Macroeconomic effects on securitized real estate markets

A comparative study of Sweden and Switzerland

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This thesis investigates to what extent macroeconomic factors influence real estate stock prices before and after the outbreak of the financial crisis in 2007. This is carried out by examining the securitized real estate markets in Sweden and Switzerland by using descriptive statistics. Bivariate regressions are conducted for the macroeconomic factors; all share stock index, exchange rates, unemployment, inflation, term structure, money supply and real GDP per capita, to examine the marginal effect of each variable. The indexed developments and volatilities of each variable and correlations to the OMXS Real Estate and WUPIX-A are compiled to further facilitate an analysis.

The results show that the macroeconomic effects on real estate stock prices differ among small economies and are inconsistent in a pre-crisis and crisis period. Solely theoretical aspects are not sufficient to describe the varying conditions in the financial markets, which have to be scrutinized in a wider economic context. Those factors that show some regularity in the relation to the real estate markets are all share indices, term structure and real GDP per capita.
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1 Introduction

This first chapter aims to provide a brief background of the real estate markets in Sweden and Switzerland from a macroeconomic perspective. This chapter also discusses the purpose and contribution of this study and gives the research question. The two European markets provide a foundation for an analysis of factors influencing the share prices of public real estate companies, which gives rise to another important issue within real estate economics; valuation of property by investors in small economies.

1.1 Background

After the Dot-com bubble from 2003, a Boom-bust period followed with an incremental high increase in the price of assets (Fregert and Jonung, 2010). However, since the start of the global financial crisis in 2007, there is a need to change the perception of real estate due to economic, social and cultural implications. Realizing that there is both an investment and a consumption good aspect of property has macroeconomic significance as the treatment can affect national welfare and growth. Furthermore, international real estate markets are heterogeneous with plenty of sub-markets and have to be handled accordingly (Murphy, 2012). Therefore, how a specific national real estate market develops should depend on the performance of the overall domestic economy. Central banks play an important role as a part of the monetary transmission mechanism and wealth creation in the society. Nevertheless, targeting stock and real estate prices to avoid economic shocks is criticized due to the informational shortage by authorities and must not be a goal in itself as it can worsen the performance of monetary policy (Mishkin, 2001). In Sweden, the Swedish Riksbank takes the asset prices of the real economy into consideration to dampen unsustainably high growth rates in the long-run and to adjust the inflation to its target level (Ingves, 2007).

In the last 10-year period since 2003, open market valuations have shown on average an annual total return of 7.3 percent for direct investments in properties in Sweden (IPD, 2012a). The same number for Switzerland was 6.1 percent (IPD, 2012b). This could be put into relation with real estate equities that during the same time period had a return of 9.7 percent in Sweden and 9.8 percent in Switzerland. Nevertheless, in the 5 years since 2008 during the financial crisis, the developments in the real estate markets have been more noteworthy. The average return on property investments in Sweden plummeted to 4.8 percent (IPD, 2012a), while in Switzerland it actually increased to 6.5 percent (IPD, 2012b). The annual return on real estate equities in Sweden reached 4.2 percent, while it in Switzerland was rather stable at 9.4 percent.
Sweden and Switzerland are both small economies with 9.45 million and 7.91 million inhabitants respectively in 2011 (World Bank, 2013). This entails a smaller internal market capacity and demand, which results in a dependency on export. In the years 2003-2012, both countries had very similar export-to-GDP ratios ranging between 43-54 percent (World Bank, 2013). To maintain a high standard of living, Sweden and Switzerland were in 2012 keeping two of the highest trade balances in the world (CIA, 2013), which reinforces the economic prosperity and welfare of the two countries. However, the export-oriented nature makes a country more vulnerable and exposed to economic downturns (Ekonomifakta, 2011) and as most of the largest trade partners are located in Europe (CIA, 2013), it enhances the risk for recession. Furthermore, the two economies are characterized by a highly skilled workforce with almost identical income generation from the different sectors. There is a strong specialization in the service sector, accounting for slightly over 70 percent of total output, followed by industry of about 28 percent and a diminishing share from agriculture of less than 2 percent (CIA, 2013).

Another aspect comprises the currencies of the two nations. During times of financial turmoil, like the outbreak of the recent financial crisis, the Swedish Krona tends to depreciate against other larger currencies. This effect is normally short-term and does not stem from economic fundamentals but rather a consequence of investors seeking stability and liquidity in the forex market (Sveriges Riksbank, 2009). This works in favor of the Swedish economy as it can uphold international demand for domestic products and retain growth. The Swiss Franc on the other hand has historically been a popular reserve currency. The country has benefited from a stable, conservative economic and political system and a banking system that stimulates inward investments, which has kept volatility in the Swiss national market at a minimum level (Allen, 2011). However, since 2009, the sound Swedish public finances and strong domestic industry have created the perception of a potentially better long-term economic development than in other national markets. This has made investors to regard Sweden equally to Switzerland as a safe-haven, with the outcome that both currencies have appreciated in the crisis (McCormick et al, 2011). In 2011, the Swiss National Bank devalued the Swiss Franc by pegging it to the Euro, as the situation was considered to be an acute threat to the Swiss economy (Wearden, 2011). A similar pattern can be observed in the property markets of the two economies where in the period 2010-2012 the total annual return for real estate investments in Sweden surged to 9.0 percent (IPD, 2012a) and in Switzerland it increased to 6.9 percent (IPD, 2012b). Real estate equities on average increased to 10.3 percent and 14.0 percent in Sweden and Switzerland respectively.
1.2 Purpose and contribution
Real estate economics constitutes a relatively young research field and many questions connected to real estate markets need more attention. The instability of the residential markets made the subprime mortgage market to collapse and initiated the financial crisis in the year of 2007 in the United States. Understanding what factors drive price developments of real estate ought to be of great concern as severe financial turmoil can potentially stem from these markets. Particularly problematic are matters regarding price developments of commercial real estates in markets where few transactions take place and therefore are difficult to examine.

This paper provides a comparative study of Sweden and Switzerland. These markets share several eminent macroeconomic traits and the intention is to examine whether this is a precondition for identical behavior in the individual real estate markets. The purpose is to investigate how economic variables co-vary with publicly traded stocks of real estate companies. This study further makes a distinction between the pre-crisis period and the crisis period with the assumption that markets are not static, different patterns could be possible to observe when diverging market conditions prevail. By being able to analyze publicly traded real estate companies, it is further claimed in this paper that stock indices of real estate companies reflect the real estate price developments as those can serve as good substitutes for property indices. Based on what is now said, as reliable data of price trends of properties in small economies is difficult to extract for statistical research, this paper aims to elaborate another approach to create knowledge in the field of real estate economics.

1.3 Research question & hypotheses
This study has the following research question:

- How do the economic variables all share index, exchange rate, unemployment rate, inflation, term structure, money supply and real GDP per capita influence the share prices of real estate companies in Sweden and Switzerland in the pre-crisis and crisis period?
- What are the determinants of value in the real estate markets?

The following hypotheses are defined based on previous research and theory:

H1: A real estate stock index has a positive relationship to an all share index in both the pre-crisis and crisis period.
H2: A real estate stock index has a negative relationship to the exchange rate.
H3: A real estate stock index has negative relationship to the unemployment rate.
H4: A real estate stock index has a positive relationship to inflation.
H5: A real estate index has a negative relationship to term structure.
H6: A real estate index has a positive relationship to money supply.
H7: A real estate index has a positive relationship to real GDP per capita.

2 Literature review

This chapter covers previous research about macroeconomic transmission effects on the real estate markets. As most of the studies are implemented in the United States or United Kingdom, there exists a theoretical gap of how macroeconomic factors influence the stocks of real estate companies in small economies.

In McCue and Kling (1994), the US securitized market is investigated by using equity Real Estate Investment Trust (REIT) data as a proxy for real estate returns. It is adjusted for systematic fluctuations in the stock market and implemented in a Vector Autoregressive-model (VAR). It is shown that macroeconomic variables explain approximately 60% of the variation in the real estate returns, whereof the nominal short-term interest rate (the three-month Treasury bill rate) accounts for 36%. The output (Federal Reserve’s Industrial Production Index) and investment (McGraw Hill Construction Contract Index) variables explain a very small part of the variations in the real estate markets.

Ling and Naranjo (1997) address the question whether the same systematic risk factors are priced in the commercial real estate market in the US as for the stock and bond markets ex ante. In the study, both appraisal-based returns and stock market-based REIT returns are used in a Multifactor Asset Pricing-model (MAP). The main findings suggest that the real estate markets are affected by real per capita growth of personal consumption expenditures for nondurable goods and services and the real Treasury bill rate. Also the term structure of interest rates, measured as the difference in yield of a 10-year Treasury bond and a three-month Treasury bill, and unexpected inflation have significant impact in the real estate markets. Unexpected inflation is here defined as the difference between realized inflation in the end of a certain time period and the expected inflation rate in the beginning of that same period.

