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The Power of the Exchange Rate:

A Study of the Role of Exchange Rates in Economic Growth and
Crisis Recovery in Denmark, Sweden and Finland 1985-2013

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Abstract: Financial crises are recurring phenomena and studying how economic parameters affect outcome and recovery processes will most likely remain an area of intense research also in the years to come. The scope of this paper circulates around the causes and effects of two crises in the period 1985-2013 and their separate effects on the economies of Denmark, Sweden and Finland. Moreover, the main variable in focus is the exchange rate. Implications of different choices of exchange rate regime will be explored in detail. The research combines a theoretical study with simple econometrics in order to try to find support for some sort of causation or correlation between the choice of exchange rate regime and economic growth.

Key words: Economic growth, exchange rate, financial crisis, Nordics, VAR analysis, monetary policy

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1. INTRODUCTION

As financial crises are a recurring phenomenon, studying how the choice of exchange rate regime can influence economic behaviour is a field of research deemed to be useful and important. Although there has been much research conducted on what role the exchange rate plays in monetary policy and its consequences for economic growth and stability, the causal link between the factors is hard, even impossible, to prove. This thesis will look into what conclusions have been drawn from a variety of literature and research, and relate it to the cases of Denmark, Sweden and Finland to see if available data seem to support the findings.

Denmark, Sweden and Finland are geographically close, have shown similar patterns of deregulations of financial markets in the 1980s, and they all adopted fixed exchange rates in the post-war era. There are important differences as well. For example, the decision to join the EC/EU occurred at quite different points in time with Denmark being almost two decades ahead of Sweden and Finland. In the late 1980s and early 1990s there were different structural policies being implemented, which according to several studies seem to have had an effect on the economic development in the 1990s and 2000s. Denmark was experiencing high unemployment already in the 1980s and implemented new policies during what has become known as the *Kartoffelkur*, which might explain why the country was able to better handle the financial and currency crises spreading out in the Nordic countries in the early 1990s. Whether this also helped Denmark to sustain a pegged currency has been up for debate. This thesis will reflect on the similarities and differences in monetary policy and economic development between Denmark, Sweden and Finland, the two latter whom can be argued to have conducted and experienced quite similar patterns during the first half of the chosen time frame. At least up until Finland decided to join the EMU, another topic that is still heavily debated and also to some extent will be discussed in this thesis.

1.2 PURPOSE AND RESEARCH QUESTION

The purpose is to study the evolution of exchange rate regimes in Denmark, Sweden, and Finland and their role in different financial crises during the late 1980s up to the late 2000s, as well as what effect the exchange rate has on economic growth and recovery from financial crises. The research question can be specified as follows:

What impact did the choice of exchange rate regime have on economic development and

crisis recovery in Denmark, Sweden and Finland during the years 1985-2013?

In order to reach a stronger conclusion, a few further sub-questions are stated to assist with the research process:

- *Why did Denmark not experience as severe of a crisis as Sweden and Finland in the early 1990s?*
- *What role did the flexible exchange rate play in Sweden's recovery from the 2008-2009 financial crisis, and can the exchange rate be argued to be a reason as to why the country handled the crisis better than Finland and Denmark?*

1.3 AIM OF THE THESIS

The aim of this thesis is to shed some light on what implications the choice of exchange rate regime had for the use of monetary and fiscal policy in Sweden, Finland and Denmark, and whether or not it had any effect on the outcome of economic development and stability in the aftermath of the two financial crises. While several studies have been conducted on the way Finland and Sweden dealt with the turbulence in the early 1990s up to the recent financial crisis, not as many includes Denmark to a great extent, which most likely has to do with the fact that Denmark did things differently. This, along with the notion that it is hard to econometrically entangle all the possible effects the exchange rate may have on economic factors, makes testing for statistical significance among these three countries and their choices of exchange rate regime hard. Because of that this thesis will primarily examine what empirical evidence has been found so far in the literature, and relate it to the chosen framework as well as to descriptive statistics of data available on the development of significant economic indicators for Denmark, Sweden and Finland. However, in order to support the discussion on what helped Sweden's recovery from the 2008-2009 a simple regression and a VAR analysis will be used to analyse the relationship between the exchange rate and economic growth.

1.4 DISPOSITION

Following the initial chapter stating the research question and presenting the subject and aim of the thesis, chapter two introduces the theoretical framework. This includes explanations of different exchange rate regimes, basic monetary and fiscal policy, as well as the macroeconomic trilemma and the possible connection between capital flows and financial

crises. The third chapter will offer an insight into the results drawn by previous studies on the role of the exchange rate and effects and causes of the crises in the 1990s and the 2000s. The fourth chapter will introduce the methodology of the study conducted in this thesis as well as present the data and models. Chapter five deals with an overview of the macroeconomic policies, including exchange rate policies, and economic development in Denmark, Sweden and Finland from the 1980s up to the early 2010s. Chapter six presents and analyses descriptive statistics using calculations and graphs as well as the results from the econometric models. The results will also be compared to those of previous studies within the field. The seventh chapter is where the discussion and analysis will take part. The discussion is based on the sub-questions to the research question presented in this chapter. This means that the role of the exchange rate will first be analysed in relation to the crisis of the 1990s, and thereafter in the light of the crisis of 2008-2009. The last chapter will offer a summarising conclusion.

2. THEORETICAL FRAMEWORK

Chapter two reviews the theoretical framework that later is applied onto the case studies of Denmark, Sweden and Finland.

2.1 EXCHANGE RATE REGIMES

The real exchange rate is a relative price, comparing prices on baskets of goods in different countries. It further shows the international competitiveness of a country. In the short term there seems to exist a relationship between changes in the nominal exchange rate and changes in the real rate, due to the fact that prices are sticky. In the long term, however, the situation is not the same. This is because over time prices are able to adapt and adjust to surrounding conditions. As a result, countries' real and nominal rates may show different developments over time (Nessén & Degrér, 2003). With a fixed exchange rate the government possesses the option of intervening on the money market. For example, if currency appreciation is affecting a country's exports in a negative way, it could be suitable for the central bank to interfere and try to stimulate economic behaviour in the right direction. The opposite case, a depreciation of the currency, could cause imports to become more expensive. This would put pressure on the central bank's inflation target, also justifying an intervention (Pilbeam, 2013).

Exchange rate fluctuations constitute a risk as financial transactions, investments, and so on, can be noted in different currencies depending on the residence of the agents involved. Adopting a fixed exchange rate limits this form of risk. Another argument for choosing a fixed exchange rate is that cooperation and coordination between countries are usually deeper than under floating exchange rates, which can be useful when dealing with problems arising on an international level (Pilbeam, 2013).

With a floating exchange rate the value of the domestic currency is allowed to fluctuate. Changes in the demand and supply of money cause alterations in the currency value. Under such a regime the central bank does not interfere by buying or selling domestic currency on the foreign exchange market. A floating exchange rate can help to automatically adjust to equilibrium between supply and demand, leading to equilibrium in the balance of payments. Furthermore, the possibility of independent monetary policy will exist (Pilbeam, 2013). Milton Friedman stated in 1953 that it is more suitable to let exchange rates adjust to the effects of shocks on their own rather than to use a fixed exchange rate and try to force the economic variables to adjust (Pilbeam, 2013).

2.2 MONETARY AND FISCAL POLICY

The monetary policy tools used by the central government have effects on many different parts of the economy, and in several different ways. Interest rates, exchange rates and credit granting are three examples of common ways in which policies are targeted and carried out. Financial conditions and interest rates tend to react relatively quickly to policy rates. Inflation as well as the demand and production sides of the economy take a bit longer to adapt to new conditions (Elmér et al., 2012).

The balance of payments consists of the current account, the capital and financial account, and the official settlements balance. These accounts can be good indicators for policy-makers in open economies and the size and sign (positive or negative) of the figures can affect decisions on economic policies such as the exchange rate regime. For example, if the government wants to pursue an expansionary monetary policy, it would buy bonds from the public. This would result in a price increase of bonds as well as an expansion of the monetary supply, which cause domestic interest rates to drop. In turn, the drop will fuel new investments, which means an increased production and hence higher output. The whole

procedure has a negative effect on the current account, at the same time as the lower interest rates cause higher capital outflows, which will lead to a deficit in the balance of payments. With fiscal policy, on the other hand, the money from selling bonds is used to fund enlarged government spending. This means that the size of the money supply is not altered (Pilbeam, 2013). Fiscal policy includes actions connected to tax regulation. For example, a tax reduction would lead to an increase of disposable income, thus expanding private consumption. Tax increases, on the other hand, would have the opposite effect (Johansen & Trier, 2014). Fiscal policy further contains what is referred to as automatic stabilizers. These are counter-cyclical adjustment mechanisms of expenditures and public revenues present in the swings of the business cycle (Flam et al., 2009).

2.3 THE MACROECONOMIC POLICY TRILEMMA

Robert Mundell, the 1999 Nobel Prize winner and ‘father of the Euro’, is a big name in the debate of exchange rate regimes. He is a big promoter of currency unions and is also well known for his part in the theory of the macroeconomic trilemma (Suherland et al., 2012). The Mundell-Fleming trilemma or open economy trilemma describes a relationship between free capital flows, independent monetary policy, and fixed exchange rates by saying that all three are not possible to conduct simultaneously (Findlay & O’Rourke, 2007). This framework implies that opening up markets to international financial flows to some extent demands a certain set of policy choices from the country.

Giving up the possibility to conduct independent monetary policy and the automatic stabilisation of the value of the exchange rate might be argued to halt the recovery process after economic crises. If this is true, it seems like a flexible exchange rate would be the optimal choice, at least for small, open economies such as the ones that are studied here. Whether this can really be the case is a problem dealt with later on in the thesis.

2.4 CAPITAL FLOWS AND FINANCIAL CRISES

Barry Eichengreen argues for the existence of a connection between capital flows and crises. According to his research there has been an increase in the frequency of crises lately. This especially refers to currency crises. The increase in the number of crises has in turn promoted the frequency of twin crises. A twin crisis refers to a phenomenon where a currency crisis and a banking/financial crisis occur simultaneously. The increase of twin crises has had

devastating effects on the output of many economies. Unfortunately, cross-country studies have not been able to produce much evidence for the nature of the connection between capital flows and crises, which partly has to do with the difficulty to measure a country's openness to capital flows (Eichengreen, 2003).

There are different arguments for what effects capital flows have. Firstly, it has been suggested that free flows reduce restrictions on resource mobilisation, enhance institutional change and transmit technological and organisational knowledge. Consequently, this view supports the theory that capital flows promote economic growth. Policies that urge capital to be transmitted from rich countries to those where capital is scarce would thus be the most justifiable policies. Secondly, some argue that the flow of capital is a source of instability due to that information asymmetries between international agents tend to be larger than within a society. Generally, it seems to exist a negative relationship between income per capita and the existence of capital controls, and a much-believed consequence is that as capital mobility expands, it becomes more problematic to effectively manage a currency peg (Eichengreen, 2003).

Lending booms, which seem to be a common phenomenon initiating banking crises, tend to be more likely to occur in certain environments. According to Eichengreen (2003), lending booms usually appear during the upswing of the global business cycle and in periods of expanding world trade. As will be evident later on, this seems to be true for the crises spreading out in the Nordic countries during the early 1990s.

3. LITERATURE REVIEW

Studies on the exchange rate and crisis recovery, both generally as well as on the Nordic countries, is presented and reviewed in this chapter.

