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ECB and Riksbank quantitative easing effect on the Swedish economy

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Abstract

The unconventional monetary policy has become standard practice by major central banks as a response to the global recession. However, the practice has continuously been used by central bank amongst the developed economy. The ECB and Riksbank make use of the practice; the belief is that the Riksbank make uses of the practice to stay competitive contra the Eurozone. Thus, this paper ought to analyze how the ECB and Riksbank monetary policy effects on the Swedish economy. The effects are simulated and analyzed in different channels with the use of impulse response functions. The method for the analysis is the use of a Bayesian VAR model, where the impulse response function simulates the response of the different channels to ECB and Riksbank monetary policy shocks. The results reveal that the Swedish economy response is greater to ECB monetary policy shocks contra the Riksbank. Which supports the notation of center country and periphery country relationship, where in this case the center central bank (ECB) is the most influential entity.

Keywords: Riksbank, ECB, Quantitative easing, capital controls, Bayesian Vector Autoregression.

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1. Introduction

Economic outbreaks have through the decades forced central banks to constantly update their fiscal and monetary policies in order to stimulate the economy and prevent further damages. When the wishful effects have not been reach, a great number of smaller- and emerging economies have fallen behind the centre country in hope to find stability from their implemented monetary policy. For this reason, have capital in- and outflows been widening and in turn enforced the speed of the financial globalization.

The constant evolvement of the financial globalization showed to have profound effects after the global financial crisis in 2008, as the economic growth have remained low. In the first attempts to boost the economy after the crisis, central banks decided to turned the direction of the interest rates towards the zero lower bound (ZLB). When the ideal result failed to materialize, central banks announced the new unconventional monetary policy: quantitative easing (QE). With the operation of QE central banks seek to stimulate and rise the liquidity in the economy, even though interest rates are already low. To do this a central bank often purchase a large set of government bonds, securities or other type of financial assets (Haldane et al. 2016).

The operation of QE has actively been used after the financial crisis in 2008, but the effects from the implementation have varied. For this reason, have a number of studies tried to analyze the most efficient transmission channels a QE operation might operate through in order to reach the sought effects. Most studies have focused on the QE implantations from the Bank of Japan (BoJ), the Bank of England (BoE) and the Federal Reserves (Fed). Due to the operation differences, certain channels have been understood to stimulate an economy more. This could explain the specific QE focus of the European Central Bank (ECB), as the bank announced the implementation in January 2015 (Krishnamurthy and Vissing-Jorgensen, 2011).

ECB’s QE focus is to reach a higher level of price stability and shorten the gap to the inflation target of 2% (Joyce et al. 2012). In order to reach the objectives and to stimulate the Eurozone appropriately, ECB have been said to operate through a number of different channels following their purchases of government bonds (Fiedler et al. 2016). According to Krishnamurthy and Vissing-Jorgensen (2011) and a multiple other studies, are some of the more dominated transmission channels the following: Portfolio-balance channel, Exchange rate channel, Debt-service channel and Credit channel.

As the centre ‘country’ in Europe is the European Central Bank, many followed the intention by implementing the operation of QE. Even economies outside the Eurozone and with a higher degree of independency, such as the central bank of Sweden (Riksbanken). Riksbanken announced the implementation of QE in February 2015, only a month after the ECB. The rushed announcement can be seen as one of many side effects of the financial integration, as even stronger independent economies have to follow when the centre ‘country’ introduce new strategies. Furthermore, Riksbanken’s QE operation is very similar to the operation of ECB. According to De Rezende (2016), is two of the targets to shorten the gap to the inflation target of 2% and to follow the ‘Sveriges Riksbank Act’ of price stability. In order to reach the operation targets, have Riksbanken kept the same purchase focus of government bonds and operated through similar transmission channels. Additionally, the economic situation in Sweden was relatively stable before the implementation of QE. For example, from data presented by Riksbanken could positive effects be seen in form of a rise in consumption, increase in investment and a decrease in unemployment rate (Riksbanken, 2015a).

For this reason, and for the purpose of our research, have we attempted to answer the following question: “*What is the macroeconomic effect on the Swedish economy by the ECB and Riksbank quantitative easing program?*” We have attempted to do so by analysing the monetary policy shock effects by the respective central bank through different transmission channels. The analysis was conducted for the time period 1999-2017 with the use of Bayesian VAR followed by an impulse response function in order to simulate the response of the transmission channels to a 1% monetary policy shock. The shocks represented a QE expansion shock and repo rate contraction by respective central banks. The Cholesky ordering of the shocks was set so the ECB monetary policy was the most exogenous variable and the Riksbank the less exogenous since the analysis was of the Swedish economy.

The five different transmission channels was analyzed in the following order, 1. The monetary policy, 2. The yield curve, 3. The exchange rate, 4. The stock indexes and lastly 5. The real economy. This paper found that the Riksbank monetary policy was contemporaneously affected by the ECB monetary policy shocks implying that Riksbank monetary policy actions was a response to ECB monetary policy. Thus, the Riksbank monetary policy in the other channels was in the first hand a response to ECB monetary policy. However, the Riksbank QE program showed not to be influenced. Furthermore, the ECB monetary policy was revealed to influence the Swedish yield curve. Frankly it was the most influential between the two of them. Hence the results supported the previous drawn results in the monetary policy case. Interestingly the yield curve revealed traits of capital inflows as Swedish yields went higher as a response to ECB monetary policy shocks.

The capital inflows notation was supported by the results found in the exchange rate section. Where results indicated a determined defense of the krona by the Riksbank, the Krona appreciated initially as a response to ECB monetary policy. However, depreciated notably as a response to Riksbank monetary policy, recalling that Riksbank monetary policy was contemporaneously affected by the ECB from the monetary policy section. The depreciation was a response of Riksbank to ECB in the first hand. The defense of weaker krona was also in line with the Riksbank price stability target. Nonetheless, the Riksbank was the primary driver of the channel.

The stock market indexes were not as receptive to the monetary policy shocks, indicating that QE had failed to exacerbate to the economy, as the indexes represented the 30 largest listed firms and Swedish listed SME. The dysfunctional bank lending channel might explain the failure. However the intention with QE is to influence the economy in general. Furthermore, this was also observed in the real economy section. However housing price was very receptive to QE from both central banks, most notably to ECB. Thus, overall the between the Riksbank and ECB, the latter central bank is influencing the Swedish economy most. Which raises the question of the Riksbank existence, as the results indicate the ECB has more to say regarding the Swedish economy

The research regarding quantitative easing is extensive, however, that cannot be said regarding research involving Riksbank QE program. Most research covers the significant systemic central bank QE programs effects, which this paper has also done. However, this paper adds to the small research including the Riksbank, additionally, the method applied of this paper with the inclusion of the Riksbank aspects stands out amongst the small research of the topic.

2. Financial globalization

2.1.1 The Complexity of Financial Globalization

Financial globalization is an ongoing process. The speed started to escalade when foreign direct investment (FDI) became more important for emerging and smaller advanced economies around the world in the 1980s (Calomiris and Neal, 2013). Due to the increasing speed of the financial integration problematic economic situations have emerged. In attempts to ease and stimulate the economy new policy implementations and further extensions have occurred regularly, but the results have varied. To understand the new economic stages and the different policy challenges they pose, there has been a growing literature on the global financial cycle. Because, only when the cycle can to some extent be understood, can affects from new policy implementations, such as quantitative easing (QE), be explained.

Ever since the Bretton Woods System was introduced in the 1940s, financial integration has been viewed as an effort to reach economic stability as countries pegged their exchange rates to the U.S. dollar to prevent larger fluctuations (Pilbeam, 2013). The effort to reach stability can be seen from the widening of capital flows in emerging and advanced economies, but for this reason they have also become more vulnerable (Gourinchas and Obstfeld, 2012). It has therefore come to an understanding that the financial cycle is one of the most important component in our economy. According to Rey (2013), does the movement of the financial cycle mainly depend on how the center country decides upon the monetary policy. For instance, the author argues that there is a global financial cycle in three components; asset prices, capital flows and credit growth. By analyzing the movements from the components further, we will see that they co-moves with the VIX[1] (Rey, 2013). The VIX is a measure of risk aversion and uncertainty in the market (Rey, 2013; Shin, 2012). However, depending on how the global financial cycle moves, from the reaction of the VIX, its effects can be seen in three major areas: market credit flows, the credit growth in the international financial system and the leverage of global banks. Likewise, the effects in these areas will vary depending on the economic statues of the country and the country's ability to control for financial flows (Rey, 2013). For instance, since countries credit and capital inflows differ to a large extent, their overall sensitivity to the global financial cycle varies. Emerging countries are often seen as more sensitive due to three reasons. First, their monetary conditions are tighter. Second, the centre country determines the monetary policy[2], and third, as their capital and credit in- and outflows often are large, their economic performances heavily depend on the flows. Small changes to the financial cycle can therefore cause effects such as excess credit growth which often is seen as a prediction of a crisis (Gourinchas and Obstfeld, 2012).

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[1] VIX: The Chicago Board Options Exchange Volatility Index. Most often used by stock and options traders to analyse the market anxiety level (Shaikh, 2015).

As the level of financial vulnerability has increased in the same pace as the financial globalization through the decades, the way to achieve independent monetary policy have changed. According to Rey (2013), were monetary policy independence with free capital mobility, only reachable if exchange rates were floating. However, due to the speed of the financial integration, can independency be reached with a managed capital account. In other words, the ‘trilemma’ becomes a ‘dilemma’. Furthermore, with a monetary policy independence, economies often seek stability to ensure credibility in long-term objectives. For example, it has been proven that monetary independence creates better conditions when maintaining price stability (Riksbanken, 1999a). This will in turn generate trust among businesses (and citizens) and hopefully create a ‘breathing’ economy. However, due to the complexity of the global financial cycle, independent economies are still hit by indirect effects which have through the last couple of years have resulted in a declining economic growth.

The economic situation that has emerged in shape of lowered economic growth is known as secular stagnation. According to Summers (2016), this is due to a surplus in savings, which dampens the overall demand and hence lowers the growth rate. Another view of the situation can be taken from Gordon (2015), who states that the lowered growth rate is due to lowered innovation effects, which comes from a lowered productivity. This causes businesses to reduce their investments and the overall results, again, give us a lowered growth rate. To handle a lowered growth rate, central banks have lowered their interest rates in order to stimulate the economy. However, keeping the interest rates low for a longer period of time will cause damages. For instance, the monetary policy has for a long period of time been considered the tool to stabilize the economy, but when it comes to secular stagnation the monetary policy might be at risk of becoming destabilized itself, and as a result of this, we may face additional economic and political imbalances (Andersson, 2017). In other words, the global financial cycle tributes to first-order policy challenges in order to prevent the economy from possible ‘booms’ and ‘bursts’.

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[2] Shows that the global financial cycle is not aligned with a specific country’s macroeconomic condition (Rey, 2013).