A VAR-model is also employed in Brooks and Tsolakos (1998) to examine the UK real estate market returns. A filtered FTSE Property Total Return Index is constructed to more reliably reflect the actual returns in the real estate markets. One important observation is that results from different studies indicate that influences from macroeconomic variables are not totally comparable internationally. Aspects like time span, return series and methodology complicate research on property markets. Furthermore, the results on the UK market are not sufficiently
strong to deduce any univocal conclusions. However, there is an indication that interest rate term structure and unexpected inflation have a more significant effect on property returns.

Ewing and Payne (2003) use a generalized impulse response method to investigate the impact of macroeconomic shocks on the equity REIT returns in the US. It can be concluded that unanticipated changes in monetary policy and real output, estimated with the federal fund rate and the coincident index respectively, likewise as shocks in aggregate price level, have a negative effect on real estate stock returns. On the contrary, an unexpected rise in default risk premium, which is defined as the spread between low-grade corporate bond (Baa) and 10-year government Treasury bond rates, gives an increase in the property returns.

It is pointed out by Bredin et al (2007) that the behaviors of REIT returns do not necessarily correspond to the overall stock market. A Generalized Autoregressive Conditional Heteroscedasticity framework (GARCH) is implemented to analyze influences of unexpected changes in monetary policy. This is here defined as unanticipated announcements by the FOMC (Federal Open Market Committee) to change the interest rates. The results show that both returns and volatility significantly respond to unanticipated rate changes. Furthermore, no evidence is put forward of a “calm before the storm”, a change of relative volatility prior and after an announcement.

Bouchouicha and Ftiti (2012) contribute by jointly examining the macroeconomic environments of the securitized market, the commercial market and the residential market in the US and the UK. Several appraisal-based and transaction-based indices are used in a dynamic coherence function (DCF) approach to study both intra and inter-market behaviors for the different segments. It is demonstrated that there exists synchronization between the real estate markets and macroeconomic variables in the two separate countries. There is a long-term (10 years) co-movement in the US and the UK with the long-term interest rate, inflation and employment growth. On the other hand, there is a desynchronization in the short (two quarters) and long-run between the real estate markets and the macroeconomic environments with economic growth, money supply and the short-term interest rate. Moreover, the returns of the different asset categorize are also different.
3 Theoretical framework

Here the principles of micro and macroeconomics that are relevant for real estate valuation are presented. In addition to that, the real estate valuation technique is contrasted and discussed in relation to the foundations of stock markets and determinants influencing equities.

3.1 The creation of value in real estate markets

To fully understand what drives the price settlement in the financial markets, one must first be familiar with the basic concepts of value creation as a part of microeconomic theory. Only then a thorough analysis can be carried out when studying the behavior of stock returns of real estate companies in a macroeconomic context.

3.1.1 The concept of value

The grounds of value are difficult to explain, but it could be said that it is created in an interaction between individuals and resources due to the expectations of future utilities (Persson, 2011). It could be further elaborated as preferences originating from social and cultural motives, which results in a demand to maximize satisfaction (Frank and Bernanke, 2009). It is in Persson (2011) also pointed out that several conditions have to be in place for an economic value to arise; a need for that product, scarcity or limited access, the right to utilize the product and exclude others from doing it, and there has to exist a market for exchangeability.

Another discussed aspect when it comes to real estate value is the yield obtained from an investment, or the future expected present values of returns. This is of a very individual nature and needs careful consideration and establishment of specific value creating factors and their magnitude and development. To be correctly evaluated, it in turn demands an investment and profitability analysis of the valued property (Persson, 2011).

3.1.2 Supply and demand

Demand is most often illustrated as a downward sloping curve plotted as a function of price and quantity for goods. The slope of the curve is determined of the price elasticity, or the responsiveness of the quantity demanded of that good to changes in its price. There are several factors affecting demand and that sensitivity to prices. If for instance more similar products are available in the market, a wider range of options can be offered, which is called the substitution effect. Moreover, the question how much simply can be afforded by an individual is called the income effect. Another aspect is time, if a product can create more efficiency, it should probably be more valuable (Frank and Bernanke, 2009).
In contrast to demand, the supply curve is upward sloping. The quantity supplied for a certain price is in the end determined by the opportunity cost of the seller, defined as the total value of what must be foregone to undertake an activity (Frank and Bernanke, 2009).

Market equilibrium is where the two curves intersect. The definition of market value by the International Valuation Standard Committee is as follows:

*Market value is the estimated amount for which an asset should be exchanged on the date of valuation between a willing buyer and a willing seller in an arm’s length transaction after proper marketing wherein the parties had each acted knowledgeably and without compulsion.*

3.1.3 **Microeconomic perspective of real estate markets**

General microeconomic theory of supply and demand is applicable also for real estate markets. However, there are several characteristics of a real estate that can obstruct an analysis (Lind and Persson, 2011):

1. Every object is unique, there are no identical real estates
2. Every real estate is fixed to a location, which increases the importance of its adjacent environment in a valuation situation.
3. Long duration. Land is eternal and buildings tend to have a very long economic value.
4. A large capital investment that most often is financed by a loan.
5. Inert supply, which decreases the total amount of transactions and creates a lack of market information in contrast to the stock market.
6. A long transaction process that needs professional expertise due to many legal and fiscal issues.

Factors influencing supply and demand of real estate stem often from political interventions, reflected in both legal issues and the overall domestic economic development. For example higher disposable incomes or at least expectations of higher future incomes, increased wealth, increased prices on alternative housing and lower costs related to the utilization of properties (e.g.
lower rents and taxes) all contribute to increase demand and make the demand curve to shift upwards. The supply is on the other hand basically determined by expectations of construction companies of future prices exceeding building costs. If the marginal construction costs decrease as a result of better organization and efficiency, lower costs for labor and machines, then the supply curve shifts downwards. What further distinguishes the real estate market is that the supply is relatively constant in the short-run as the building process spans over a long time period (Lind and Persson, 2011).

### 3.1.4 Macroeconomic analysis of real estates

An analysis of real estate markets from a macroeconomic point-of-view has to be performed with a holistic approach in terms of understanding the overall economy. Macroeconomic studies primarily focus on specific countries/regions and depict current states or expectations of economic trends and developments. A real estate market must therefore be contextualized in the analysis to extract the linkage between the real estate market and country-specific macroeconomic factors (Lind and Persson, 2011). These macroeconomic factors are directly fundamental to determine the effects of value-adding factors of real estate prices and in subsequence real estate equities. Four macroeconomic factors that have major implications on real estate prices are the percental change in GDP, inflation, interest rates and the cyclical variations in the economy according to Lind and Persson (2011):

**GDP:** Is described as the sum of the economic value added by organizations in a specific country. The value created by the national market actors is calculated by subtracting the total production cost from the total sales price, thus giving the value added. When analyzing the GDP of a country, the demographical structure of the population creates potential for future economic growth. The age distribution in the labor force and the structure of economic sectors give an indication of the future value added. A country’s balance sheet, giving information about import/export gives the current state of that country. Furthermore, the total level of investments, innovation pace, the level of competition, government incentives and the judicial system, providing security to compete in an open market, are all important factors for economic welfare.

**Inflation:** It implies that the general price level increases and is usually measured with a CPI (Consumer Price Index). When calculating the actual inflation, a price index is created with a “basket” of consumer goods with given different weights for an average household. Inflation is created on a microeconomic level through both the demand and supply side if for instance the demand on goods and services exceed production capability, or production costs as wages and raw materials increase. The effects of inflation can therefore vary because of its nature. The
effects are mainly dependent if the inflation is expected or unexpected. If the inflation is expected, actors on the market take precautions to prevent financial losses. At the same time if, the inflation is unexpected, certain groups could take advantage of the “element of surprise”. For instance the mortgage holders when their repayments lose relative value and thus making the loan “cheaper”.

**Interest rate:** Is defined as the price of borrowing money and is analyzed from a microeconomic perspective with supply and demand. Therefore, the needs of market participants - those who want to save become lenders and those who need a money infusion to invest become borrowers - give us a market equilibrium and an interest rate decided by market forces. A high inflation makes the relative value of money lower. Borrowers therefore demand a higher interest rate to compensate for the expected loss in value.

**Cyclical variations:** In periods of economic prosperity, also known as “booms”, economy is characterized by thrusting activity with businesses using their full capacity and labor force. Investment levels are also high. In a recession the opposite happens. Businesses start braking in and reduce labor force with higher unemployment rates as a result. A common perception of the underlying mechanism of these cyclical variations is that an event occurs that changes consumers’ perception on the future and subsequently demand on goods and services. The change in consumption pattern makes the demand curve to shift. The government tries to respond and hinder the effects through fiscal measures and the central bank through expansive monetary policy.

### 3.1.5 Real estate valuation

According to Persson (2011), an appropriate approach to value commercial real estate and other properties for investment purposes is a cash-flow method. This suggests that an explicit calculation period of discounted net operating incomes (NOI) is estimated, and thereafter the calculation of a continuing value after all current contracts have been taken into consideration and the capital flow is evaluated to be stable over time.

Important for the valuation is the ability to make realistic assumptions of the incomes and costs generated from the property and their correspondence to market values. The most evident income is the rent and it should be adjusted for any potential deviation from the market trend. Therefore, it is essential to distinguish between *market value* and *current value*. Current rent is the income according to the current contract whereas the market rent is what a property could give on the open market, and thus the income that reasonably can be obtained when a contract is
renewed. Furthermore, it is crucial to estimate the vacancy rate as this can severely influence the income.