3.1 FINANCIAL CRISES IN THE NORDICS

In a study conducted by Lars Jonung in 2010 on the Nordic financial crisis in the early 1990s, one main point made was that the reasons behind the escalation of the financial crisis (or twin crisis) in the early 1990s can be seen as a result of liberalizing financial markets in an

environment where a pegged but adjustable currency was at the centre of the monetary system. The liberalisation led to a long and excessive lending boom, rising asset prices, followed by an increase in investment and consumption behaviour. After the turn sometime around 1990, varying a bit among the countries, employment fell, GDP growth turned negative, and unemployment rose drastically. Sweden and Finland had no choice but to abandon their pegged currencies in order to avert the depression that was spreading. Jonung finds that the reason for the governments not being able to soften the boom was largely due to the pegged exchange rates that made it impossible for the countries' to conduct completely independent monetary policies. Interest rate increases could not be used to affect consumption behaviour to the extent that was necessary, even though the rise in the real rate had some effects on asset prices in the form of asset price deflation. The records seem to show that even though the national budgets showed large surpluses from increasing taxes as a result of larger consumption, higher wages and similar developments, the fiscal policies still were not tight enough to dampen the accelerating boom. Furthermore, Jonung finds that speculative attacks hit both the Swedish krona and the Finnish mark, following hand in hand with the European currency crisis breaking out in 1992, the same month as the Finnish currency started floating. The Swedish one went the same direction two months later (Jonung, 2010).

According to Jonung (2010) the number one reason leading to the Nordic countries' recovery from the crisis environment of the early 1990s was an accelerating growth in exports. The policies adopted after the 1990s crisis in Finland and Sweden were initially designed to reduce budget deficits. Later, the focus was changed and the target became to lower the public debt. These fiscal policies showed to be effective. In the following five years Finland and Sweden managed to turn their budget deficit into surpluses (Jonung, 2010).

One of the conclusions Jonung draws from the financial crisis of the early 1990s is that official forecasts at the time were not able to correctly predict and identify the boom-bust cycle. Economists generally were in favour of free capital flows but did not fully understand what imbalances and other effects that could follow, as well as what measures needed to be in place to handle these. Jonung suggests that when initiating a move towards liberalized capital markets, the real interest rate should be somewhat close to the international equilibrium level. A cautious approach might result in a smoother transition (Jonung, 2010). But whether this would be possible in practise is questionable. Most likely the policy makers did what they

deemed to be the most suitable approach from the information available. It is always easier to find the ‘correct’ solution to problems in hindsight than it is at the time of its appearance.

Although Jonung’s research from 2010 is mostly targeted towards Sweden, Finland and Norway who all showed a somewhat similar pattern in the wake and recovery of the financial crisis – even though Norway due to its heavy reliance on natural resources is deemed to be a special case – he does assign a few sentences to Denmark. He discusses why this country managed to take advantage of the positive effects of liberalisation without ending up deep into the crisis and having to abandon its pegged currency. A well-capitalised banking system along with monetary and financial policies targeted towards macroeconomic and financial stability are the key components, even though Jonung in this study does not further elaborate on what exact policies made Denmark successful and whether or not these policies would have been applicable in the cases of Sweden, Finland and Norway.

Jaakko Kiander and Pentti Vartia conducted a study exploring the similar developments in Sweden and Finland during the 1990s. They much like Jonung conclude that the reason behind the crisis and recession of the early 1990s was largely the result of deregulations of financial markets (Kiander & Vartia, 2011). The liberalisation of markets started earlier in Denmark, and this head start could be an explanation as of why Denmark managed the transition without ending up in a large financial crisis. Consumption and investments were further brought down by solvency problems. This caused output and employment to fall both in Finland and Sweden between 1991 and 1993. The focus on exchange rate targeting removed depreciation alternatives that could have been helpful in these times, and led to central banks having to maintain high interest rates (Kiander & Vartia, 2011).

According to Kiander and Vartia, the biggest contribution to the recovery from the crisis in the early 1990s was the relaxation of monetary policy along with currency depreciation following the EMS crisis of 1992. The adopted lower interest rates stimulated an environment with more stable asset prices, putting an end to deflationary pressures. In 1994 private consumption and investment were once more showing positive growth patterns. Kiander and Vartia agree with Jonung that forecast errors of the crisis were big, actually bigger than what the average forecast errors had been in the post-war period for these countries. They conclude that it is difficult to open up markets to free financial flows when

conducting a fixed exchange rate (Kiander & Vartia, 2011). However, Denmark is one of the countries that did manage this transition without having to change the exchange rate regime. Unfortunately, Denmark is not part of Kiander and Vartia's analysis, so this thesis will have to pick up where they left off in order to compare Sweden and Finland with the case of Denmark, and see whether or not a flexible exchange rate seems to be better for dealing with the negative effects of financial crises.

3.2 THE ROLE OF THE EXCHANGE RATE

Suni and Vihriälä (ETLA Report from 2013) explores what would have happened if Sweden had joined the EMU at its beginning in 1999. This is done through a counterfactual analysis. They find inflationary performance to be quite similar between Finland and Sweden, even though these countries have pursued different choices of exchange rate regimes. Furthermore, they find that since the start of the recent global crisis Sweden has fared better than Finland and its GDP growth has been higher. In their simulation of the outcome of a Swedish EMU membership in the counterfactual analysis, Suni and Vihriälä set the Swedish central bank rate equal to the level of the ECB steering rate. The exchange rate of 1999 was used to fix the euro exchange rate. Their results suggest that the rate of inflation would have been almost the same if Sweden had been part of the monetary union as it was with independent monetary policy. Their analysis on GDP data for Sweden and Finland suggests that the choice of monetary regime of these two countries have not affected economic growth to any large extent. The growth rates up until 2009 are very similar (Suni & Vihriälä, 2013). However, considering that these findings are based on only a decade of data, it is hard to draw any major conclusions. If Finland and Sweden were to experience another crisis in the future and they both stay with their separate exchange rate regimes, we cannot be sure results would have been the same. It can be assumed, though, that the longer time period the two countries stay with their chosen exchange rates, the more data can be collected and, hopefully, more accurate and trustworthy conclusions can be drawn.

In a report published by GnS economics in 2012, the role of the exchange rate and the EMU membership of Finland were analysed. By conducting an analysis where the data of a different reality where Finland had not decided to join the EMU in 1999 is simulated, the costs and benefits of Finland's membership in the monetary union are estimated and discussed. The timeframe used ranges from 1999 to 2011. The drawbacks of this type of

counterfactual analyses, similar to the one conducted by Suni and Vihriälä, is that it relies on many assumptions. One of these assumptions is that it assumes that everything in the world economy would happen in the same way in the imaginary scenario as it did in reality. Furthermore, in the GnS economics study it is assumed that even if Finland would not have joined the EMU the country would still make all the structural arrangements necessary for fulfilling the criteria for an EMU membership. This assumption can be questioned. If Finland had not wanted to join the monetary union, then why would it use resources to adapt to the union's regulatory framework and convergence criteria?

The simulation in the study is based on the exchange rate between the Swedish krona and the Finnish mark. Both the interest rate differential (based on ten-year government bonds) and the partially simulated history of the exchange rate are used to simulate the exchange rate between the mark and the krona. Furthermore, the exports of Finland in the imaginary scenario where Finland is not part of the EMU are simulated. The model is created with a dependence mainly on GDP growth rates of the euro zone and the United States. According to the simulations and statistical estimation results a depreciation of the exchange rate between the mark/euro rate and rising economic activity on the world markets lead to increases in the Finnish exports. Appreciation and decreasing economic activity naturally would have the opposite effect (GnS economics, 2012).

The results from this study suggest that if Finland had remained outside the euro zone, the export during the IT bubble would have been about six per cent less. However, its exports would have shown a more stable development in the early 2000s as well as during the 2008-2009 financial crisis. In other words, the recovery from the financial crisis would likely have been smoother if Finland had not been an EMU member. This is partly due to the fact that in that scenario Finland could have used its independent monetary policy to cause the currency to depreciate, leading to an increase in exports. The study further finds that production over time has decreased in Finland. At the time of the study, it was found that production costs in Finland were about twenty per cent higher than in Sweden. The results from the simulation model indicate that sticking to the Mark would not have completely prevented the export and productivity decrease. In conclusion, the study finds both pros and cons with the euro membership. It helped Finland gain more benefits during the IT boom 2000-2001, but had negative effects on the outcome of the Finnish economy in the 2008-2009 financial crisis (GnS economics, 2012).

Ghosh et al. (1996) find a strong link between the choice of exchange rate regime and economic growth. Their research is conducted from an overall perspective and not limited to a certain few countries or targeted specifically towards the Scandinavian region. Their results suggest that a pegged exchange rate might lead to a lower rate of inflation, and a flexible exchange rate may allow for faster growth and development. Furthermore, they find that higher shares of investment seem to be present under pegged exchange rates, while faster productivity growth tends to occur under flexible rates. In their sample, the net per capita GDP growth showed to be somewhat higher under a floating exchange rate regime. While it is hard to entangle the effects of the exchange rate on variables such as growth and inflation, since the exchange rate has several both direct and indirect effects, Ghosh et al. do try to make their study quite comprehensive. They use data for all IMF countries from 1960 to 1990, and differ from earlier studies by including different levels of pegged and flexible exchange rates as well as the difference between the exchange rate declared by the central government and the one actually shown in practice. The link between fixed exchange rates and low inflation comes from both a discipline effect and a confidence effect. The first one refers to the political costs associated with leaving a pegged currency, and the latter to the amount of trust in the government. The study supports evidence in both directions of the causality of this link.

The research of Ghosh et al. (1996) concludes that the exchange rate does matter, and that the strongest connection can be found between the exchange rate and inflation. The test results showed lower inflation and smaller variance for fixed exchange rate regimes compared to floating rates. It cannot be fully proved that the one thing affect the other, but Ghosh et al. argue that there seems to be evidence supporting at least some form of causal effect (Ghosh et al., 1996). This study was chosen because it is considered to be a large study that incorporates several countries and hence could be a good compliment to the previous four which focused exclusively on a few Nordic countries. However, since this research was carried out before the recent global crisis it can be assumed that some of the results might not be the same if the study were to be repeated with more recent time series data gathered from the 2000s.

Lastly, in 2011 Horst Feldman published a paper exploring the effects of exchange rate volatility on unemployment. It is based on annual data on 17 countries from 1982 to 2003, including Sweden, Finland and Denmark. His results suggest that higher volatility in the real effective exchange rate leads to higher unemployment rate. In the model it has been controlled for other variables that affect unemployment, including labour market institutions, business cycle fluctuations, product market regulations, and share of trade in GDP. The results show support for an argument that exchange rate volatility in a certain year has an effect on unemployment in the coming year (Feldman, 2011).

4. METHODOLOGY AND DATA

Chapter four introduces and justifies the methodology used in the research conducted for this thesis as well as present the data and econometric models.

4.1 METHODOLOGY

The main approach of this thesis is literature-based and descriptive, with research on what policies were implemented and what differences and similarities can be seen between countries, as well as whether or not the choice of exchange rate regime can be a possible explanation of what has been observed. This will be done by analysing data on GDP, investments, inflation, unemployment, exports, and current account balances. Furthermore, there will be a minor econometric part in order to research if there seems to be reason to believe that there is any relation between the exchange rate and some macroeconomic indicators for economic growth.

4.1.1 LIMITATIONS

In order to get a good understanding of each and every country's economic development and policy decisions, the study has been limited to involve only three countries. These are Denmark, Sweden and Finland. While it would have been interesting to search for heavy support for a correlation between exchange rates and economic development, the extent of such a model lies beyond the scope of this research. This is due to the fact that it is too hard to disentangle the specific effects of the exchange rate, since the state of an economy is affected also by many other factors. There will, however, be a simple regression model as

well as a VAR analysis based on data for Sweden 1995-2010 in order to see if there seems to be any support for a correlation in the given data. This is though mostly used as a supplement to the major literature and descriptive-based analysis to determine whether or not the conclusions drawn from this analysis possibly could be thought to have any statistical significance. Furthermore, on some of the descriptive statistics the graphs do not show the entire period of 1985-2013 due to limitations in data availability.