In order to better understand how the economy works and why certain policies are implemented (but may lack effectiveness and credibility), we need to study the financial cycle to a larger extent. According to Borio (2014), are there a few characteristics which define a cycle more and should be highly observed at all times. For instance, the cycle is highly dependent of policy regimes such as monetary-, financial- and real economy policies. The cycle is also closely related with systemic banking crises as well as it shows a close connection to credit and property prices. Lastly, its duration and amplitude (the overall effects) last much longer compared to a regular business cycle.

At this point we can conclude the following:
a) The global financial cycle tributes to first-order policy challenges and forces central banks to introduce new operations in order to stimulate the economy, as for instance QE (Borio, 2014).
b) It is important to follow the movements of the VIX to prevent, or at least dampen, possible effects from an economic crisis.
c) It is difficult to keep a capital account managed in order to maintain a level of monetary policy independence (due to our level of financial globalization).
d) Emerging markets are vulnerable.

2.1.2 The level of financial independency

Through the years, a number of studies have analyzed in which type of stage economies are more beneficial – in autarky or in a financial integrated market. The results have been very elusive due to the statues of the economy. According to the neoclassical growth model, financial integration is associated with an increase in allocative efficiency and better risk sharing (Pilbeam, 2013). However, the result only correlates with larger economies. When it comes to smaller economies (such as Sweden), results have shown that financial integration forces an economy into a steady state, and specific welfare gains are hard to find (Gourinchas and Jeanne, 2006). Due to the results, the focus has shifted towards specific channels of capital in- and outflows. The change of focus can be seen in the studies from Jeanne et al. (2012), Kose et al. (2006) and Obstfeld (2009), as they investigated if there were any specific gains from capital in- and outflows of ‘growth and consumption volatility’. Yet again, no significant result could be presented. This means that they could not show any specific impacts from financial openness. The foregone welfare gains of financial integration could potentially be explained by a study by Bekaert et al. (2005). The authors state that welfare gains from capital flows can only be attained if the financial sector of an economy has reached a certain level of development. The statement seems to be correct following the event study made by Henry (2007) of financial integration. For instance, Henry (2007) states that significant result could be shown in the shape of a fall in cost of capital, and a rise in investment in more developed economies. However, the result was only significant before new reforms and policies were introduced, as countries sought to stabilize their economies further.

When Rey (2013) faced the same elusive welfare results from financial integration, she decided to approach the situation a bit differently. The new approach was to analyze certain channels which are closer related to risk sharing properties of the external balance sheet during times of crisis. Rey (2013), believes that these channels will show more profound effects from financial integration. Following the suggestions from Rey (2013), Gourinchas et al. (2012) show that when the global financial crisis hit, there were multiple (and large) wealth transfers between the U.S. and the economies around the world[3]. In this scenario it is clear that the U.S. acted as the centre country (decided upon the monetary policy), as the U.S. managed to insure economies and prevent larger damages. If we look deeper into the transfer procedure it will be easier to see how profitable economies were due to the (global) financial integration in order to restore ‘stability’ after the collapse. For example, emerging economies are most often short in equity and FDI, but ‘long’ in U.S. government debt (opposite scenario for the U.S.). Therefore, when crisis occur, the holding of U.S. government bonds most often remains stable while the rate of liabilities (containing risky assets) fall. This means that the large external balance sheet in emerging markets can help stimulate the economy in crisis, and depending on the structure of the economy, it may also contribute to risk sharing. In other words, by closely monitoring capital in- and outflows, economies can prevent collapses (Gourinchas et al. 2012).

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[3] The wealth transfer from the U.S. to the rest of the world have been estimated to be around 2 trillion dollars. The scenario was seen as a valuation loss on the U.S. net external asset position (Gourinchas et al. 2012).

From the collaboration between U.S. and the countries around the world, a fairly stable economic situation could be put in order (under the circumstances) and further ‘booms and bursts’ could be prevented. Therefore, it comes as no surprise that the degree of financial independence has decreased through the years (Popov, 2017). Although, looking at the scenario from another angle, a few questions come to mind. For instance, are welfare gains from financial globalization centralized around the level of risk sharing? And, are higher levels of risk averseness the reason for the decrease in independency?

It may seem that the lower levels of financial independency are highly beneficial, but taking the ‘risk’ of being more independent can also help an economy in many ways. For instance, with a level of stability (due to a higher degree of monetary independence) economies can oversee currency and maturity mismatches and prevent possible smaller economic crises to break through (Rey, 2013). However, the prevention of smaller crises is still not granted as the global financial cycle can still have indirect effects on an economy. In order to increase the chances by gaining more welfare and better prevent possible negative effects, Rey (2013, pp. 21) suggests the following policies implementations to get a higher standard of independence:

“a) Impose targeted capital controls.
b) Act on one of the sources of the financial cycle itself: the monetary policy of the Fed (the Federal Reserve’s) and other main central banks.
c) Act on the transmission channel cyclically by limiting credit growth and leverage during the upturn of the cycle using national policies (and possibly doing the reverse during downturns) – i.e. putting macro-prudential policies in place.
d) Act on the transmission channel structurally by imposing stricter limits on leverage for all financial intermediaries.”

(Rey, 2013. pp. 21)

2.1.3 Problems when countries face different economic situations

We will now look at possible situations which can emerge when countries operate on different degrees of independency.

When financial crises hit, central banks are forced to introduce new policies in order to stimulate the economy. According to Borio (2014), a policy change often occurs in the prudential-, monetary- and fiscal policies as the central banks attempt to maintain the focus of the firm and not cause further speculations and possible upsets in the financial cycle. The collaboration of policies is a tough procedure and tiny mistakes can put the economy into critical situations. The main idea with policy changes is to build some sort of defense when a financial 'boom' is approaching and to keep the system stable when (for instance) the course of a stock falls. However, if the collaboration of policies does not sufficiently protect the system as a financial 'booms' or 'bursts' manage to breaks through, it can result in a serious balance sheet recession (Bardo and Landon, 2013). Central banks are therefore forced to implement new operations to protect the economy from falling into persistent and serious flow problems, such as secular stagnation, which was explained by Summers (2016), Gordon (2015) and Borio (2014).

The implemented policies after the financial crisis in 2008 were not successful as the economy fell deeper into secular stagnation (Summers, 2014). One of the reasons why the effects did not occur (at the time) was due to the way central banks handled the expansionary monetary policy (Bardo and Landon, 2013). The implementation of the expansionary monetary policy was still necessary to prevent the economy from further financial damages and larger fluctuations of interest rates, but the overall growth results was negative (Haldane et al., 2016).

A further explanation to the foregone effects can be taken from Borio (2014). The author means that the degree of independence and the stage of economic development varied too much between countries (and they still do). This made the financial cycle unsynchronized as central banks introduced new policies and hence desire effects did not occur. Furthermore, due to the unsynchronized cycle, central banks had to lower interest rates even further (approached the 'zero-lower bound') and an effect of lowered growth rate followed. According to Andersson (2017), the effects of lowered growth were first noticed by countries with direct connections to the crises. To tackle the change, households started to increase their savings in order to reduce the overall debt. From the higher levels of saving, a lowered demand on the market emerged.

In these type of scenarios, when countries face different economic situations, they tend to fall behind the centre country which lays out the monetary policy (as we saw with the wealth transfers from the U.S). However, if we look at the situation from another angle, we can see that there is an excessive trust in that the centre country will present a stabilization policy that will generate positive and quicker economic effects. This is often not the case when dealing with lowered growth rates (Andersson, 2017). Growth rates problems are long-term and are, according to Hansen (1939) and Gordon (2015), the solution to expand policies regarding the overall supply (in the market), since only then an increase in innovation can occur. With more and better innovations and a higher level of productivity, our economy will start to 'breath' again.

The solution may be in sight, but due to the economic eagerness to find stability, central banks have been forced to continue with an expansionary monetary policy and to implement new operations in order to stimulate our economy. A particular operation is quantitative easing.

2.2 Quantitative easing

2.2.1The unconventional monetary policy: quantitative easing

The conventional monetary policy of lowering interest rates towards the 'zero-lower bound' (ZLB) was the central banks' attempt to stimulate the economy, as the idea was to boost the investment levels (Joyce et al. 2012). The operation was successful in the pursuit of smaller fluctuations, but the overall result showed that the world economy had reached the same recession levels since the 1930s (Reinhart and Rogoff, 2009). However, as central banks held on to the idea that an economic recovery would prevail after further interventions of new conventional monetary policies, the situations ended up getting worse. Constant introductions of new policies made the financial cycle unsynchronized between countries, and therefore the desirable outcomes were shown to be ineffective (Borio, 2014). According to Joyce and co-authors (2012), a larger scale of financial losses occurred instead, and banks and borrowers got into question as there were an increase in bubble bursting. Following the study of Schmitt-Grohe and Uribe (2010), central banks had fallen into a 'liquidity trap'[4], as they could no longer stimulate the economy or follow up the demands of the market. In other words, the previously successful monetary transmission mechanism had gone out of order and the eager of price and financial stability forced central banks to turn to unconventional monetary policies.

As conventional monetary policies concentrate more on the action to influence the price of money with purchases of short-term securities, unconventional monetary policies' focus is on longer maturity assets, as the idea is to influence the economy in the future (Joyce et al. 2011). However, unconventional monetary policies can be constructed in all sorts of ways and can therefore appear in many shapes. The general question is more often about the amount of asset purchase a central bank goes through with, since the actual amount determines the stimulation of the economy (Fewley and Juvenal, 2012). So, how much larger should the expansion of a central bank's balances sheet be? Depending on the expansion, an economic shock can also be a common effect of an unconventional monetary policy as the purchase by a central bank may signal future changes on the market and therefore affect short-term rates (Fewley and Juvenal, 2012). However, with a larger expansion of the balance sheet, central banks most often seek to influence interest rates to a higher degree in the long run (Christensen and Gillian, 2018).

A very common unconventional monetary policy after the financial crisis in 2008 has been 'Quantitative Easing' (QE). With the operation of QE, a central bank's balance expansion is focused on quantified amounts of financial assets from private institutions in order to stimulate the economy (Haldane et al. 2016). The type and the number of financial assets purchases may vary depending on the effects the central bank wants to achieve. The most common types of (longer maturity) asset purchases is of government bonds, corporate bonds and mortgage backed bonds (sometimes all at once). According to Pilbeam (2013) and Fewley and Juvenal (2012), some of the most desired QE effects are the following:

a) To increase the prices on the market in order to lower the yields (on market assets).

b) To prevent the risk of deflation from happening (therefore have an impact on the risk premiums).

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[4] A Liquidity trap may emerge when saving rates are high and interest rates low. In this scenario, the monetary policy may become inefficient (Schmitt-Grohe and Uribe, 2010).

c) Increase the liquidity holding of banks in order to increase lending to businesses and consumers.

