean.

$\beta_{lev} = \text{Correlation Coefficient} \times \frac{\text{Std. Dev. of DNB Bank ASA}}{\text{Std. Dev. of OBX}}$			
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Table 5: Leveraged Equity Beta

4.2 Debt Beta of DNB Bank ASA

To calculate the debt beta we regressed DNB Lang Obligasjon 20 against returns from OBX (see Table A.3 in the appendix). We used the last five years of data to undertake the analysis. The debt fund was chosen based on the fact that it invests in high quality interest bearing securities similar to DNBs issued debt, uses NOK and is an open-ended fund that was launched in 2002.

The following scatter plot was obtained based on the analysis:

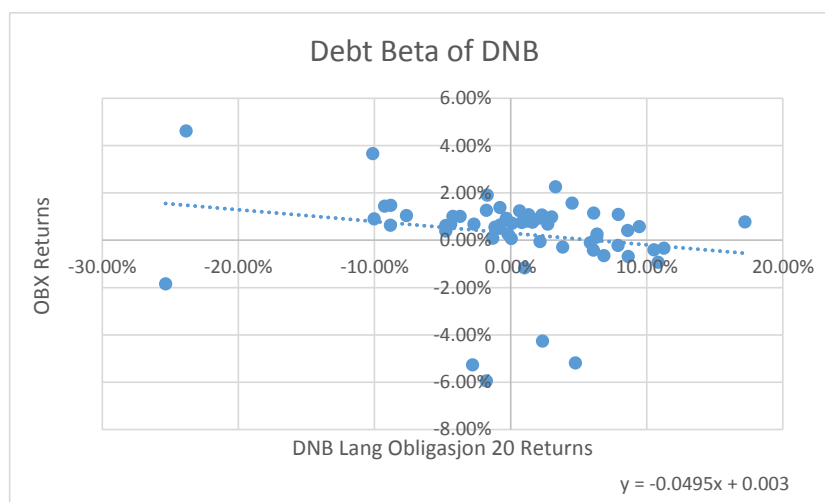


Figure 7: Debt Beta of DNB Bank ASA based on returns of DNB Lang Obligasjon 20

The slopes of the trend-lines of the scatter plot depict that the debt beta of DNB Bank ASA is -0.05.

Additionally, the following results were obtained which indicates the debt beta of DNB Bank ASA is indeed -0.05.

Debt Beta of DNB Bank ASA	Values
Correlation coefficient between returns of DNB Lang Obligasjon 20 and OBX	-0.21

Standard Deviation of Returns of DNB Lang Obligasjon 20	0.02
Standard Deviation of Returns of OBX	0.07
Leveraged debt Beta of DNB Bank ASA	-0.05
$\beta_d = \text{Correlation Coefficient} \times \frac{\text{Std. Dev. of DNB Bank ASA}}{\text{Std. Dev. of OBX}}$	

Table 6: Debt Beta of DNB Bank ASA

The negative beta of debt indicates that the returns on debt for DNB Bank ASA are lower than the risk free rate in a well diversified market portfolio. Overall, the investment represents an insurance against systematic shocks inherent in the market. A similar negative beta is observed in securitized gold funds.

4.3 Unlevered Beta of DNB Bank ASA

Unlevered beta of DNB Bank ASA was calculated using the existing market value of its equity and debt reported by the bank in its 2013 Quarter 1 Report which are presented below:

(Million NOK, unless specified otherwise)

Equity (E) Value of DNB Bank ASA	
Stock Price as on 31.05.2013 (NOK)	95.45
Shares Outstanding (Million)	1,628.80
Market Value of Equity (E)	155,469

Table 7: Equity Value of DNB Bank ASA

(Million NOK, unless specified otherwise)

Debt (D) Value of DNB Bank ASA	
Due to Credit Institutions	359,158
Deposits from Customers	862,164
Financial Derivatives	93,318
Debt Securities	375,939
Subordinated Loan Capital	18,610

Total Value of Debt (D)	1,709,189
--------------------------------	------------------

Table 8: Debt Value of DNB Bank ASA

From the levered equity beta (β_{lev}) and debt beta (β_d) found earlier and the taxation rate (t) of 28% in Norway, the unlevered beta (β_u) of DNB Bank ASA was calculated using:

$$\beta_u = \beta_{lev} \times \left[\frac{E}{E + (1-t)D} \right] + \beta_d \times \left[\frac{(1-t)D}{E + (1-t)D} \right]$$

The unlevered beta of DNB Bank ASA was found to be 0.01.

4.4 New Capital Structure based on Basel III standards and Norwegian Capital Requirements

The new capital structure based on Basel III standards and Norwegian Capital Requirements was found by using the following methodology and assumptions:

- The present RWA level of the bank (NOK 891,346 million on March 31, 2013), was observed from its 2013 Quarter 1 results
- The probable RWA levels at the completion of the capital requirements phase-in arrangements was estimated to be ranging from a decrease of 20%, 15%, 10%, 5% to an increase of 5%, 10%, 15%, 20%. The reason we estimate at different variations of RWA is because of the estimation uncertainty associated with the new proposed rules for risk weighting DNBs assets.
- At different levels of RWA, the total CET 1 capital, total tier 1 capital and total primary capital was estimated based on the capital requirements standards
- The total primary capital was compared with the existing primary capital. If an additional primary capital is required to fulfil the capital requirements standards, it was assumed to be raised through issuance of equity
- It was assumed that the market value of the bank's equity will not fall on issuance of new equity. This is in accordance with earlier discussions indicating that the signalling value is removed when the cause of the issuance is mandated by the regulator.

- Debt of the bank was assumed to be at the existing levels, that is, as observed from 2013 Quarter 1 results
- For the Norwegian legislation, for sensitivity analysis, the retail mortgage loans have been adjusted in the same proportion of RWA
- For the Norwegian legislation, the risk-weight on mortgage loans has been changed from the existing 22.8% level to 35% level as required by the new rules

The capital requirements stipulated by Basel III norms is summarised below:

Capital Requirements as per Basel III Standards	% of RWA
CET 1 Capital	4.5%
Capital Conservation Buffer (Additional CET 1 capital)	2.5%
Countercyclical Buffer (Additional CET 1 capital)	2.5%
Total CET 1 Capital	9.5%
Additional Tier 1 Capital	1.5%
Total Tier 1 Capital	11.0%
Tier 2 Capital	2.0%
Total Primary Capital	13.0%

Table 9: Capital Requirements as per Basel III standards

The capital structure of DNB Bank ASA at different levels of RWA based on the Basel III capital requirements standards (2019 onwards) is as follows:

(Million NOK, unless specified otherwise)

Change in RWA compared to existing RWA	-20.0%	-15.0%	-10.0%	-5.0%	0.0%	5.0%	10.0%	15.0%	20.0%
RWA	713,077	757,644	802,211	846,779	891,346	935,913	980,481	1,025,048	1,069,615
Total CET 1 Capital Required	67,742	71,976	76,210	80,444	84,678	88,912	93,146	97,380	101,613
Additional Tier 1 Capital Required	10,696	11,365	12,033	12,702	13,370	14,039	14,707	15,376	16,044
Tier 2 Capital Required	14,262	15,153	16,044	16,936	17,827	18,718	19,610	20,501	21,392
Total Primary Capital Required	92,700	98,494	104,287	110,081	115,875	121,669	127,462	133,256	139,050
Existing Primary Capital	116,744	116,744	116,744	116,744	116,744	116,744	116,744	116,744	116,744
Additional capital to be raised through equity	-	-	-	-	-	4,925	10,718	16,512	22,306
Total Number of Shares Outstanding (Face Value: 10 NOK)	1,628.80	1,628.80	1,628.80	1,628.80	1,628.80	2,121.27	2,700.65	3,280.02	3,859.40
Market Value of Equity (E) (assuming no devaluation in	155,469	155,469	155,469	155,469	155,469	202,475	257,777	313,078	368,380