4.1.2 DESCRIPTIVE STATISTICS

To support and further evaluate on and discuss the information gathered from different literature, secondary data has been gathered from existing databases and used for comparative and descriptive analysis. Data has been plotted in graphs in order for it to be compared both between countries and over time. Furthermore, the standard deviations and correlation coefficients for some data series have been calculated.

$$\sigma = \sqrt{E[(X - E(X))^2]} \quad (1)$$

Source: Westerlund, 2005

Equation 1 depicts the general formula for the standard deviation. σ is the sign for the standard deviation, $E[(X - E(X))^2]$ represents the mean squared value of the observed value of each observation minus the calculated mean value of the observations.

$$\text{corr}(X, Y) = \frac{\text{cov}(X, Y)}{\sigma_X \sigma_Y} = \frac{E[(X - E(X))(Y - E(Y))]}{\sigma_X \sigma_Y} \quad (2)$$

Source: Westerlund, 2005

The correlation coefficient describes the relationship between two variables, X and Y, in a closed interval. A perfect negative correlation would have a coefficient of -1, and (+)1 would represent a perfect positive correlation. 0 would mean no correlation at all. The correlation could further be expressed as the covariance between X and Y divided by the standard deviation of X multiplied by the standard deviation of Y (Westerlund, 2005).

4.1.3 ORDINARY LEAST SQUARES REGRESSION

As a complement to the discussion based on descriptive statistics and available literature, an econometric model will be estimated to shed some light on whether the causal effect of changes in the exchange rate seems to be visible in the data, and whether or not the topic of this thesis seems to be backed by some statistical significance. Low unemployment is a sign of economic wellbeing, and reducing unemployment after a crisis is often a much desired

step in the recovery process. In order to see if the exchange rate possibly can be used to affect the unemployment rate a regression with unemployment as the dependant variable will be run. The regression was inspired by some previous studies conducted on exchange rates (Feldman, 2011; Edlund & Karlsson, 1993) and can be specified as follows:

$$UN_t = \beta_0 + \beta_1 ER_{t-4} + \beta_2 GDP_{t-4} + \beta_3 CPI_{t-4} + e_t \quad (3)$$

UN_t is the logged first difference of unemployment at time t , β_0 is the intercept, β_{1-3} are coefficients, ER is the logged first difference in the SEK/USD exchange rate, and CPI is the logged first difference in the consumer price index used as a proxy for inflationary development. e_t is the error term at time t . $t-4$ represent time t minus four quarters, i.e. one year prior to t .

4.1.4 VECTOR AUTOREGRESSIVE MODEL (VAR)

In order to further elaborate on what the data set says about the different variables a vector autoregressive model will be constructed based on the same variables as the OLS regression. In an article by Edlund and Karlsson (1993) a VAR model was used to forecast and analyse different variables' effect on the Swedish unemployment rate. This article inspired the choice of model used in this thesis. The VAR model describes the development of selected variables over the sample period (1995-2010) as linear functions of historical values. Every variable has its own equation that depicts a linear relationship between the dependent variable and its own lagged values as well as lagged values of the explanatory variables. It treats all variables symmetrically and as endogenous, hence not making any assumptions regarding an exogenous nature of the explanatory variables (Enders, 2010). In the process of estimating the VAR model results that will be presented later on, STATA was ordered to choose the most appropriate number of lags. The maximum number of lags was set to eight, and the result became a model with equations using four lags for each variable. This is consistent with the number of lags used for the OLS regression as well as with what Feldman (2011) used in his. The choice of incorporating lags into the equations lies upon assumptions that the unemployment ratio is not immediately affected by changes in the explanatory variables. Using a lag of one year allows the model to detect connections in changes up to a year prior to time t . Furthermore, Feldman (2011) motivates his choice of a one-year lag with the

argument that it removes some of the concerns regarding a possible simultaneity bias as well as accepts the possibility of sluggish adjustment.

The equations of the VAR model developed for this paper are specified in Appendix 1. Just like in the OLS regression the variables are unemployment, exchange rate, GDP and CPI. In the VAR analysis, however, four different regressions are fitted into the model. One with unemployment as the dependant variable, one with exchange rate as the dependant variable, one with the exchange rate, and one with CPI. Also, not only the values at t-4 (one year prior to the point in time denoted t), but t-1, t-2, t-3, and t-4 are all included for every variable in each equation, making the VAR model more comprehensive than the OLS regression.

As briefly mentioned, the VAR model does not demand variables to be exogenous. Since the model used in this paper only incorporates four variables assuming that each of them is completely endogenous to the model and only affected by one another is not realistic. Neither is an assumption of all variables being exogenous. Several other forces outside of this model most likely also affect the unemployment ratio, both externally and internally. In the economic sciences models where the explanatory variables to some extent are also affected by dependent variable(s) are common and a way to deal with this issue without making unrealistic assumptions about the exogenous or endogenous nature of variables is to use an autoregressive model such as VAR (Asteriou & Hall, 2011). The assumed simultaneity among variables supports an approach where all variables are to be treated equally, as endogenous, independent of whether they are actually endogenous or exogenous (Enders, 2010). The VAR model can give an idea of in which way there could be a possible causality or, more correctly, Granger causality.

4.2 DATA

4.2.1 DATA FOR DESCRIPTIVE STATISTICS

The data on exchange rates comes from the World Bank. This data is yearly averages, and is shown as the number of local currency units per US dollar. It comprises data from 1985 to 2013 for the Swedish (SEK), Danish (DKK) and Finnish (FIN, EUR) currencies. Data on exports have also been gathered from the World Bank statistical database, and shows exports as a percentage of total GDP from 1985 to 2013. The data on public debt as a percentage of

GDP comes from the same database, and is available from 1995 to 2012 on a yearly basis. Data on gross national savings (with 2013 as the base year), inflation, unemployment and the current account balances 1985-2013 come from the IMF economic outlook database. They are all yearly data. GDP per capita data come from the World Bank, PPP adjusted and with 2011 as the base year. Constant prices denoted in international dollars are used. The reason for several different databases being used is due to the limitations of data available for the chosen time period in the individual databases.

4.2.2 DATA FOR REGRESSION AND VAR ANALYSIS

For the econometric models data on unemployment, the SEK/USD exchange rate, GDP, and CPI from 1995 to 2010 are used. The time frame is both due to limitations of available data as well as the fact that it was of interest to only use data of a period when the exchange rate was allowed to float (another possibility could have been to include a dummy variable taking on a different value for fixed and flexible rate) as well as to include the turbulent years of the recent financial crisis. The seasonally adjusted quarterly unemployment data was collected from the Eurostat database, the quarterly data on the SEK/USD exchange rate from the Swedish central bank (Riksbanken), and the seasonally adjusted quarterly data on GDP from Statistics Sweden. The GDP data is in constant prices, with 2013 as the reference year. The data on consumer price index, CPI, was also collected from Statistics Sweden. The data was available on a monthly basis but recalculated to a quarterly average.

5. COUNTRY-SPECIFIC OVERVIEWS

Chapter five goes through the economic characteristics of the three Nordic countries in focus, especially concerning what policies, market liberalizations and structural changes that were implemented in the 1980s and first half of the 1990s.

5.1 DENMARK

- * 1973: joined EC
- * 1982: monetary policy with exchange rate stability as the main goal
- * 1987: Danish currency pegged to the D-Mark
- * 1986: policies and structural change was implemented in what has been known as the *kartoffelkur*

Sources: Ingebritsen, 1988; Møller Christensen & Topp, 1997; Johansen & Trier, 2014.

Similar to several other countries, export of raw materials was the number one sector contributing to production, output and development in Denmark (Ingebritsen, 1998). But after joining the EC as the first Nordic country in 1973, transformation could be seen in the Danish economy. Structural changes were made in 1982, involving the commitment to keep a fixed exchange rate along with tightening of fiscal policy and a law against wage indexation. Even though there was instability in the Danish economy, the government decided to stick with the exchange rate goals and did not follow Sweden's path towards large devaluations (Møller Christensen & Topp, 1997).

In the early 1990s, there was a move from agriculture to manufactured goods as the most crucial contributor to national income (Ingebritsen, 1998). The average increase in consumer prices was about 6.9 per cent in 1980-1989. This number fell to below three per cent in the 1990s. This, as well as the decline in growth rate of wages can be explained by Denmark's political shift, deciding to focus on maintaining a stable currency rate over the other EU countries. Along with this, the government resigned from using repeated devaluations to deal with economic problems (Johansen & Trier, 2014). Furthermore, the increase in prices of oil and raw materials in 2008 resulted in rising consumer prices. This trend was reversed during the crisis (Johansen & Trier, 2014).

Consumption increased at an impressive rate in the second half of the 1980s, and in 1986 it reached past seven per cent. Hand in hand with this, the balance of payments was showing a large and increasing deficit. The government acted by enforcing what has been known as the Kartoffelkur in October 1986 as an attempt to curve the consumption bubble. One important part of this policy was the adoption of mixed loans that put tighter regulations on the real estate market. This, along with tax reforms limiting the interest deduction, contributed to both a fall in house prices as a result of less demand as well as a decrease in the overall consumption. It was not until 1990 that a positive trend could once more be seen in the consumption patterns. In 1993, mixed loans that had been introduced during the Kartoffelkur was once again removed and annuity loans reintroduced. At the same time as the credit rules came into action there was a large reduction in the interest rate, which eventually led to rising real estate prices and increased private consumption. In the recession connected to the 2008 crisis private consumption fell (Johansen & Trier, 2014).

Between 1985 and 1994, 47 out of a total of somewhere around 225 banks and savings banks were forced to close in Denmark. This was more than the combined number in the preceding forty years. However, it did not impact the Danish economy as badly as one might think. The assets of the worst-off banks constituted a mere two per cent of the combined assets of all Danish banks and savings banks. This can be compared to the banking crisis in the late 2000s, when more than half of the Danish banks were forced to make reconstructions and recapitalisations and several went bankrupt. In the 2007-2009 banking crisis in Denmark, the negative effects were larger compared to the crisis in the 1990s, and many needed to be bailed out by the government. This is much connected to the fact that by now the inter-bank lending with foreign banks had increased significantly, meaning that the Danish economy became more vulnerable to events happening on the global markets (Anderson, 2011).

Denmark adopted a monetary policy with exchange rate stability as a key aspect in 1982, and in 1987 the Danish currency was pegged to the D-mark (Johansen & Trier, 2014). Denmark experienced a long period of recession from 1987 to 1993, something that was not present in the neighbouring countries (Johansen & Trier, 2014). In 1993, the band of the ERM was widened to plus/minus 15 per cent, allowing for more fluctuations of the pegged exchange rates. However, the breakdown of the old ERM system did not affect Denmark as severe as it did many other EU countries (Møller Christensen & Topp, 1997).

The Danish currency depreciated in the latter half of 2008 in relation to the outbreak of the crisis, also following a period where the difference between the Danish central bank's lending rate and the one of the ECB had been negative. In order to stabilise the currency, Denmark's central bank chose to intervene on the foreign exchange market. However, this action was not enough and the central bank had to raise its monetary policy interest rates. The currency crisis along with the financial crisis made this a twin crisis. Repeated interventions were needed (Padkjær Abildgren, 2011). Denmark did not manage to escape the 2008 crisis as smoothly as it did the one in the 1990s.

5.2 SWEDEN

- * 1985-1990: interest controls and foreign exchange market regulations were removed
- * 1990: The Swedish Company Law Committee was established to change the Swedish Companies Act to follow the EC regulations
- * 1990 (spring): restrictive stabilization policies
- * 1992: floating exchange rate
- * 1995: monetary policy with price stability (2 % inflation) as main goal + EU membership

Sources: Nohagen, 2009; Andersen, 2011; Ingebritsen, 1998.