The incurred costs are to the greatest extent operation and maintenance costs, capital investments and property tax. When data on costs is retrieved it should preferably not be conventionalized but rather be evaluated on an individual basis as a part of prevailing market conditions for properties of the same age and condition.

Persson (2011) discusses what should be regarded as a correct approach to determine the cost of capital for real estate as the risk level has to be benchmarked against other types of assets. Generally, it consists of a macroeconomic part, a risk free real interest rate and the expected inflation, together with a risk premium. The latter is a combination of geographical location and the characteristics of the property related to its market potential. This can further be simplified by describing it as a risk premium added to a nominal risk free sovereign bond interest rate in the secondary market, with a duration as long as the explicit forecast period.

The exit yield to discount the last year’s NOI and to calculate the continuing value is the cost of capital subtracted with the long-term growth rate (g). Another way to extract the same yield is to divide the NOI in the end of the calculation period by the market value of the real estate, which is often approximated by benchmarking against other properties with similar characteristics from the market.

A real estate value can be illustrated in the following way:

\[
CV = \frac{NOI_{n+1}}{c - g} \\
V = \sum_{t=1}^{n} \frac{R_t - O_t - M_t - I_t - T_t}{(1 + c)^t} + \frac{CV_n}{(1 + c)^n}
\]

\[
V = \text{Real estate value} \\
R = \text{Rent} \\
O = \text{Operation costs} \\
M = \text{Maintenance costs} \\
I = \text{Capital investments} \\
T = \text{Property Tax} \\
CV = \text{Continuing value} \\
c = \text{Cost of capital} \\
g = \text{growth}
\]

### 3.2 The valuation of stocks

To understand what macroeconomic factors influence the share prices of real estate firms, it becomes necessary to complement what the previous section has discussed about value drivers in these companies with knowledge of what factors affect and are priced in the overall stock market.
This section further aims to clarify “the art” of stock valuation and its application on real estate companies.

### 3.2.1 Company valuation

According to Koller et al (2010), the discounted cash flow (DCF) model is a favorite among practitioners as it solely relies on flows of cash from the core business, rather than depending on accounting-based earnings. The model discounts free cash flow (FCF), meaning such cash available to all investors - equity holders, debt holders and any other non-equity investors - at the weighted average cost of capital. The valuation process can be said to follow four steps:

1. Value the company’s operations by discounting free cash flow at the weighted average cost of capital (WACC)
2. Identify and value non-operating assets, such as excess marketable securities, nonconsolidated subsidiaries, and other equity investments. Summing the value of operations and non-operating assets gives enterprise value.
3. Identify and value all debt and other non-equity claims against the enterprise value. Debt and other non-equity claims include (among others) fixed rate and floating-rate debt, unfunded pension liabilities, employee options and preferred stocks.
4. Subtract the value of non-equity financial claims from enterprise value to determine the value of common equity. To estimate price per share, divide equity value by the number of current shares outstanding.

The most crucial value drivers are the growth rate in revenues and the return on invested capital (ROIC). Sustaining high growth is a major challenge as companies have natural life cycles and the most effective strategy is to create new markets through new products or to convince existing and new customers to buy more of a product. Those strategies minimize competition and retaliation is low. Publicly traded companies tend to grow faster than the economy as financial markets are liquid, which makes these companies able to attract capital more easily. Another reason could be that companies can outsource business activities abroad and that transfers national economic expansion away from certain geographical regions (Koller et al, 2010). ROIC on the other hand depends on the market structure and if companies can sustain a competitive advantage. As explained by Porter (1980) in the theory of the five forces, for optimal business conditions there is a need for low threat of new entrants, weak pressure from substitute products, no significant bargaining power from buyers and suppliers and in addition to that, a low degree of rivalry among existing competitors. As for growth, ROIC is tied to for how long companies can stick to
price premium respectively cost and capital efficiency advantages in the current business cycle and then being able to innovate.

The estimated FCF in the explicit forecast period is based on the net operating profit less adjusted taxes (NOPLAT) and invested capital. The latter one is normally connected to changes in revenues. The explicit forecast period must be long enough for a company to reach a steady state, defined as:

- The company grows at a constant rate by reinvesting a constant proportion of its operating profits into the business each year.
- The company earns a constant rate of return on both existing capital and new capital invested.

According to Koller et al (2010), the recommendation is to use the WACC to get the present value of both FCF and the continuing value. In generating the continuing value, the growth rate \((g)\) is normally set as the long-term inflation rate. However, it should not be incorporated in the calculations as that would assume that NOPLAT can grow without any incremental capital investment.

\[
CV = \frac{NOPLAT_{n+1}}{WACC} \quad V = \sum_{t=1}^{n} \frac{FCF_t}{(1+WACC)^t} + \frac{NOPLAT_n}{(1+WACC)^n}
\]

In the calculation of the WACC several conditions should be fulfilled:

- It must include opportunity costs of all investors – debt, equity, and so on – since free cash flow is available to all investors, who expect compensation for the risks they take.
- It must weight each security’s required return by its target market-based weight, not by its historical book value. Target capital structure can be estimated by reviewing comparable companies’ capital structure or management’s explicit and implicit attitude to financing.
- Any financing-related benefits of costs, such as interest tax shields, not included in free cash flow must be incorporated into the cost of capital or valued separately using adjusted present value.
- It must be computed after taxes (since free cash flow is calculated in after-tax terms)
- It must be based on the same expectations of inflation as those embedded in forecasts of free cash flow.
- The duration of the securities used to estimate the cost of capital must match the duration of the cash flow.
The capital asset pricing model (CAPM) is the most common way to calculate the cost of equity. In the European market for company valuation, the German long-term sovereign bond is approximated as the risk free rate and the Beta is a measure for company specific risk regarded as a stock’s co-movement with the market (Koller et al, 2010). What makes the Beta interesting is that adjusts the risk premium of the stock market to incorporate industry specific risk in the return demanded by equity investors.

For companies with publicly traded debt it is possible to calculate the yield to maturity by retrieving the current bond price and promised cash flows from the market (Koller et al, 2010).

\[ c_e = r_f + \beta (E(R_m) - r_f) \]

\[ WACC = \frac{E}{V} c_e + \frac{D}{V} c_d (1 - T_m) \]

\( E = \) Equity  \\
\( D = \) Debt  \\
\( V = \) Target capital structure (E+D)  \\
\( T_m = \) Marginal tax rate  \\
\( c_d = \) Cost of debt  \\
\( c_e = \) Cost of equity  \\
\( r_f = \) Risk free rate  \\
\( \beta = \) Beta  \\
\( E(R_m) = \) Expected market return

### 3.2.2 Differences between real estate and financial securities

In Eriksson (2009), the link between real estate values and the pricing of real estate equities is discussed. As the valuation of real estates and real estate companies, where the underlying assets are the properties themselves, are both ideally carried out through a cash flow analysis, it should theoretically not be possible to separate those two values. Even if this in the long run is claimed to be correct, some fundamental differences between real estates and the stock markets make the values to go apart in the short run. The two main reasons for a discount to net asset value (NAV) are double taxation and costs for central administration. For convenience, a standardized valuation of the portfolio is more common than valuations of individual properties even despite it can distort the accuracy of a valuation, and also the exact required rates of return for the separate markets are problematic to determine. What creates a premium to NAV on the other hand could be an assumption that professional and specialized property management can generate excess values in the long run and also the liquidity of the securitized markets. It is in Lee (2011) shown that liquidity risk is priced independently of regional market risk in the international equity markets. Liquidity risk is more important in developed countries with high transparency, low political risk and that are subject for cross-border investment flows.
3.2.3 Supply and demand in the macroeconomic environment

To make a relevant analysis of factors influencing the stock markets, it becomes crucial to understand the forces of prices (inflation) and the interest rate on output as described in Blanchard (2009). Fiscal and monetary policies in an open economy constitute measures to influence the income level of an economy, illustrated in two relationships:

\[
\text{IS: } Y = C(Y - T) + I(Y, i) + G + NX(Y, Y^*, \frac{1+i}{1+i}E^e)
\]

\[
\frac{M}{P} = YL(i)
\]

From a fiscal perspective, output depends positively on consumption as disposable income minus taxes, investments as positively related to income and negatively to the interest rate, and positively to government spending and net exports. The last factor implies that increased income is negative for domestic output as it increases imports, and foreign income is positive to exports and output. Lastly the exchange rate has a negative effect on output and is based on the ratio of the domestic interest rate and the foreign interest rate, multiplied by the expected exchange rate. The assumption is that when the domestic interest rate increases, then it becomes more lucrative for investors to hold domestic bonds and the demand for the local currency makes the exchange rate to increase.

Output can be affected through monetary policy on the other hand by increasing the money supply and the interest rate by the central bank.