<i>existing market price)</i>										
Debt (assumed constant at existing levels)	1,709,189	1,709,189	1,709,189	1,709,189	1,709,189	1,709,189	1,709,189	1,709,189	1,709,189	1,709,189

Table 10: Capital Structure of DNB Bank ASA at different levels of RWA based on the Basel III capital requirements standards (2019 onwards)

The capital requirements stipulated by Norwegian legislation (Ministry of Finance, Norway, 2013) is summarised below:

Capital Requirements as per Basel III Standards	% of RWA
CET 1 Capital	4.5%
Capital Conservation Buffer (Additional CET 1 capital)	2.5%
Systemic Risk Buffer (Additional CET 1 capital)	3.0%
Countercyclical Buffer (Additional CET 1 capital)	2.5%
Total CET 1 Capital	12.5%
Buffer for Systemically Important Banks	2.0%
Total Primary Capital	14.5%

Table 11: Capital Requirements as per Norwegian legislation

The capital structure of DNB Bank ASA at different levels of RWA based on the Norwegian legislation capital requirements standards (2016 onwards) is as follows:

(Million NOK, unless specified otherwise)

Capital Structure with EXISTING risk-weights on mortgage loans									
Change in RWA compared to existing RWA	-20.0%	-15.0%	-10.0%	-5.0%	0.0%	5.0%	10.0%	15.0%	20.0%
RWA at existing risk weights	713,077	757,644	802,211	846,779	891,346	935,913	980,481	1,025,048	1,069,615
Total CET 1 Capital	89,135	94,706	100,276	105,847	111,418	116,989	122,560	128,131	133,702
Buffer for Systemically Important Banks	14,262	15,153	16,044	16,936	17,827	18,718	19,610	20,501	21,392
Total Primary Capital	103,396	109,858	116,321	122,783	129,245	135,707	142,170	148,632	155,094
Existing Primary Capital	116,744	116,744	116,744	116,744	116,744	116,744	116,744	116,744	116,744
Additional capital to be raised through issuance of equity	-	-	-	6,039	12,501	18,963	25,426	31,888	38,350
Total Number of Shares Outstanding (Face Value: 10 NOK)	1,628.80	1,628.80	1,628.80	2,232.69	2,878.92	3,525.14	4,171.37	4,817.59	5,463.82
Market Value of Equity (E) (assuming no devaluation in existing market price)	155,469	155,469	155,469	213,110	274,793	336,475	398,157	459,839	521,522
Debt (assumed constant at existing levels)	1,709,189	1,709,189	1,709,189	1,709,189	1,709,189	1,709,189	1,709,189	1,709,189	1,709,189
Capital Structure with NEW risk-weights on mortgage loans									
Change in RWA compared to existing RWA	-20.0%	-15.0%	-10.0%	-5.0%	0.0%	5.0%	10.0%	15.0%	20.0%

RWA at existing risk weights	713,077	757,644	802,211	846,779	891,346	935,913	980,481	1,025,048	1,069,615
Retail Mortgage Loans	54,240	57,630	61,020	64,410	67,800	71,190	74,580	77,970	81,360
RWA with new risk weights on Mortgage Loans	783,815	832,804	881,792	930,780	979,769	1,028,757	1,077,746	1,126,734	1,175,723
Total CET 1 Capital	97,977	104,100	110,224	116,348	122,471	128,595	134,718	140,842	146,965
Buffer for Systemically Important Banks	15,676	16,656	17,636	18,616	19,595	20,575	21,555	22,535	23,514
Total Primary Capital	113,653	120,757	127,860	134,963	142,066	149,170	156,273	163,376	170,480
Existing Primary Capital	116,744	116,744	116,744	116,744	116,744	116,744	116,744	116,744	116,744
Additional capital to be raised through issuance of equity	-	4,013	11,116	18,219	25,322	32,426	39,529	46,632	53,736
Total Number of Shares Outstanding (Face Value: 10 NOK)	1,628.80	2,030.05	2,740.38	3,450.72	4,161.05	4,871.38	5,581.71	6,292.05	7,002.38
Market Value of Equity (E) (assuming no devaluation in existing market price)	155,469	193,768	261,570	329,371	397,172	464,973	532,775	600,576	668,377
Debt (assumed constant at existing levels)	1,709,189	1,709,189	1,709,189	1,709,189	1,709,189	1,709,189	1,709,189	1,709,189	1,709,189

Table 12: Capital Structure of DNB Bank ASA at different levels of RWA based on Norwegian Legislation capital requirements standards (2016 onwards)

4.5 Levered Beta of DNB Bank ASA

The unlevered beta was levered at levels of Debt and Equity arrived at in the previous stage based on the capital structure stipulated by the Basel III norms and Norwegian legislation using the formula:

$$\beta_{lev} = \beta_u \times \left[1 + (1 - t) \frac{D}{E} \right] - \beta_d \times \left[(1 - t) \frac{D}{E} \right]$$

The levered beta at different levels of RWA and debt-equity mix based on Basel III capital requirements is shown below:

(Million NOK, unless specified otherwise)

Change in RWA compared to existing RWA	-20.0%	-15.0%	-10.0%	-5.0%	0.0%	5.0%	10.0%	15.0%	20.0%
RWA	713,077	757,644	802,211	846,779	891,346	935,913	980,481	1,025,048	1,069,615
Market Value of Equity (E)	155,469	155,469	155,469	155,469	155,469	202,475	257,777	313,078	368,380
Debt (assumed constant at existing levels)	1,709,189	1,709,189	1,709,189	1,709,189	1,709,189	1,709,189	1,709,189	1,709,189	1,709,189
Levered Beta	0.50	0.50	0.50	0.50	0.50	0.39	0.31	0.25	0.22

Table 13: Levered Beta of DNB Bank ASA at different levels of RWA based on Basel III capital requirements standards

The levered beta at different levels of RWA and debt-equity mix based on Norwegian legislation requirements is shown below:

(Million NOK, unless specified otherwise)

Capital Structure with EXISTING risk-weights on mortgage loans									
Change in RWA compared to existing RWA	-20.0%	-15.0%	-10.0%	-5.0%	0.0%	5.0%	10.0%	15.0%	20.0%
RWA	713,077	757,644	802,211	846,779	891,346	935,913	980,481	1,025,048	1,069,615
Market Value of Equity (E)	155,469	155,469	155,469	213,110	274,793	336,475	398,157	459,839	521,522
Debt (assumed constant at existing levels)	1,709,189	1,709,189	1,709,189	1,709,189	1,709,189	1,709,189	1,709,189	1,709,189	1,709,189
Levered Beta	0.50	0.50	0.50	0.37	0.29	0.24	0.20	0.18	0.16
Capital Structure with NEW risk-weights on mortgage loans									
Change in RWA compared to existing RWA	-20.0%	-15.0%	-10.0%	-5.0%	0.0%	5.0%	10.0%	15.0%	20.0%
RWA with new risk weights on Mortgage Loans	783,815	832,804	881,792	930,780	979,769	1,028,757	1,077,746	1,126,734	1,175,723
Market Value of Equity (E)	155,469	193,768	261,570	329,371	397,172	464,973	532,775	600,576	668,377
Debt (assumed constant at existing levels)	1,709,189	1,709,189	1,709,189	1,709,189	1,709,189	1,709,189	1,709,189	1,709,189	1,709,189
Levered Beta	0.50	0.40	0.30	0.24	0.20	0.18	0.15	0.14	0.13

Table 14: Levered Beta of DNB Bank ASA at different levels of RWA based on Norwegian legislation capital requirements standards

4.6 Expected Return on Stock using CAPM

Using the levered beta (β_{lev}) and the Market Risk Premium (5.14%) calculated in the previous stages, the expected return on stock of DNB Bank ASA is calculated using Capital Asset Pricing Model

$$R_e = R_f + \beta_{lev} \times MRP$$

The expected return on stock at different levels of RWA and debt-equity mix based on Basel III capital requirements is shown below:

(Million NOK, unless specified otherwise)