Devaluations characterized much of the beginning of the eighties in Sweden. In 1982 the krona was devalued by 16 per cent. Devaluations along with influences from an economic upturn in the international business cycle made the Swedish export sector bloom and the economy did well during the majority of the 1980s. However, considering the high inflation level of the early 1980s (over 10 per cent), the government promised not to use devaluations to escape economic crises to the same extent in the future. Sweden was trying to establish a stable fixed exchange rate along with a moderate inflation. In the mid-1980s, the benefits from the devaluations had been exhausted, and a shortage of labour was becoming evident, resulting in an accelerating increase in wages. At about the same time, deregulations of financial markets around the world was in motion, integrating the financial markets to a greater extent than ever before (Nohagen, 2009). By 1985 interest rate controls were fully removed in Sweden. At this point in time lending ceilings on banks and financial institutions were also removed. More and more foreign exchange market regulations were further abolished from 1985 to 1990 (Andersen, 2011). In 1990 The Swedish Company Law Committee was established to change the Swedish Companies Act to follow the EC regulations (Ingebritsen, 1998). Events on the world market, such as the reunification of Germany (more loans necessary), caused increases in interest rates. Due to the link between Nordic currencies and the German mark through currency pegs, interest rates in these countries were also affected. Many countries fell into deep recessions. Real estate prices fell in Sweden, and a rising budget deficit led to the public (central government) debt becoming greater and greater. In the spring of 1990, the government started with restrictive stabilisation policies. But it was too late to stop a crisis. The crisis spread from the real estate market to the financial market and banking sector (Nohagen, 2009). The high inflation of ten per cent in 1990 fell to a mere two per cent in 1992. After allowing the exchange rate to float, the effective exchange rate dropped by approximately ten per cent (Berg & Gröttheim, 1997).

There was also a currency crisis spreading out over Europe, largely affecting Sweden and making the existing financial crisis turn into a twin crisis. The Swedish currency was overvalued, and the central bank tried to defend the fixed exchange rate by increasing the interest rate and using the currency reserve to buy SEK. On the 16 September 1992, the steering interest rate was first increased to 75 per cent. When it was clear this increase was not helping, the central bank further raised the interest rate to 500 per cent later the same day. The economy still demanded the government to keep using its currency reserves. When these eventually ran out, Sweden was forced to abandon the fixed exchange rate. This happened on the 19 November 1992. Starting from 1993, price stability became the main goal. And in 1995 the inflation target of two per cent was set. Policies targeted towards keeping the inflation low caused a rise in unemployment, which reached 16 % in the mid-1990s. In 1995 Sweden joined the European Union (Nohagen, 2009).

The Swedish monetary policy framework consists mainly of four parts, an inflation target; the inflation forecast by the Swedish central bank; the repo rate, borrowing and lending rates; and the portfolio of domestic securities and foreign reserves used to intervene on the money market. In February 1995 the central bank for the first time used a repo rate that was allowed to vary. This resulted in reactions on the markets which led to higher volatility due to the uncertainty of the central bank's intentions. Hence, the repo rate is now set by the central bank itself and no longer allowed to vary (Berg & Gröttheim, 1997). Berg and Gröttheim (1997) further summarises the monetary policy aims in the first half of the 1990s as follows. November 1992 to summer of 1994 was characterised by an export-led recovery along with easing of monetary policy. From August 1995 to December 1995 tighter monetary policy and increased capacity utilisation were central cornerstones.

Policy measures used by the Swedish central bank during the recent financial crisis includes repo rate cuts and loans offered to Swedish banks not only in SEK but also in US dollars. The reason for the latter action was to improve the liquidity of the banks in the Swedish financial system.

5.3 FINLAND

- * 1991: collapse of the Soviet Union affecting the Finnish economy
- * 1992: floating exchange rate
- * 1993: the central bank started with inflation targeting (2 %)
- * 1995: Finland joined the EU
- * 1996: joined ERM
- * 1999: joined EMU and adopted the euro

Sources: Andersen, 2011; Ingebritsen, 1998; Rudebeck & Henriksson, n.d.; Lennartsdotter, 2003.

Deregulations were going on all over Europe and Finland was no exception. Together with Sweden, Finland was the country worst hit by the banking crisis in the early 1990s. Compared to the other Nordic countries, Finland was affected more by the collapses of the Russian and Ukrainian economies. In the eighties about twenty per cent of Finland's exports went to Ukraine and Russia, which can be compared with the early 1990s when the corresponding percentage was close to zero (Andersen, 2011). After the announced decision by the Swedish government to join the EC, Finnish authorities and business sector became further concerned of what impact this would have on the business sectors, since the Finnish industry now relied heavily on the Swedish one. Finland followed Sweden, and in 1995 both countries joined the EU (Ingebritsen, 1998).

Just like Sweden, Finland had problems with high inflation that made the country lose its competitiveness and further leading to exports declining. Economic growth stagnated in 1990, and in 1991 the Finnish economy was beginning to shrink (Kiander & Vartia, 2011). The unemployment rate increased fivefold between 1990 and 1993. During the same period the ratio of public debt to GDP became four times as large and asset prices had fallen by fifty per cent (Pikkarainen et al., 1997). In September 1992 Finland was forced to leave its peg for a floating exchange rate, and in 1993 they started with inflation targeting, showing a much similar time frame to Sweden (Rudebeck & Henriksson, n.d.). The floating exchange rate led to the Finnish currency immediately depreciating by 30 per cent. Letting go of the fixed exchange rate also made it possible for the central bank to cut the short-term interest rates by ten percentage points within a few months (Klander & Vartia, 2011). In 1994 consumption and investment started growing again. In 1996 the similarities between Sweden and Finland took a different turn as Finland decided to join ERM and, eventually, the EMU (Rudebeck &

Henriksson, n.d.). Finland joined the ERM on 15 October 1996, and was qualified for the EMU at its introduction in January 1999 (Lennartsdotter, 2003). The Finnish budget showed signs of improving and went from a deficit of three per cent in 1996 to a surplus of one per cent in 1998. The inflation fell as well following the upswing in the Finnish business cycle (Rudebeck & Henriksson, n.d.). The increased growth of exports starting in 1993 appears to have helped the Finnish economy out of the recession (Pikkarainen et al., 1997).

Just like in neighbouring countries, the Finnish banks were heavily indebted with loans they struggled to repay. Most of them were secured with collateral that after the housing bubble were worth only a fraction of their initial values. These patterns are much similar to what happened in many countries in the late 2000s. Finland, however, seems to have drawn lessons from its crisis in the nineties, and did not fall as deeply into a trap in the recent crisis as many other countries did (Andersen, 2011). In the early 1990s the economic policy was focused on reducing external debts and strengthening the balance sheets of Finnish companies. When the current account went from a deficit to a surplus in 1994, the new goals became to increase efficiency on the labour market, inflation targeting, and cut central government expenditures. In 1993 Finland announced an inflation target of two per cent that would be valid starting from 1995 (Pikkarainen et al., 1997).

The main goal of the monetary policy of the euro system is price stability, which hence currently also is the focus of the Finnish economy (Suomen pankki, n.d.). Since 1999 Finland has a joint steering rate with the ECB (Rudebeck & Henriksson, n.d.). Finland's changeover to the ERM went smoothly as the country's monetary policy showed to be well adapted to the ERM conditions. The key rate was close to the German one, and inflation grew according to the target, showing that Finland managed to recover from the crisis that had extreme negative effects on the economy earlier in the same decade (Lennartsdotter, 2003).

5.4 THE EMU

As the topic for this thesis circulates around exchange rate regimes, the EMU as a monetary union represents a very fixed exchange rate and cannot be excluded from the analysis. An important consequence of entering a monetary union is the integration of financial markets among member countries. Flam et al. (2009) find support for this phenomenon in the euro area. Furthermore, they find positive effects on trade as a result of the elimination of nominal

exchange rates due to the common currency. Before a country can join the EMU there are criteria that need to be fulfilled. These criteria mainly relates to inflation, long-term interest rates, public finances, and the exchange rate. For example, the budget deficit of the country in question must not exceed three per cent of GDP, and the public sector's gross debt is not allowed to be higher than sixty per cent of GDP (Rodenberg & s, 2003). Joining the EMU further implies giving up one's own monetary policy for the one conducted by the ECB at the same time as adopting the euro as the main currency (Berg, 2003). The euro exchange rate is considered fixed among the members, but is allowed to float on foreign exchange markets. When needed the euro system might intervene by selling or buying euro against other currencies (Suomen pankki, n.d.). However, the switch from independent monetary policy to the joint one of the EMU does not imply that inflation and economic activity of the individual euro country cannot differ from the overall levels of the euro area. Deviations can occur both often and for long periods (Boije & Tågström, 2003). All risks associated with economic shocks are not removed or limited by the membership of a monetary union.

The implementation of the Single European Act was followed by gradual removing of capital controls. According to Eichengreen and Wyplosz (1993) this can partly be held responsible for problems in managing the Exchange Rate Mechanism and the currencies involved. This, in turn, created speculative pressures targeted at governments and central banks. And, as has been explained in the theoretical framework, speculative attacks play a role in the set-off of twin crises. This is also consistent with the results from Jonung's study from 2010.

It has been suggested by some researchers that the fact that countries within the EMS did not manage to cooperate to the extent necessary caused market pressures to deepen and turn into a crisis. If cooperation had worked better, the adjustment and response to market pressures would most likely have been smoother. Eichengreen concludes that if even Europe, one of the most developed regions when it came to monetary cooperation, had trouble dealing with the crisis in a joint manner, it shows that collective organization of exchange rates does not run without difficulties (Eichengreen, 2003).

Unlike Finland, Sweden and Denmark decided to stay outside the EMU at its introduction in 1999. Denmark acquired opt-out clauses in connection to the Maastricht Treaty (Flam et al., 2009). Even though both Sweden and Denmark have shown interest in the monetary union and held referendums, the no-opinion has been the dominating result. Denmark has been

granted exception from parts of the Maastricht Treaty, and is hence not obliged to enter into the monetary union. Sweden, however, does not have the same exception and is required to enter into the EMU according to the Maastricht Treaty. However, in practise this will not happen until (if) the Swedish government decides to. This is due to the fact that Sweden at the moment does not fulfil all requirements since it has not fixed its currency with the ERM II as well as has not adapted central bank legislation to fit the policy framework of the ECB. In the referendum in 2003, 56 per cent of the population voted against EMU membership (Flam et al., 2009).

6. EMPIRICAL RESULTS

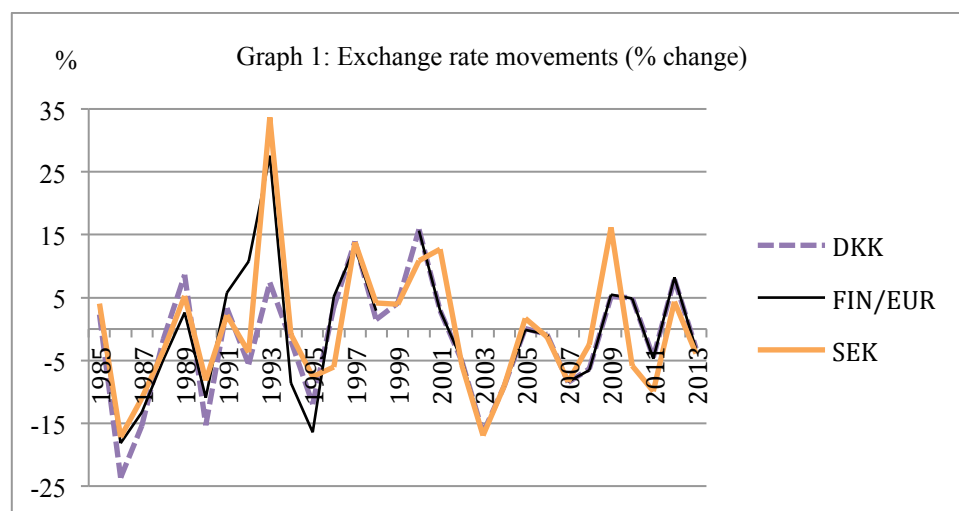
Chapter six presents the results that were obtained from the research and data.

6.1 DESCRIPTIVE STATISTICS

The data set presented in chapter four has been plotted in graphs that are presented below.

6.1.1 EXCHANGE RATE MOVEMENTS

In Graph 1 the percentage change in exchange rates for Sweden, Denmark and Finland from 1985 to 2013 can be observed. That the Swedish currency was valued below the Danish during most of the 1985-2013 period can be seen as a result of several devaluations that were made in Sweden in the 1980s as well as in relation to the crisis in early 1990s when the SEK was allowed to float. From the graph one can see that the Swedish and Finnish currencies



Data source: The World Bank. Denmark: DKK/USD, Sweden: SEK/USD, Finland: FIN/USD and EUR/USD. Currency per USD, yearly average, percentage change.