These economic strategies in turn affect the price level and output through the supply of labor force and market stimulations in two other relationships:

\[
\text{AS: } P = P^e(1 + \mu)F(1 - \frac{Y^*}{L}, z)
\]

\[
\text{AD: } Y = Y \left(\frac{M}{P}, G, T\right)
\]

The price level depends on the expected price level multiplied by a markup giving the additional cost for wages in an imperfectly competitive market and a function dependent on unemployment, expressed here as labor force minus total output as a result of employment, and other factors affecting unemployment.

Output in the AD relation is here defined as a positive function of real money supply and government spending, and negatively related to taxes.
3.2.4 The stock market and macroeconomics

The cash-flow analysis used to value stocks is highly dependent on expectations of future economic conditions. Therefore, the valuation of stocks has a close linkage to the macroeconomic expectations of the future. When analyzing macroeconomic effects on stocks this should be the main principle. Two factors that are shown to be affecting publicly traded stocks are news about GDP growth and unemployment. Other effects such as durable goods and retail sales news are shown to have an insignificant effect on stocks (Birz and Lott, 2010). Other studies confirm other macroeconomic factors to have an effect on stocks. Among these, the balance of trade, inflation, money supply and housing starts are all explained as variables that have some effect either on the return of stocks, the volatility or both. Further evidence makes clear that industrial production has mere importance to the change in stock behavior (Flannery and Protopapadakis, 2002). Bali and Cakici (2010) also show that, after controlling for countries’ aggregate dividend yield, earnings-to-price ratios, inflation risk, exchange rate uncertainties, aggregate volatility risk and past returns characteristics, world market risk is not priced in asset pricing. It is rather national systematic and idiosyncratic risks that are relevant.

4 Method

This chapter presents the statistical approach to investigate the relationship between specified macroeconomic variables and the return on stocks of real estate companies. Furthermore, a discussion of business research is given to facilitate evaluation and understanding for the methodological implications of this study.

4.1 Deductive and inductive research

The deductive approach to research is most common and implies that a researcher deduces a hypothesis grounded in what can be known in terms of theoretical considerations of a particular domain, which then is subjected to empirical scrutiny. This incurs skillfulness to translate the hypothesis and concepts reinforcing it into operational entities that should result in a scientific research method. For a study to be regarded as inductive, theory is instead an outcome of previous findings (Bryman and Bell, 2011).

This study investigates the research question deductively as current hypotheses are based on previous research and is supposed to through the chosen method generate new theoretical knowledge.
4.2 Quantitative and qualitative research

A superficial distinction between a quantitative and qualitative research approach is that the former incorporates quantifiable measurements, and the other does not. However, there is more to be said. Quantitative studies are mostly deductive and adopt natural scientific models that embody a view that certain properties of events are external and unaffected by the social reality. Qualitative studies on the other hand are predominantly inductive and try to generate theories by examining cases from the social world, which is assumed to be founded on subjective interpretations and ever shifting realities of individuals (Bryman and Bell, 2011).

Even if there is an assumption of changing economic patterns throughout time in this study, the basic idea is that macroeconomic theory can provide guidance for valid economic management that can be scrutinized using a statistical method. Therefore, this study can be considered to follow a quantitative approach.

4.3 Macroeconomic variables

This investigation intends to establish a relationship between selected macroeconomic factors and price developments of stocks of real estate companies. To measure the stock returns for Sweden, an OMX Real Estate Index provided by Nasdaq OMX is used, and for Switzerland, the WUPIX-A property index available through Wüest & Partner. The definition of a real estate company according to this paper is:

An enterprise that owns, manages and develops any category of property to create long-term profitability for its owners.

More specifically, the indices used in this investigation consist of securities from the following companies:
Here below the economic variables selected on the basis of theory and previous research are presented:

**Stockholm OMX / SIX Swiss Exchange:** Previous research has implemented statistical methods to isolate the effect of systematic risk associated with the financial markets to find the actual transmission between macroeconomic factors and the securitized real estate markets (see e.g. McCue and Kling, 1994; and Brooks and Tsolakos, 1998). In this study, the real estate market is also investigated for behavior conformity with the overall stock market in both Sweden and Switzerland.

**Exchange rate:** The exchange rate has an impact on international investors’ purchasing power and could as a consequence influence the demand for real estates. It is shown in Bali and Cakici (2010) that systematic risk factors like the exchange rate influence regional markets differently and therefore the Swedish and Swiss real estate markets are examined and analyzed separately. The exchange rates of the Swedish Krona and the Swiss Franc are relative to the Euro and US Dollar.

**Unemployment:** Macroeconomic theory makes clear that this variable channels through the economic system and has an impact on the welfare by influencing the price level and output. It is further shown in Birz and Lott (2010) that unemployment affects the general stock market. The selected data is seasonally adjusted to avoid some regular high fluctuations in the labor market that may occur during the year, which could distort the results of the study.
**Inflation**: The value of money is shown to have a significant synchronization with real estate returns in Bouchouicha and Ftiti (2012). Even earlier research shows that there is a connection between this economic factor and real estate securities, both for unexpected and realized inflation (see e.g. Ling and Naranjo, 1997). Also Flannery and Protopapadakis (2002) show that this is true for stocks in general. In this study, the national CPI indices are used as proxies for inflation. The data is not seasonally adjusted.

**Term structure**: It is here defined in accordance with previous literature as the difference in yield to maturity between the long 10-year government bond and short 3-month Treasury bill. It is supposed to reflect the expectations by the market participants on future monetary policy and changes to the interest rates. This is shown to have a potential impact on real estate securities in research by Ling and Naranjo (1997) and Brooks and Tsołakos (1998).

**Money supply**: This variable is supposed to examine the effect of the access to monetary assets and the influence on the real estate stock prices. Only M1 money is here considered, which is the total amount of notes and coins, but also checks and currency that is available for direct withdrawal from deposits in financial institutions. Previous research show different findings on the influence of money supply and returns (see e.g. Flannery and Protopapadakis, 2002; and Bouchouicha and Ftiti, 2012).

**Real GDP/capita**: The aggregate production, or income of the society, has a directly influential effect on the stock market according to Birz and Lott (2010), and theoretically this should also affect the real estate market as well (Lind and Persson, 2011). Here the real GDP is used to investigate the influence growth of the economy has on real estate stocks separately from fluctuations in the value of money.

All the economic variables are indexed (=100), starting either from the first data point in 2003 or from 2008, depending on sample period.

### 4.4 Data collection

The results of this study are generated through secondary data. A secondary analysis has the advantages of often providing high quality data, as the sampling procedure is often meticulously carried out by organizations, to a very low cost and time spent on collection (Bryman and Bell, 2011). This data used in this research paper is retrieved from Thomson Reuters Datastream. The database collects data from a wide array of sources such as Eurostat, The Swedish Riksbank, WM/Reuters, OECD Statistics and Nasdaq OMX. This is also complemented with information
from Wüest & Partners, Swiss Statistics (FSO), Swiss National Bank (SNB) and the Cantonal Office for Statistics of Canton Ticino (Ustat).

To improve the accuracy of the study, available daily data on Stockholm OMX, SIX Swiss Exchange and the exchange rates is used. Monthly data is used for unemployment, inflation, term structure and money supply. For real GDP per capita, only quarterly data is applied. The sample period is from January 2003 to December 2012. The objective is to investigate whether the relationships between the securitized market for real estates and the macro economy have changed between the pre-crisis period of 2003-2007 and the crisis period 2008-2012.

4.5 Statistics
This research paper focuses on describing relationship through descriptive statistics, that aim to use graphical and numerical procedures to summarize and process data. This can be contrasted to inferential statistics, which focus on using the data to make predictions, forecasts and estimates to make better decisions (Newbold et al, 2010).

The data is presented using both a univariate and bivariate analysis and visually illustrated through time-series diagrams and scatter plots. There are several numerical measures that then can be applied to facilitate the analysis of data (Newbold et al, 2010) and are therefore here selected:

Mean and median: The mean is the sum of the data value of the population divided by the number of observations. The median is the middle observation when the population is arranged in increasing (decreasing) order. The mean and the median can be used to analyze the skewness of the distribution of data. In this paper the median is used as a measure for average index development in the two subsequent periods to make sure that no short-term variations from the trend distort the results.

Standard deviation: A measure giving the dispersion from the mean. A relatively low value explains if the variable has been fairly constant over time. Standard deviation is a proxy for volatility. Here the volatility is calculated as the standard deviation divided by the median index development.

Pearson’s r: The correlation coefficient is a standardized measure of the linear relationship between two variables. It is a particularly useful measure as it provides both direction and strength of a relationship. The coefficient ranges from -1 to +1 for a perfectly negative and
positive relationship respectively. A value of 0 would then mean that no correlation between real estate stock returns and the macroeconomic variable exists.

### 4.6 Method criticism

An important point to bear in mind, when using descriptive statistics, is that the methods implemented to detect relationships between variables do not necessarily prove causality. There may possibly exist no causality at all or it may not be uncomplicated to determine the causal direction. This problem concerns the issue of internal validity (Bryman and Bell, 2011). Nevertheless, in this study, all the variables that are tested for a relationship with real estate stock returns are selected from theory and findings of previous research where an evident transmission effect from the macro economy is established.