Change in RWA compared to existing RWA	-20.0%	-15.0%	-10.0%	-5.0%	0.0%	5.0%	10.0%	15.0%	20.0%
RWA	713,077	757,644	802,211	846,779	891,346	935,913	980,481	1,025,048	1,069,615
Expected Return on Equity	4.80%	4.80%	4.80%	4.80%	4.80%	4.22%	3.80%	3.54%	3.35%

Table 15: Expected Return on Stock of DNB Bank ASA at different levels of RWA based on Basel III capital requirements standards

The expected return on stock at different levels of RWA and debt-equity mix based on Norwegian legislation capital requirements is shown below:

(Million NOK, unless specified otherwise)

Capital Structure with EXISTING risk-weights on mortgage loans										
Change in RWA compared to existing RWA	-20.0%	-15.0%	-10.0%	-5.0%	0.0%	5.0%	10.0%	15.0%	20.0%	
RWA	713,077	757,644	802,211	846,779	891,346	935,913	980,481	1,025,048	1,069,615	
Expected Return on Equity	4.80%	4.80%	4.80%	4.12%	3.71%	3.45%	3.27%	3.14%	3.04%	
Capital Structure with NEW risk-weights on mortgage loans										
Change in RWA compared to existing RWA	-20.0%	-15.0%	-10.0%	-5.0%	0.0%	5.0%	10.0%	15.0%	20.0%	
RWA with new risk weights on Mortgage Loans	783,815	832,804	881,792	930,780	979,769	1,028,757	1,077,746	1,126,734	1,175,723	
Expected Return on Equity	4.80%	4.30%	3.78%	3.47%	3.27%	3.13%	3.02%	2.94%	2.87%	

Table 16: Expected Return on Stock of DNB Bank ASA at different levels of RWA based on Norwegian legislation capital requirements standards

4.7 Post-tax Return on Debt issued by DNB Bank ASA

The post-tax return on debt (NOK 1,709,189 million) issued by DNB Bank ASA was calculated based on the interest expense (NOK 5,564 million for the quarter ending March 31, 2013) reported by the bank in its 2013 Quarter 1 report. The annual post-tax return was thus observed to be

$$R_d = \text{Interest Rate} \times (1 - t) = \frac{5,564}{1,709,189} \times 4 \text{ quarters} \times (1 - 28\%) = 0.94\%$$

4.8 Weighted Average Cost of Capital

The weighted average cost of capital for DNB Bank ASA was calculated using the expected return on equity (R_e), return on debt (R_d), expected market value of Equity (E) and Debt (D) using:

$$WACC = R_e \times \left[\frac{E}{E + D} \right] + R_d \times \left[\frac{D}{E + D} \right]$$

WACC at different levels of RWA based on Basel III capital requirements is shown below:

(Million NOK, unless specified otherwise)

Change in RWA compared to existing RWA	-20.0%	-15.0%	-10.0%	-5.0%	0.0%	5.0%	10.0%	15.0%	20.0%
RWA	713,077	757,644	802,211	846,779	891,346	935,913	980,481	1,025,048	1,069,615
WACC	1.26%	1.26%	1.26%	1.26%	1.26%	1.28%	1.31%	1.34%	1.37%

Table 17: WACC of DNB Bank ASA at different levels of RWA based on Basel III capital requirements standards

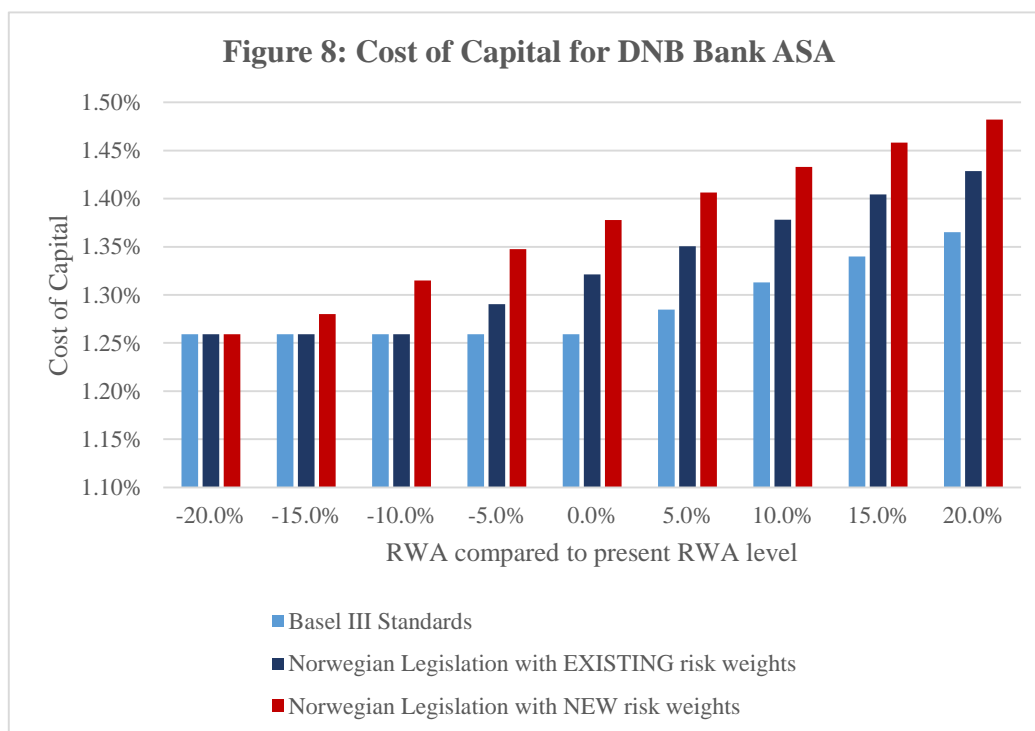
WACC at different levels of RWA based on Norwegian legislation capital requirements is shown below:

(Million NOK, unless specified otherwise)

Capital Structure with EXISTING risk-weights on mortgage loans										
Change in RWA compared to existing RWA	-20.0%	-15.0%	-10.0%	-5.0%	0.0%	5.0%	10.0%	15.0%	20.0%	
RWA	713,077	757,644	802,211	846,779	891,346	935,913	980,481	1,025,048	1,069,615	
WACC	1.26%	1.26%	1.26%	1.29%	1.32%	1.35%	1.38%	1.40%	1.43%	
Capital Structure with NEW risk-weights on mortgage loans										
Change in RWA compared to existing RWA	-20.0%	-15.0%	-10.0%	-5.0%	0.0%	5.0%	10.0%	15.0%	20.0%	
RWA with new risk weights on Mortgage Loans	783,815	832,804	881,792	930,780	979,769	1,028,757	1,077,746	1,126,734	1,175,723	
WACC	1.26%	1.28%	1.31%	1.35%	1.38%	1.41%	1.43%	1.46%	1.48%	

Table 18: WACC of DNB Bank ASA at different levels of RWA based on Norwegian legislation capital requirements standards

Figure 8 summarizes the analysis of cost of capital for DNB Bank ASA at different RWA levels:



4.9 Chronological review of Cost of Capital

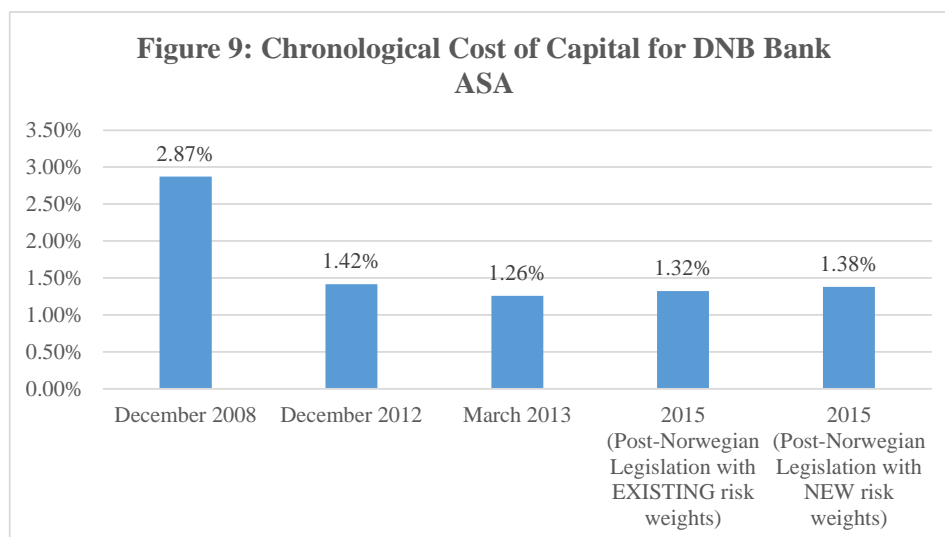
The cost of capital of DNB Bank ASA was assessed from its capital structure in the past and going forward, based on the capital requirements proposed by Basel III and Norwegian legislation. In carrying out this analysis, the Market Risk Premium, tax rate and the beta of debt was assumed to be constant at the existing levels, whereas the other parameters of Capital Asset Pricing Model were observed as follows:

