Credit expansion – A study of the relation between bank lending and economic growth in Sweden
Abstract

A non-Granger causality test between bank lending and different economic performance measures represented by the real economy, real assets and the financial economy is conducted on Sweden. To capture for the effects of structural changes in the economy, a long period is analyzed (142 years) and two types of tests are made, one for the short-run and one for the long-run. The main findings are that the effect of bank lending on the measures has changed over time and that real asset prices and stock prices have surged since the financial crisis during the early 1990’s. This combined with expansionary monetary policy conducted by the central bank raises questions regarding the financial stability in Sweden. Similar studies performed on other countries show that credit booms are important in shaping business cycles and also the danger of too high leveraging among households is stressed.

Keywords: Bank lending, Economic growth, Financial stability, Granger causality test
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1. Introduction

The Swedish central bank, the Riksbank, is an inflation targeting central bank that uses the repo-rate to control the inflation and support sustainable economic growth (The Riksbank, 2015a). On February 18th 2015 the Riksbank confirmed that it would continue the path of conducting expansionary monetary policy. They announced a lowering of the repo-rate into negative territory (-0.1%), along with a government bond purchasing program of 10 billion SEK (The Riksbank, 2015b). The argument behind this action is to increase the rate of inflation, but what it also implies is that the credit expansion will be continued with possible severe consequences for the financial stability. An overheated real estate- and stock market in Sweden are considered to be two potential issues with the policy conducted since it creates floods of credit to firms and households (Heikensten, 2014). The recent financial crisis in the U.S. is a fresh example of what too high levels of debt might lead to.

The positive side of credit is that it allows for investments in new technology and innovations which is essential in the aspect of consistent economic growth. Many economists argue that credit is a fundamental cornerstone in the financial system, as long as it is issued for productive purposes (Hansson and Jonung, 1997; Levine and Zervos, 1998 and De Gregorio and Guidotti, 1995). The two different aspects of credit invites to a discussion whether it has positive or negative effects on economic growth and how the causality runs between the variables. The discussion is interesting since economic growth also creates demand for more credit (N.G Andersson et al., 2013).

More specifically, two hypotheses will be discussed in the thesis. The first is that credit affects different economic measures of performance differently. The measures chosen are the real economy, real assets and financial assets and these will be represented by different variables that will be described more in detail later. The second hypothesis is that the relationship between bank lending and the variables has changed over time, along with overall structural changes in the economy.

The existing literature argues that both ways of causation between credit and economic growth is possible, which gives reason to more thoroughly study the matter. The volume of credit is growing and becoming a more important source for financing in Sweden,
further motivating an investigation about the risks and consequences of the present financial climate. Economists today seeks to stress the problem of excessive credit growth; despite this no study with the aim of addressing this problem has been conducted on Sweden.

We begin by going through the existing literature on the role of credit in our economic system and what part it plays in financial crises. Further, some emphasis is put on the historical perspective of credit and issues related to financial regulation and deregulation. After that, the Swedish case is presented including the history of the banking sector and how credit has affected the economic system. It is revealed that bank's current business models seems to rely more on loans connected to real estate rather than traditional productive investments, opening up for a discussion regarding financial stability.

After the theory is presented and the historical relationship is laid out, the data and the econometric method used are explained. The data sample collected for this thesis starts 1870 and ends year 2012, with a few exceptions. A non-Granger causality test is then performed in order to examine the short- and long-run relationship between bank lending and different measures of economic growth in Sweden.

Finally the results are presented, analyzed and followed by some concluding remarks. The results indicate non-robustness between bank lending and the other variables analyzed and that the causality changes over time. The results were not strong enough to confirm the hypothesis that bank lending affects the real economy, real assets and financial assets differently. The structure of the economy is very complex and has changed significantly over the years examined, which is one of the explanations to the results obtained.
2. Bank Lending and Economic Growth

The relationship between credit and economic growth is currently widely debated. Jordá et al. (2015), Aikman et al. (2013) and Reinhart and Rogoff (2010) all stress the risks with credit booms and the role it plays in financial turmoil. A combination of historically low interest rates and increased bank lending in Sweden has triggered a debate on the role of credit in the financial system (Jonung, 2015). Since studies of the relationship between credit growth and economic growth are missing for this specific country, a thesis aimed at filling that hole seems timely.

One limitation in this thesis is that it will not deal with all kinds of credit but rather focus on one fragment, namely bank lending, in order to avoid the problem of numerous changes in definitions that has happened during the financial sector's development. The upcoming segment aims at describing which role bank lending has in our economic system, how it affects the three variables chosen to measure economic growth, the implications it has for financial crises and lastly how the purpose of bank lending has changed over the years of interest. Two hypotheses will be formulated and later on tested and evaluated.

2.1 The Role of Credit

The first step in order to determine what role bank lending plays in the economic system is to see how it affects different sectors of the economy. Theory suggests that depending on which sector that is subject to the lending, it might either promote economic growth or increase the risk of a credit boom and thereby impose financial instability. The first hypothesis that the thesis will be built on is that the effect of bank lending is different on real economic activity (represented by GDP per employee per year, the capital stock and total factor productivity), real assets (represented by prices on residential property) and financial assets (represented by the stock market) in Sweden. A more detailed explanation of the variables will be presented in the data section. The idea of choosing these particular representations is that they all have the property of measuring economic performance in different ways. Furthermore, it seems to be an appropriate selection looking at previous studies (Bordo and Haubrich, 2009). By separating the variables from each other, we may isolate the effect that bank lending has on the different sectors.
Starting with the real economy, King and Levine (1993) argues that higher levels of financial development positively affect growth rates, capital accumulation and factor productivity. It needs to be stated that credit is only one component among many when measuring financial development. It is stressed also that the result only holds when the financial system allocates credit to the private sector, and not to the public sector. Further, this view is supported by De Gregorio and Guidotti (1995) who concluded that bank credit to the private sector is positively correlated with GDP growth and that the efficiency rather than the amount of credit is the most important factor behind this result. Contrary to these scholars, other papers that examine the relation between bank lending and GDP growth show that when this ratio increases, so does the risk of banking crises and with them a lower GDP growth (Aikman et al., 2013 and Jordá et al., 2014).