Another aspect is the external validity, whether or not the results can be generalized (Bryman and Bell, 2011). As for social sciences in general, it becomes a matter of discussion if the results can make any inferences to be drawn in a wider context. As it is practically impossible to control for all factors that interact with stock returns, it also probably becomes unattainable to make an exhaustive analysis and reach conclusions applicable for all possible cases. The aim of this paper is therefore rather to solely create knowledge and understanding regarding economic relationships.

The reliability here concerns if the variables adopted to elucidate relationships are consistent in time, as well as comparable between countries. To enhance reliability, only data is used from sources that are generally accepted by institutions of higher education (Thomson Reuters Datastream) and only complemented with data from official national authorities and institutions (e.g. SNB and FSO), or recognized quality guarantying private companies with associates (e.g. IPD with Wüest & Partner). Furthermore, only commonly used parametric variables are adopted to reflect the domestic economic development in this research, and where necessary, the same variables for the individual countries are retrieved from the same data source to not jeopardize comparability and risk that the compositions of the macroeconomic variables are different. Considering that historical values of macroeconomic parameters always even can be publicly accessed, and as long as the data sources are meticulously selected, it makes this kind of study well suited for replication and for being applied on new cases.
5 Results

This chapter provides the results of the thesis. The statistics are presented for the two countries separately and is then analyzed in the next chapter.

5.1 Sweden

In this first section, the graphs and scatter plots in appendices A1 and A2 are described. After that, also appendix A3 showing the average indexed development of the economic variables and the volatility in the pre-crisis and crisis period is explained.

5.1.1 Time series and regression data

What can be observed in graph A1.1 is that during the 10 year time period, the OMXS Real Estate index and the OMXSPI have had a similar behavior. Both indices had a very positive price development trend after 2003, but responded strongly to the outbreak of the financial crisis with falling share prices. A substantial recovery from 2009 can be observed.

In graph A1.2, the exchange rate (SEK/EUR) seems to be relatively stable until the eruption of the financial crisis when the Swedish Krona decreases in value against the Euro. However, in the crisis period the Swedish currency seems to adjust to a pre-crisis level. For the exchange rate of the Swedish Krona against the US Dollar in graph A1.3, it can be observed that there was a gradual strengthening of the Swedish currency since 2003 until the financial crisis when the exchange rate weakened. In the crisis period, the Swedish Krona has been adjusting to its former strength.

The Swedish unemployment in graph A1.4 shows a significant lag in contrast to the responsiveness of the securitized real estate market to the business cycle. The unemployment increased after 2003 to go down in 2006. Later in 2008, after the financial markets already plumped, the unemployment increased again to a relatively high level.

The inflation in graph A1.5 does seem to show a weak relationship to the securitized real estate market. When the financial market has severely fluctuated during a 10 year period, the price level has been stably increasing.

Graph A1.6 shows a great fluctuation in the Swedish term structure. Since 2004, there was a downward trend where the rate of return of the Swedish 10-year government bond fell relatively to the 3-month T-bill, to make the relationship negative right after the start of the financial
turmoil. The difference between the two yields of the securities then increased again to later diminish again in a later part in the crisis period.

The fluctuations in both the Swedish money supply (M1) and real GDP per capita have been low in graphs A1.7 and A.1.8 respectively in contrast to the real estate stock market. Nevertheless, the money supply has almost doubled since 2003, when the real GDP growth per capita at the same time has been significantly low with a decrease in connection to the financial crisis.

Visualized in plots A2.1 and A2.2 in appendix A2, the marginal effect of OMXSPI has on OMXS Real Estate is illustrated for the pre-crisis and crisis period. Due to a very high $R^2$ of 0.9407 and 0.8383 for both periods respectively, it tells that the development in the OMXS Real Estate index can to a high degree be explained by the OMXSPI. The marginal effects of 1.0295 and 1.4273 further give the percental changes of the OMXS Real Estate when OMXSPI changes by 1 percent. The responsiveness is stronger during the crisis than it was before.

In A2.3 and A2.4 it is shown how the relationship between the OMXS Real Estate and the exchange rate (SEK/EUR) has altered. From a very low $R^2$ of 0.1089 in the period 2003-2007, it increased dramatically to 0.7444 in 2008-2012. The relationship has also gone from being positive to negative with a marginal change of 13.237 to -2.3144. The relationship between the stock index and the exchange rate (SEK/USD) in plots A2.5 and A2.6 has been quite stable, 0.3775 and 0.4194 in $R^2$ in the two subsequent periods. The reaction from the OMXS Real Estate decreased from -5.7927 to -1.3338.

The connection between unemployment and OMXS Real Estate disappeared between the pre-crisis and crisis period as observed in A2.7 and A2.8. The $R^2$ went from 0.4046 to only 0.0056. Also the responsiveness from the OMXS Real Estate of -2.5449 became insignificantly low of 0.0777.

In plots A2.9 and A2.10, the relationship to inflation is illustrated. As can be observed, both the explanatory power of the variable and the reaction by the OMXS Real Estate got weaker. $R^2$ decreased from 0.6329 to 0.5236, and the coefficient from 26.21 to 7.5514.

A behavior where the macro variable becomes less influential in the crisis period of 2008-2012 can also be noticed for the term structure in A2.11 and A2.12. From having an explanatory power of 0.4311 before 2008, it became almost insignificant from that year, 0.0806. The marginal effect on the OMXS Real Estate from a 1 percent change in term structure altered from -0.637 to -0.0015 between the two periods.
In A2.13 and A2.14, the relationship between the Swedish real estate securitized market and the money supply is described. The $R^2$ remains relatively high for the two time periods, 0.8441 and 0.5843 respectively. The coefficient decreases from 3.6537 to 1.8372 as well.

Lastly, in plots A2.15 and A2.16, it is shown that real GDP per capita has a strong connection to OMXS Real Estate in 2003-2007. $R^2$ is 0.851 and the marginal effect 11.325. In the crisis period 2008-2012, the statistics indicate a slightly less relationship. $R^2$ is lowered to 0.6764 and the marginal effect to 5.0178.

### 5.1.2 Average variable change and volatility

In appendix A3 the average achieved index levels for the pre-crisis and crisis period are shown, together with the standard deviation for each period. These represent the index development in 2003-2007 and 2008-2012, and the corresponding volatility, for investors holding the equities during these time periods.

What can be observed is that the OMXS Real Estate had a much better development since 2003 until the end of 2007 than starting from January 2008 until the end of 2012. The median index level reached 177.58 pre-crisis and was only 100.03 during the crisis. The standard deviation also decreased significantly from 50.41 to 20.55, giving a volatility of 0.33 and 0.21. The OMXSPI showed an index drop from 171.58 to 88.81 and a volatility of 0.32 and 0.15 respectively.

The exchange rate (SEK/EUR) showed a fairly constant index level with a barely noticeable change in both periods, 100.58 and 99.04. Nevertheless, the standard deviation increased significantly from 1.46 to 7.66, giving a volatility of 0.01 and 0.08. A different pattern can be observed for the exchange rate (SEK/USD). A median weakening of the Swedish currency against the US dollar before the crisis since 2003 shifted to a median strengthening from 2008 and onward, 84.68 and 105.61. Despite an increase in the second period, also the volatility was enhanced from 0.07 to 0.09.

The Swedish unemployment was on average increasing since 2003 until the end of 2007, and continued to rise after from 2008. The variation in unemployment was however increased as well with from the pre-crisis to the crisis period with volatility of 0.13 and 0.16 respectively.

The price level had a slight but consistent increase with 101.56 and 103.13 throughout the sample period with constant volatility level in the two subsequent periods of 0.02.

What can be further observed is that the Swedish term structure showed a significant difference in behavior in the pre-crisis and crisis periods. From a median increase to 151.06 in the first
period, there was a vast change to 3661.44 in the latter period. The corresponding standard deviation was very high of 61.05 and 4509.04.

The money supply in Sweden did not increase as much in the later period as it did in the first, 116.76 and 114.78. Also the volatility decreased from 0.13 to 0.08.

The Swedish real GDP per capita increased to 106.60 in 2003-2007 to then decrease in 2008-2012 to 98.62. The volatility did decrease as well, from 0.05 to 0.03.

5.2 Switzerland

Like in the previous section, here the results related to Switzerland are described from appendix B1 and B2, illustrating the relationships between the national real estate stock index and macroeconomic variables. Then also the results in appendix B3 of the average factor development and volatility is explained.

5.2.1 Time series and regression data

In graph B1.1 it can be observed that the overall market index SIXSPI had a consistently higher return level in comparison with WUPIX-A in the pre-crisis period. In the crisis period on the other hand, there is a steeper upward trend in WUPIX-A than in SIXSPI.

In graph B1.2 it can be seen that a fairly constant exchange rate (CHF/EUR) start fluctuating in the beginning of the crisis and gets a negative slope shortly after to later become leveled in 2012. Graph B1.3 shows a down sloping trend since 2003 in the exchange rate (CHF/USD) in contrast to B1.2.

Graph B1.4 shows great fluctuation in the unemployment rate with a decreasing trend from the end of 2003. The outbreak of the financial crisis and in the end of 2008 seems to be a turnaround point with rapidly increasing unemployment. This is later drastically abated in 2011 where the unemployment level is stabilized on a 2003-year level.