2.2.2 The View of QE

Questions regarding the operation of QE have occurred when certain effects have not been reached and instead caused more turbulence on an economy. Studies in this area have therefore been adopted to make the view of QE clearer and explain why some effects have not appeared.

To address the idea from Pilbeam (2013), a purchase of long-term security bonds should lead to a lowering of the long-term interest rates as there will be a rise in the monetary base (expansion of balance sheet). A rise in the monetary base should lead to an increasing demand of long-term security bonds, a rise in prices and eventually a lowering of yields. However, a rise in the monetary base can consequently cause implications such as an upsurge in the expectations of inflations (causes speculation) and a rise in the inflation risk premia. This could eventually lead to a rise of longer-term yields when the idea is to lower them. In other words, the operation of QE can cause inflationary dangers. The level of danger depends on the rise in the monetary base and if the procedure is temporary or permanent, since the length of an operation can vary a lot (Pilbeam, 2013).

From the study of McLeay et al. (2014), QE is meant to “circumvent the banking sector as its main operation is to increase the private sector spending directly” (McLeay et al. 2014, pp. 25). Why the increase in supply in the private sector sometimes does not occur to the extent a central bank wishes, may be due to the increase of independency of central banks around the world (Garriga, 2016; Riksbanken, 1999a). One of the reasons for the increase of independency is due to the fact that central banks seek further stabilization, as they want to avoid short-term political decisions, which can have its effect on the economy. However, when operating independently, central banks can make the decision to rise the funding to commercial banks, but they cannot decide what the banks should do with the additional funding (Baldwin and Wyplosz, 2015).

As the interpretation of the financial cycle and preferences for certain assets (and their maturities) among investors varies to a large extent, the outcome of a QE operation is often hard to predict. Following the words of Bernanke (2015), “the operation of QE works in practice, but not in theory”[5]. However, by studying certain transmissions channels, through which QE operates, the effects of QE might be easier to understand.

2.2.3 The Transmission Mechanism of QE

The importance of certain transmission channels depends on the focus of a central bank (Krishnamurthy and Vissing- Jorgensen, 2011). According to Haldane et al. (2016), can the transmission mechanism of QE can be divided into two steps. Step one: a central bank expands their balance sheet as they look to create more reserves in order to purchase short-term bills. Step two: the central bank extends the maturity program in order to exchange the purchased short-term bills for longer-term bonds. When the operations of both sides have been executed, no specific effect has yet occurred since the bank is still holding on to the bonds. Only when they are purchased (i.e. a transaction happens) can the different channels transform certain effects on the market and possibly decrease the long-term real interest rates (Fewley and Juvenal, 2012). One may therefore be able to understand the sought after effect from a central bank from the purchase of specific bonds and their relation to certain channels.

There are a number of possible transmission channels a central bank can operate through. We will outline some of the most common ones and their effects from government bond purchases below.

- Signaling channel – where effects from a QE operation are shown on the future outlook of the short-term interest rates (Fewley and Juvenal, 2012).
- Portfolio balancing channel – where effects from a QE operation can influence the prices of assets as well as affect the credit volumes. The long run effects are often seen in form of a decline in interest rates. The effects from the ‘portfolio-balance channel’ are often generated through many sub-channels (Alsterlind et al. 2015).
- Liquidity channel – where effects from a QE operation can lead to a decrease in risk premiums, an increase in the liquidity system, and a lowered volatility (Haldane et al. 2016).

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[5] Bernanke spoke at the Brookings Institution during the conference: ’Central Banking after the great Recession: Lessons learned and challenges ahead’ (Benanke, 2015).

- Exchange rate channel – where effects from a QE operation can weakened a country's currency to gain more welfare, especially in operations overseas (Haldane et al. 2016).
- Bank lending channel – where effects from a QE operation can stimulate the economy in order to increase in the lending by banks (Haldane et al. 2016).

Some of the mentioned transmission channels can be seen in the most standard models of monetary policy when estimating macroeconomic effects. However, when it comes to estimate the effects from a QE operation a number of studies have seen to focus more on the following two channels: the liquidity channel and the portfolio balancing channel (Krishnamurthy and Vissing-Jorgensen, 2011; Fewley and Juvenal, 2012; Joyce et al. 2012). As the effects from the portfolio-balance channel is to a large extent are generated from a number of sub-channels, its impact on an economy may be tough to predict. To address Krishnamurthy and Vissing-Jorgensen (2011), are some of the sub-channels the following: the duration risk channel, liquidity channel, safety premium channel and default risk channel. For instance, only the 'duration risk channel' can affect a great amount of assets at different level of maturities (Krishnamurthy and Vissing-Jorgensen, 2011).

In attempts to analyze the channels and their overall effectiveness in an operation of QE (in the 'bigger picture'), three areas must be looked at more closely. According to Haldane et al. (2016), these areas are the following: area one: the type of asset bought, area two; the structure of the financial system and economy and area three; the design of the asset purchase operation (type of bond focus). To address Miles and Schanz (2014), the most prevailing QE effects are noticed when the financial system is impaired. This raises the question whether the QE effects in the Swedish economy are more inertial since the financial markets have less imperfections?

2.2.4 Brief history of QE (Japan, U.K., U.S.)

Since the operation of QE have grown progressively through the years and is today considered a very important tool in the process to reach stabilization and other economic goals, it is important to know how economies have used the operation before. For instance, which channels did they operate through? What type of bonds did they target and why? What were the effects? Three countries, which have used the operation actively through the last couple of years (decades), are Japan, the U.S. and U.K.

Japan

When the economy in Japan approached the ‘Zero Interset Rate Policy’ (zero lower bound) after almost a decade of financial difficulties in the 1990s, the Bank of Japan (BoJ) announced their purchase of Japanese government bonds (JGB) (Vespignani, 2015). The short-term goals with the purchase was to prevent the risk of liquidity shortage and create stability, while the long-term goals were to rise the inflation level as well as to increase investments by lowering their long-term interest rates (Andolfatto and Li, 2014). According to Kimura et al. (2002) and Shirakwa (2002), the used channels of the transmission mechanism were the ‘asset supply channel’ and the ‘monetary base channel’ which both belong under the ‘portfolio balancing channel’. Many studies have been made in order to analyze the overall effects from the first ‘modern’ use of QE, but the results have varied depending on the analyzed area. For instance, if we would once again address the studies of Kimura et al. (2002) and Shirakwa (2002), no profound effects could be seen after the first year due to the zero interest policy. However, according to a study of Schenkelberg and Watzka (2012), the operation did have temporary effects such as a significant lowering of long-term interest rates and a significant rise in outputs and prices. BoJ used QE again in 2010, but it went under the name of ‘quantitative and qualitative monetary easing (QQE)’ (Fujiki, 2017). The focus was on longer maturity government bonds and riskier assets (corporate bonds, real estate derivatives etc.) (Arslanalp & Botman, 2015). However, BoJ did not reach the outcomes they were after (Fujiki, 2017).

United States of America

Approximately two months after the financial crisis in 2008, the Federal reserve (Fed) announced their first use of QE. Today, almost ten years later, four operations have been announced (He and Krishanmurthy, 2013). The Fed’s goal with each operation was to liquidate the conditions in the housing market and to lower borrowing cost, as they did by lowering the long term interest rates (Fewley and Juvenal, 2012). To reach the implemented goals, the Fed purchased debt of government-sponsored enterprises (GSE), mortgage-backed securities and treasury bonds. The amount the Fed purchased for each new QE operation varied, but positive effects emerged for each new set-up. According to Krishnamurthy and Vissing-Jorgensen (2011) and He and

Krishnamurthy (2010), the Fed operated under very ‘safe’ channels. Some of the channels were; the signaling channel, to lower future interest rates; the inflation channel, to control for possible inflations outcomes; the default risk channel, to stimulate the economy further; and the pre-payment risk premium channel, to control the risk premia of investors. According to Haldane et al. 2016, have the Federal Reserves presented positive result during their QE run so far.

United Kingdom

The Bank of England (BoE) decided to implement the QE operation in the first quarter of 2009 (Kapetanios et al. 2012). Their main target was to reach the inflation target of 2% and to lower the unemployment levels through the purchases of UK government bonds (known as gilts) (Chung et al. 2012). These gilt were brought from the non-bank private sector (Cross et al. 2010). Further, the operation of BoE was not specifically concentrated to liquidate the banking system; instead the focus was to affect the overall price on a number of different assets, which were issued to help the lending to households and companies (Joyce et al. 2012). The effects from the QE operation were to a large extent gathered from the ‘banking lending channel’ and the ‘portfolio balancing channel’ (Butt et al., 2014). Did they succeed? According to Bunn and co-authors (2018), BoE’s operation of QE - with the focus on government bonds – have played a major role in the low levels of investment and productivity in the UK. Bunn et al. (2018) further explain that due to the low levels of investment, the overall productivity has fallen and caused small levels of technology improvement. These finding goes along with Gordon’s (2015) idea of secular stagnation. Hence, the QE case of U.K. may not be the most successful operation.

2.3 Quantitative Easing in Sweden

2.3.1 The history to QE in Sweden

When the financial crisis occurred in 2008 Sweden, compared to countries such as the United States and United Kingdom, did not turn to the strategy of unconventional monetary policies. Instead Riksbanken (the central bank of Sweden) maintained their focus on conventional monetary policy to follow the Act of ‘Sveriges Riksbank’ from 1993 of price stability (Riksbanken, 1999a). The attempt to maintain price stability after the crisis showed strength of a strong independent monetary policy, but due to the financial globalization, Riksbanken was later forced to undergo certain policy changes (Boel and Waller, 2016). In July 2009, Riksbanken decided to cut the inflation target rate from 2% to 0.25% and lower the repo-rate target. They also launched a ‘bank lending program’ in order to keep the economy fairly stable, and the program lasted until 2011 (De Rezende, 2016). However, due to the slow economic recovery from foreign countries, Riksbanken had to announce their switch towards unconventional monetary policies in February 2015 (De Rezende, 2016).

The high measures of the financial globalization could be seen in the slow economic recovery and the difficulties it had caused on a small economy such as Sweden to maintain a higher degree of monetary independence (Carbo and Di Casola, 2018). For instance, the economic situation before the QE implementation in Sweden was still relatively good following the data from Riksbanken. For instance, from 2013 to 2014 Sweden had shown positive effects in form of a rise in economic growth, consumption, investment, retail sales and a decrease in unemployment rate (Riksbanken, 2015a). With these results, Sweden seemed to be in a fairly good condition before the implementation, so why did Riksbanken introduce QE?

2.3.2 The implementation of QE and its transmission channels in Sweden

Riksbanken switched to the unconventional monetary policy form of QE and the purchase focus was on nominal government bonds with maturities up to two to eleven years in order to promote inflation (De Rezende, 2016). Compared to other central banks, Riksbanken managed to lower the target interest rate (repo rate) below zero when they began purchasing the government bonds (Carbo and Di Casola, 2018). Speculations at the time of the announcement of the QE said that the operation was mainly due to provide extra liquidity and avoid certain ‘liquidity traps’ (Ferdinandusse et al. 2017). By addressing De Rezende (2016, pp. 5), there was another reason for the operation: “the Swedish (QE) program was not aimed at providing extra liquidity to restore the functioning of certain markets. The main goal was to lower interest rates in various markets as a means of avoiding a quick appreciation of the Swedish krona and of encouraging banks to lend, thereby stimulating the economy and marking inflation return to its 2% target” (De Rezende, 2016, pp.5).