Moving on to the relationship between bank lending and real asset prices, it is well-known that increased lending for investments linked to real estate is a significant trend. The matter is illustrated well by Mian and Sufi (2014) who provided evidence that it was the lending boom in the U.S. during 2000-2006 that fueled the house-price growth in the same period, and not vice-versa. If the same way of causality can be found for Sweden, it would be an important empirical result since there are currently discrepancies in the debate whether it is house-prices that cause more bank lending or the other way around.

As concluded in Jonung (2015), we have seen a global financial revolution during the past 20 years. This has led to overwhelming structural changes in the economy and thereby it is motivated to further investigate the financial sector. The financial markets react quickly to new information available and hence adjust faster to shocks than the real economy due to less stickiness (Carvalho, 2006). This difference between the real economy and financial assets gives substance to the hypothesis stated earlier. The main idea is that some prices are stickier than others by nature, resulting in that if bank lending is a more fundamental driver of our economy today, it should affect the financial assets faster than the prices of residential property and the representations of real economic activity.
Recent studies put a lot of emphasis on the fact that excessive amounts of credit often leads to financial crises, but already in 1939, economist Joseph Schumpeter pointed out the danger of that too reckless lending would help trigger these crises (Kuznets, 1940). Large amounts of bank lending going in the direction of real assets is a current problem and stressed by Jordà et al. (2015). The authors show that a mortgage credit boom in the post-war period unambiguously makes financial and normal recessions worse. This was not the case in the pre-war period, according to their work. The distinction between normal and financial recessions is that the latter is characterized by larger flows in credit, which leads to that the recessions tends to last longer and to be more severe than normal recessions (Aikman et al., 2013 and Claessens et al., 2008). How the credit boom is structured (i.e. which sector that is subject to the credit) also has implications for the shape of the business cycle (Jordá et al., 2014). Early research on the subject of business cycles shows that the rate of change in the money supply has a positive relation with the movement of real economic activity and is also a leading indicator over the business cycle (Friedman and J. Schwartz, 1963). Hence, theory predicts that credit expansions can both work as a forecast tool of the swings in the economy and reveal if the next economic recession is going to have a financial or a normal character.

The changing behavior of financial institutions is another factor contributing to higher leveraging in the economy. The traditional view of banks businesses is that they provided multiple kinds of long-term credit to firms, households, governments and other institutions and earned interest payments for those services (Hansson and Jonung, 1997 and Thunholm, 1962). With respect to the current financial climate where the interest rates are exceptionally low, new ways of making profit is discovered. Jordá et al. (2015) argues that one structural change in banks business models is that they are more focused on short-term borrowing from the public and capital markets. This implies that in the pursuit of larger market shares and profit, the risk-taking also increases. Further, according to Aikman et al. (2013), one of the critical mechanisms behind the aggregate credit build-up is that greater individual risk-taking among financial institutions is encouraged by strategic complementarities. Put in other words; if one institution increases their risk taking, then others will either mimic that behavior or lose in competitiveness.
2.2 Historic Perspective

Having described the basic concepts about credit and its relationship to economic growth, it is time to introduce the next hypothesis. This relates to the constantly changing nature of our economy. Knowing that the economy has changed significantly over the years, we should be able to identify that the causality between bank lending and the different variables is changing over time. If this is the case we might derive these changes to certain policy regimes that are significant by either periods of economic growth or recessions. The data-sample will be divided into smaller periods in the analysis to address this hypothesis.

By observing the advanced economies in the world, we can conclude that leveraging has escalated since World War II (WW2). The ratio of bank lending to GDP was four times higher right before the global financial crises 2008 compared to 1945 (Moritz and Taylor, 2012). One reason is that the central banks have responded with more aggressive monetary policy during times of financial distress. The positive side of those interventions is a more secure banking system in the sense that central banks act as lenders of last resort, which creates more confidence in the economic system. The other side of the coin is that more credit flows into the economy, encouraging a huge expansion of leverage (Schularick and Taylor, 2012).

Policymakers and economists have historically supported both financial regulation and deregulation, depending on the current state of the economy. With respect to the macroeconomic stability, financial regulations are imposed when the market needs to be controlled. One example of regulation is capital restrictions that forces banks to internalize losses, which decreases the risk-taking among them and mitigates moral hazard (Hanson et al., 2010). Financial deregulation has important economic benefits since it allows for the private sector to function without supervision and also reduces transaction costs (Goodfriend and King, 1988). As a consequence of the fast development within the information technology sector, we have for the past three decades witnessed tendencies toward financial deregulation.

Another identifiable trend is that a larger part of the lending is going in the direction of households instead of firms (Beck et al., 2012). Whether this is a positive or negative
development for economic growth is subject to debate, even though a major part of the scholars argue that the negative consequences outweigh the positive ones. Jappelli and Pagano (1994) concludes that not letting households borrow sufficiently reduces the savings rate which in turn hinder economic growth. Further, De Gregorio (1996) states that increased credit to households have a positive effect on enrolment for secondary school. Pereira (2006) has the opposite opinion. He argues that when firms get access to more credit it contributes to higher growth due to more investments, while consumers will use their credit to consumption instead. Furthermore, a study made by Finocchario et al. (2011) shows that during the last 15 years, Swedish households have doubled their debt to income ratio, where mortgage is the major part of this debt. The risk of too much leveraging might lead to financial concern due to increased household’s exposure to macroeconomic fluctuations, but also intensifying the effects of crises. In the same study, the authors conclude that it is difficult to point at a certain reason to why the leveraging has grown to such a large extent. Economic theory gives suggestions such as increased expected future income, low real interest rates and financial development as motives to the leveraging (ibid).