The price level in Switzerland has been pretty constant throughout the 10 year period as shown in graph B1.5. There have been very small fluctuations and the price level has been increasing.

Graph B1.6 shows the development in the term structure compared to WUPIX-A. A lowering term structure can be observed in the pre-crisis period, and then a fast enhancement in 2008. The Swiss term structure gets then again a downward trend. WUPIX-A reflects an optimistic view of the markets in 2009 thus leading to a high index rate.
Graph B1.7 shows a relatively constant money supply level in the pre-crisis period, followed by a sudden liquidity stimulation through an increase of M1 money in 2008. This becomes an unrelenting trend during the crisis period. The WUPIX-A shows likewise an upward slope in the aftermath of the financial crisis in 2007.

Graph B1.8 shows almost inexistent change in GDP per capita, but a minor adjustment to a lower level after 2008.

In appendix B2, the plots B2.1 and B2.2 give us the marginal effect between WUPIX-A and SIXSPI. The $R^2$ in the pre-crisis period is 0.9583, which means that the changes in SIXSPI can to a very high degree explain the changes in WUPIX-A. This is not the case in the post-crisis period when the $R^2$ is 0.2333, which indicates a weak explanatory level by SIXSPI on WUPIX-A. The coefficients of 0.6711 and 1.2997 show that there is a greater change in WUPIX-A when SIXSPI changes with 1 percent after 2008 than prior to 2008.

Plot B2.3 and B2.4 give an indication of the explanatory level and the marginal effect between the exchange rate (CHF/EUR) in the pre-crisis and crisis periods. In the pre-crisis the $R^2$ was 0.6511 and after the crisis it was 0.7596, which indicates a slightly stronger connection after than before the crisis. The marginal effect on the other hand is 7.1557 pre-crisis and -2.0676 during crisis. Plot B2.5 and B2.6 show the same properties, but for the CHF/USD currency exchange rate. The plots show a greater connection in the crisis period than in the pre-crisis period. The coefficients in subsequent periods are -3.4533 and -2.1794 respectively.

Plot B2.7 and B2.8 show the relationship between the unemployment rate and WUPIX-A. Unemployment had in the pre-crisis period relatively high explanatory power with a $R^2$ of 0.6435, but a significantly lower $R^2$ of 0.0059 in during the crisis. Both coefficients show a negative marginal effect with WUPIX-A.

B2.9 and B2.10 show the relationships between WUPIX-A and inflation. $R^2$ for the pre-crisis period is high with 0.8176, while for the crisis period it is weak, 0.048. The relative change is 16.936 and 7.9674 respectively.

Furthermore, it is seen in B2.11 and B2.12 the difference in $R^2$ for term structure and the real estate index. It changes from a strong 0.8231 to a weak 0.1909. The marginal change does not alter drastically, but stays negative in both periods, -0.8387 and -0.0178.
Finally, plot B2.13 and B2.14 show a high R² in the first period in comparison with the latter period. If the real GDP per capita changes by 1 percent, then the WUPIX-A changes correspondingly with 7.3617 pre-crisis and 9.8023 in the crisis period.

5.2.2 Average variable change and volatility

The WUPIX-A had a median index increase in the first period of 2003-2007 to 137.56 and a slightly smaller in the later period of 2008-2012 to 119.61. The same is true for the standard deviation, descending from 28.55 to 22.47, giving a volatility of 0.21 and 0.19. The SIXSPI moved in different directions in the two subsequent periods, increasing first to 139.68 and then decreasing to 83.03. The volatility was lowered as well. From reaching 0.30 in 2003-2007 it fell to 0.10 in 2008-2012.

The exchange rate of the Swiss Franc reacted diversely to different currencies. Against the Euro the Swiss Franc decreased in value in the pre-crisis period, reaching 106.77. Then in the crisis period it got significantly strengthened, observed as a falling index down to 83.45. The volatility was nevertheless higher in the second period, 0.03 and 0.11 respectively. Against the US dollar the development was almost identical in the two periods, showing a strengthening of 89.54 and 90.89. Here the volatility was also higher in the second period, an ascending standard deviation from 4.50 to 8.52, giving volatilities of 0.05 and 0.09.

Unemployment in Switzerland increased in both periods, given as 115.48 and 124.02. It was the same case for volatility, up from 0.12 to 0.16.

The Swiss value of money and its corresponding volatility were relatively constant, only changing from 102.37 to 101.28 and having constant volatility of 0.01 between the sample periods.

The term structure showed in 2003-2007 a decrease in the median difference of the rate of returns between 10 year government bonds and T-bills, giving an index value of 72.26. In 2008-2012, the gap substantially augmented up to 429.63. There was an equal effect on the standard deviation, up from 45.08 to 214.43.

When it comes to the money supply, the stimulation of market liquidity raised from 117.19 in the first sample period to 157.76 in the second. However, significantly enhanced volatility can also be observed.

Lastly, the real GDP per capita showed a median increase up to the financial crisis in 2007 of 103.85, and then fell back to 98.80 during the crisis. The volatility was still slightly higher, 0.04, in the former period than it was in the latter, 0.01.
5.3 Correlation matrix

In the correlation matrix, it is possible to see the relationship of each single variable to the national real estate stock index, the OMXS Real Estate and WUPIX-A. For Sweden, there is a consistency of the correlation in both time periods among the factors; OMXSPI, inflation, term structure, money supply and real GDP per capita. For Switzerland, the same is true for the factors; SIXSPI, term structure and real GDP per capita.

6 Analysis

This chapter presents an analysis of the results. The chapter is divided in separate sections where every economic factor is discussed by relating it to previous theory and compared for Sweden and Switzerland.

6.1 OMXSPI/SIXSPI

Previous studies follow the assumption that the securitized real estate market is based on the same systematic risk factors as the overall stock market, and therefore a strong relationship should exist (see e.g. McCue and Kling, 1994; Brooks and Tsolakos, 1998). Our results show indeed that there is a strong co-variation between the securitized real estate market and the equivalent stock market of a country. It can be shown that the correlation between the two indices have a strong correlation in the pre-crisis period in both Sweden and Switzerland. The difference is that the OMXS Real Estate slightly outperformed the OMXSPI and in Switzerland the SIXSPI showed a somewhat better price appreciation than the WUPIX-A. This can be understood through the corresponding marginal effects and higher median index levels.

Interestingly, there is a different pattern in the crisis period. The strong correlation in Sweden remains, with the OMXS Real Estate showing a higher average index level in relation to the OMXSPI. Such development can be explained through higher forecasted NOI on property level (Persson, 2011) and higher estimated free cash flow from a portfolio of a company in the real estate sector than what overall investments in other sectors could generate, resulting in a price appreciation of real estate stocks (Koller et al, 2010). In Switzerland on the other hand, the relationship from the pre-crisis period fades with the WUPIX-A outperforming SIXSPI in the crisis period. This could signal about a reevaluation of underlying risk factors driving the real estate market in contrast to the whole Swiss economy. If the real estate market is considered to have substantially lower risk than the overall stock market, but still incorporating the same properties as stocks, then it becomes a very attractive alternative investment. With an expected Beta close to zero (Koller et al, 2010), it becomes a substitute for bonds, with a much higher
upside potential as the demand should theoretically exceed the supply of real estate stocks in the marketplace (Frank and Bernake, 2009). Despite this fact, the positive correlations remain for both countries in the two periods. Hypothesis H1, that a real estate index has a positive relationship to an all share index can be confirmed.

6.2 Exchange rate

For Sweden, the average exchange rate of the Swedish Krona against the Euro was kept rather stable throughout both periods. What is more remarkable is that the development of the exchange rate has low explanatory power of OMXS Real Estate in the first period. However, in the crisis period a negative relationship existed. Moreover, the volatility of the exchange rate (SEK/EUR) was much greater in the crisis period. For the exchange rate (SEK/USD) there were negative relationships in both of the subsequent periods.

Interesting for Switzerland is that the relationship of the exchange rate (CHF/EUR) with the securitized real estate market changes from being strongly positive to being significantly negative. An evident appreciation of the Swiss Franc took place against the Euro in the crisis period with also increased volatility. Against the US dollar, the appreciation has been consistent throughout the whole sample period.