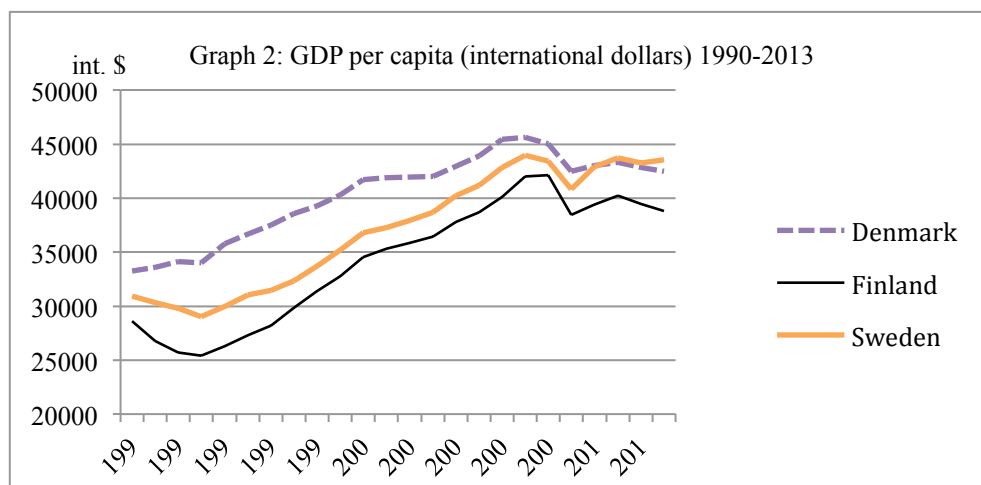
depreciated in 1993 and the USD became more expensive in relation to SEK and FIN. As reviewed in the previous chapter, the Swedish currency fell after it was allowed to float, suggesting that it was overvalued in the early 1990s.

The Finnish currency has been the strongest among the three during the period studied. The gap around 1999 is due to the switch from the Finnish mark to the euro. After Finland's switch to the euro in 1999, the movements in the Finnish and Danish currencies are almost identical. This is much expected considering that the DKK is fixed to the euro and their currencies should move in a jointly manner.

6.1.2 GDP PER CAPITA

Denmark has had the highest GDP per capita up until the end of the recent crisis when the country was surpassed by Sweden, as can be observed in Graph 2. It appears as if Finland experienced the largest drops both in the 1990s crisis as well as in the 2008-2009 crisis. Even though the three countries are on different levels, the nature of the development over time is similar among them. Positive and negative changes occur somewhat simultaneously among them.

While Sweden and Finland both experienced negative changes in the GDP per capita growth rates in the early 1990s, Denmark managed to keep it at an increasing level. This suggests that Denmark was not hit as badly by the crisis as the other two countries, consistent with empirical evidence presented in the previous chapter as well as in the literature review.



Data source: The World Bank. GDP/capita, international dollars, constant prices

Table 1: Correlation of GDP per capita		
	1991-2000	2001-2010
Denmark, Finland	0,58	0,91
Denmark, Sweden	0,72	0,93
Sweden, Finland	0,89	0,93

Own calculation. Data source: The World Bank.

Table 2: Standard deviation of GDP per capita		
	1991-2000	2001-2010
Denmark	0,01	0,02
Finland	0,04	0,04
Sweden	0,03	0,03

Own calculation. Data source: The World Bank.

Overall, though, it can be said that apart from some minor deviations the three countries have experienced quite similar developments of GDP per capita despite their different exchange rate regimes.

In Table 1 the correlation coefficients between Denmark and Finland, Denmark and Sweden, and Sweden and Finland, are presented. Overall in the 1990s and 2000s the correlation was the strongest between Finland and Sweden. Both Sweden and Finland have increased their correlation with Denmark from the years 1991-2000 to 2001-2010. In the latter period they are all closely correlated. This suggests that there are other factors playing larger roles in the determination of the development of GDP per capita than the exchange rate since the countries are closely correlated despite their different exchange rate regimes.

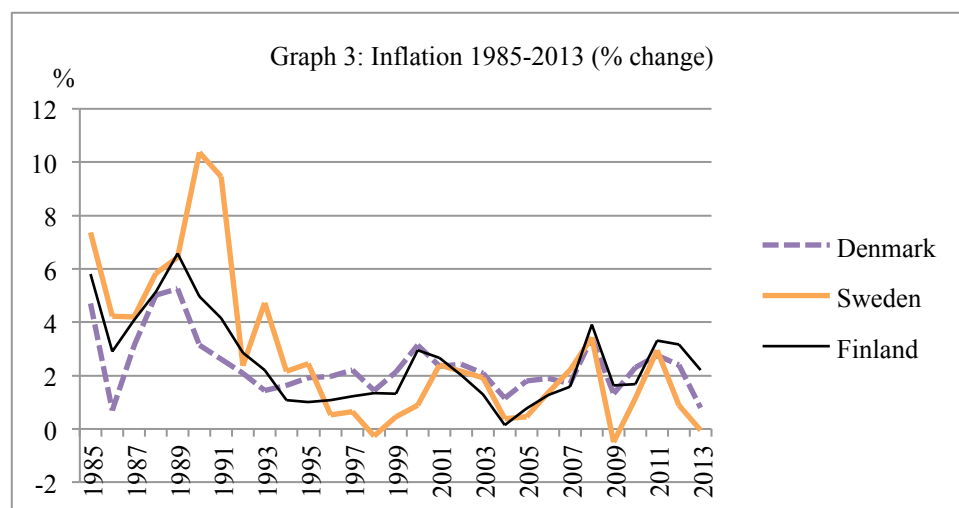
All standard deviations are low, suggesting that the countries GDP growth rates are not very volatile. It should be noted, however, that the calculations are based on yearly averages. With a higher frequency of the data, the variations could very well be higher.

6.1.3 INFLATION

From Graph 3 it is evident that Sweden experienced a very high inflation around the 1990s, which was also explained in the previous chapter. It is about four percentage points higher than Finland's inflation peak of somewhere between six and seven per cent. It also, based on this data set, seems like Sweden's recovery was more shaky (volatile) than Finland's. This is also reflected in Table 4 showing the standard deviation calculations.

When it comes down to inflation patterns, the correlation was the strongest between Sweden and Finland in the 1990s, but stronger between Denmark and Finland in the 2000s. Most surprising is the massive increase in correlation between Denmark and Sweden from the first to the second period. The fact that Finland and Denmark now are so correlated is likely connected to the two countries being much under the influence of the ECB's monetary policy. Sweden, being able to more freely conduct its monetary policy since leaving the pegged currency in 1993, can use more tools to try to affect the inflation. The inflation peak Sweden experienced in relation to the financial crisis might to some extent explain why the correlation between Sweden and Denmark was so low in 1991-2000.

Both during the whole time period (1991-2010) and in the two sub-periods (1991-2000, 2001-2010) the standard deviation was higher in Sweden than in Denmark and Finland. This suggests a more volatile evolution of the inflation rate in Sweden than in the other two countries during these decades.



Data source: The IMF, inflation rate, average consumer prices.

<u>Table 3: Correlation of inflation</u>		
	1991-2000	2001-2010
Denmark, Finland	0,58	0,87
Denmark, Sweden	0,17	0,83
Finland, Sweden	0,73	0,74

Own calculation. Data source: The IMF.

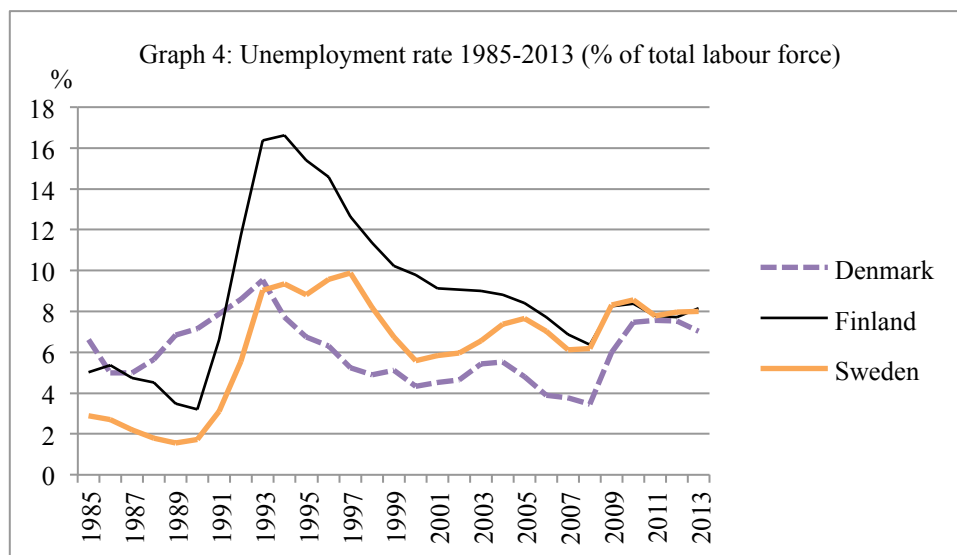
<u>Table 4: Standard deviation of inflation</u>		
	1991-2000	2001-2010
Denmark	0,53	0,63
Finland	1,08	1,03
Sweden	2,88	1,16

Own calculation. Data source: The IMF.

6.1.4 UNEMPLOYMENT

Denmark's unemployment rate was higher than the other two's in the 1980s, but as can be seen from the graph it managed to get down to the same level as Finland around 1986/87. What is remarkable from this graph is that Finland's unemployment level skyrocketed in relation to the financial crisis in the early 1990s. As was mentioned previously, Finland was at this time also negatively affected by the problems in the Soviet Union. Perhaps this can account for some of the differences between the unemployment rates of Finland and the other two countries. The export sector was negatively affected and most likely also had consequences for the labour market. Though this is just speculation and the data does not explain the reason behind the differences, just the size of the disparities.

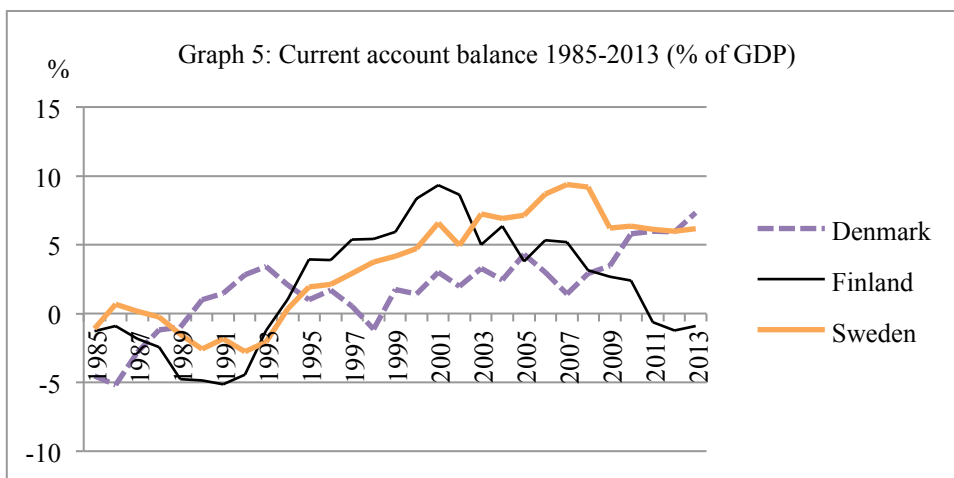
What can further be seen from the graph above is that it takes almost ten years before the Finnish rate is down to the Swedish level. The Danish unemployment, peaking in 1993, had been the lowest up until 2011. While Denmark did fare better than Sweden and Finland in the early 1990s crisis, this graph shows that the country was still suffered some. The unemployment rate was almost ten per cent in 1993. Another fact that can be concluded from the data is that after the crisis escalating in 2008 the unemployment rates among the three countries have been converging to a level around eight per cent. According to the graph, Denmark's rate seems to start diverging in 2012-2013 and decrease.