Financialization is a modern word for describing a country which finance share of income is rising, meaning increasing financial claims on bank’s balance sheets and the accumulation of household debt (Jordá et al., 2014). These characteristics are applicable to Sweden as well as many other advanced economies. One of the reasons is that technological inventions have allowed the financial system to become more efficient (ibid). The deregulation process is also contributing, as mentioned before. Analyzing the relationship between bank lending and the financial assets over different time periods again seems interesting, in order to see how the financialization has affected the economy.

After this general discussion regarding credit and economic growth, we will move on to more specifically analyze Sweden. A historical background on the banking sector and the economic development will be provided. By analyzing a long time series for Sweden, we will get a broader picture of the possible threats and opportunities related to a larger and more complex financial sector which is characterized by more credit. The period will include different kind of policy regimes and primary drivers of economic growth, as well as periods of financial regulation and deregulation.
3. History of Sweden’s Banking Sector

During the last 140 years the society of Sweden has experienced extensive structural changes. Looking specifically at the banking sector, both periods of regulation and tighter credit control has prevailed as well as deregulation and credit expansion. In the second half of the 19th century, a large number of commercial banks were founded which contributed to that the financial sector grew. The strength of these newly founded banks was that they established a strong connection to the industry and hence specialized on corporate finance. They had a vital role in financing the railway system and contributed to the industrialization process in Sweden (Hansson and Lindgren, 1989). The commercial banks and the industry helped each other to expand their respective business by using the synergy effects that were present.

While the ties to the industry characterized the commercial banks, the savings banks had their counterpart in the households and local businesses. The quick development of the farming techniques can partly be credited to the savings banks lending to that sector. The savings banks were greater in numbers than the commercial banks, but they were also smaller in its operations (Larsson, 1993). The business structure of the savings banks was focused on the long term rather than the short term. They were also different from the commercial banks in the sense that they had more concentrated ownership.

In the beginning of the 20th century, the banking sector was forced under tighter regulations. A new law that was implemented 1904 gave the Riksbank exclusive right to emit bills in Sweden. This was something that, until this point, the commercial banks also were allowed to do. In 1907, The Bank Inspection Board took over the supervision of the commercial banks with the primary purpose of restricting the growth of the commercial banks business by limiting the number of future startups (SCB, 2015c). Beside the Bank Inspection Board, the Law of Banking also ensured that the banks business was sound and did not promote excessive risk taking (Thunholm, 1962). This law was introduced as early as 1846, but was extended gradually. The combination of tighter regulations on banks and the start of World War I (WW1) marked a period of less bank lending and overall slower economic activity.
The two World Wars affected the banking sector quite differently. During the 1920’s, many banks were forced to merge to be able to commit to their obligations, as the economic environment was characterized by deflation. Another important incentive that drove the concentration of banks was the cost advantage of fewer and larger banks (Thunholm, 1962). In the interwar period the financial markets were volatile and the government of Sweden responded by showing an increasing interest in controlling the financial market (Larsson, 1993). In the aftermaths of WW2, Sweden experienced an economic boom and the banking sector was once again regulated via higher reserve requirements, maximum levels of lending and a direct control of the interest rates (Hansson and Jonung, 1997).

After Sweden joined the Bretton Woods-system year 1951, the economy flourished and few economic crises took place over the next decades. The regulations that were introduced during the 50’s seems to have had desired results, even though the inflation was relatively high until the 90’s. Two distinctive trends could be seen at this point of time, namely that the banks shifted focus from the industry to the housing sector and an enhanced international activity, though the capital markets still were very restricted (Hansson and Lindgren, 1989). Figure 1 presents the mortgage share of total bank lending between 1870 and 1968. Unfortunately this data was presented only up until this date, but research from Jordá et al. (2014) shows that the increasing trend is intact. Between 1960 and 2010 the total bank lending in Sweden increased by a factor of 0.8, where 0.5 of these were mortgage lending and 0.3 were non-mortgage lending.
From the 1950’s and onwards the competition among the financial institutions got tougher. Mergers happened more frequently which resulted in a few, very powerful, banks. As of today, the Swedish banking system is highly concentrated to the four largest banks; Handelsbanken, Nordea, SEB and Swedbank whom together stands for roughly 75 % of both borrowing and lending, meaning they have a fundamental role in the function of the financial system (The Riksbank, 2014).

A process of deregulation of the commercial banks and the capital markets started approximately 1985, which meant that the banks could widen their business models and find more opportunities to increase their profits. The Riksbank did no longer control the maximum amounts of lending, which caused the demand and supply of credit to rise steeply (Jonung, 2000). This rapid increasing financial activity was soon replaced by a more negative environment for the banks, when large capital outflows and high interest rates, among other things, caused a banking crisis in beginning of the 90’s. The crisis peaked when Sweden was forced to leave the fixed exchange rate regime, resulting in severe consequences like high rates of unemployment, a price fall on the real estate
market, lower industry output and increased government deficit (ibid). From 1992 and onwards, Sweden has applied a floating exchange rate system.

Magnusson (2000) called the structural change that took place after the crisis by “the third industrial revolution” and stated that the core in this revolution was the new information- and communication technology available, further increased globalization and better efficiency in form of increased factor productivity. This revolution was not something unique for Sweden, but such a significant event like a banking crisis seems to have become a defining moment in the history. Furthermore, The Riksbank got more responsibility for the financial stability instead of the government after the deregulation.