(Million NOK, unless specified otherwise)

Comparison of Cost of Capital	December 2008	December 2012	March 2013	2015 (Estimated - After adhering to Norwegian Legislation with EXISTING risk weights on mortgages)	2015 (Estimated - After adhering to Norwegian Legislation with NEW risk weights on mortgages)
Outstanding shares (million)	1,332.7	1,628.8	1,628.8	2,878.92	4,161.0
Share Price (NOK)	27.00	66.60	95.45	95.45	95.45
Market Value of Equity	35,981.55	108,478.08	155,468.96	274,792.63	397,172.09
Due to Credit Institutions	147,371	283,093	359,158	359,158	359,158
Deposits from Customers	570,312	787,245	862,164	862,164	862,164
Financial Derivatives	119,168	92,653	93,318	93,318	93,318
Debt Securities	507,680	414,998	375,939	375,939	375,939
Subordinated Loan Capital	43,612	21,090	18,610	18,610	18,610
Total Debt (D)	1,388,143	1,599,079	1,709,189	1,709,189	1,709,189
Interest Expense	53,373	26,391	5,564	5,564	5,564
Post Tax Return on Debt	2.8%	1.2%	0.9%	0.9%	0.9%
Leveraged Beta of Equity	0.46	0.52	0.50	0.50	0.20
Beta of Debt (assumed constant)	-0.05	-0.05	-0.05	-0.05	-0.05
Risk free Rate	4.47%	2.10%	2.23%	2.23%	2.23%
Expected Return on Equity	6.84%	4.78%	4.80%	3.71%	3.27%
Weighted Average Cost of Capital	2.87%	1.42%	1.26%	1.32%	1.38%

Table 19: Chronological Review of Cost of Capital of DNB Bank ASA

Figure 9 summarizes the chronological cost of capital of the bank:



4.10 Critical Assessment of Methodology

Our methodology analyses the cost of capital once the bank adheres to the capital requirement complete their phase-in. This is 2019 for Basel III and 2016 for Norwegian legislation.

The Capital Asset Pricing Model has certain underlying assumptions which may not hold in the true world. Specifically, it ignores transaction costs and taxation on equity returns. It also assumes that the capital markets are completely efficient with a free flow of information and that investors are completely rational in making their investment decisions. It gives an analysis of return that is pertaining only to systematic risk while assuming that investors do not assume any unsystematic risk because of diversification.

It is not feasible to explore all the possible scenarios by changing all the variables that affect the bank's capital cost. The assumptions underlying the above methodology may be exactly accurate, but are close estimations based on current circumstances.

The risk-free rate and thereby, the Market Risk Premium may change going forward. If the risk-free rate and the MRP fall significantly, the expected return on stock of DNB Bank ASA will be fall, resulting in a lower cost of capital.

Given DNB Bank ASAs continuously changing capital structure, it might be simplistic to assume that the level of debt remains constant. If the level of debt in the bank's capital structure increases, the overall cost of capital will be lower.

DNB Bank ASA has had significant profits (NOK 13,423 million for year 2012) and can hence, source its primary capital requirement from retained earnings. It may not require issuance of equity to meet the entire gap of its existing equity and equity required by the capital requirement standards. If the bank satisfies the proposed capital requirement through its retained earnings, its cost of capital may not rise as much.

The assumption that the price of stock will not change on issuance of new shares may not hold if DNB actually has to issue new equity. However as argued by Admanti, et al. (2011), if the negative signal associated with equity issuance is removed because of regulatory observance, the price of stock may not decrease significantly, as is the case for DNB.

5. Discussion

We estimated DNB Bank ASAs capital structure under future capital requirements stipulated by Basel III and Norwegian legislation rules. While the methodology above find changes in cost of capital that are reasonable, certain finds might surprise outsiders.

For almost all academic purposes, the beta of debt is assumed to be zero. This implies that there is no risk involved in receiving interest payments and principal repayments on debt assumed by an entity. A beta of debt implies no risk of bankruptcy. Researching a highly leveraged financial institution, we found this assumption to be inaccurate. Our methodology found the risk involved for owners debt owed by DNB Bank ASA compared to market returns, thereby finding the beta of DNB Bank ASA's debt. Our findings confirm the arguments laid forth by DNBs CFO, stating the depositor insurance and implicit guarantees on this state-owned bank, make their debt more of a safe haven (as gold) than a normal risky asset.

The estimation of MRP is based on 10-year comparison of returns on OBX compared to the returns on 10-year bonds issued by the Norwegian government. The MRP for Norway widely used by academicians, analysts and managers has a median of 5.0% and an average of 5.5% (Fernandez, et al., 2011). The cost of capital is not highly sensitive to MRP within these bounds. This is evident from the following table showing the sensitivity of cost of capital using existing capital structure, Basel III standards, Norwegian legislation with existing risk-weights and Norwegian legislation with new risk weights at different levels of MRP. While the changes will be larger if we use more extreme MRP estimates, it is unlikely to affect our conclusions.

Weighted Average Cost of Capital (%)

MRP	March 2013 (Existing capital structure)	2015 (Norwegian Legislation with EXISTING risk weights on mortgages)	2015 (Norwegian Legislation with NEW risk weights on mortgages)	2019 (Basel III Capital Requirements)
5.00%	1.26%	1.32%	1.37%	1.25%
5.10%	1.26%	1.32%	1.38%	1.26%
5.14% (calculated value)	1.26%	1.32%	1.38%	1.26%
5.20%	1.26%	1.32%	1.38%	1.26%
5.30%	1.26%	1.33%	1.38%	1.27%
5.40%	1.26%	1.33%	1.39%	1.27%
5.50%	1.26%	1.34%	1.39%	1.27%

Table 20: Sensitivity analysis of DNB Bank ASA's cost of capital with Market Risk Premium

We observe that at higher levels of RWA, DNB Bank ASA requires higher primary capital to maintain their capital adequacy ratios. Beyond retaining profits, DNB Bank ASA may have to issue equity. As RWA levels increase, the levered beta falls, implying a lower expected return on DNB Bank ASA's equity. However, while the expected return on the bank's equity falls in this scenario, there would be a significant increase in equity of DNB Bank ASA in its overall capital structure. This increase in equity would more than offset the fall in return on equity, giving rise to an increase in the overall cost of capital.

With the implementation of new capital requirement standards, DNB Bank ASA has announced an increase of 0.3% on interest on its mortgage loans. Other banks are expected to follow DNB Bank ASA's lead and increase their mortgage rates as well (The Foreigner, 2013). We find the increase in cost of capital for DNB to be 0.12% (1.26% increasing to 1.38%, as per Norwegian legislation). The increase by DNB Bank ASA and other banks in their mortgage rates exceeds the effect on cost of capital due to the new capital requirements. It indicates lacking competition in the Norwegian banking market. The Norwegian banking market show tendencies to be oligopolistic in nature wherein a group of firms exert control on the overall market. The banks seem to be profiteering by increasing interest rates under the pretext of capital requirement standards. In the long run, end-consumers would end up suffering high costs. The Government of Norway would do well to take measures to increase competition in the Norwegian banking market in order to keep lending rates in check, to the benefit of Norwegian consumers and businesses.