As Riksbank's focus is the target inflation rate of 2%, most purchases must be of longer maturity government bond in order to lower the interest rate (De Rezende, 2016). For this reason, effects are often generated from a number of different transmission channels. According to Alsterlind et al. (2015), Riksbanken operates through four specific channels to reach the sought market effects. These are the following:

a) The signaling channel: The purchase signal expansive monetary policy, also going forward.
b) The premium channel: The purchases reduce the supply of bonds, which pushes bond prices upwards so that interest rates fall.
c) The portfolio channel: The purchases can bring about contagion effects to prices of other assets.
d) The liquidity channel: Because of the purchases, the liquidity surplus of the banks in relation to Riksbanken increases.

As we can see, the channels affect the economy in different ways. The first three channels are also often used on an international platform to reach specific market effects (Alsterlind et al. 2015). However, by adopting the operation of QE, Riksbanken poses negative risks on the economy of Sweden. For instance, the level of efficiency from purchases of (long maturity) government bond (as they lower the interest rate) depends on take from corporations and households (Alsterlind et al. 2015). If there is a fear of a negative economic trend in the future, the foreseen effects may never be profound. Further, if the market fears a lowered capacity utilization and a decrease in the quality of developments aboard, the level of intensity in the export industry may fall (Alsterlind et al. 2015). This means that the domestic industry appreciation will increase, but in return the level of productivity will depreciate (= lowered innovation) (Gordon, 2015).

From the previous scenario, another risk is prevailed. To address common economic theory, when the Swedish interest rate drop, relative to foreign rates, the exchange rate is negatively affected. In this scenario the Swedish economy can easily be taken advantage of by other central banks (Carbo and Di Casola, 2018).

Riksbanken's use of QE, by purchasing government bonds, can influence the expansiveness of the monetary policy in various ways through the different channels. For instance, the purchase of maturity bonds (with a certain length) could lead to a fall in interest rates without getting the wishful effects, due to the uncertainty in the economic outlook (Alsterlind et al. 2015). For this reason, a few questions arise. For example, to what extent must Riksbanken concentrate on how the centre country decides upon the monetary policy?

2.3.3 Quantitative Easing in the European Central Bank (ECB)

The centre “country” in Europe is the European Central Bank (ECB). We will therefore review the QE operation used by ECB.

The implementation of the unconventional monetary policy case of QE in the euro area, by ECB, happened in January 2015. The reason for the late implementation was mainly said to be of two reasons: first, having all member nations to agree on the operation; second, the difficulties in following the rules of the European Union (Lyziak and Paloviita, 2016; Claeys and Leandro, 2016). However, ever since the introduction of the Euro (in 1999), one of the main objectives from ECB has been to maintain price stability (Lyziak and Paloviita, 2016). ECB has been fairly successful in this matter, but when the consumer price index (CPI) fell by 0.6% at the end of 2014, ECB predicted a large dampening of their economic recovery and hence decided to expand their balance sheet (introduce QE) (Fiedler et al. 2016). The objective of price stability was still there after the implementation, but another objective was to get closer to the target inflation rate of 2%.

The purchase focus of ECB has mainly been on ‘large scale government bonds’ since only then can a certain level of control of inflation pressure be attained (Krishnamurthy and Vissing-Jorgensen, 2011). Furthermore, with a purchase of ‘large scale government bonds’, it is also possible to disturb certain yield curves of ‘highly rated fixed interest rates’ (Joyce et al. 2011).

At this point we can see that the purchase focus by Riksbanken is very similar to ECB. It has therefore come to our attention that possible effects from ECB’s QE operation may come from the same transmission channels, and hence cause certain spillover effects on the decisions made by Riksbanken.

Some of the transmission channels ECB have been said to operate through in order to reach the objective goals of price stability, and being as close as possible to the inflation target of 2%, are the following:

a) Portfolio-balance channel: Through this channel(s) the operation of QE (from ECB) signals a target to keep interest rate low in the future. However, a possible complication could rise when the sought effects does not appear. If instead an increase of interest rate would occur, it could affect the lower yield on government bonds and potential investors would invest elsewhere (Fawley and Neely, 2013).
b) Exchange rate channel: Through this channel, downward pressure on exchange rate can be reached if the low interest rates remain. If the scenario emerges, there will be a growing demand for domestic products in domestic as well as foreign markets. This could eventually lead to a better and more stable balance of payment (Krishnamurthy & Vissing-Jorgensen, 2011).
c) Debt-service channel: Through this channel, effects of a lowered borrowing costs transpires, which in turn could stimulate both investment and consumption (Fawley and Neely, 2013).
d) Credit channel: Through this channel, commercial banks' balance sheet can be affected, which could potentially lead to a rise in lending (Fawley and Neely, 2013).

From the following two statements of Stefan Ingves (President of Riksbanken) and Per Jansson (Vice President of Riksbanken), the connections between Riksbanken and ECB is very clear to see.

- October 03, 2017, Stefan Ingves (President of the Swedish Central bank): “We are neighbors with an elephant and when the elephant moves we are effected” (SvD Näringsliv, 2017). In a press release from Riksbanken, which SvD Näringsliv (SvD) took part of, the President of the Riksbanken, Stefan Ingves, explained that any decisions made by the ECB and whatever happens in the euro area, will have crucial effects on the Swedish economy and monetary policy.
- September 14, 2017, Per Jansson (Vice President of the Swedish Central Bank): “To end the stimulations before the ECB would be a ‘suicide’ mission” (Carlström, 2017).

In an interview with the Swedish newspaper SvD Näringsliv, the Vice President of Riksbanken, Per Jansson, explained the devastating effects that could occur if Riksbanken stopped their purchase of government bonds before ECB.

3. Methodology

3.1 Bayesian Vector Autoregression

The VAR(p) model introduced to macro-econometrics advocated by Sims (1980) has an essential role til this day in macroeconomics. A VAR model models the evolution of a set of endogenous variables over a sample period as a linear function of their past, i.e., it is a multiple AR model in one model. However, as Rummel (2015) and many others have addressed the VAR(p) model is cursed, i.e., the curse of dimensionality. The curse addressed the fact that VAR(p) fails to correctly estimate the influence of parameters on the data and vice versa, it fails to have an economic meaning. Thus, we make use of a Bayesian VAR (BVAR) model which introduced an economic meaning to the VAR model.

$$Y_t = c + A_1\ y_{t-1} + \cdots + A_p y_{t-p} + \varepsilon_t \tag{1}$$

The VAR model above is similar to an AR model; however, the coefficients consist of vectors where c is a vector of constants, A_1 and A_p are parameters matrices, Y_t is the vector of the endogenous variable, i.e. the data variables and lastly ε_t is a white-noise vector error term. So the VAR is multiple AR's in vector matrices. The problem that arises in the VAR model is the influence relationship between A_p and y_{t-p}, where the parameter A_p influences y_{t-p}, with a ratio of 1. Meaning A_p dominates, but what is A_p ? It has no real economic meaning, it can only explain the past i.e. the lags in the VAR model, i.e. Y_t is influenced by the lag of $A_p y_{t-p}$. Thus, the model relies on A_p and if it is estimated incorrectly due to limitation of data or due to sample period, then models based on the VAR model becomes imprecise, such as the Impulse Response Function.

Thus, the use of Bayesian statistics, which introduced economic meaning to VAR by converting the VAR results into the real probability of the event. Meaning that BVAR allows A_p to be influenced by y_{t-p}. It introduced the real probability of the even by first giving it prior information i.e., a prior belief of the event, then followed by a posterior belief and lastly the evidence of probability i.e., the real probability. The priors differ, the differ depending on the characters of the data.

3.1 Model

The model of this paper is the model given in equation (1) however with Bayesian inference, thus instead of using a VAR, we are using a BVAR in the spirit of (Churm et al. 2015). As we found our model to be invariant, i.e., not dependent on which prior, we make use of Litterman-Minnesota prior which is a simple go-to model in macroeconomics due to it incorporates the prior belief that the endogenous variables in the VAR follow a random walk or an AR process (Churm et al. 2015). Thus, if endogenous variables are nonstationary, then one should incorporate that they follow random walk process while stationary variables follow a simple AR process. An AR-root table shows that the BVAR is stationary. Thus we incorporate the AR process. We set the BVAR model by Churm et al. (2015), where the prior is set as loose prior. Meaning that Y_{t-p} influences on A_p with a ratio of 1, Y_{t-p} dominates. BVAR model used in this paper has Y_t consisting of 15 variables, meaning that $A_1 \dots A_p$ is a funaction of 225 parameters. The lag selection for the model is four. We make use of the total balance sheet as a proxy for QE following the second strand. We assess the central bank impacts on different channels as the impact exacerbates differently in different channels by Krishnamurthy and Vissing-Jorgensen (2011).

3.2 Data

Our dataset consists of 15 variables which have all been transformed to represent percentage points (see table 1). The data period is monthly observations covering 1999/10-2017/12. This paper covers Sweden. Hence, all the data except for two variables are Swedish market variables. The data represent the real activity, prices, part of the yield curve and stock indices.

Table 1				
Block	Variable	Description	Transformation	Data source
Real economy	Riksbank total balance sheet	The weekly consolidated financial statement of assets belonging to the Riksbank	LN x 100 DIFF	Riksbank
	Riksbank repo rate	Riksbank's main refinancing repos	DIFF	Riksbank
	Government expenditure	The Swedish government expenditure quarterly	LN x 100 DIFF	Datastream
Yield curve	3-month t-bill	The Swedish 3-month treasury bill	DIFF	Riksbank
	10-year bond	The Swedish benchmark 10-year treasury bond	DIFF	Riksbank
Real economy	Housing prices	Domestic house prices, Sweden	LN x 100 DIFF	Bloomberg
	HICP	Harmonized Index Consumer Prices, harmonized European union basis 2015=100	DIFF	SCB
	Unemployment rate	Unemployment rate start date 2001 (15-74), pre-2001 (16-64)	DIFF	SCB
	Industrial production	The industrial production index for Sweden	LN x 100 DIFF	St.Louis Fed
ECB	ECB total balance sheet	The weekly consolidated financial statement of assets belonging to the Eurosystem	LN x 100 DIFF	Eurostat
	ECB repo rate	ECB main refinancing repos	DIFF	Eurostat
Exchange rate	EUR/SEK	Euro denominated in Krona	DIFF	Bloomberg
	NEER	Nominal effective Exchange Rate vis-à-vis a batch of EER-19 currencies against the Krona	DIFF	St.Louis Fed
Stock market	OMX30	Swedish stock index for the 30 most traded stocks	LN x 100 DIFF	Bloomberg
	OMXPI	Sweden all share stock index	LN x 100 DIFF	Bloomberg

3.3 Cholesky ordering

We make use of an Impulse Response Function which simulates the response of variable Y to one-time 1% shocks in variable X. However, we are making use of Cholesky ordering, which orders the variable in lower triangle in this model, where the most exogenous variables come first, and the most endogenous variables come last (see table 2). Since we ought to investigate the respective impact of ECB and Riksbank QE, our Cholesky ordering is the following.