One part of the change was that The Riksbank decided to establish an inflation target at 2 per cent annually in 1993 (The Riksbank, 1993). During this regime the financial stability was reckoned to be solid and the real economy in Sweden performed well until the crisis 2008. One reason for this fine period of economic growth was credited to the stable monetary policy conducted and the general understanding was that there were efficient ways and tools to encounter financial crises (Ingves, 2013). With result in hand, the recent crisis showed us that the tools (mainly the repo-rate) were not as good as predicted, or rather that the tools were insufficient to adapt to the changes in the financial system. The Swedish economist Lars Heikensten, former governor of the Riksbank and member of the Swedish Finance Ministry, doubts the capability of the Riksbank to pursue the primary goal of low and stable inflation and at the same time make sure that we have a secure and stable payment system, i.e. work for financial stability (Heikensten, 2014). The present Governor of the Riksbank, Stefan Ingves, confirms that he is worried about the current situation. He states that the greatest fear right now is the accumulation of debt with simultaneous rapid price increases on real estate that is ongoing. The severe consequences from this cannot be neglected, with the U.S. housing market as a recent example (Ingves, 2013). The below graph presents a price index for residential property in Sweden, indicating that the prices grew roughly at the same pace as the average price level until 1990, whereas for the latest 25 years the prices have spiked. The two series has been normalized to 100 for 1875 and for 1957.
The implications of rapid increases in residential property prices and credit have been stressed by Jordá et al. (2014). They claim that growing levels of mortgages creates financial fragility and problems for the macroeconomic policies. To the contrary, Finocchiaro et al. (2011) argues that it has historically been difficult to predict asset price bubbles and that other factors have strong influence of the house-prices in Sweden, for example a strong regulated market for residential property, limited market for renting and the allocation of debt. Furthermore, there is evidence that the price increases of residential property in Sweden mainly emerges from the biggest cities (Englund, 2011), hence the whole picture will not be included here since this thesis is limited to the prices in Stockholm and Gothenburg. Another important factor that drives the prices upwards is that the demand for housing exceeds the supply in these cities. In a report by Englén et al. (2014) it is concluded that the immigration and the high birth rate are the reasons for the growing population in the capitol.
To justify a continued examination regarding bank lending and economic growth in Sweden, the below figure illustrates the ratio between bank lending and total GDP from 1870 to 2014, indicating an increasing trend over the series.

Figure 3

**Ratio Between Total Bank Lending and GDP**

![Graph showing ratio between total bank lending and GDP from 1870 to 2014](image)

Source: See Appendix A and B

It is now motivated to perform the statistical tests to find an answer to the two hypotheses stated in earlier chapter. Next section will firstly describe and motivate the data and the econometric model followed by an analytical part where the results will be presented.
4. Empirical Analysis

4.1 Data
Creating a long and consistent time series of bank lending in Sweden is one of the contributions of this thesis. It was time-consuming to find data from various sources and adjust to changes in definitions over the sample period. Furthermore, a major part of SCB’s data set was recently digitalized and therefore not many similar studies have had access to this material so far (SCB, 2015a). Structural changes in both the banking sector, in terms of mergers and new startups, and bank’s balance sheets results in difficulties of accurate measuring total bank lending. The number of participants on the financial markets has also grown extensively during the sample period. Even though banks still are the most important and biggest ones when it comes to credit, new institutions as investment banks, pension funds, insurance companies and mutual funds now also play substantial roles (IMF, 2015). All the commercial banks, savings banks and co-operative banks are included in the measure and other financial intermediaries and the central bank are excluded. The data on bank lending is used from the official bureau of statistics in Sweden (SCB, 2015d) and from Bank of International Settlements (BIS, 2015). An inflation-index created by Edvinsson and Söderberg (2010) and SCB (2015b) is used to convert all values from nominal to real ones. For more details regarding the data on bank lending, see Appendix A.

As for real economic activity, the following variables were collected: Swedish data of labor productivity (represented by GDP per employee per year), capital stock, total factor productivity (TFP) and GDP per capita in the U.S. as a control variable. Other papers that measures real economic activity had similar choices of variables (N.G Andersson et al., 2013 and Bordo and Haubrich, 2009). However, given that this thesis has a long time-span, the measurement of GDP per employee per year and TFP are different from those that examine shorter time periods. Choosing GDP per employee per year is a more reasonable measurement of economic activity than GDP per capita, as it captures for at least two important facts. These are that people worked more hours per day in the past and that women gradually have been integrated in the workforce. As for TFP, Bengtsson (2012) argues that the labor’s share of income varies more than just over the business cycle and that it would be inappropriate to use the same number over
the whole series. The argument is that the production of goods and services is more capital intensive rather than labor intensive today. Using a variable measure of labor’s share of income will be more justifiable than having a constant value. Further details on this data are available in Appendix B.

The real assets are represented by price index for residential property in Stockholm and Gothenburg and a house price index for the U.S. as a control variable. We are currently seeing fast escalation in these indices in Sweden, especially in the major cities. According to the common index for housing, HOXSWE, the index has doubled since the measurement began in 2005 (Nasdaq Nordic, 2015).

However, due to this short period of time that HOXSWE provides, data from Bohlin (2014) and Blöndal et al. (2014) are used, which stretches from 1875 to 2012. The index is constructed from information on sale-prices as well as tax assessment values and the method is called the “sales price ratio method”. As is pointed out by the authors, measuring residential property index is rather complicated and the specification is very different compared to stock indices. One example is that the description of securities does not change over time, while residential properties are heterogeneous and unique objects with different quality and they are also traded more infrequently.

The last set of data is an annual stock index in Sweden as a representation for the financial assets and an index for Standard & Poors (S&P) as a control variable. Waldenström (2014) provides the entire Swedish series and Williamson (2015) the one for S&P. There are two main reasons to include financial assets in the model; the first one is that a lot of credit naturally moves in the direction of financial assets and secondly financial assets are less sticky than the real economy and real assets, making it interesting to see how this might impact the results. More details on the data of real and financial assets can be found in Appendix C.

4.2 Motivation of Sample Periods
To examine whether the results are robust or if the interpretation is different depending on which period is analyzed, the data is divided into sub-samples. This will provide a hint if the relation between the variables has changed during different policy regimes in
Sweden. Selecting the subsamples will be based on historic events that had significant effects on the economy and to some extent the availability of variables. For example, Shiller’s index of housing data in the U.S. did not start until 1891 and in 1957 an average of house- and apartment prices have been used, making it more reasonable to start at that specific year rather than 1947 (also described in Appendix C).