6. Conclusion

Using the Capital Asset Pricing Model method, we find that raising equity levels in the capital structure of DNB Bank ASA, raises the weighted average cost of capital. This stems from the fact that tax treatment on debt favours capital funded by debt rather than equity. Additionally, the asymmetry of information between management and outsiders gives rise to the pecking order, wherein management is averse to raising equity externally and tends to use retained earnings as a substitute. In the case of DNB Bank ASA, it is observed that the cost of capital increases as the bank assumes higher levels of RWA. Comparing the Basel III standards to the Norwegian legislation on capital requirements, the bank has to assume a higher cost of capital to adhere to the requirements of Norwegian legislation. Even at present levels of RWA, the bank's cost of capital increases from 1.26% as per Basel III requirements to 1.38% as per Norwegian legislation (with new risk-weights).

While noticeable for a large bank, this difference does not alone justify the increase of 0.3 percentage points in mortgage interest rate DNB levied on its customers. The interest rate increase seems to be too high by more than two-fold.

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8. Appendix

Table A.1: Oslo Bors Stock Exchange Benchmark Index (OBX) and DNB Bank ASA Returns

Date	Monthly Risk-free Rate	OBX Value	Monthly Returns	OBX Monthly Real Yield (Return over risk-free rate)	DNB Stock Values (NOK)	Monthly Returns	DNB Monthly Real Yield (Return over risk-free rate)
28.05.93	0.57%	303.57	-	-	12.25	-	-
30.06.93	0.57%	312.25	2.86%	2.29%	14.15	15.51%	14.94%
30.07.93	0.57%	338.28	8.34%	7.76%	16.20	14.49%	13.92%
31.08.93	0.57%	360.70	6.63%	6.06%	17.00	4.94%	4.37%
30.09.93	0.57%	342.24	-5.12%	-5.69%	16.70	-1.76%	-2.34%
29.10.93	0.57%	387.27	13.16%	12.59%	20.00	19.76%	19.19%
30.11.93	0.57%	357.07	-7.80%	-8.37%	19.10	-4.50%	-5.07%
30.12.93	0.57%	385.51	7.96%	7.39%	16.85	-11.78%	-12.35%
31.01.94	0.62%	431.29	11.88%	11.25%	21.50	27.60%	26.97%
28.02.94	0.62%	433.05	0.41%	-0.21%	19.70	-8.37%	-8.99%
30.03.94	0.62%	395.86	-8.59%	-9.21%	16.50	-16.24%	-16.87%
29.04.94	0.62%	395.53	-0.08%	-0.71%	19.00	15.15%	14.53%
31.05.94	0.62%	393.01	-0.64%	-1.26%	16.60	-12.63%	-13.25%
30.06.94	0.62%	367.10	-6.59%	-7.21%	15.90	-4.22%	-4.84%
29.07.94	0.62%	400.69	9.15%	8.53%	16.25	2.20%	1.58%
31.08.94	0.62%	398.79	-0.47%	-1.10%	16.90	4.00%	3.38%
30.09.94	0.62%	361.12	-9.45%	-10.07%	15.80	-6.51%	-7.13%
31.10.94	0.62%	368.80	2.13%	1.51%	17.00	7.59%	6.97%
30.11.94	0.62%	381.45	3.43%	2.81%	17.00	0.00%	-0.62%
30.12.94	0.62%	403.37	5.75%	5.12%	18.40	8.24%	7.61%
31.01.95	0.62%	400.49	-0.71%	-1.33%	18.30	-0.54%	-1.16%
28.02.95	0.62%	382.01	-4.61%	-5.23%	17.00	-7.10%	-7.72%
31.03.95	0.62%	361.75	-5.30%	-5.92%	16.50	-2.94%	-3.56%
28.04.95	0.62%	391.31	8.17%	7.55%	16.50	0.00%	-0.62%
31.05.95	0.62%	390.65	-0.17%	-0.79%	16.40	-0.61%	-1.23%
30.06.95	0.62%	403.29	3.24%	2.62%	16.70	1.83%	1.21%
31.07.95	0.62%	411.89	2.13%	1.51%	17.20	2.99%	2.37%
31.08.95	0.62%	407.75	-1.01%	-1.62%	16.70	-2.91%	-3.53%
29.09.95	0.62%	414.34	1.62%	1.00%	17.30	3.59%	2.97%
31.10.95	0.62%	397.62	-4.04%	-4.65%	17.10	-1.16%	-1.78%
30.11.95	0.62%	400.47	0.72%	0.10%	16.60	-2.92%	-3.54%
29.12.95	0.62%	407.06	1.65%	1.03%	16.60	0.00%	-0.62%
31.01.96	0.57%	413.00	1.46%	0.89%	17.80	7.23%	6.66%
29.02.96	0.57%	423.90	2.64%	2.07%	20.80	16.85%	16.29%
29.03.96	0.57%	426.82	0.69%	0.12%	19.90	-4.33%	-4.89%
30.04.96	0.57%	459.76	7.72%	7.15%	18.90	-5.03%	-5.59%
31.05.96	0.57%	458.62	-0.25%	-0.81%	19.60	3.70%	3.14%

Date	Monthly Risk-free Rate	OBX Value	Monthly Returns	OBX Monthly Real Yield (Return over risk-free rate)	DNB Stock Values (NOK)	Monthly Returns	DNB Monthly Real Yield (Return over risk-free rate)
28.06.96	0.57%	455.08	-0.77%	-1.34%	19.70	0.51%	-0.05%
31.07.96	0.57%	437.43	-3.88%	-4.44%	20.20	2.54%	1.97%
30.08.96	0.57%	450.36	2.96%	2.39%	20.60	1.98%	1.42%
30.09.96	0.57%	462.14	2.62%	2.05%	20.70	0.49%	-0.08%
31.10.96	0.57%	478.90	3.63%	3.06%	21.20	2.42%	1.85%
29.11.96	0.57%	509.87	6.47%	5.90%	24.00	13.21%	12.64%
30.12.96	0.57%	532.58	4.45%	3.89%	24.40	1.67%	1.10%
31.01.97	0.49%	577.61	8.46%	7.96%	26.60	9.02%	8.53%
28.02.97	0.49%	585.07	1.29%	0.80%	30.00	12.78%	12.29%
26.03.97	0.49%	591.66	1.13%	0.64%	28.60	-4.67%	-5.16%
30.04.97	0.49%	600.77	1.54%	1.05%	25.70	-10.14%	-10.63%
30.05.97	0.49%	632.29	5.25%	4.76%	27.90	8.56%	8.07%
30.06.97	0.49%	650.06	2.81%	2.32%	28.70	2.87%	2.38%
31.07.97	0.49%	698.81	7.50%	7.01%	32.10	11.85%	11.36%
29.08.97	0.49%	684.54	-2.04%	-2.53%	30.50	-4.98%	-5.48%
30.09.97	0.49%	709.68	3.67%	3.18%	29.70	-2.62%	-3.11%
31.10.97	0.49%	695.54	-1.99%	-2.48%	31.70	6.73%	6.24%
28.11.97	0.49%	663.80	-4.56%	-5.05%	30.60	-3.47%	-3.96%
30.12.97	0.49%	676.36	1.89%	1.40%	34.80	13.73%	13.23%
30.01.98	0.45%	655.93	-3.02%	-3.47%	33.20	-4.60%	-5.05%
27.02.98	0.45%	685.20	4.46%	4.01%	41.70	25.60%	25.15%
31.03.98	0.45%	733.75	7.09%	6.64%	41.50	-0.48%	-0.93%
30.04.98	0.45%	747.75	1.91%	1.46%	39.20	-5.54%	-5.99%
29.05.98	0.45%	687.41	-8.07%	-8.52%	40.50	3.32%	2.87%
30.06.98	0.45%	692.16	0.69%	0.24%	40.20	-0.74%	-1.19%
31.07.98	0.45%	681.64	-1.52%	-1.97%	41.40	2.99%	2.54%
31.08.98	0.45%	520.68	-23.61%	-24.06%	28.00	-32.37%	-32.82%
30.09.98	0.45%	469.47	-9.84%	-10.29%	23.20	-17.14%	-17.59%
30.10.98	0.45%	547.65	16.65%	16.20%	25.90	11.64%	11.19%
30.11.98	0.45%	514.64	-6.03%	-6.48%	29.00	11.97%	11.52%
30.12.98	0.45%	501.81	-2.49%	-2.94%	26.30	-9.31%	-9.76%
29.01.99	0.46%	551.60	9.92%	9.46%	32.20	22.43%	21.97%
26.02.99	0.46%	523.30	-5.13%	-5.59%	27.80	-13.66%	-14.12%
31.03.99	0.46%	560.87	7.18%	6.72%	28.30	1.80%	1.34%
30.04.99	0.46%	597.69	6.56%	6.10%	28.20	-0.35%	-0.81%
31.05.99	0.46%	590.71	-1.17%	-1.63%	27.40	-2.84%	-3.30%
30.06.99	0.46%	584.12	-1.12%	-1.58%	26.00	-5.11%	-5.57%
30.07.99	0.46%	598.81	2.51%	2.05%	27.00	3.85%	3.39%
31.08.99	0.46%	622.44	3.95%	3.49%	31.30	15.93%	15.47%
30.09.99	0.46%	624.65	0.36%	-0.10%	30.60	-2.24%	-2.70%
29.10.99	0.46%	603.44	-3.40%	-3.86%	30.40	-0.65%	-1.11%
30.11.99	0.46%	647.27	7.26%	6.80%	32.60	7.24%	6.78%
30.12.99	0.46%	713.91	10.30%	9.84%	32.90	0.92%	0.46%
31.01.00	0.52%	677.13	-5.15%	-5.67%	30.10	-8.51%	-9.03%