Table 2

Cholesky ordering			
ECB QE			
ECB QE	ECB REPO		
ECB QE	ECB REPO	Riksbank QE	
ECB QE	ECB REPO	Riksbank QE	Riksbank repo

4. Results

How the Swedish economy responds to monetary policy shocks from the ECB and the Swedish Riksbank are shown in Figures 1 to 10. Each figure illustrates the response from a one unit monetary policy shock on the Swedish macroeconomic variables up to ten periods. The shocks simulate a one percent shock in the change of the central bank balance sheet, i.e., a QE expansion shock. Furthermore, one percent shock in the change of the epo rate, thus a contraction by the central bank. The analysis is carried through different channels, monetary policy, yield curve, exchange rate, stock markets and the real economy.

The table results of the of the IRF is presented in appendix A. As robustness, we have also used a traditional VAR model presented in Appendix B as graphs as a supplement to the figures presented in this section. Overall, the initial response to the shock is insignificant, however significant in the second period and following periods. Thus, we assume that initial response to the shock is insignificant if not stated otherwise.

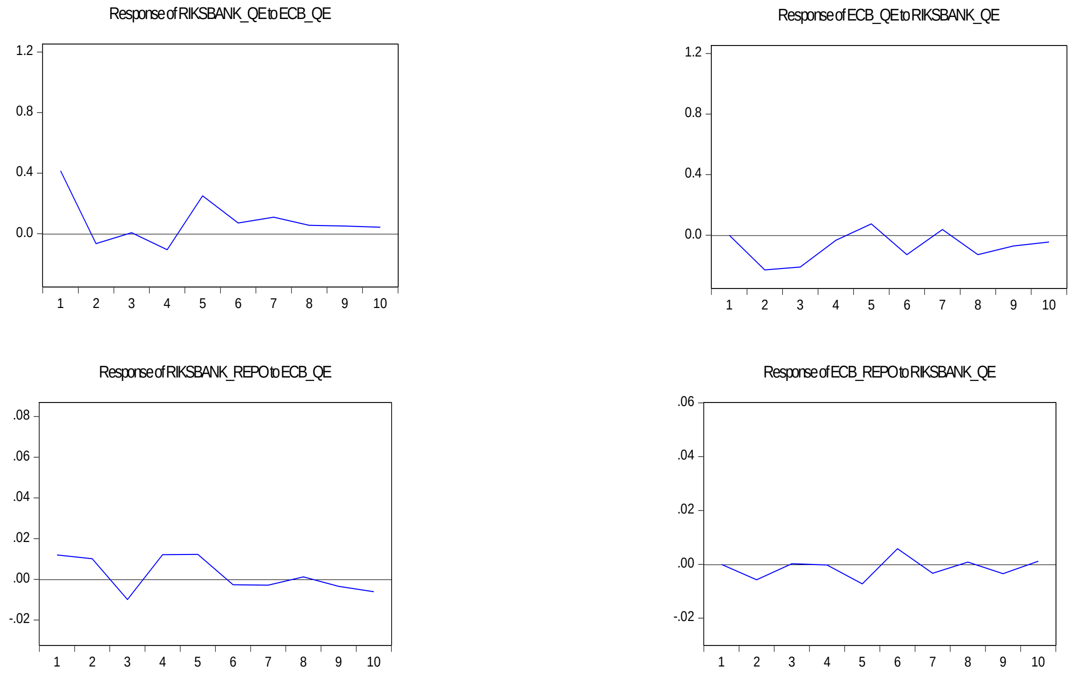
4.1 Monetary policy

We begin by presenting the results of the response of the monetary policy to a surprise move by ECB and Riksbank. With ECB shocks located to the left and the Riksbank at the right in the figures. Figure 1 presents the response of the respective central bank monetary policy vis-á-vis QE shock expansions. Riksbank QE responds contemporaneously to an ECB expansion shock with a QE expansion. However, the ECB responds with a QE contraction to Riksbank QE expansion shock. The repo rates respond in the same manner, Riksbank repo rate responds contemporaneously with a contraction to an ECB QE expansion shock. Overall the response of the Riksbank repo rate to ECB is 2x greater than the other way around. However, the response by respective QE is identical. Thus the impact of respective QE program vis-à-vis is zero. Figure 2 presents a different story, the response of the respective central bank monetary policy vis-á-vis a repo rate contraction in the figure, reveals that response of respective QE's vis-á-vis repo contraction is 1.5x greater for ECB. However notably ECB QE expansion shock contemporaneous effect on the Riksbank repo rate over the ten periods. The Impact of the ECB is 5.5x greater than the Riksbank impact.

The use of QE is more than asset purchase since the intention with the purchase is to target the long-end (intermediate and long-term bonds), i.e., assets with longer maturities than one year De Rezende (2016). Thus, QE program is conducted in conjunction with asset purchases and repo rates. The repo rates target the short-end, i.e., assets with maturities shorter than a year. Thus, spillover from QE operation takes place all along the yield curve.

The results materialize the quote by Stefan Invges "We are neighbor with an Elephant.". The results support the notation of spillover from the center to periphery argued by Rey (2013), but also Vespignani (2015) who finds spillover effects from three systemic critical central banks' balance sheet onto the monetary policy of ECB. However, the Riksbank response of a contraction is not in line with theory, as an ECB's QE expansion should induce a rate cut. However, the presence of spillover to the repo rate indicates the ECB's is influential in steering the Riksbank repo rate but note it is not the intention of the ECB to do so.

Figure 1. Response of Riksbank and ECB monetary policy tools vis-á-vis a QE expansion shock by ECB and Riksbank.



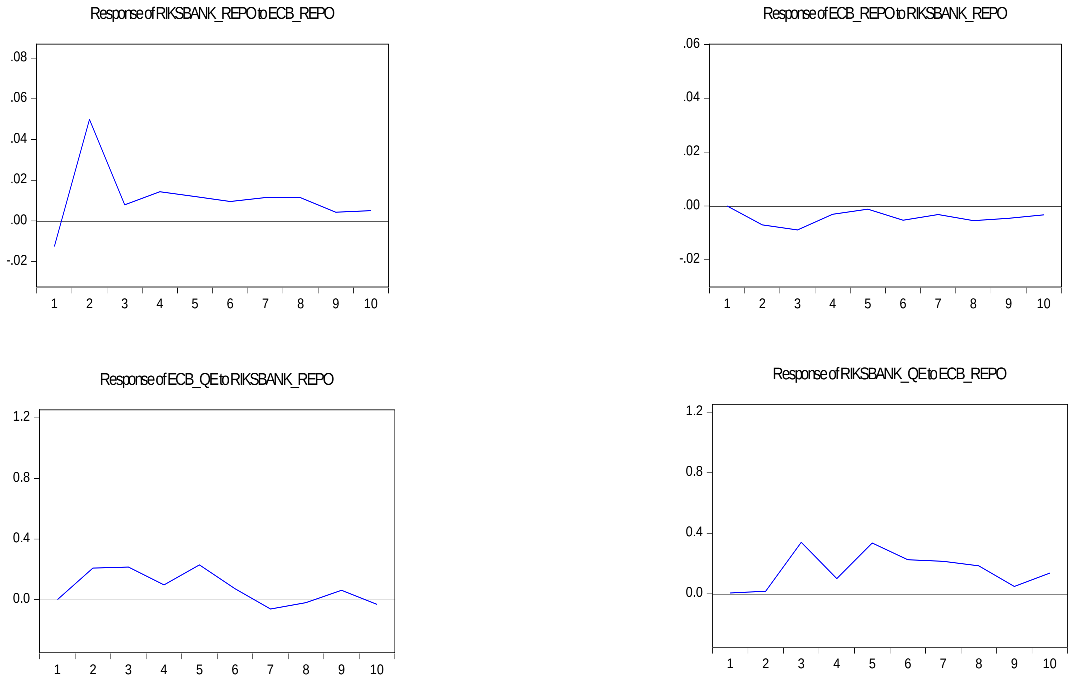
Response of RIKSBANK_QE to ECB_QE

Response of ECB_QE to RIKSBANK_QE

Response of RIKSBANK_REPO to ECB_QE

Response of ECB_REPO to RIKSBANK_QE

Figure 2. The response of Riksbank and ECB monetary policy tools vis-á-vis a repo rate contraction shock by ECB and Riksbank**.**



Response of RIKSBANK_REPO to ECB_REPO

Response of ECB_REPO to RIKSBANK_REPO

Response of ECB_QE to RIKSBANK_REPO

Response of RIKSBANK_QE to ECB_REPO

4.2 Yield curve

Figure 3 presents the response of the Swedish 3-month treasury bill and the benchmark 10-year treasury bond to ECB and Riksbank QE expansion shock. The initially contemporaneous effect on both the 3-month and 10-year to an ECB QE expansion shock is an increase in yields, where the both are initially significant, the 10-year is significant throughout. Were the 3-month and 10-year increases 0.016 respectively 0.014 percentage point in the first month. However, both rates decline in following months after the shock, note that these are Swedish treasury rates. It is not the intention of the ECB to lower Swedish rates, as the intention with ECB QE is to lower eurozone rates. The outcome is the intention of the Riksbank, which succeeds in doing so in the first months, more notably in the 3-month. As the 3-month reaches down to 0.017 percentage point decrease, however, the Riksbank shock fails to lower the Swedish 10-year.

The response of the Swedish rates to a contraction shock by the respective central bank is presented in figure 4. Notably is the 3-month significant 0.035 percentage point increase as a contemporaneous response to a repo rate contraction surprise by ECB. Which is in line with expectations, however yet again it is not the intention of the ECB to push the 3-month treasury higher with a contraction. That would be the intention of the Riksbank. However, the ECB's impact on both rates is roughly 3.5x higher than Riksbank.