The start of WW1 combined with tighter regulations of the banking sector marks the first period. Secondly, the inter-war period is analyzed. The end of WW2 brought new economic structures including greater importance of active macroeconomic policies, additional bank supervision and a more explicit role of the central banks as “lenders of last resorts” (Schularick and M.Taylor, 2012) and hence marks the beginning of the third period. Lastly, the financial deregulation in Sweden during the 1980’s will be the last break of the series. The table below lists the sub-samples used for the different variables.

<table>
<thead>
<tr>
<th>Regression of</th>
<th>Period 1</th>
<th>Period 2</th>
<th>Period 3</th>
<th>Period 4</th>
</tr>
</thead>
</table>

Furthermore, regressions on the entire sample period are made as well. In that case, dummies have been included for 1914-1918 and 1939-1945 to avoid the large effects that the two World Wars brought.

The selection of time periods has support in the literature. Moritz and M. Taylor (2012) made a similar study for advanced economies and found a stable relationship between economic growth and volume of credit between 1870 and 1944 except from the Great Depression. During the post-war period however, the credit grew more rapidly once the recovery was over, especially after the financial deregulation.
4.3 The Model

The data-set on the four variables are used to set up a VAR-model and test for non-Granger Causality. It is important to emphasize that the existence of unit roots or co-integrating relations themselves are not the goal of this econometrical model, but rather to look at the causality between the variables (Toda and Yamamoto, 1995). The non-Granger causality test shows whether one time series variable's future values are better predicted with the history of only that variable itself, or if more explanatory power can be obtained when using another variable's history also. In our case, we are interested in the causality between bank lending and the other variables and whether the relationships have changed over the sub-samples.

Totally 15 estimations were made for tests in levels, four for each period of real economic activity, real assets and financial assets. In addition, one test was made for the whole sample period, except for the excluded periods of war. The same procedure was repeated for testing the short-run effect, by using the first difference.

4.3.1 Test in First Difference

A VAR-model is estimated to test for the short-run associations among the variables. The first difference is used in the first three tests.

\[ BL_t = a_0 + a_1 BL_{t-1} + \cdots + a_2 BL_{t-m} + a_3 RE_{t-m} + a_4 X_{t-m} + \varepsilon_t \]  
(1)

\[ BL_t = a_0 + a_1 BL_{t-1} + \cdots + a_2 BL_{t-m} + a_3 RA_{t-m} + a_4 X_{t-m} + \varepsilon_t \]  
(2)

\[ BL_t = a_0 + a_1 BL_{t-1} + \cdots + a_2 BL_{t-m} + a_3 FE_{t-m} + a_4 X_{t-m} + \varepsilon_t \]  
(3)

\( BL \) represents bank lending, \( RE \) is real economic activity, \( RA \) is real assets and \( FA \) is financial assets. \( X \) is the control variable and is represented by U.S. data on GDP per capita (1), real house price index (2) and real stock index (3), to see if bank lending could be affected by something else than the variables chosen. \( \varepsilon_t \) represents the error term. To have U.S. data as a control for misspecification of our model is reasonable since we assume that the U.S. economy affects the Swedish, but the causality should not be true for the reverse case. If we do not find significance for our control variable in a particular model, then the results obtained are stronger.
If the coefficient $a$ equals 0, then the null-hypothesis of non-Granger causality is rejected and hence the explanatory variable does help to explain the history of the dependent variable. Lag length of my non-Granger causality is set to 2 since we are dealing with annual data. Tests were performed with both one and two lags and the results were roughly the same.

### 4.3.2 Test in Levels

Toda and Yamamoto (1995) provide a technique to perform a non-Granger causality test for long-run associations. The equations are rather similar to the previous section, but one additional lag has been included to control for non-stationarity. The strength of this technique is that we do not have to mind the order of integration or the co-integration when we are running the regressions.

\[
BL_t = a_0 + a_1 BL_{t-1} + \cdots + a_2 BL_{t-m} + a_2 BL_{t-m+1} + a_3 RE_{t-m} + a_3 RE_{t-m+1} + a_4 X_{t-m} + a_4 X_{t-m+1} + \epsilon_t \tag{4}
\]

\[
BL_t = a_0 + a_1 BL_{t-1} + \cdots + a_2 BL_{t-m} + a_2 BL_{t-m+1} + a_3 RA_{t-m} + a_3 RA_{t-m+1} + a_4 X_{t-m} + a_4 X_{t-m+1} + \epsilon_t \tag{5}
\]

\[
BL_t = a_0 + a_1 BL_{t-1} + \cdots + a_2 BL_{t-m} + a_2 BL_{t-m+1} + a_3 FE_{t-m} + a_3 FE_{t-m+1} + a_4 X_{t-m} + a_4 X_{t-m+1} + \epsilon_t \tag{6}
\]

The following variables are linearized by taking logarithms of the initial values: Bank loans, GDP per employee per hour, U.S. GDP per capita, capital stock, real price stock index in Sweden and Average S&P common stock index. This is to avoid exponentially growing series.
5. Results and Discussion

This section aims at evaluating the hypotheses by presenting and analyzing the results from the tests. Testing the first differences reveals the short-run causality while the tests in levels are related to the long-run. Finally, a further discussion is held regarding some problems related to the data and the model.

5.1 Short-Run

Tests for non-Granger causality between bank lending and the real economy lack significant results over the short-run. A more important result is that real assets Granger-causes bank lending in the fourth period and that the reverse is not true, indicating a unidirectional relationship. It suggests that we have a situation where prices on residential property are driving bank lending to some extent in Sweden. This is opposite of what Mian and Sufi (2014) concluded, which was that the causality ran the other way around during the credit boom in the U.S. in the early 2000’s. The control variable for the regression, home prices in the U.S., is insignificant which provides strength to this result.