Date	Monthly Risk-free Rate	OBX Value	Monthly Returns	OBX Monthly Real Yield (Return over risk-free rate)	DNB Stock Values (NOK)	Monthly Returns	DNB Monthly Real Yield (Return over risk-free rate)
29.02.00	0.52%	708.82	4.68%	4.16%	30.40	1.00%	0.48%
31.03.00	0.52%	718.88	1.42%	0.90%	32.40	6.58%	6.06%
28.04.00	0.52%	698.76	-2.80%	-3.32%	31.40	-3.09%	-3.60%
31.05.00	0.52%	725.92	3.89%	3.37%	31.80	1.27%	0.76%
30.06.00	0.52%	763.65	5.20%	4.68%	35.60	11.95%	11.43%
31.07.00	0.52%	792.78	3.81%	3.30%	36.50	2.53%	2.01%
31.08.00	0.52%	878.66	10.83%	10.31%	41.20	12.88%	12.36%
29.09.00	0.52%	857.46	-2.41%	-2.93%	39.50	-4.13%	-4.64%
31.10.00	0.52%	858.68	0.14%	-0.38%	40.30	2.03%	1.51%
30.11.00	0.52%	779.11	-9.27%	-9.78%	42.70	5.96%	5.44%
29.12.00	0.52%	783.66	0.58%	0.07%	47.50	11.24%	10.72%
31.01.01	0.52%	794.73	1.41%	0.89%	43.00	-9.47%	-9.99%
28.02.01	0.52%	793.78	-0.12%	-0.64%	45.40	5.58%	5.06%
30.03.01	0.52%	728.81	-8.18%	-8.70%	41.40	-8.81%	-9.33%
30.04.01	0.52%	769.32	5.56%	5.04%	40.00	-3.38%	-3.90%
31.05.01	0.52%	781.12	1.53%	1.01%	39.60	-1.00%	-1.52%
29.06.01	0.52%	743.46	-4.82%	-5.34%	40.50	2.27%	1.75%
31.07.01	0.52%	725.20	-2.46%	-2.98%	40.00	-1.23%	-1.75%
31.08.01	0.52%	690.90	-4.73%	-5.25%	43.80	9.50%	8.98%
28.09.01	0.52%	571.42	-17.29%	-17.81%	33.00	-24.66%	-25.18%
31.10.01	0.52%	582.12	1.87%	1.35%	33.60	1.82%	1.30%
30.11.01	0.52%	621.24	6.72%	6.20%	37.30	11.01%	10.49%
28.12.01	0.52%	650.32	4.68%	4.16%	40.40	8.31%	7.79%
31.01.02	0.53%	635.61	-2.26%	-2.79%	41.00	1.49%	0.95%
28.02.02	0.53%	642.87	1.14%	0.61%	44.70	9.02%	8.49%
27.03.02	0.53%	694.74	8.07%	7.54%	46.60	4.25%	3.72%
30.04.02	0.53%	654.48	-5.79%	-6.33%	44.40	-4.72%	-5.25%
31.05.02	0.53%	630.42	-3.68%	-4.21%	41.50	-6.53%	-7.06%
28.06.02	0.53%	572.35	-9.21%	-9.74%	40.90	-1.45%	-1.98%
31.07.02	0.53%	522.92	-8.64%	-9.17%	38.50	-5.87%	-6.40%
30.08.02	0.53%	505.25	-3.38%	-3.91%	38.10	-1.04%	-1.57%
30.09.02	0.53%	427.54	-15.38%	-15.91%	32.40	-14.96%	-15.49%
31.10.02	0.53%	452.79	5.91%	5.37%	34.30	5.86%	5.33%
29.11.02	0.53%	487.19	7.60%	7.07%	35.90	4.66%	4.13%
30.12.02	0.53%	443.40	-8.99%	-9.52%	32.60	-9.19%	-9.72%
31.01.03	0.42%	420.51	-5.16%	-5.58%	33.40	2.45%	2.03%
28.02.03	0.42%	389.36	-7.41%	-7.83%	27.10	-18.86%	-19.28%
31.03.03	0.42%	399.26	2.54%	2.12%	28.70	5.90%	5.48%
30.04.03	0.42%	444.16	11.25%	10.83%	33.40	16.38%	15.96%
30.05.03	0.42%	460.05	3.58%	3.16%	36.40	8.98%	8.56%
30.06.03	0.42%	496.16	7.85%	7.43%	35.60	-2.20%	-2.62%
31.07.03	0.42%	536.21	8.07%	7.65%	37.50	5.34%	4.92%
29.08.03	0.42%	563.34	5.06%	4.64%	35.10	-6.40%	-6.82%
30.09.03	0.42%	523.50	-7.07%	-7.49%	33.80	-3.70%	-4.12%