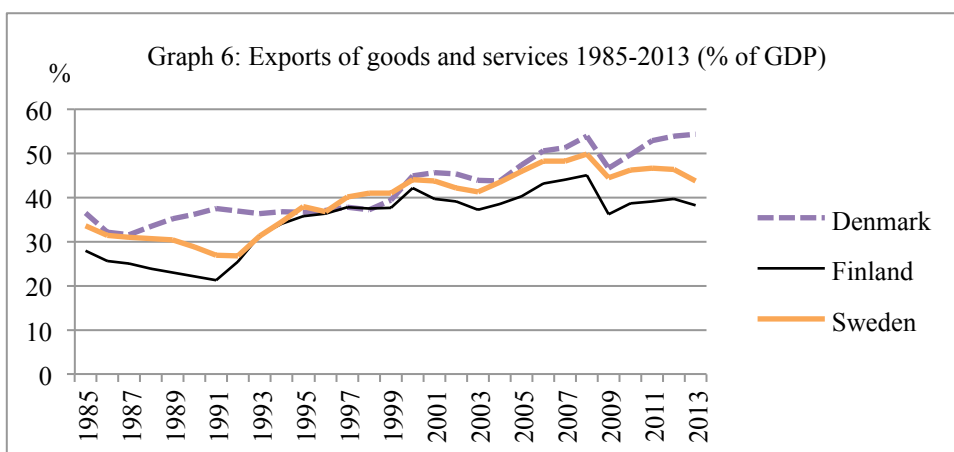
Data source: The IMF. Unemployment rate.

6.1.5 CURRENT ACCOUNT BALANCE

In the graph it can be seen that Denmark had a current account deficit in the latter half of the 1980s, which the country managed to turn into a surplus around 1990. While Sweden and Finland both experienced deficits around the turn of the decade up until sometime around 1994, Denmark did not show the same figures. This possibly could be explained by the fact that Denmark had struggled already some years earlier and had to tighten the fiscal policy before the financial crisis broke out. Furthermore, as mentioned earlier, Denmark was not as badly hit by the crisis as Finland and Sweden. If Sweden and Finland's currencies were overvalued in the early 1990s, this would most likely have affected the current account balance negatively. From the previous chapter it was seen that in the new Finnish policy starting from 1995 one aspect was to limit government spending, which might be an explanation for what can be observed in the increasing current account surplus in the graph. Furthermore, it can be observed that Finland was the only country among the three that experienced a large drop in the 2000s, starting 2000-2001. It can possibly be connected to joining the EMU and hence giving up the ability to conduct independent monetary policy.



Data source: The IMF. Current account balance.



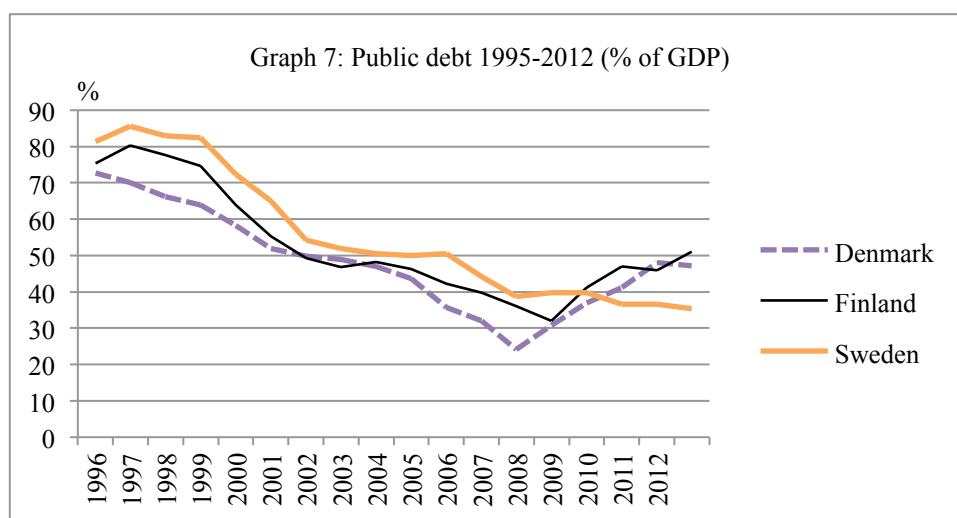
Data source: The World Bank. Exports of goods and services.

6.1.6 EXPORTS

As can be observed in Graph 6, all three Nordic countries in this study are quite reliant on the export sector. The increased exports argued to have helped Finland and Sweden recover from the crisis in the early 1990s are visible as increases starting in 1992 and remaining a high percentage of GDP. There is a decrease around 2000, which is right after Finland switched to the Euro. This could, but definitely do not have to, imply that the exchange rate switch and/or the valuation of the mark at that time was not beneficial for the export sector. It could also represent a fear associated with the new currency and monetary regime, temporarily affecting the exports negatively. Sweden and Denmark also saw a drop in the exports' share of GDP.

6.1.7 PUBLIC DEBT

Graph 7 suggests that all three countries had major public debts in the latter part of the 1990s (1985 to 1995 is not included in the graph due to scarcity of data). Denmark had a lower debt relative to the others during most of the time leading up to the 2008-2009 crisis. Denmark's lowest point, with a central government debt of approximately 24 per cent of GDP, happened right before the crisis. After that the public debt started rising again. Finland, having its lowest peak about a year after Denmark, also experienced rising public debt as a result of the financial crisis. Sweden, on the other hand, has managed to keep its central government debt at a low level, and from 2010 has the lowest public debt as a percentage of GDP among the three countries. This further gives support to the argument that Sweden managed to survive the crisis better than Denmark and Finland. Even though the data does not tell us exactly what the increased debt in the other two countries was used for and whether or not Sweden would have benefited from using similar methods.



Data source: The World Bank. Total central government debt.

From the country-specific overview of Denmark, it was concluded that many Danish banks struggled in the financial crisis, several ending in bankruptcy. Extensive bailout deals were made and backed by the central government, possibly accounting for some of the increased debt (Andersson, 2008). However, just because the Swedish government is doing well on the debt side does not necessarily mean that the entire economy is showing a pattern in the similar direction. On the contrary, there is some evidence for increased debt among private households in recent years (Alfelt & Winstrand, 2015).

6.2 ECONOMETRIC RESULTS

6.2.1 REGRESSION RESULTS

The results from the simple regression model with first difference of logged unemployment as the dependent variable showed no significance of the logged difference in the exchange rate coefficient with four lags. This would suggest that in this data set there is not much evidence for a linear relationship between exchange rate movements and changes in the unemployment rate. An attempt of a regression with no lags was done as well, but the exchange rate coefficient was not significant here either. The coefficients of GDP and CPI with four quarterly lags showed to be significant, GDP with a significance level of 0.1 and CPI with 0.05. The coefficients of GDP_{t-4} and ER_{t-4} were slightly negative but close to zero, the CPI_{t-4} -coefficient was positive and approximately 2.8 suggesting a positive relationship with the unemployment rate. The results from this regression did not give much information about what possible connection there could be between the exchange rate and unemployment. The table containing the full results from the OLS regression is available in Appendix 2.

6.2.2 VAR MODEL RESULTS

The results from the VAR model are presented in table A3 in Appendix 3. As is visible in the table, all four lagged GDP coefficients are significant for unemployment while, according to the results from this specific model on this specific data set, the exchange rate does not have any significant impact on unemployment. However, there seems to be reason to believe that there could be Granger causality in the opposite direction. The coefficients for unemployment with one, two and three quarterly are significant with a 0.05 significance level. Furthermore, the exchange rate change in period t-1 seem to possibly have an affect on the exchange rate in period t, suggesting that the change in exchange rate in the current quarter depends on the

exchange rate change in the previous quarter. The coefficient of the exchange rate change in period $t-1$ is further significant for the change in consumer price index in period t . The coefficients of the exchange rate change in period $t-2$ are also significant for unemployment and CPI. In the table, for the equation with unemployment as the dependant variable, GDP has negative coefficients, exchange rate circulates around zero and mostly negative, and CPI has positive coefficients except from the coefficient with one quarterly lag. This is somewhat similar to what the OLS regression showed.

The results from the VAR model cannot be interpreted without uncertainty. Enders (2010) concluded that unrestricted VAR model results are commonly overparameterised. Moreover, due to the model's lack of theoretical background it is hard to draw any conclusions (Asteriou & Hall, 2011), but it can be a good choice in order to explore what type of relationship could possibly exist between a certain set of variables.

6.3 RESULTS IN COMPARISON TO PREVIOUS RESEARCH

The results from the econometric models used in the research for this paper suggest that it is hard to determine any direct effects of changes in the exchange rate on changes in the unemployment rate for Sweden under its flexible exchange rate, even after adding lagged variables. That changes in the value of the exchange rate will automatically generate lower unemployment, or higher GDP, seems hence unlikely if using the interpretation of the results from the simple models conducted here. These results were expected since it from previous literature has been determined that it is hard to determine the causation between the exchange rate and other variables. Even if there is evidence supporting some sort of correlation between variables it does not necessarily imply causation.

Taking into account that the econometrical models used here are quite simplistic and the data set is relatively small, it is not possible to draw any general conclusions, but just a way to deeper explore what the data set can tell us about its properties. The VAR model is a bit more comprehensive than the simple regression and explores the data deeper. But these results do not really confirm the results of previous research such as the study by Feldman (2011). Perhaps data on more countries, data with higher frequency or more variables added to the regressions would have improved the results and made them more similar to the results received from the previous studies conducted by scholars.

7. DISCUSSION

Chapter seven discusses the findings presented in chapter six and relates them to the theoretical framework and the papers in the literature review.

7.1 EXCHANGE RATES IN THE 1990s – DENMARK VS SWEDEN AND FINLAND

The macroeconomic trilemma states that a country cannot have a fixed exchange rate, open capital markets and independent monetary policy simultaneously. Considering that the removal of controls in the 1980s made markets more integrated than ever before, the choice more or less boiled down to choosing between a fixed exchange rate and the ability to conduct independent monetary policy. Denmark has managed to keep a credible fixed exchange rate regime up until the recent financial crisis, something that is very much an exception in comparison with the other Nordic countries. Scholars seem to be quite united in the view that increased capital flows as a result of increasingly globalizing markets was a large offset in the 1990s crisis. This is consistent with the theoretical framework and Eichengreen's theory of the connection between capital flows and crises.

The turbulence during the 1990s that forced both Sweden and Finland to abandon their fixed exchange rates did not end up forcing Denmark to do the same. As was mentioned earlier, one explanation could be the fact that Denmark experienced trouble in its economy already in the 1980s. Denmark made arrangements, such as the kartoffelkur which changed the conditions for mortgages and credit granting and tax reforms. That the country started these reforms earlier – before the currency crisis escalated in Europe and the financial crisis spread in the Nordics – could possibly explain why Denmark managed to not get as badly affected by the twin crisis as its neighbours. These fiscal policies can be argued to have prevented the lending boom and speculative attacks that were visible in Finland and Sweden to become equally large in Denmark. That all countries had fixed exchange rates at the time of the crisis meant that they could not use monetary policy instruments to a wide extent. With a fixed exchange rate the risk that currencies are overvalued also exists since they are not allowed to automatically adjust to the market value. These limitations put heavier pressure on fiscal policy instruments in the 1990s, as can be seen by the tax reforms etcetera that was implemented. History suggests that Sweden started to change policies and react to what was

happening too late and hence was not able to stop the crisis without giving up the fixed exchange rate.