Table 2: Results of the non-Granger causality test for first difference.

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Granger causality between BL and RE</td>
<td>-</td>
<td>BL(\rightarrow)RE*!</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Granger causality between BL and RA</td>
<td>-</td>
<td>BL(\rightarrow)RA*!</td>
<td>-</td>
<td>BL(\rightarrow)RA*</td>
<td>-</td>
</tr>
<tr>
<td>Granger causality between BL and FA</td>
<td>-</td>
<td>BL(\leftrightarrow)FE**</td>
<td>BL(\rightarrow)FE*!</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Note: “*” and “**” Denotes significance at a 5% level and at a 10% level respectively. “\(\leftrightarrow\)” denotes causality both ways, “\(\rightarrow\)” one way and “-” no causality at all. “!” indicates that the control variable is significant.

Source: See Data-section

It is interesting that this result emerges in a period that was characterized by increased leveraging among the households. This does somewhat identify the source of the problem with increased bank lending; the current house- and apartment prices in the biggest cities forces citizens to borrow more to afford living. With this result in mind,
the development of the prices on the housing market may be something that the authorities should put more emphasis on. The Riksbank state that the most crucial threat against the financial stability in Sweden is the amount of debt accumulated by the households, where a major part consists of mortgages (The Riksbank, 2015c).

This creates a conflict for the Riksbank and highlights the consequences of monetary policy. Their mean of controlling the inflation is through the short term interest rate. Suppose they want to lower the interest rate in order to boost inflation and in turn the demand for goods and services. What this also implicates is an increasing demand for credit, since the consumers gets more utility of borrowing money than saving due to the low interest rates that prevails. If the households expect the interest rate to remain low in combination with an economy that grows over a longer period, they will borrow more money to invest even more in housing. Gan (2010) suggest that the major part of household's wealth comes from houses rather than consumption. This indicates that the attempt of the Riksbank to boost the inflation in fact more likely feeds the real estate market. This spiral will inevitably create an asset bubble, which upon bursting will affect the whole economy severely, having in mind what happened in the U.S. during 2008. This summarizes the challenge for the Riksbank; it is difficult to fight low inflation and simultaneously control the housing prices when the interest rates are at these low levels.

From reading Table 2 we can see that the inter-war period provides significance for all the estimations in the short-run, which is something that has to be interpreted with care. It is not very likely that the model perfectly describes the relationship between bank lending and the other variables. In addition to this, the number of observations is too few to draw any meaningful conclusions during this period. In period three bank lending is Granger causing financial assets, but the control variable is also significant for this regression.

Due to the lack of results in the short-run it is hard to draw any further conclusions and answer the initial state hypotheses. In order to investigate the matter in more detail, we will move on to the long-run.
5.2 Long-Run

The results for the long-run tests are presented in Table 3 below.

Table 3: Results of the non-Granger causality test for level data.

<table>
<thead>
<tr>
<th>Granger causality</th>
<th>Period 1</th>
<th>Period 2</th>
<th>Period 3</th>
<th>Period 4</th>
<th>Whole sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Granger causality between BL and RE</td>
<td>-</td>
<td>BL→RE*!</td>
<td>BL→RE**</td>
<td>BL→RE*</td>
<td>BL→RE*</td>
</tr>
<tr>
<td>Granger causality between BL and RA</td>
<td>BL→RA*</td>
<td>BL→RA*!</td>
<td>BL→RA*</td>
<td>BL→RA**</td>
<td>-</td>
</tr>
<tr>
<td>Granger causality between BL and FE</td>
<td>-</td>
<td>BL→FE*!</td>
<td>BL→FE*!</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Note: “**” and “***” Denotes significance at a 5% level and at a 10% level respectively. “←→” denotes causality both ways, “←” one way and “-” no causality at all. “!” indicates that the control variable is significant.

Source: See Data-section

The Granger causality tests between bank lending and the real economy provides somewhat ambiguous and non-robust results. In the third period and for the whole sample, the history of bank lending can help predict the future values of the real economy, but the opposite is true during the fourth period. What is worth mentioning is that the fourth period only had 22 observations compared to the third period and the whole sample, which had 36 and 128 observations respectively. Thus, more credibility is given to the stronger results where more observations are included. To some extent, this does confirm the second hypothesis, that the effect of bank lending has changed over time and that the deregulation in the 1980’s coincides with this result. Period 2 was also characterized by deregulation and even though the control variable is significant for all tests in this period, it confirms the causality that occurred in the fourth period.

The regression between bank lending and the real economy is the only full sample test that provides significance, both for the short and the long-run and it is also significant at a 5 % level. A closer look at this result tells us that it is the factor productivity that is Granger-caused by bank lending in a unidirectional way. What this implies is that when larger amounts of credit are given from banks to firms, the production of goods and
services has become more effective through investments in technology and human capital. We did have the same causality in the third period as for the whole sample and Sweden during that period was characterized by a strong industry that occupied a large part of the workforce. It follows quite naturally that this outcome emerges in the long-run and not in the short-run tests, because investments in the production takes time before it can yield any improvement. Organizations, capital, knowledge and other inputs in the production process have to be rearranged in order to adapt to new and more efficient technology (Magnusson, 2000).

To further relate this to theory, Friedman and J. Schwartz (1963) pointed out that credit booms are a leading indicator over the real economy, which seems to be true for Sweden during a major part of the 2000th century. Prior to the financial crisis in the early 1990’s, bank lending was a good predictor of both the real economy and real assets. In the financial climate that prevailed during the third period, consumers and firms had few incentives to save money due to the high rates of inflation. Figure 4 depicts the inflation rate over the sample period.