In the case of Sweden, stable public finances and relatively good business climate in contrast to both other European countries and the United States should be important determinants for investors seeking safe allocation of funds. A rapid recovery from the financial crisis with better economic development and higher growth create a perception of a faster increasing interest rate. This in turn increases the exchange rate, and future expectations of a higher exchange rate enhance this effect even further as the return on domestic bonds is higher in relation to foreign bonds (Blanchard, 2009). Despite a negative impact on output, an optimistic sentiment in the market with increasing consumption and an inclination by companies to make immediate investments to stimulate demand should be reflected in appreciating prices of stocks. As discussed in Lind and Persson (2011), real estate has certain traits that are different from other types of assets. One is a fixed location, which makes real estate more exposed to exchange rate fluctuations as companies investing domestically are limited what concerns diversification. A good business climate that can ensure stable cash flows could therefore be of greater importance than changing exchange rates. The higher volatility in the crisis period stems most likely from the depreciation of the Swedish Krona in relation to the financial crisis when investors dropped it for more liquid currencies like the Euro and US dollar (Riksbanken, 2009), which does not change the negative relationship between real estate stocks and the exchange rate.
The WUPIX-A had a positive price development in the pre-crisis period, as well as in the crisis period. However, the relationship towards the exchange rate (CHF/EUR) changed from being positive to negative. The Swiss real estate market should be regarded as attractive, independently on the exchange rate. The volatility was significantly higher in the crisis period due to an appreciation of the Swiss currency. A decision was made to peg the Swiss Franc against the Euro. This measure was taken to prevent a collapse of the Swiss export as the exchange rate has a negative relationship to growth in output (Blanchard, 2009). This has an indirect influence on the investment climate, thus fixing the exchange rate could increase the expectations of future relative income of the companies listed in WUPIX-A. An even greater appreciation of the Swiss currency could have potentially harmed the Swiss real estate market. By pegging the exchange rate to a future predictive level, it creates more certainty for estimating cash flows, which should have a positive effect on the share prices in general.

Given the results that the exchange rate shows some substantial correlation, but inconsistent relationships in the examined periods, H2 can then be rejected.

### 6.3 Unemployment

Unemployment seems to have a relatively high negative correlation with the real estate market in the pre-crisis period, where a positive index development of real estate securities can be related to decreasing unemployment. This works accordingly with Birz and Lott (2010) who showed that news about unemployment affect the stock market. Nevertheless, the results in this study make clear that the correlation between these variables vanish in the crisis period in both Sweden and Switzerland. In Sweden, there is throughout the sample period a significant lag in the unemployment compared to the response of the OMXS Real Estate. Even if there is a strong negative sentiment in the securitized real estate market from 2007, it takes some time to channeling this effect to the labor market. Even if the prices in securitized real estate market recuperate in the crisis period, the skepticism and relatively high unemployment rate remains in the labor market. In Switzerland the pattern is pretty similar with WUPIX-A. A negative relationship exists in the pre-crisis period, to then become almost insignificant in the crisis period. However, the responsiveness of the Swiss labor market to the real estate stock market still seems to be more accurate. Such effect could possibly be best described with more liberal labor politics in the Swiss market in comparison to a more socially secure labor environment in Sweden, which makes the adjustment to market conditions more inert.

As explained through macroeconomic theory in Blanchard (2009), fiscal and monetary actions can be deployed in the short run to stimulate demand. This effect is though realized in the labor
market only in the medium run, resulting in lowered unemployment and higher price levels. On the corporate level, short term staggering demand means lower income, but labor costs remaining high. A revision of the explicit forecast period resulting in lower free cash flows, gives decreased corporate value and falling share prices (Koller et al, 2010). Lowered interest rates and political stimulations as government spending or tax cuts can however make the demand to stabilize through more consumption and a will to invest. For real estate companies, contracts are normally signed for many years, making NOI not to change directly. Considering that real estate need large capital investments upfront and are mostly financed through loans (Lind, 2011), lowered interest rates can decrease financing costs. An economic downturn should therefore not necessarily affect real estate companies negatively in the short-run. In the crisis period when unemployment has stabilized, yet on a high level, companies may find effective ways to operate with a downsized labor force and become reluctant to re-employ when profitability has started increasing again. As this most likely makes the share prices to increase, a discrepancy is created between share price development and unemployment. H3 can therefore be rejected.

6.4 Inflation

In both Sweden and Switzerland it is possible to observe a strong relationship between increasing price levels and asset prices up to the outburst of the financial crisis. As explained by Flannery and Protopapadakis (2002), inflation should have a significant relationship with asset prices. What concerns the securitized real estate market specifically, it is independently shown by both Ling and Naranjo (1997) and Brooks and Tsolakos (1998) that unexpected inflation affects these assets. Ewing and Payne (2003) further show that shocks in the aggregate price level has a negative effect on asset prices, and Bouchouicha and Ftiti (2012) make clear that there is a long-term co-movement between inflation and the real estate market.

Theory suggests that growing output and therefore growing income levels in the society creates demand through enhanced consumption and investment, which in turn positively affects prices on goods and services (Blanchard, 2010). In the pre-crisis period, the prices of stocks substantially exceeded the general price level. A so called Boom-bust process means that rising optimism with new business and investment opportunities after a financial crisis like the Dot-com bubble, and a general public perception of relatively low interest rates, make that real prices on assets like stocks and property increase much faster than the price level on consumption goods (Fregert and Jonung, 2010).

In the crisis period, the relationship between inflation and real estate stocks became significantly weaker and negative in Switzerland. It can then possibly be explained that other factors have a
more major role in determining the stock prices. Also an impact on price levels of consumption goods and services can normally not be observed before in the medium-run, while an improving economic outlook has a more immediate effect on securities because of a highly liquid market. The impact of an appreciating Swiss Franc against other currencies most likely also created uncertainty about future inflation levels. As previous literature confirm, it is rather that uncertainty that drive the relationship between inflation and asset prices than actual inflation. As the correlation became negative in the crisis period in Switzerland, one may think that an unexpected outcome of current price levels affected the relationship in the way the results point out. H4 can therefore be rejected.

6.5 Term structure

The term structure could be regarded as a very significant variable for both Sweden and Switzerland in the pre-crisis period. There was a negative relationship with the real estate stock markets suggesting that a positive market sentiment with increasing security prices is related to the perception that the risk in the long-run decreases. This results in a diminishing gap between the short-term and long-term nominal interest rates. It could be seen as when long term economical prospects become better and the risk is reflected in the interest rates, the return on government bonds converges with the one of T-bills. Borrowers are then more inclined to lend funds and it also becomes more lucrative to finance long-term projects at corporate level, which makes investments to increase and the demand by investors for stocks pushes the prices of real estate securities up. This could have been predicted according to the results by Ling and Naranjo (1997) and Brooks and Tsolakos (1998). The correlation is not as strong in the crisis period, but still consistent. H4 can be confirmed.

6.6 Money supply

The money supply is an important tool in influencing the economical development through monetary policy. By increasing the nominal M1 money supply and decreasing the interest rate, the incentives for saving are removed in favor of consumption and investment (Blanchard, 2010). Both Bredin et al (2007) and Ewing and Payne (2003) show that unanticipated changes in monetary policy affect real estate stocks. Flannery and Protopapadakis (2002) also show that a relationship exist with the stock market in general. Bouchouicha and Ftiti (2012) are the only authors denying synchronization between the real estate markets and money supply.

What can be observed in the results of Sweden is a strikingly strong and positive relationship between this factor and the development of the OMXS Real Estate index in both periods. This
could indicate that measures taken to stimulate the business climate, also affecting the real estate market, creates an optimistic view on profitability of corporations with continuing high income levels and making the stock prices to appreciate.

In Switzerland on the other hand, the M1 money supply level was kept on a relatively constant level in the pre-crisis period, giving a very weak relationship to stock development in WUPIX-A. In the crisis period, the money supply was radically increased as a part of the strategy to peg the Swiss Franc against the Euro. This artificial measure to radically change the market conditions in Switzerland seems to have resulted in a statistically insignificant relationship between these two variables. H6 is rejected.

6.7 Real GDP per capita
As macroeconomic theory implies, output has a direct effect on the prosperity of the economy. In both Sweden and Switzerland the OMXS Real Estate and WUPIX-A have a positive relationship to the development in real GDP per capita in the two subsequent periods. However, previous studies show diverging evidence. Birz and Lott (2010) claim that news about real GDP do influence stock markets. For real estate markets, there is not necessarily a strong relationship (Bouchouicha and Ftiti, 2012). Ewing and Payne (2003) show nonetheless that unanticipated changes actually also do affect the securitized real estate market.

Increased real output should result in higher innovation pace and industrial production. Companies can take advantage of a growing economy and increase revenues without considerably affecting the internal competition balance of the business sector (see Koller et al, 2010; and Porter, 1980). When the private and corporate income levels increase, it can also stimulate domestic demand for residential properties and office space etc. Countries such as Sweden and Switzerland have confronted the financial crisis with good economic conditions and therefore had a solid economic foundation to attract foreign investments. This increases the demand for real estates and the relative value of the real estate securities mutually. H7 can be confirmed.
7 Conclusions

This final chapter of the thesis provides a summarizing discussion about the results and also elaborates on suggestions for future research.

7.1 Major findings

This study follows the theoretical assumption according to Eriksson (2009) that, with some restrictions, a national real estate stock index can work as a good proxy for the valuation of the domestic property market. It can be concluded that the usage of bivariate regression models cannot confirm the theoretical aspects of the securitized real estate market in the macroeconomic environment. Isolating macroeconomic variables and their relationship on the real estate market is not possible to scrutinize the economic conditions that prevail in the financial markets.

This study aims to investigate Sweden and Switzerland to examine whether similar economic circumstances in small economies are a pre-condition for comparable real estate market behavior in a pre-crisis and crisis period. It can be concluded that these markets respond differently to macroeconomic conditions and that theory does not consequently work as intended in practice. Macroeconomic variables that show a consistent relationship with the real estate markets in both Sweden and Switzerland are systematic risk transmitted through an all share index, term structure and real GDP per capita.