The contemporaneous response of the 3-month to ECB repo contraction reveals capital inflows. An ECB repo contraction implies a slowdown in economic activity in Eurozone, as the contraction comes typically at the end of a boom cycle. It can also be a rate hike as part of normalizing the repo rate from very low or negative levels. Meaning a rate hike would not have any impact as it fails to change to change the incumbent regime ((Joyce et al. 2012),), which is the possible case observed in 10-year to Riksbank repo rate shocks. However, a contraction nonetheless means the party is about to end, especially for the stock market. Since interest rates negative correlation with stock markets historically. Capital flows out to fixed income market or another stock market simply seeking higher returns, such as Sweden. However, the capital inflow implies a stronger Krona, which in return in the case of Sweden increases the likelihood of rate cut. Meaning that the current yields become relative valuable compared to bonds issued after a rate cut, in bond language "Yield down, price up." The likelihood of such as monetary policy action is due Sweden's character as a small open-economy and to the Riksbank mandate of price stability. As a committee member of Riksbank has stated, a strong krona would hamper its inflation target of 2% (Riksbanken, 2018a), which is part of its primary objective of price stability (Riksbank). Which takes us to next channel, exchange rate.

The results reveal an active signaling channel, i.e., lowering of the expectations on the short-end. While the portfolio rebalancing channel, i.e., the lowering of the long-end of the yield curve, results are vaguer. The Riksbank monetary policy succeeds with its intention of lowering yields. However it only succeeds in doing so at short-end, it managed to push the 10-year yield higher. The results except for the Riksbank pushing the 10-year higher is aligned with De Rezende (2016) who finds the effect of the Riksbank unconventional monetary policy on the signaling channel. However, he also finds the impact through the portfolio rebalancing decreasing yields which we do not. Furthermore, this is in accordance to Krishnamurthy & Vissing-Jorgensen (2011) who argues that QE’s impact is different through different channels, as we did find that ECB’s monetary policy influences the Riksbank in the previous section. However, the ECB’s QE did not influence the Riksbank QE as one would have expected. Here in this section we find that ECB to influences yield curve overall.

The 10-year bond going higher might be a result of less foreign demand of 10-year, implying price down, yield up. This is possible if there is less demand for the krona because with weaker krona follows fewer demands for Swedish treasuries. Thus, the Riksbank QE expansion shock to the 10-year seems to be steeping the yield curve, as it should be lowering or keep it stable in a scenario of weaker krona This takes us to next section, exchange rates.

Figure 3. Responses of Swedish 3-month treasury bill and 10-year treasury bond to QE expansion shock by ECB and Riksbank.

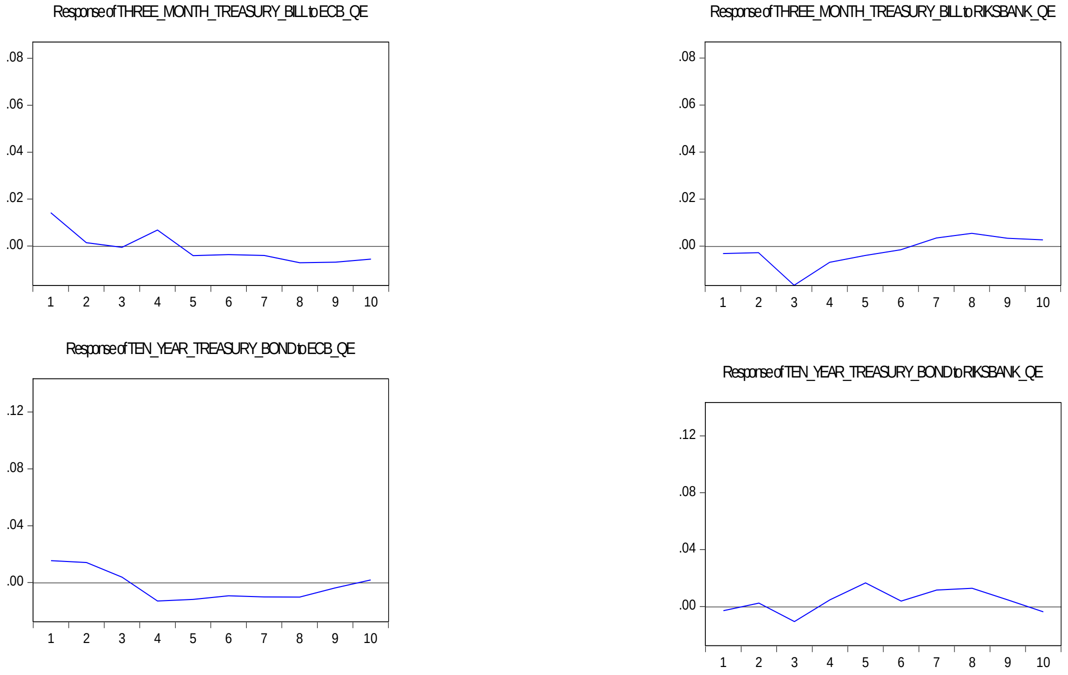
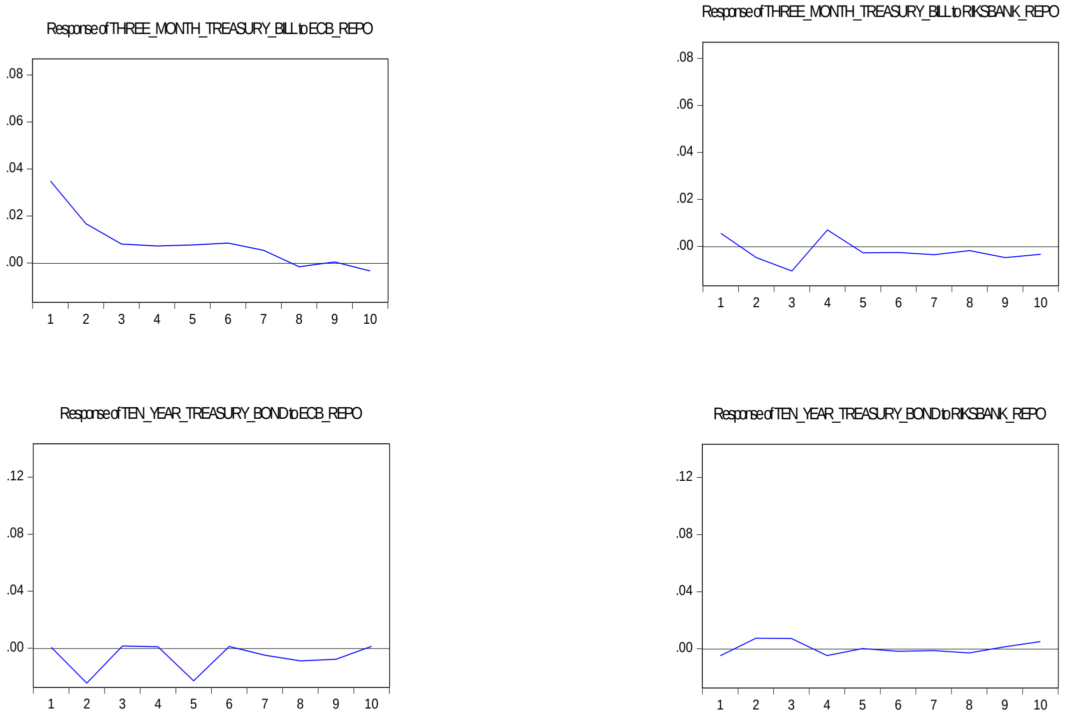


Figure 4. Responses of Swedish 3-month treasury bill and 10-year treasury bond to a repo rate contraction shock by ECB and Riksbank.



4.3 Exchange rate

Figure 5 presents the contemporaneous response of EUR/SEK and NEER to QE expansion shock by the respective central bank. The Riksbank succeeds with the intention of depreciating the krona which observed by both EUR/SEK and NEER. Most Notably is the EUR/SEK significant instant 0.29 percentage point depreciation response to a Riksbank QE expansion shock. The 0.11 percentage point decrease in NEER is supporting the results drawn from EUR/SEK. However, the krona appreciates in response to ECB monetary policy, which is in line with macroeconomic theory, as ECB is not the central bank who oversees the krona. The Riksbank impact on EUR/SEK is 3x than ECB.

The respective central bank repo rate contraction contemporaneous effect on the exchange rates is presented in figure 6, where the EUR/SEK reveals an appreciation in the krona for the first months followed by a depreciation trend the following months. The trend seems to be dominated by a depreciation. Thus the krona depreciation as a response to ECB repo rate shock is aligned with theory. Similar can be drawn regarding NEER response to ECB repo surprise. The response of the exchange rates to a Riksbank repo shock is significant throughout but reveals no noteworthy regime changes.

The role of the exchange rate is particularly important for open economies, where the notable shares of the economic activity consist of foreign trade. Which is the case for Sweden an export-dependent country who needs to ensure a weaker EUR/SEK. Since the Riksbank monetary policy is contemporaneously affected by ECB monetary policy, a weaker krona recorded in results is a calculated action by the Riksbank. As a weaker krona implies less foreign demand for the krona, which in return means less capital inflow. Thus, the demand for Swedish bond decreases as the krona is weakening as emphasized in the yield curve section, price down, yield up. However, bonds are purchased by the Riksbank with the intention of pushing yields down which was notably in 3-month treasury bill. The action is within its mandate of price stability

Sweden is a country with a floating rate, however almost act identically to countries with a pegged currency. Which raises the question regarding if it is a dilemma and not a trilemma (Rey, 2013). As the Riksbank actions seem to indicate a calculated defense of krona.

Figure 5. Responses of EUR/SEK and Nominal Effective Exchange Rate (NEER) to a QE expansion shock by ECB and Riksbank.