![Figure 4](image-url)

**Rate of Inflation %**


The situation promoted borrowing and in combination with strong capital controls imposed by the government, large amounts of credit were held within the borders. When suddenly the capital controls where released and credit was allowed to float freely, the fixed exchange rate regime broke down and a financial crisis was triggered.
Moving on to the next result we can see that bank lending is Granger-causing house-prices in both Stockholm and Gothenburg during the third period and that the control variable is significant for Stockholm. The causality between bank lending and real assets thereby seems to be similar to the relationship between bank lending and the real economy, which contradicts the hypothesis that bank lending affects the variables differently. Hansson and Lindgren (1989) identified that the commercial banks shifted focus from investments in the industry to the housing market around the 1950's. The timing coincides with the result of the estimation made, that bank lending seems to have been a driving factor for the real assets in Stockholm and Gothenburg. The result in the fourth period is contradictory to the one in the third period, but only at a 10 % significance level. Still it indicates that we have the same result in the fourth period for both the short-run and the long-run for real assets.

5.3 Data Issues
The first thing to notice is that for some of the estimations, the different representations of the variables seem to explain each other. For example, GDP per employee per year explains the future values of factor productivity in the fourth period quite well. Both belonging to the group of real economy, it means that one explanatory variable Granger-causes another. A similar result is found for the asset prices in Stockholm and Gothenburg for some periods and the correlation between those two measures is high.

In addition to this, the results are more significant for the long-run and later periods compared to the short-run and earlier periods. It is reasonable to assume that the theories and choices of data better fits the economic environment of today than in the beginning of the sample. As the recent history of Sweden has told us, the country has gone through several structural changes in recent times that have affected the economy. This means that the purpose of bank lending is different today and confirms our expectation regarding the second hypothesis; the effect of bank lending has changed over time. Significant results in the first period are missing, except from that the real asset prices in Stockholm were Granger-caused by bank lending in the long-run test. If we would have got more interpretable results in the first period, we could have used these to really compare to later periods and achieve a stronger confirmation of the hypothesis.
The first hypothesis relates to the effects of credit on the different economic variables. For the short term, no results indicate that bank lending has affected the variables differently over the same estimation window. For the long term, both period three and four showed similar ways of causation for the estimations. Bank lending was a good predictor of the economy in the third period and vice versa was true for the fourth period (except for financial assets in the latter case).

Further, it can be argued that the sample periods chosen are too small. Especially period two and four ended up with very few observations, below 30 which is a critical level. The alternative was to choose fewer time periods to get rid of this problem but in that case, it would be harder to answer the question at hand and the tests would be more similar to the one conducted on the whole sample. The goal was to determine structural shifts that could work as natural motivations for the sample periods chosen. In addition to this, another weakness with this econometric technique is that the non-Granger causality test is sensitive to the specification of the model. If relevant variables are excluded from the model and hence not accounted for, then the empirical evidence is fragile (Alimi and Ofonyelu, 2013). The lack of result in the first period could be a sign of misspecification.

We did not find supporting evidence to the theory about price stickiness, which could be explained by the lack of results when testing the relationship between bank lending and financial assets. Financial assets were expected to be affected faster by changes in bank lending after a structural change, for example a period of deregulation, than the real assets and the real economy. The few significant results that were observed are weak due to that the control variable was significant as well. It could be that the stock market is not representing financial assets well enough and that additional variables would have solved this problem by indicating some sort of causing relationship. Anyhow, the ongoing financialization is still relevant to discuss in the light of the future economic growth in Sweden. It gives many possibilities to find financing abroad when investments are about to be made, but there are also dangers with the high transparency and globalization. Giannetti (2014) stresses one negative fact, which is that both investors and banks today are affected by the “flight home” effect, which means that in times of domestic financial distress, they generally cut of activity abroad to decrease risks and instead move these funds to domestic markets. The consequence is that
financial shocks and credit cycles are transmitted from the original country to the international markets more than what would be necessary.

6. Concluding Remarks

Despite the fact that the results from the non-Granger causality tests are quite insignificant, we can still draw some meaningful conclusions. One of the main findings in this thesis is that the effect of bank lending on a number of economic performance measures has changed over time, corresponding to the fact that the role of credit has changed as well. It could not be determined how bank lending specifically affected the different variables, which meant that this hypothesis was not supported by the results. It can be concluded that the economic environment is very complex and that additional variables could have added more significance to the results. The non-Granger causality tests for the short-run provided overall insignificant results, except that real assets Granger-caused bank lending in the fourth period.

Bank lending, asset prices and prices on the stock market have surged since the early 1990’s, apart from a few exceptions during crises. One factor behind the current financial climate is the expansionary monetary policy driven by The Riksbank in pursuit of increasing the rate of inflation. It has clearly contributed to that the ratio between bank lending and GDP has increased over the last two decades. Some argues that The Riksbank does not have the tools to ensure both financial stability and work for an inflation target. Representatives from Finansinspektionen and the Swedish Government have expressed anxiety over the financial stability and the fact that more people today are dependent on credit to survive (Svenska Dagbladet, 2015). This supports the fact that this is a critical issue that deserves a lot of attention in the current debate.

Another finding in this thesis is that the increased leveraging among households in Sweden is one of the greatest future concerns. Economists argue that a substantial part of this leveraging is connected to higher prices on real estate in the biggest cities. This challenge was to be addressed by the new mortgage requirement presented by Finansinspektionen during the summer of 2015, which did not happen after all, because the court in Jönköping claimed that the change was not supported by the law (Finansinspektionen, 2015).
A suggestion for further research within the area of credit and economic growth in Sweden would be to find better and additional proxies for the financial economy, since those results were least significant. The financial sector will certainly gain more importance in the aspect of the increased globalization and deregulation that we are seeing. To incorporate more than just the asset prices in Stockholm and Gothenburg would also be interesting and provide a more general picture over the real estate market. By doing so, a different view of the relationship between bank lending and real assets might be seen.