7.2 Proposals for future research

It would be highly recommended to carry out more research on the securitized real estate market specifically. As a real estate can equally be regarded as a consumption good likewise as an alternative investment asset, the channels it can affect the social welfare and financial system are several. More sophisticated statistical methods should be implemented to investigate multivariate effects by macroeconomic variables on the securitized real estate market in small economies to form a better understanding of the behavior pattern of these assets when different economic conditions prevail. Even though countries that seemingly have strong similarities and are comparable in terms of economical, political and social aspects, these factors could give a skewed comparison. Factors should be evaluated and tested with statistical methods to precise what makes countries comparable and from there start to evaluate sub-markets, e.g. the real estate market, in every country.
References


Appendix A1
Here the diagrams are provided showing the annual indexed changes between the Swedish OMXS Real Estate and each macroeconomic variable:

Graph A1.1

Graph A1.2
Graph A1.3

Graph A1.4
Graph A1.5

Graph A1.6
Graph A1.7

Graph A1.8
Appendix A2
Here the relationships between every individual macroeconomic factor and the Swedish OMXS Real Estate are presented as the marginal effect from the independent macro variable on the Real estate index in the two separate time periods:

Plot A2.1

Plot A2.2
Exchange rate (SEK/EUR) 2003-2007

\[ y = 13.237x - 1154.5 \]
\[ R^2 = 0.1089 \]

Exchange rate (SEK/EUR) 2008-2012

\[ y = -2.3144x + 331.31 \]
\[ R^2 = 0.7444 \]
Plot A2.7

Plot A2.8
Plot A2.9

Inflation SE 2003-2007

\[ y = 26.21x - 2503.7 \]
\[ R^2 = 0.6329 \]

Plot A2.10

Inflation SE 2008-2012

\[ y = 7.5514x - 672.21 \]
\[ R^2 = 0.5236 \]
Plot A2.11

Plot A2.12
Plot A2.13

Money supply M1 SE 2003-2007

Money supply M1

y = 3,6537x - 250,97
R² = 0,8441

OMXS Real Estate

Plot A2.14

Money Supply M1 SE 2008-2012

Money supply M1

y = 1,8372x - 104,94
R² = 0,5843

OMXS Real Estate
Real GDP / Capita SE 2003-2007

\[ y = 11.325x - 1028 \]
\[ R^2 = 0.851 \]

Real GDP / Capita SE 2008-2012

\[ y = 5.0178x - 394.99 \]
\[ R^2 = 0.6764 \]
Appendix A3
Here are some more descriptive statistics regarding the Swedish macro variables provided to facilitate an analysis in the two examined time periods:

<table>
<thead>
<tr>
<th>OMXS Real Estate</th>
<th>OMXSPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>178,39</td>
</tr>
<tr>
<td>Median</td>
<td>177,59</td>
</tr>
<tr>
<td>StDev</td>
<td>58,41</td>
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<tr>
<td>Volatility (%)</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Exchange Rate (SEK/EUR)</th>
<th>Exchange Rate (SEK/USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
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</tr>
<tr>
<td>Median</td>
<td>100,58</td>
</tr>
<tr>
<td>StDev</td>
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<tr>
<td>Volatility (%)</td>
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<table>
<thead>
<tr>
<th>Unemployment - Sweden</th>
<th>Inflation - Sweden</th>
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</thead>
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<tr>
<td>Mean</td>
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<table>
<thead>
<tr>
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<th>Money Supply - Sweden</th>
</tr>
</thead>
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<tr>
<td>Median</td>
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<tr>
<td>StDev</td>
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<table>
<thead>
<tr>
<th>Real GDP / Capita - Sweden</th>
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<tbody>
<tr>
<td>Mean</td>
</tr>
<tr>
<td>Median</td>
</tr>
<tr>
<td>StDev</td>
</tr>
<tr>
<td>Volatility (%)</td>
</tr>
</tbody>
</table>
Appendix B1
These diagrams show the indexed changes of WUPIX-A and the investigated macroeconomic factors during the period 2003-2012:

Graph B1.1

Graph B1.2
Graph B1.5

Graph B1.6
Appendix B2
These plots describe the correlation between every individual macroeconomic factor and the WUPIX-A and is presented as the marginal effect from the independent macro variable on the Real estate index in two separate time periods, 2003-2007 and 2008-2012.

Plot B2.1

Plot B2.2
Plot B2.3

Exchange rate (CHF/EUR) 2003-2007

\[ y = 7.1557x - 633.41 \]
\[ R^2 = 0.6511 \]

Plot B2.4

Exchange rate (CHF/EUR) 2008-2012

\[ y = -2.0676x + 297.31 \]
\[ R^2 = 0.7596 \]
Exchange rate (CHF/USD) 2003-2007

\[ y = -3.4533x + 447.41 \]

\[ R^2 = 0.2965 \]

Exchange rate (CHF/USD) 2008-2012

\[ y = -2.1794x + 320.01 \]

\[ R^2 = 0.6824 \]
Unemployment CH 2003-2007

$y = -1.6945x + 322.73$

$R^2 = 0.6435$

Unemployment

Unemployment CH 2008-2012

$y = -0.0875x + 133.71$

$R^2 = 0.0059$
Inflation CH 2003-2007

\[ y = 16.936x - 1594.2 \]

\[ R^2 = 0.8176 \]

Inflation CH 2008-2012

\[ y = 7.9674x - 684.51 \]

\[ R^2 = 0.048 \]
Plot B2.11

Plot B2.12
Plot B2.11

Money supply M1 CH 2003-2007

\[ y = -1,4602x + 325,22 \]

\[ R^2 = 0,0295 \]

Plot B2.12

Money supply M1 CH 2008-2012

\[ y = 0,0248x + 84,647 \]

\[ R^2 = 0,0073 \]
Real GDP / Capita CH 2003-2007

\[ y = 7,3617x - 629,31 \]
\[ R^2 = 0,9172 \]

Real GDP / Capita CH 2008-2012

\[ y = 9,8023x - 853,2 \]
\[ R^2 = 0,3975 \]
Appendix B3
These are some more descriptive statistics regarding the Swiss macro variables provided to facilitate an analysis in the two examined time periods:

<table>
<thead>
<tr>
<th>WUPIX-A</th>
<th>SIXSPI</th>
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<tbody>
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<td></td>
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<td>Mean</td>
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<tr>
<td>Median</td>
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<td>STDev</td>
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</table>

<table>
<thead>
<tr>
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<th>Exchange Rate (CHF/USD)</th>
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<td></td>
<td>107,59</td>
</tr>
<tr>
<td>Mean</td>
<td>106,77</td>
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<tr>
<td>Median</td>
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<tr>
<td>STDev</td>
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</table>

<table>
<thead>
<tr>
<th>Unemployment - Switzerland</th>
<th>Inflation - Switzerland</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>109,23</td>
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<tr>
<td>Mean</td>
<td>115,48</td>
</tr>
<tr>
<td>Median</td>
<td>13,53</td>
</tr>
<tr>
<td>STDev</td>
<td>0,12</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Term structure - Switzerland</th>
<th>Money supply - Switzerland</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>80,16</td>
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<tr>
<td>Mean</td>
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<tr>
<td>Median</td>
<td>45,08</td>
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<td>STDev</td>
<td>0,62</td>
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<table>
<thead>
<tr>
<th>Real GDP per capita</th>
<th>2003-2007</th>
<th>2008-2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>104,72</td>
<td>98,37</td>
</tr>
<tr>
<td>Median</td>
<td>103,85</td>
<td>98,80</td>
</tr>
<tr>
<td>STDev</td>
<td>3,73</td>
<td>1,19</td>
</tr>
<tr>
<td>Volatility (%)</td>
<td>0,04</td>
<td>0,01</td>
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</table>
Appendix C
Here a matrix is presented with all the correlations between national macro variables and the domestic real estate stock indices:

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong>Pearson's r</strong></td>
<td></td>
<td></td>
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<tr>
<td><strong>OMXS Real Estate:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMXSPI</td>
<td>0,97</td>
<td>0,92</td>
</tr>
<tr>
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<td>-0,86</td>
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<tr>
<td>Exchange Rate (SEK/USD)</td>
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<td>-0,65</td>
</tr>
<tr>
<td>Unemployment</td>
<td>-0,64</td>
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<tr>
<td>Inflation</td>
<td>0,80</td>
<td>0,72</td>
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<tr>
<td>Term Structure</td>
<td>-0,66</td>
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<tr>
<td>Money Supply</td>
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<td>0,76</td>
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<tr>
<td>Real GDP / Capita</td>
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<td><strong>WUPIX - A</strong></td>
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<td></td>
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<td>SIXSPI</td>
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<td>-0,83</td>
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<tr>
<td>Unemployment</td>
<td>-0,80</td>
<td>-0,08</td>
</tr>
<tr>
<td>Inflation</td>
<td>0,90</td>
<td>-0,08</td>
</tr>
<tr>
<td>Term Structure</td>
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</tr>
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<td>Money Supply</td>
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<td>0,09</td>
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<td>Real GDP / Capita</td>
<td>0,96</td>
<td>0,63</td>
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</table>