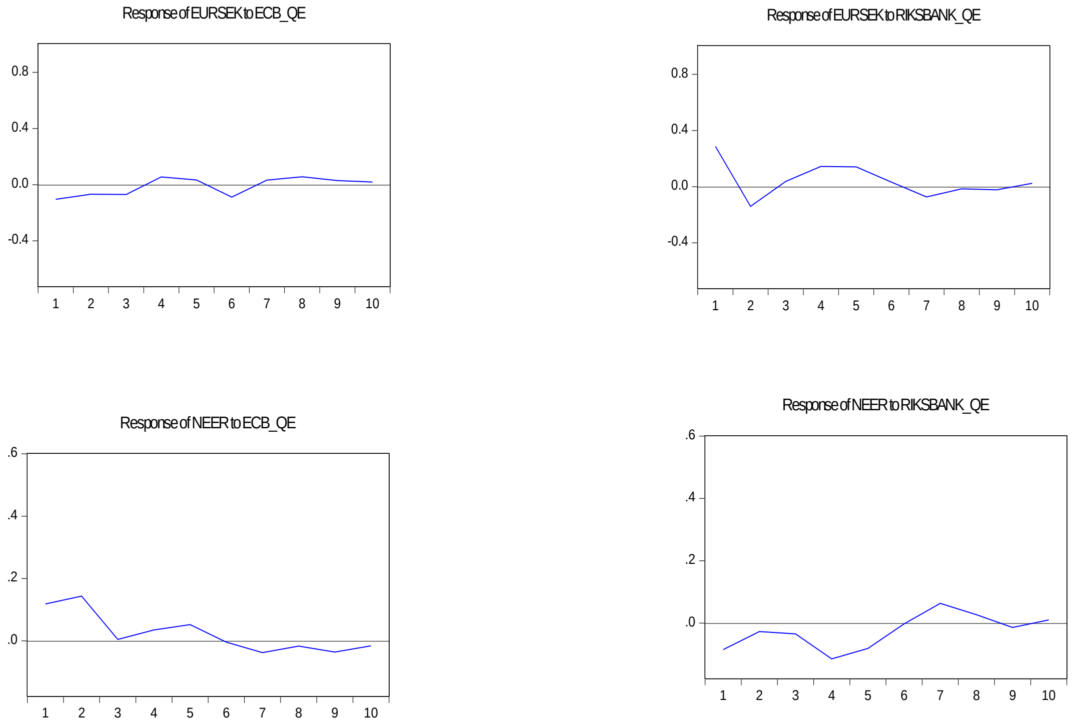
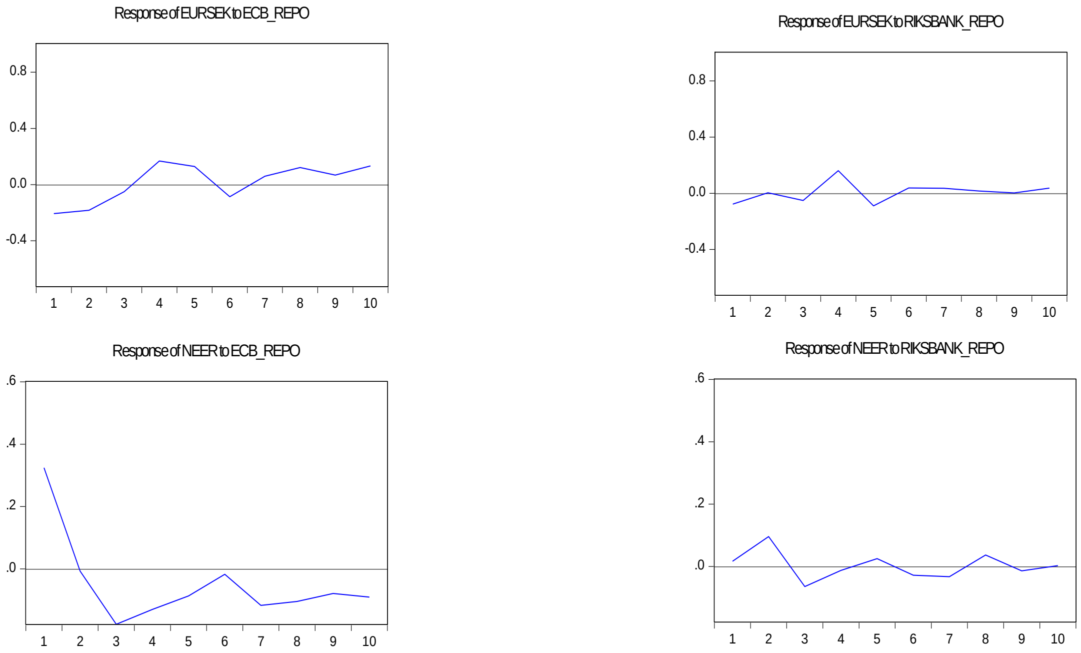


Figure 6. Responses of EUR/SEK and Nominal Effective Exchange Rate (NEER) to a repo rate contraction shock by ECB and Riksbank.



4.4 Stock market

The contemporaneous responses of the of the leading Swedish stock index (OMX30) and all share index (OMXPI) to a QE shock by respective central bank presented in figure 7 are significant throughout for ECB QE expansion shock case. However, ECB expansion shock has no notable effect on the indexes, as the subsequent response reduces the initial responses. Which is observed by the contemporaneous response to the Riksbank QE shock. However, the contemporaneous response of the indexes to a rate contraction by respective central bank presented in figure 8 tells a different story. The OMX30 increases initially as a response to an ECB contraction. However, it decreases in the following months. OMXPI follows an identical path. The same is observed by the indexes response to Riksbank contraction surprise which is significant throughout.

The contemporaneous response to both QE expansion shows that QE fails to exaceberate out to the economy, so far we have observed effects through the monetary channel, yield curve channel, and exchange rate channel. Where QE showed effects through the different channels, e.g., the yield curve section revealed the presence of the signaling. Which in return should induce short-term lending as the 3-month treasury is the benchmark for all interest rates with the same maturity. Meaning induced lending by banks out to the economy, the induced lending theoretically would lead to a better business climate for business. Which would have a fallout on stocks, i.e., the OMX30 and OMXPI. However the latter represent the overall business climate, as Small and Medium-sized Enterprises (SME), and which are the beneficiary of a better business climate is incorporated in the index. So, in theory, OMXPI should be most receptive and increase as a response to Riksbank QE expansion shock. However, the lending channel may not work as it should. The reasons vary but, e.g., in lower interest rate environment banks can make use of the environment as rates are lowered for them too, they can make an arbitrage profit through not lowering their lending rates. Then the outcome is no effect of QE as noted in the stock indexes figures, due to bank lending channel not working as it ought to do.

Bank lending channel dysfunctionality does not imply capital outflows. It implies market dysfunctionality. However, it does not stop capital inflows as observed in yield curve section and exchange rate section. However also in this section, as figure 8 were the contemporaneous indexes response to ECB repo rate contraction reveals capital inflow. An ECB repo contraction is terrible news for equities in the eurozone. Thus, capital flows out as a response to a contraction; the capital flows towards higher returns, the Riksbank repo rate at the moment is lower than ECB repo rate. Hence Riksbank lower repo rate and the stock indexes offers an arbitrage opportunity, but that is til the Riksbank which is contemporaneously affected by ECB responds.

Figure 7. Responses of OMX30 and OMXPI to a QE expansion shock by ECB and Riksbank.

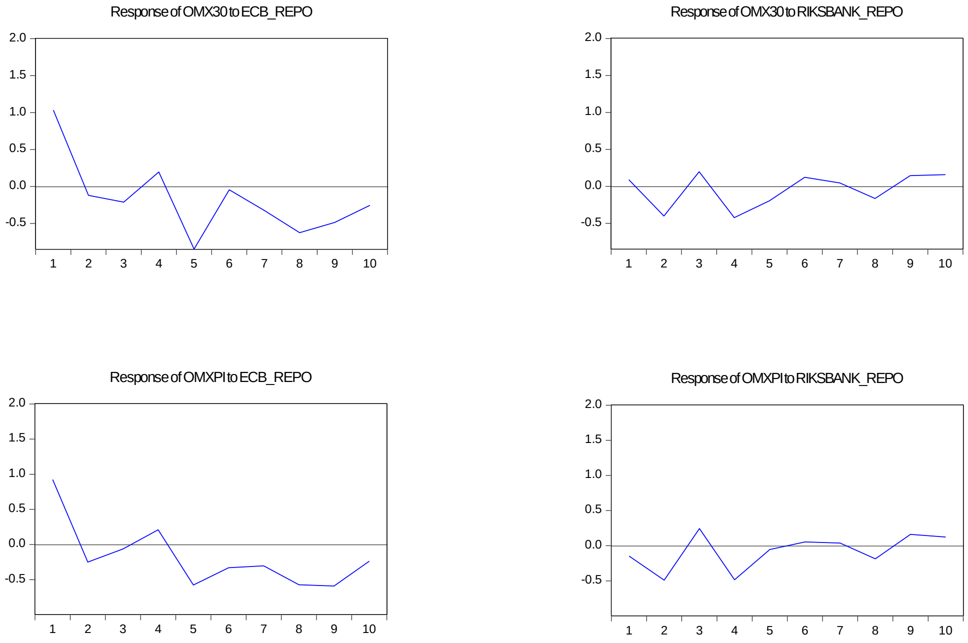
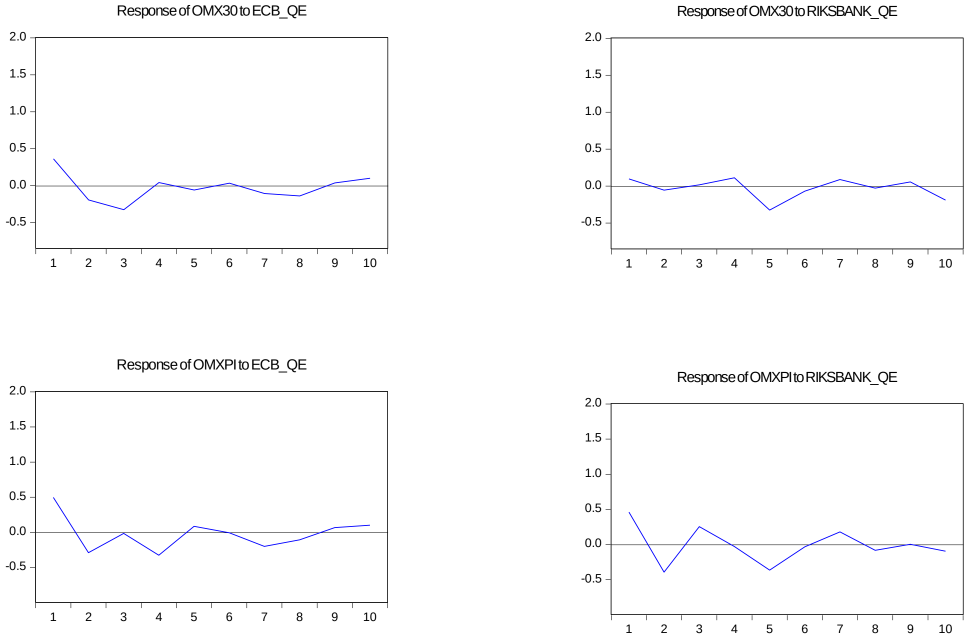


Figure 8. Responses of OMX30 and OMXPI to a repo rate contraction shock by ECB and Riksbank.



4.5 The real economy

Finally, the last channel the real economy’s response to a QE expansion shock presented in figure 9. Overall the results support the conclusion drawn in the stock market section of QE fails to exacerbate out to the economy. There few noteworthy responses, e.g., Riksbank QE expansion leads to increased housing prices, as does ECB QE expansion. Hence housing prices are very receptive to QE expansion, note that ECB monetary policy contemporaneously affects Riksbank monetary policy. Interestingly Riksbank QE expansion shock decreases industrial production growth. Were ECB expansion shock leads to significant increase in industrial growth. Inflation is inconsistent over time, there seems to some vague increase in inflation as a response to ECB, but Riksbank has no notable effect. Figure 10 presents the real economy’s response to a contraction. ECB repo contraction surprise increases industrial growth in first months. However, the following months are followed by a decrease. Inflation is decreasing and so is unemployment. The Riksbank contraction shock manages to decrease inflation as it ought to do, and similar occurs in industrial growth.

Overall, the housing prices seem to be absorbing QE, but the other segments of the real economy are not-responsive. Perhaps for the very reasons discussed in the stock market section, where the bank lending channel might not work as intended.