This thesis did not aim to predict when the next financial crisis in Sweden will occur; such a task is very difficult even for the most initiated economists. The goal was rather to describe the purpose and history of bank lending in Sweden from a long-run perspective and to see if the causality relationships changed during different policy regimes.
7. References


Finansinspektionen. 2015. “FI går inte vidare med amorteringskravet” Available at: http://fi.se/Press/Pressmeddelanden/Listan/FI-gar-inte-vidare-med-amorteringskravet/
Retrieved 2015-08-11.


OECD StatExtracts. 2015. “Average annual wages” Available at: https://stats.oecd.org/Index.aspx?DataSetCode=AV_AN_WAGE#
Retrieved 2015-05-14


SCB. 2015a. “Om digitaliseringen” Available at: http://www.scb.se/sv_/Hitta-statistik/Historisk-statistik/Om-digitaliseringen/


SCB. 2015c. “Sök historisk statistik” Available at: http://www.scb.se/sv_/Hitta-statistik/Historisk-statistik/Sok-historisk-statistik/

SCB. 2015d. “Sammandrag av enskilda bankernas uppgifter 1866-1911” Available at: http://www.scb.se/sammandragenskildabankernasuppgifter1866-1911/


Svenska Dagbladet. 2015. “Amorteringskrav svävade över bankmötet” Available at: http://www.svd.se/amorteringskrav-svavade-over-bankmotet/om/naringsliv


Retrieved 2015-05-16

Retrieved 2015-08-14

The Riksbank. 2015b. “Riksbank cuts repo rate to −0.10 per cent, buys government bonds for SEK 10 billion and is prepared to do more at short notice” Available at: http://www.riksbank.se/en/Press-and-published/Press-Releases/2015/Riksbank-cuts-repo-rate-to-010-per-cent-buys-government-bonds-for-SEK-10-billion/
Retrieved 2015-05-03

Retrieved 2015-08-04


Retrieved 2015-05-06
Appendix

A. Bank Lending
The data on bank lending is used from the official bureau of statistics in Sweden (2015c) between 1870 and 1968 and from Bank for International Settlements (2015) from 1980 to 2012. The measurement of bank lending includes outstanding bank loans to the non-public sector, with domestic and foreign bills excluded. Commercial banks and savings banks have both been included, but data on savings banks lending only exist from 1880 and onwards. Since savings banks stood for a significant part of the lending, the test in levels starts in 1880, while the test in first difference starts 1870. The measurement between 1980 and 2012 from BIS includes lending from domestic banking sector to private non-financial sector. These two series have been connected and adjusted for breaks when a new source is used by using the same method as BIS does (BIS, 2015).

B. Real Economic Activity
From the extensive work of Schön and Krantz (2012) I used data on Swedish GDP and total persons employed. From Hubermann and Minns (2007) I used data on total hours worked per year, except for the period from 2000-2010 where data from OECD (2015) was used. I had to interpolate this series because the observations were from every 10 years. From these sources I was able to calculate GDP per employee per year.

As a measurement of the capital stock, I use estimates of buildings- and machinery investment from Schön and Krantz (2012). Maddison (1994) have made a similar analysis applied on six advanced countries and the intension was to use his approach but to exclude the measure of equipment and vehicles. The average life of non-residential structures is 39 years and as of machinery the average life is 14 years. War damage has not been accounted for, since Sweden they did not actively participate in WW1 and WW2. All assets are scrapped when their expected lives expire and the estimates are for mid-year.

The total factor productivity (denoted “A” below) is related to how much input of labor and capital that is required to produce one unit of output. This measure is usually estimated by a Cobb-Douglas function:
\[ Y = AL^{(1-\alpha)}K^\alpha \tag{7} \]

\[ A = \frac{Y}{L^{1-\alpha}K^\alpha} \tag{8} \]

The challenge is to find suitable values of \( \alpha \), the output elasticity of capital or the proportion of capital that participates to create output, to solve for the factor productivity. Different benchmark values of \( \alpha \) is used in the literature; 1/3 (Joshički et al., 2011) and 1/4 originally by Cobb and Douglas (Cobb and Douglas, 1928), but more precise numbers would be more appropriate, thus a method used by Bengtsson (2012) fits better in this thesis. A constant return to scale is assumed; otherwise the elasticity of labor and capital would not equal 1 in the model.

\( \alpha \) has been calculated using data from Edvinsson (2015) and below figure shows the labor share of factor productivity (which is given by \( 1 - \alpha \)). Labor share of factor productivity is calculated by taking wages and salaries for employees for the total aggregate economy and divide this by total nominal gross value added.

![Labor Share of Factor Productivity](image)

Notable is that capital has become more important in the production process due to the fact that marginal productivity of labor has increased historically. It is also consistent
with the fact that total capital stock has grown relatively more than the estimation of hours worked.

To control for other variables that might affect bank lending I use U.S. GDP per capita per year. This data is obtained from Johnston and Williamson (2015) who estimated the GDP between 1870 to 1929 and then used figures from Bureau of Economic Analysis from 1930 to 2014.

C. Real and Financial Assets
For the real assets, Bohlin (2014) and Söderberg et al. (2014) estimated the index of residential property from 1875 to 1957 for Stockholm and Gothenburg and a house- and apartment index from 1958 to 2012 in Stockholm and Gothenburg. Between 1958 and 2012, we used an average of the indices of houses and apartments in order to create one series of values instead of two and also to account for the regulations of rent of the apartments. We normalized the first part of the series (1875-1957) to 100 in year 1912, which is the reason to why the indices have different start values. The second series on the other hand, between 1958 and 2012, have been normalized to 100 in the first year (1958).

To control for the real assets I use data on real home price index for the U.S. This index is constructed by Robert Shiller (2005) and stretches from 1890 to present.

The series of the average S&P common stock index is used from Williamson (2015). The economic research institute Cowles Commission has constructed that data from 1871-1926 and from 1927 to present the institute Standard & Poor’s figures is used.