Date	Monthly Risk-free Rate	OBX Value	Monthly Returns	OBX Monthly Real Yield (Return over risk-free rate)	DNB Stock Values (NOK)	Monthly Returns	DNB Monthly Real Yield (Return over risk-free rate)
31.10.03	0.42%	592.42	13.17%	12.75%	41.30	22.19%	21.77%
28.11.03	0.42%	595.87	0.58%	0.16%	41.20	-0.24%	-0.66%
30.12.03	0.42%	625.94	5.05%	4.63%	44.40	7.77%	7.35%
30.01.04	0.36%	670.15	7.06%	6.70%	42.10	-5.18%	-5.54%
27.02.04	0.36%	736.61	9.92%	9.55%	44.40	5.46%	5.10%
31.03.04	0.36%	707.27	-3.98%	-4.35%	45.00	1.35%	0.99%
30.04.04	0.36%	671.17	-5.10%	-5.47%	43.50	-3.33%	-3.70%
28.05.04	0.36%	677.12	0.89%	0.52%	42.60	-2.07%	-2.43%
30.06.04	0.36%	724.36	6.98%	6.61%	47.30	11.03%	10.67%
30.07.04	0.36%	715.12	-1.28%	-1.64%	48.00	1.48%	1.12%
31.08.04	0.36%	719.54	0.62%	0.25%	52.50	9.38%	9.01%
30.09.04	0.36%	774.67	7.66%	7.30%	53.25	1.43%	1.07%
29.10.04	0.36%	752.62	-2.85%	-3.21%	54.00	1.41%	1.05%
30.11.04	0.36%	812.42	7.95%	7.58%	57.75	6.94%	6.58%
30.12.04	0.36%	821.59	1.13%	0.76%	59.75	3.46%	3.10%
31.01.05	0.31%	839.07	2.13%	1.82%	58.25	-2.51%	-2.82%
28.02.05	0.31%	902.47	7.56%	7.24%	63.25	8.58%	8.27%
31.03.05	0.31%	887.65	-1.64%	-1.95%	64.75	2.37%	2.06%
29.04.05	0.31%	831.95	-6.27%	-6.59%	60.00	-7.34%	-7.65%
31.05.05	0.31%	867.05	4.22%	3.91%	62.50	4.17%	3.86%
30.06.05	0.31%	955.91	10.25%	9.94%	68.25	9.20%	8.89%
29.07.05	0.31%	1005.04	5.14%	4.83%	68.00	-0.37%	-0.68%
31.08.05	0.31%	1064.08	5.87%	5.56%	67.25	-1.10%	-1.41%
30.09.05	0.31%	1101.58	3.52%	3.21%	67.50	0.37%	0.06%
31.10.05	0.31%	1014.91	-7.87%	-8.18%	66.50	-1.48%	-1.79%
30.11.05	0.31%	1054.00	3.85%	3.54%	70.75	6.39%	6.08%
30.12.05	0.31%	1112.82	5.58%	5.27%	72.00	1.77%	1.46%
31.01.06	0.34%	1194.53	7.34%	7.00%	74.50	3.47%	3.13%
28.02.06	0.34%	1223.54	2.43%	2.09%	82.00	10.07%	9.73%
31.03.06	0.34%	1314.46	7.43%	7.09%	88.25	7.62%	7.28%
28.04.06	0.34%	338.62	-74.24%	-74.58%	85.50	-3.12%	-3.46%
31.05.06	0.34%	317.67	-6.19%	-6.53%	78.25	-8.48%	-8.82%
30.06.06	0.34%	315.65	-0.64%	-0.98%	77.25	-1.28%	-1.62%
31.07.06	0.34%	321.95	2.00%	1.66%	78.00	0.97%	0.63%
31.08.06	0.34%	321.63	-0.10%	-0.44%	81.75	4.81%	4.47%
29.09.06	0.34%	309.95	-3.63%	-3.97%	79.90	-2.26%	-2.60%
31.10.06	0.34%	337.93	9.03%	8.69%	85.60	7.13%	6.79%
30.11.06	0.34%	346.45	2.52%	2.18%	83.70	-2.22%	-2.56%
29.12.06	0.34%	371.37	7.19%	6.85%	88.50	5.73%	5.40%
31.01.07	0.40%	387.11	4.24%	3.84%	93.70	5.88%	5.48%
28.02.07	0.40%	369.56	-4.54%	-4.93%	83.00	-11.42%	-11.82%
30.03.07	0.40%	386.16	4.49%	4.09%	85.80	3.37%	2.98%
30.04.07	0.40%	398.97	3.32%	2.92%	85.50	-0.35%	-0.75%
31.05.07	0.40%	414.55	3.91%	3.51%	81.40	-4.80%	-5.19%

Date	Monthly Risk-free Rate	OBX Value	Monthly Returns	OBX Monthly Real Yield (Return over risk-free rate)	DNB Stock Values (NOK)	Monthly Returns	DNB Monthly Real Yield (Return over risk-free rate)
29.06.07	0.40%	426.52	2.89%	2.49%	76.20	-6.39%	-6.79%
31.07.07	0.40%	418.43	-1.89%	-2.29%	77.70	1.97%	1.57%
31.08.07	0.40%	399.17	-4.60%	-5.00%	79.90	2.83%	2.43%
28.09.07	0.40%	423.13	6.00%	5.60%	82.70	3.50%	3.11%
31.10.07	0.40%	438.04	3.52%	3.13%	88.50	7.01%	6.61%
30.11.07	0.40%	422.60	-3.52%	-3.92%	86.90	-1.81%	-2.21%
28.12.07	0.40%	422.08	-0.12%	-0.52%	83.00	-4.49%	-4.89%
31.01.08	0.37%	335.47	-20.52%	-20.89%	69.60	-16.14%	-16.52%
29.02.08	0.37%	367.78	9.63%	9.26%	77.00	10.63%	10.26%
31.03.08	0.37%	356.72	-3.01%	-3.38%	77.30	0.39%	0.02%
30.04.08	0.37%	405.23	13.60%	13.23%	76.30	-1.29%	-1.67%
30.05.08	0.37%	437.62	7.99%	7.62%	73.40	-3.80%	-4.17%
30.06.08	0.37%	411.22	-6.03%	-6.41%	64.80	-11.72%	-12.09%
31.07.08	0.37%	374.95	-8.82%	-9.19%	66.30	2.31%	1.94%
29.08.08	0.37%	377.41	0.66%	0.28%	63.10	-4.83%	-5.20%
30.09.08	0.37%	281.73	-25.35%	-25.72%	44.40	-29.64%	-30.01%
31.10.08	0.37%	214.54	-23.85%	-24.22%	38.50	-13.29%	-13.66%
28.11.08	0.37%	192.79	-10.14%	-10.51%	26.30	-31.69%	-32.06%
30.12.08	0.37%	199.13	3.29%	2.92%	27.00	2.66%	2.29%
30.01.09	0.33%	201.15	1.01%	0.68%	23.60	-12.59%	-12.93%
27.02.09	0.33%	191.57	-4.76%	-5.09%	25.65	8.69%	8.35%
31.03.09	0.33%	203.72	6.34%	6.01%	30.25	17.93%	17.60%
30.04.09	0.33%	226.66	11.26%	10.93%	41.75	38.02%	37.68%
29.05.09	0.33%	265.71	17.23%	16.89%	52.00	24.55%	24.22%
30.06.09	0.33%	254.46	-4.23%	-4.57%	49.00	-5.77%	-6.10%
31.07.09	0.33%	269.39	5.87%	5.53%	53.34	8.86%	8.52%
31.08.09	0.33%	271.58	0.81%	0.48%	61.50	15.30%	14.96%
30.09.09	0.33%	293.03	7.90%	7.57%	66.90	8.78%	8.45%
30.10.09	0.33%	299.29	2.13%	1.80%	65.95	-1.42%	-1.75%
30.11.09	0.33%	317.56	6.10%	5.77%	63.80	-3.26%	-3.59%
30.12.09	0.33%	339.32	6.85%	6.52%	62.75	-1.65%	-1.98%
29.01.10	0.29%	329.81	-2.80%	-3.10%	67.65	7.81%	7.52%
26.02.10	0.29%	317.57	-3.71%	-4.00%	64.20	-5.10%	-5.39%
31.03.10	0.29%	342.61	7.89%	7.59%	67.90	5.76%	5.47%
30.04.10	0.29%	348.15	1.62%	1.32%	70.45	3.76%	3.46%
31.05.10	0.29%	313.20	-10.04%	-10.33%	64.50	-8.45%	-8.74%
30.06.10	0.29%	299.43	-4.40%	-4.69%	63.15	-2.09%	-2.39%
30.07.10	0.29%	327.73	9.45%	9.16%	75.45	19.48%	19.18%
31.08.10	0.29%	322.09	-1.72%	-2.01%	69.65	-7.69%	-7.98%
30.09.10	0.29%	349.95	8.65%	8.36%	80.05	14.93%	14.64%
29.10.10	0.29%	371.22	6.08%	5.78%	80.40	0.44%	0.14%
30.11.10	0.29%	361.25	-2.69%	-2.98%	76.00	-5.47%	-5.77%
30.12.10	0.29%	400.40	10.84%	10.54%	81.90	7.76%	7.47%
31.01.11	0.26%	393.25	-1.79%	-2.05%	79.50	-2.93%	-3.19%