After Sweden and Finland allowed their currencies to float, both currencies were immediately devalued. As can be seen in the descriptive statistic in chapter six, the exports of both Finland and Sweden started to rise in the first half of the 1990s, consistent with economic theory. It was furthermore argued previously that increased exports helped both Sweden and Finland to recover from the crisis (Pikkarainen et al., 1997; Berg & Gröttheim, 1997). Sweden continued to float even after the recovery from the turbulent years in the early 1990s. An explanation for the country's successful management with the flexible rate could be how fast and effective the monetary policy goal was switched from an exchange rate target to inflation target, and succeeding with using the markets and the interest rate to affect economic behavior (Eichengreen, 2003).

In Sweden's case the floating exchange rate does seem to benefit the country more than a fixed. It should not be forgotten, however, that both Sweden and Finland's economies were doing exceptionally well in the late 1980s with their fixed rates. It could be that, in order for fixed exchange rates to work well within Sweden, the capital flows should not be too large so monetary policy can still be used freely. Another possibility is that it was more the shock of the macroeconomic trilemma boiling down to a dilemma between a fixed exchange rate and independent monetary policy that happened too fast for Sweden and Finland to deal with the changes. With a flexible rate the automatic stabilisers might have started the recovery process earlier. Jonung (2010) argues that with flexible rates Finland and Sweden would have been able to deal with the crisis in a more efficient way.

7.2 2008-2009 CRISIS – SWEDEN VS DENMARK AND FINLAND

While the main emphasis so far in this chapter has been on the early 1990s, comparing the effects of different exchange rate regimes during the crisis of that decade with what happened in the recent global crisis is a natural step in making the analysis broader and more current. An important difference between the crisis of the 1990s and the crisis of 2008 is the commitment to keep and stabilize the fixed exchange rates, which was a major part of all three countries' monetary regimes in the early 1990s (Eichengreen, 2003). Mundell has argued that the euro does not bear the blame for the recent crisis, but that it all boils down to

fiscal solvency problems among some countries in the Euro area (Sutherland et al., 2012). However, everyone does not share his point of view. Debates over whether or not standing outside of the euro zone saved some countries, like Sweden, from falling into a great recession in the late 2000s has been brought up a lot in recent years.

An argument against membership in the EMU is that Sweden and Denmark have managed very well without joining, better than Finland it would seem. GDP per capita is higher in these countries compared to the EU average and it has been suggested that not adopting the euro as the main currency helped Sweden to handle and recover relatively smoothly from the 2008 crisis. Sweden and Denmark, in terms of monetary and fiscal policy, have also managed to keep inflation at a low and steady level (Flam et al., 2009). The goal of monetary policy further differs between Sweden and Denmark. As mentioned in previous chapters, Sweden has adopted an inflation target while Denmark focuses on keeping its exchange rate fixed towards the euro without too much volatility.

It is hard to predict what would have happened under other currencies, such as Finland not being part of the EMU or if Sweden had decided to join the monetary union alternatively return to a pegged currency. The Growth and Strategy (GnS) economics report from 2012 suggests that this is because currency rates tend to follow a *random walk*, making the future unpredictable. However, the data on GDP suggest that even with different exchange rate regimes the growth rates have been quite similar among the three countries in the 2000s, with correlations close to one. These cross-country comparisons hence seem to support an opinion of exchange rate regime choices becoming less important as markets become more integrated. During the financial crisis, though, there were some differences in how much the countries were hit by negative effects. In the years leading up to the introduction of the EMU, studies found that Sweden would have a hard time adjusting to asymmetric shocks in the absence of independent monetary policy and an exchange rate allowed to float (Suni & Vihriälä, 2013). So, even if the growth trends appear similar between Sweden and Finland in the present case, the same might not have been true if Sweden had been the one joining the monetary union and Finland had stuck with a flexible exchange rate.

Flam et al. (2009) found that Denmark's policy of fixing its exchange rate to the euro and the historical evidence of a monetary policy rate closely following the one of the ECB, insinuating that the overall macroeconomic development of this small, open economy would

most likely have been very similar if Denmark had decided to join the EMU at its beginning in 1999. They further found that the monetary union most likely have not affected the dynamics of public debt and deficits of the countries within the euro area. The descriptive data of public debt as a percentage of GDP presented in chapter six show very similar developments among Sweden, Finland and Denmark, much supporting the conclusion by Flam et al.

The results from the econometric models do not show much significant support for the impact of exchange rate volatility on unemployment and GDP. One possibility could be that the exchange rate might affect these variables indirectly, through CPI and other possible factors, as well as in its way of limiting the possibility to conduct certain types of monetary and fiscal policies. Previous studies are divided in their results. Some studies say the exchange rate regime does not matter, some say currency union is the optimal choice, and some promote flexible rates. The theories most likely differ between developed and developing countries as well. Sweden, Finland and Denmark are very much developed, and they are all doing relatively well even with different regimes.

All in all, the results from the econometric model conducted here does not give any significant confirmation of any of the results that Feldman (2011), Jonung (2010), Kiander and Vartia (2011), and Ghosh et al. (1996) reached in their studies on the effect of different exchange rates on economic growth and crisis recovery. Mostly, it follows the conclusions by Suni and Vihriälä (2013) in saying that it does not seem to exist that big of a difference between fixed and flexible rates in the Nordic countries. The results of Ghosh et al.'s model suggested that countries with pegged exchange rates generally experience lower inflation. But if observing Graph 3 showing the rate of inflation for Sweden, Denmark and Finland, the data from 1985 to 2013 does not support these findings. Sweden's inflation showed to be lower during the period with a flexible rate, and during the latter years the patterns are very similar among the three countries despite their different exchange rate regimes. Finland's current account deficit suggests that joining the EMU has changed either the balance of payments or the capital account. This suggests that even if the exchange rate regime according to the tests conducted in this research does not support any big effect of changes in exchange rates, changing the regime may be able to have effects on the economy through other channels, such as the current account balance.

Considering the regularity at which countries change their exchange rate regimes, what is considered to be the best rate for a certain country can differ in different time periods. Denmark has managed to stick to its regime for a long time, all through the scope of this research (1985-2013), while Sweden switched once and Finland twice. The euro crisis most likely has brought negative effects, and whether a currency fixed to the euro will continue to be an optimal choice for Denmark only the future will be able to tell.

8. CONCLUSION

The crisis of the early 1990s in the Nordic countries was to a large extent caused by the increased globalisation connected to the removal of capital controls of the 1980s. The monetary and fiscal tools used and policies implemented resulted in various outcomes. In this paper it has been explored to what extent the choice of exchange rate regime, and hence the possibility to conduct independent monetary policy, affected the recovery after the 1990s and 2000s crises as well as the economic development in the period ranging from 1985 up until 2013.

For most of the economic indicators studied, quite similar patterns could be seen among Sweden, Denmark and Finland. This is especially true for the 2000s. The correlation coefficients showed that the inflation and GDP per capita trends have become more correlated between Sweden, Denmark and Finland in the 2000s compared to the 1990s. This suggest that independent of whether one has exchange rate stability or inflation targeting as the main policy goal, the economic outcomes are much similar in today's globalised world. At least for the small, open Nordic countries.

In the 1990s when all countries were under pegged exchange rates and hit by a crisis, Denmark managed to handle the situation better than the other two. When allowed to adopt a flexible rate, Sweden became the frontrunner with its development in the 2008 crisis and quick recovery after the exchange rate was changed following the 1990s crisis. Finland did also manage a quite impressive recovery from the first crisis, at least in terms of GDP and inflation. This has been argued to be an outcome of the increase in exports following the

currency devaluation as a result from changing to a flexible exchange rate. Unemployment, however, lingered high for a long time. Since Finland did not have a flexible rate during any of the crises it is impossible to know exactly how the growth and crisis management would have looked like under such conditions. Simulation results from previous studies have generated support both for and against a crucial role of the choice of exchange rate regime. This topic is within a field of research where it is hard to distinguish cause from effect, making it impossible to with any certainty say that one regime is better than another in every given scenario.

This research has not managed to draw any broad conclusions about the exact role of the exchange rate and which regime is the best for economic growth and crisis recovery. It has, however, managed to give some clarity on what the theory, literature and research say on the matter and it has offered a qualified discussion of pros and cons for either regime based on available data from 1985 to 2013 for Sweden, Finland and Denmark. The role of the exchange rate is a topic that have been widely researched and debated, and so far there seems to be no clear answer to what is the best type of regime in all situations to best handle the macroeconomic trilemma and increased capital flows. The uncertainty around the power of the exchange rate will most likely be a hot topic for further research in many years to come. Like Eichengreen once expressed it, "*The exchange rate is the chink in the armor of modern-day macroeconomic policymakers*" (Eichengreen, 2003:99).

A possibility to extend this research would be to do a more comprehensive VAR analysis including more relevant variables and also to test for Granger causality. To include Denmark and Finland in the econometric model would make possible for deeper cross-country conclusions.

LIST OF REFERENCES

- Andersen, S. E. (2011). *The Evolution of Nordic Finance*, New York/Hapshire: Palgrave Macmillan
- Andersson, P. (2008). Danish deposits backed in bank bail-out deal, *Financial Times*, 6 October 2008, Available at: www.ft.com/cms/s/0/f4e2f0e6-93c9-11dd-9a63-0000779fd18c.html#axzz3a01H9oXM [Accessed: 13 May 2015]
- Alfelt, G. & Winstrand, J. (2015). Svenska hushållens skuldsättning – uppdatering för 2014, *Ekonomiska kommentarer*, no. 1, 2015, Sveriges Riksbank, Available at: http://www.riksbank.se/Documents/Rapporter/Ekonomiska_kommentarer/2015/rap_ek_kom_nr1_150129_sve.pdf
- Asteriou, D. & Hall, S. G. (2011). *Applied Econometrics*, Basingstoke: Palgrave Macmillan, 2nd ed.
- Berg, C. (2003). Monetary policy in the Eurosystem, in *Swedish monetary policy and EMU*, Sveriges Riksbank, pp. 38-45, Available at: http://www.riksbank.se/Upload/Dokument_riksbank/Kat_publicerat/Broschyrrer/penemu_e.pdf
- Berg, C. & Gröttheim, R. (1997). Monetary policy in Sweden since 1992, in *Monetary Policy in the Nordic Countries: Experiences Since 1992*, BIS, Policy Papers, no. 2, pp. 140-182
- Boije, R. & Tägtström, S. (2003). Economic balance and stabilisation policy, in *Swedish monetary policy and EMU*, Sveriges Riksbank, pp. 51-58, Available at: http://www.riksbank.se/Upload/Dokument_riksbank/Kat_publicerat/Broschyrrer/penemu_e.pdf
- Edlund, P-O. & Karlsson, S. (1993). Forecasting the Swedish Unemployment Rate: VAR vs. Transfer Function Modelling, *International Journal of Forecasting*, vol. 9, no. 1, pp. 61-76
- Eichengreen, B. (2003). *Capital flows and crises*, Cambridge: MIT Press

Eichengreen, B. & Wyplosz, C. (1993). The Unstable EMS, *Brookings Papers on Economic Activity*, vol. 1993, no. 1, pp. 51-143

Elmér, H., Guibourg, G., Kjellberg, D. & Nessén, M. (2012). The Riksbank's monetary policy measures during the financial crisis – evaluation and lessons learnt, *Sveriges Riksbank Economic Review*, 2012, no. 3, pp. 2-24

Enders, W. (2010). *Applied Econometric Time Series*, Hoboken, N.J.: John Wiley & Sons

Feldman, H. (2011). The Unemployment Effect of Exchange Rate Volatility in Industrial Countries, Bath Economic Research Papers, no. 1/11, University of Bath, Department of Economics, Available at: <http://www.bath.ac.uk/economics/research/working-papers/2011-papers/01-11.pdf> [11 May 2015]

Findlay, R. & O'Rourke, K. H. (2007). *Power and Plenty. Trade, War, and the World Economy in the Second Millennium*, Princeton and Oxford: Princeton University Press

Flam, H., Fatás, A., Holden, S., Jappelli, T., Mihov, I., Pagano, M. & Wyplosz, C. (2009). EMU at Ten. Should Denmark, Sweden and the UK join?, SNS Economic Policy Report, 2009, Stockholm: SNS Förlag

Ghosh, A. R., Gulde, A-M., Ostry, J. D. & Wolf, H. (1996). Does the Exchange Rate Regime Matter for Inflation and Growth?, *Economic Issues*, vol. 2, International Monetary Fund, Washington D. C.

GnS economics (2012). Finland and the EMU: costs, benefits, and the way forward, Available at: <http://gnseconomics.com/wp-content/uploads/2012/03/Finland-and-the-EMU-gns.pdf> [Accessed: 25 January 2015]

Ingebritsen, C. (1998). *The Nordic States and European Unity*, New York: Cornell University Press

Johansen, P. U. & Trier, M. (2014). Danmarks økonomi siden 1980 – en oversigt, Copenhagen: Handelshøjskolens Forlag

Jonung, L. (2010). Lessons from the Nordic Financial Crisis, report prepared for the American Economic Association meeting in Denver January 2011, Available at: www.aeaweb.org [Accessed: 25 January 2015]

Kiander, J. & Vartia, P. (2011). Lessons from the crisis in Finland and Sweden in the 1990s, *Empirica*, vol. 38, pp. 53-69

Lennartsdotter, P. (2003). Finland's, Italy's and Greece's path to the monetary union, in *Swedish monetary policy and EMU*, Sveriges Riksbank, pp. 10-16, Available at: http://www.riksbank.se/Upload/Dokument_riksbank/Kat_publicerat/Broschyret/penemu_e.pdf

Møller Christensen, A. & Topp, A. (1997). Monetary policy in Denmark since 1992, in *Monetary Policy in the Nordic Countries: Experiences Since 1992*, BIS, Policy Papers, no. 2, pp. 5-23

Nessén, M. & Degrér, H. (2003). The krona's central rate in ERM II, in *Swedish monetary policy and EMU*, Sveriges Riksbank, pp. 17-21, Available at: http://www.riksbank.se/Upload/Dokument_riksbank/Kat_publicerat/Broschyret/penemu_e.pdf

Nohagen, L. (2009). Sveriges Ekonomi – introduction i samhällsekonomi, Stockholm: Bonnier Utbildning AB

Padkjær Abildgren, K. (2011). Monetary Policy after the Crisis – The Lessons from a Fixed-Rate Regime, background paper to the speech by Jens Thomsen at the SUERF and National Bank of Poland Conference on “Monetary Policy after the Crisis”, National Bank of Poland, Warsaw, 4 March 2011, Available at: https://www.nbp.pl/badania/konferencje/2011/suerf-nbp/pdf/2011_suerf-nbp_jt_background_paper.pdf [Accessed: 13 May 2015]

Pikkarainen, P., Suvanto, A., Hukkinen, J. & Pyyhtiä, I. (1997). Monetary policy in Finland: experiences since 1992, in *Monetary Policy in the Nordic Countries: Experiences Since 1992*, BIS, Policy Papers, no. 2, pp. 28-43

Pilbeam, K. (2013). *International Finance*, Basingstoke: Palgrave Macmillan

Rosenberg, I. & Ådahl, M. (2003). Introduction and background, in *Swedish monetary policy and EMU*, Sveriges Riksbank, pp. 5-9, Available at:
http://www.riksbank.se/Upload/Dokument_riksbank/Kat_publicerat/Broschyret/penemu_e.pdf

Rudebeck, K. & Henriksson, J. (n.d.). Växelkursen och konjunkturen: En jämförelse av svenska och finska erfarenheter, Finansdepartementet, Regeringskansliet

Suherland, P., Schröder, G., Kellenberger, J., González, F., Belka, M., Brown, G., Ferguson, N., Roubini, N., Verhofstadt, G. & Mundell, R. (2012). Europe's Next Steps, *New Perspectives Quarterly*, vol. 29, no. 3, pp. 28-41

Suni, P. & Vihriälä (2013). Euro – How Big a Difference: Finland and Sweden in Search of Macro Stability, ETLA Reports, no. 7, The Research Institute of the Finnish Economy, Available at: <https://www.etla.fi/wp-content/uploads/ETLA-Raportit-Reports-7.pdf>
[Accessed: 28 April 2015]

Suomen pankki / Finlands bank (n.d.). Växelkurspolitik, Available at:
<http://www.suomenpankki.fi/sv/rahopolitiikka/valuuttakurssipolitiikka/Pages/default.aspx>
[Accessed: 28 April 2015]

Westerlund, J. (2005). Introduktion till ekonometri, Lund: Studentlitteratur

DATA SOURCES

Eurostat. Available at: <http://ec.europa.eu/eurostat/data/database> [Accessed: 10 May 2015]

IMF. Available at: <http://www.imf.org/external/data.htm> [Accessed: 20 April 2015]

Sveriges Riksbank. Available at: <http://www.riksbank.se/sv/Rantor-och-valutakurser/>
[Accessed: 10 May 2015]

Statistics Sweden / Statistiska centralbyrån. Available at: http://www.scb.se/sv_/hitta-statistik/ [Accessed: 10 May 2015]

World Bank. Available at: <http://data.worldbank.org/> [Accessed: 20 April/9 May 2015]

APPENDIX 1: VAR MODEL SPECIFICATION

$$\begin{aligned}
 UN_t = & \gamma_a + \alpha_{a1}UN_{t-1} + \alpha_{a2}UN_{t-2} + \alpha_{a3}UN_{t-3} + \alpha_{a4}UN_{t-4} + \beta_{a1}GDP_{t-1} + \\
 & \beta_{a2}GDP_{t-2} + \beta_{a3}GDP_{t-3} + \beta_{a4}GDP_{t-4} + \theta_{a1}ER_{t-1} + \theta_{a2}ER_{t-2} + \theta_{a3}ER_{t-3} + \\
 & \theta_{a4}ER_{t-4} + \phi_{a1}CPI_{t-1} + \phi_{a2}CPI_{t-2} + \phi_{a3}CPI_{t-3} + \phi_{a4}CPI_{t-4} + e_t^{UN} \quad (A1a)
 \end{aligned}$$

$$\begin{aligned}
 GDP_t = & \gamma_b + \alpha_{b1}UN_{t-1} + \alpha_{b2}UN_{t-2} + \alpha_{b3}UN_{t-3} + \alpha_{b4}UN_{t-4} + \beta_{b1}GDP_{t-1} + \\
 & \beta_{b2}GDP_{t-2} + \beta_{b3}GDP_{t-3} + \beta_{b4}GDP_{t-4} + \theta_{b1}ER_{t-1} + \theta_{b2}ER_{t-2} + \theta_{b3}ER_{t-3} + \theta_{b4}ER_{t-4} + \\
 & \phi_{b1}CPI_{t-1} + \phi_{b2}CPI_{t-2} + \phi_{b3}CPI_{t-3} + \phi_{b4}CPI_{t-4} + e_t^{GDP} \quad (A1b)
 \end{aligned}$$

$$\begin{aligned}
 ER_t = & \gamma_c + \alpha_{c1}UN_{t-1} + \alpha_{c2}UN_{t-2} + \alpha_{c3}UN_{t-3} + \alpha_{c4}UN_{t-4} + \beta_{c1}GDP_{t-1} + \beta_{c2}GDP_{t-2} + \\
 & \beta_{c3}GDP_{t-3} + \beta_{c4}GDP_{t-4} + \theta_{c1}ER_{t-1} + \theta_{c2}ER_{t-2} + \theta_{c3}ER_{t-3} + \theta_{c4}ER_{t-4} + \phi_{c1}CPI_{t-1} + \\
 & \phi_{c2}CPI_{t-2} + \phi_{c3}CPI_{t-3} + \phi_{c4}CPI_{t-4} + e_t^{ER} \quad (A1c)
 \end{aligned}$$

$$\begin{aligned}
 CPI_t = & \gamma_d + \alpha_{d1}UN_{t-1} + \alpha_{d2}UN_{t-2} + \alpha_{d3}UN_{t-3} + \alpha_{d4}UN_{t-4} + \beta_{d1}GDP_{t-1} + \\
 & \beta_{d2}GDP_{t-2} + \beta_{d3}GDP_{t-3} + \beta_{d4}GDP_{t-4} + \theta_{d1}ER_{t-1} + \theta_{d2}ER_{t-2} + \theta_{d3}ER_{t-3} + \\
 & \theta_{d4}ER_{t-4} + \phi_{d1}CPI_{t-1} + \phi_{d2}CPI_{t-2} + \phi_{d3}CPI_{t-3} + \phi_{d4}CPI_{t-4} + e_t^{CPI} \quad (A1d)
 \end{aligned}$$

UN = logged first difference of unemployment

ER = logged first difference of exchange rate

GDP = logged first difference of GDP

CPI = logged first difference of CPI

$\gamma_a, \gamma_b, \gamma_c, \gamma_d$ = intercepts for equation A1a-A1d

α_{xy} = coefficient for UN in equation x with y number of lags

β_{xy} = coefficient for GDP in equation x with y number of lags

θ_{xy} = coefficient for ER in equation x with y number of lags

ϕ_{xy} = coefficient for CPI in equation x with y number of lags

$e_t^{UN}, e_t^{GDP}, e_t^{ER}, e_t^{CPI}$ = error terms for equation A1a-A1d

APPENDIX 2: OLS REGRESSION RESULTS

<u>Table A2: Results OLS regression</u>	
	(1)
VARIABLES	UN
GDP _{t-4}	-0.130* (0.08)
ER _{t-3}	-0.013 (0.12)
CPI _{t-3}	2.839** (1.15)
Constant	-0.010 (0.01)
Observations	59
R-squared	0.110
Standard errors in parentheses	
*** p<0.01, ** p<0.05, * p<0.1	

APPENDIX 3: VAR MODEL RESULTS

<u>Table A3: Results VAR model</u>				
	(1)	(2)	(3)	(4)
VARIABLES	UN	GDP	ER	CPI
UN _{t-1}	0.022 (0.14)	-0.080* (0.04)	0.364** (0.17)	0.017 (0.02)
UN _{t-2}	0.123 (0.14)	0.058 (0.04)	-0.365** (0.18)	0.012 (0.02)
UN _{t-3}	0.115 (0.13)	0.087** (0.04)	-0.354** (0.16)	-0.019 (0.02)
UN _{t-4}	-0.115 (0.12)	0.015 (0.04)	0.205 (0.15)	-0.014 (0.01)
GDP _{t-1}	-0.796*** (0.30)	-0.098 (0.09)	-0.078 (0.38)	0.006 (0.04)
GDP _{t-2}	-0.859*** (0.29)	0.003 (0.09)	-0.444 (0.37)	0.066* (0.04)
GDP _{t-3}	-0.866*** (0.30)	-0.080 (0.09)	-0.342 (0.37)	-0.007 (0.04)
GDP _{t-4}	-0.891*** (0.29)	0.883*** (0.09)	-0.238 (0.37)	0.024 (0.04)
ER _{t-1}	0.067 (0.11)	-0.052 (0.03)	0.579*** (0.14)	-0.039*** (0.01)
ER _{t-2}	-0.133 (0.11)	0.021 (0.03)	-0.241* (0.14)	0.026* (0.01)
ER _{t-3}	-0.093 (0.11)	-0.043 (0.03)	-0.061 (0.14)	-0.001 (0.01)
ER _{t-4}	-0.091 (0.11)	0.048 (0.03)	-0.013 (0.14)	0.006 (0.01)
CPI _{t-1}	-1.178 (1.09)	-0.636* (0.33)	1.718 (1.38)	0.283** (0.14)
CPI _{t-2}	0.865 (1.15)	-0.461 (0.35)	2.413* (1.45)	-0.039 (0.15)
CPI _{t-3}	1.860 (1.18)	0.177 (0.36)	-4.288*** (1.49)	0.268* (0.15)
CPI _{t-4}	1.580 (1.19)	-1.318*** (0.36)	-0.150 (1.50)	-0.308** (0.15)
Constant	0.010 (0.01)	0.009*** (0.00)	0.008 (0.01)	0.002 (0.00)
Observations	59	59	59	59

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1