Date	Monthly Risk-free Rate	OBX Value	Monthly Returns	OBX Monthly Real Yield (Return over risk-free rate)	DNB Stock Values (NOK)	Monthly Returns	DNB Monthly Real Yield (Return over risk-free rate)
28.02.11	0.26%	408.31	3.83%	3.57%	86.60	8.93%	8.67%
31.03.11	0.26%	408.49	0.04%	-0.22%	84.85	-2.02%	-2.28%
29.04.11	0.26%	413.39	1.20%	0.94%	85.30	0.53%	0.27%
31.05.11	0.26%	405.99	-1.79%	-2.05%	81.15	-4.87%	-5.13%
30.06.11	0.26%	386.66	-4.76%	-5.02%	75.20	-7.33%	-7.59%
29.07.11	0.26%	383.59	-0.79%	-1.05%	78.60	4.52%	4.26%
31.08.11	0.26%	349.68	-8.84%	-9.10%	64.75	-17.62%	-17.88%
30.09.11	0.26%	322.92	-7.65%	-7.91%	59.40	-8.26%	-8.52%
31.10.11	0.26%	356.93	10.53%	10.27%	64.95	9.34%	9.08%
30.11.11	0.26%	354.02	-0.82%	-1.08%	58.80	-9.47%	-9.73%
30.12.11	0.26%	357.60	1.01%	0.75%	58.55	-0.43%	-0.69%
31.01.12	0.18%	365.95	2.34%	2.16%	61.90	5.72%	5.55%
29.02.12	0.18%	397.40	8.59%	8.42%	71.75	15.91%	15.74%
30.03.12	0.18%	394.39	-0.76%	-0.93%	73.20	2.02%	1.85%
30.04.12	0.18%	389.21	-1.31%	-1.49%	61.70	-15.71%	-15.89%
31.05.12	0.18%	353.19	-9.25%	-9.43%	55.10	-10.70%	-10.87%
29.06.12	0.18%	375.55	6.33%	6.16%	58.95	6.99%	6.81%
31.07.12	0.18%	392.54	4.52%	4.35%	63.50	7.72%	7.54%
31.08.12	0.18%	404.35	3.01%	2.83%	66.60	4.88%	4.71%
28.09.12	0.18%	415.42	2.74%	2.56%	70.25	5.48%	5.31%
31.10.12	0.18%	410.64	-1.15%	-1.33%	71.20	1.35%	1.18%
30.11.12	0.18%	411.12	0.12%	-0.06%	70.55	-0.91%	-1.09%
28.12.12	0.18%	410.30	-0.20%	-0.37%	70.40	-0.21%	-0.39%
31.01.13	0.19%	429.85	4.76%	4.58%	76.40	8.52%	8.34%
28.02.13	0.19%	435.58	1.33%	1.15%	85.50	11.91%	11.73%
27.03.13	0.19%	434.21	-0.31%	-0.50%	85.65	0.18%	-0.01%
30.04.13	0.19%	444.24	2.31%	2.12%	94.25	10.04%	9.86%
31.05.13	0.19%	453.82	2.16%	1.97%	95.45	1.27%	1.09%

Table A.2: Annualised returns on 10-year Norwegian Government Bond Yield

Year	Annual Return
1993	6.86%
1994	7.46%
1995	7.43%
1996	6.78%
1997	5.89%
1998	5.40%
1999	5.52%
2000	6.22%
2001	6.24%
2002	6.38%
2003	5.04%
2004	4.36%
2005	3.74%
2006	4.07%
2007	4.78%
2008	4.47%
2009	4.00%
2010	3.52%
2011	3.12%
2012	2.10%
2013	2.23%

Source: (Norges Bank, 2013)

Table A.3: Comparison of returns of DNB Lang Obligasjon 20 with OBX

Date	OBX Value	DNB Lang Obligasjon 20 Values (NOK)	Monthly Return (OBX)	Monthly Return (DNB Lang Obligasjon)
30.06.08	411.22	9,509.34	-	-
31.07.08	374.95	9,649.61	-8.82%	1.48%
29.08.08	377.41	9,769.47	0.66%	1.24%
30.09.08	281.73	9,589.22	-25.35%	-1.85%
31.10.08	214.54	10,032.30	-23.85%	4.62%
28.11.08	192.79	10,399.42	-10.14%	3.66%
30.12.08	199.13	10,634.21	3.29%	2.26%
30.01.09	201.15	10,510.46	1.01%	-1.16%
27.02.09	191.57	10,576.13	-4.76%	0.62%
31.03.09	203.72	10,604.25	6.34%	0.27%
30.04.09	226.66	10,568.27	11.26%	-0.34%
29.05.09	265.71	10,649.76	17.23%	0.77%
30.06.09	254.46	10,756.94	-4.23%	1.01%
31.07.09	269.39	10,746.23	5.87%	-0.10%
31.08.09	271.58	10,827.45	0.81%	0.76%
30.09.09	293.03	10,945.26	7.90%	1.09%
30.10.09	299.29	11,047.65	2.13%	0.94%

Date	OBX Value	DNB Lang Obligasjon 20 Values (NOK)	Monthly Return (OBX)	Monthly Return (DNB Lang Obligasjon)
30.11.09	317.56	11,174.21	6.10%	1.15%
30.12.09	339.32	11,101.27	6.85%	-0.65%
29.01.10	329.81	10,516.48	-2.80%	-5.27%
26.02.10	317.57	10,622.22	-3.71%	1.01%
31.03.10	342.61	10,598.98	7.89%	-0.22%
30.04.10	348.15	10,680.59	1.62%	0.77%
31.05.10	313.20	10,776.76	-10.04%	0.90%
30.06.10	299.43	10,850.41	-4.40%	0.68%
30.07.10	327.73	10,912.96	9.45%	0.58%
31.08.10	322.09	11,121.99	-1.72%	1.92%
30.09.10	349.95	11,045.45	8.65%	-0.69%
29.10.10	371.22	10,999.01	6.08%	-0.42%
30.11.10	361.25	11,074.55	-2.69%	0.69%
30.12.10	400.40	10,971.11	10.84%	-0.93%
31.01.11	393.25	10,318.41	-1.79%	-5.95%
28.02.11	408.31	10,289.22	3.83%	-0.28%
31.03.11	408.49	10,297.07	0.04%	0.08%
29.04.11	413.39	10,380.75	1.20%	0.81%
31.05.11	405.99	10,511.84	-1.79%	1.26%
30.06.11	386.66	10,552.89	-4.76%	0.39%
29.07.11	383.59	10,698.47	-0.79%	1.38%
31.08.11	349.68	10,767.15	-8.84%	0.64%
30.09.11	322.92	10,880.28	-7.65%	1.05%
31.10.11	356.93	10,836.81	10.53%	-0.40%
30.11.11	354.02	10,892.42	-0.82%	0.51%
30.12.11	357.60	11,005.68	1.01%	1.04%
31.01.12	365.95	10,536.82	2.34%	-4.26%
29.02.12	397.40	10,580.90	8.59%	0.42%
30.03.12	394.39	10,649.60	-0.76%	0.65%
30.04.12	389.21	10,658.95	-1.31%	0.09%
31.05.12	353.19	10,813.09	-9.25%	1.45%
29.06.12	375.55	10,827.56	6.33%	0.13%
31.07.12	392.54	10,998.06	4.52%	1.57%
31.08.12	404.35	11,106.90	3.01%	0.99%
28.09.12	415.42	11,182.32	2.74%	0.68%
31.10.12	410.64	11,244.97	-1.15%	0.56%
30.11.12	411.12	11,325.22	0.12%	0.71%
28.12.12	410.30	11,354.94	-0.20%	0.26%
31.01.13	429.85	10,766.66	4.76%	-5.18%
28.02.13	435.58	10,882.45	1.33%	1.08%
27.03.13	434.21	10,983.78	-0.31%	0.93%
30.04.13	444.24	11,100.89	2.31%	1.07%
31.05.13	453.82	11,095.17	2.16%	-0.05%

Source: (Bloomberg, 2013)