Although, stimulus policy to the real economy seems to be limping. Might be an indication of secular stagnation as addressed by Andersson (2017) and Gordon (2015). However, as Andersson (2017) address. The expansionary monetary policy might work temporarily, but it does not address the structural problem instead it might be even worse the problem in the future as we continuously try to borrow demand from the future today. Sweden amongst many developed nations has witnessed slowing of productivity and innovation, and population forecast implies an upside-down pyramid.

However, the result of the real economy in this paper are not in line with previous literature such as Schenkelberg and Watzka (2012) who finds effects of QE on the real economy in pre-crisis Japan.

Figure 9. Responses of the real economy to a QE expansion shock by ECB and Riksbank.

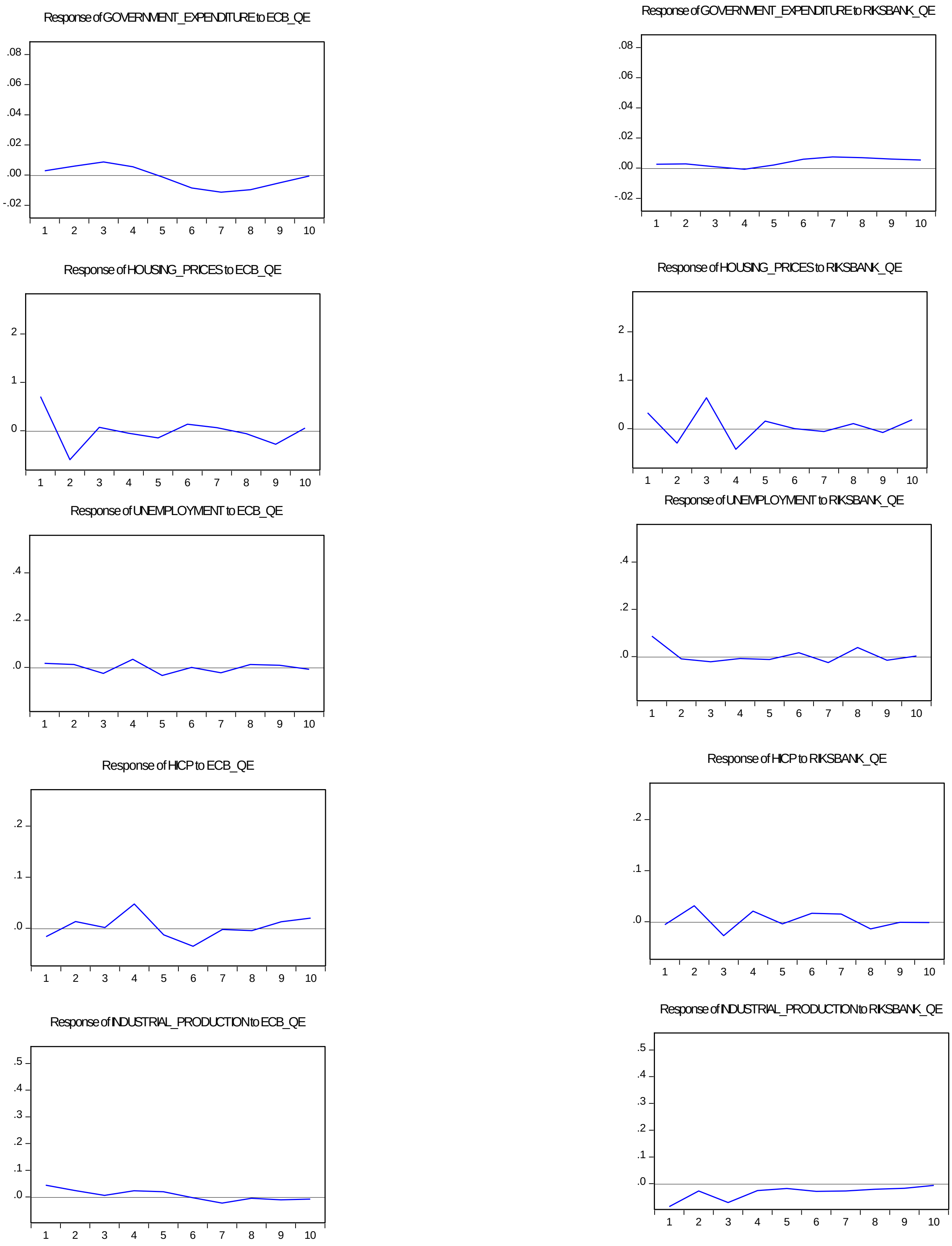
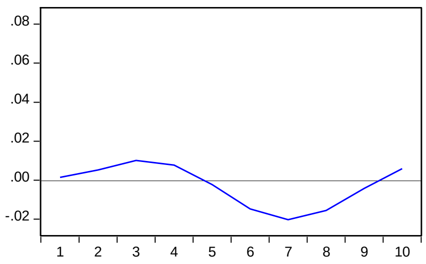
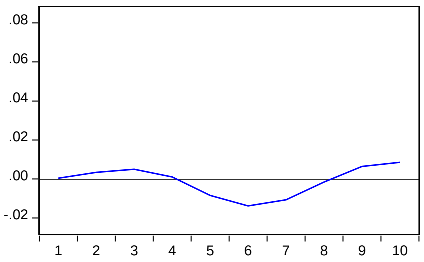


Figure 10. Responses o the real economy to a repo rate contraction shock by ECB and Riksbank.

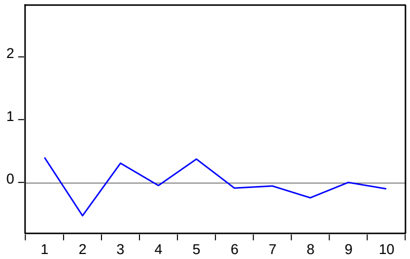
Response of GOVERNMENT_EXPENDITURE to ECB_REPO



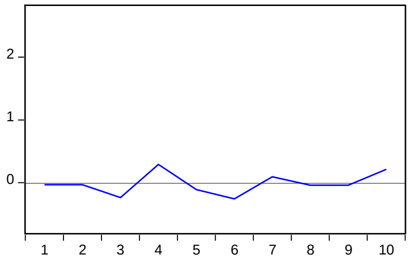
Response of GOVERNMENT_EXPENDITURE to RIKSBANK_REPO



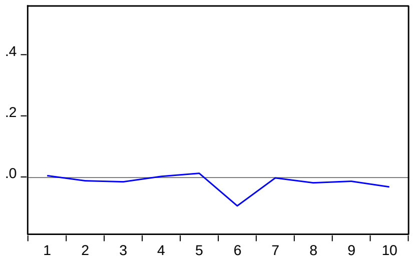
Response of HOUSING_PRICES to ECB_REPO



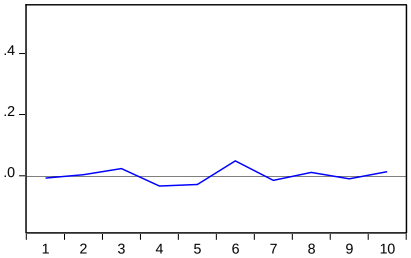
Response of HOUSING_PRICES to RIKSBANK_REPO



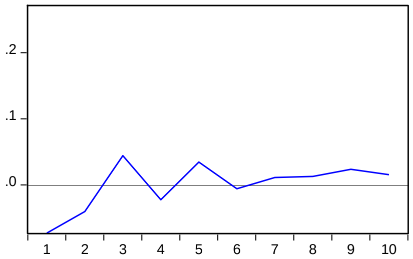
Response of UNEMPLOYMENT to ECB_REPO



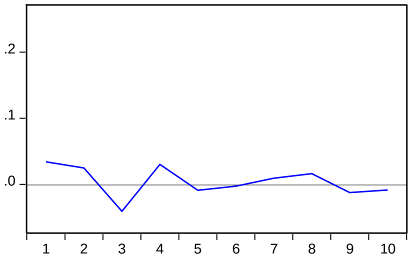
Response of UNEMPLOYMENT to RIKSBANK_REPO



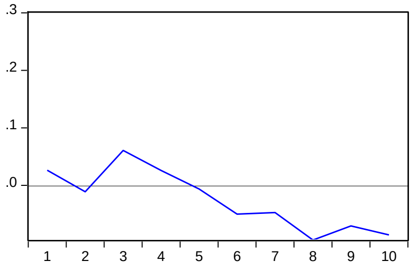
Response of HICP to ECB_REPO



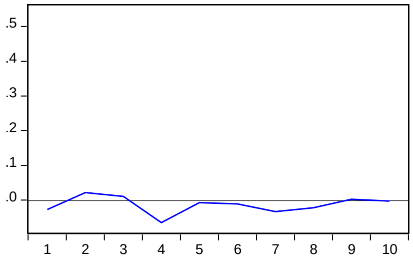
Response of HICP to RIKSBANK_REPO



Response of INDUSTRIAL_PRODUCTION to ECB_REPO



Response of INDUSTRIAL_PRODUCTION to RIKSBANK_REPO



Conclusion

This paper has reviewed the ECB and the Riksbank quantitative easing policy effect on the Swedish economy, by analyzing the impact through different channels. The monetary policy channel, the impact of respective central bank vis-á-vis monetary policy, the yield curve channel, their impact on the Swedish 3-month treasury bill and 10-year bond. The exchange rate channel, EUR/SEK Nominal Effective Exchange Rate, the stock market with OMX30 and OMX all share finally the real economy (House prices, Harmonized Index of Consumer Prices, Governmental expenditure, Unemployment, Industrial production). We find evidence of ECB monetary policy influencing the Riksbank monetary policy. However, the respective QE programs do not influence each other. We also found evidence of ECB influencing the yield curve, implying that ECB is influential in shaping the expectations in the Swedish economy. The Riksbank was most influential in the exchange rate channel. However, the Riksbank monetary policy is contemporaneously affected by ECB monetary policy shocks. For the stock market, we found that ECB repo rate to be most influential. For the real economy, the results were mixed, as housing prices absorbed most of the monetary shocks. To our understanding does the results go along with the theory of the ongoing process of financial globalization. Due to the low levels of independency does financial cycle have an increasing impact on new policy implementations from the centre ‘country.’ This we can see from the QE operation of ECB and its impact on the Swedish economy.

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Appendix A

Response of ECB QE:

Period	ECB QE	ECB repo	Riksbank QE	Riksbank repo
1	2,178423	0	0	0
2	0,53295	0,365511	-0,229246	0,207583
3	0,242274	0,105791	-0,210345	0,214879
4	0,218764	0,137118	-0,033499	0,096337
5	0,35596	0,171089	0,074531	0,228852
6	0,179769	0,215744	-0,129205	0,071912
7	0,195135	0,213482	0,036602	-0,062423
8	0,197853	0,154619	-0,12862	-0,020275
9	0,121774	0,240689	-0,07172	0,060881
10	0,026355	0,11206	-0,04589	-0,031972
Mean	0,4249257	0,1716103	-0,0737392	0,0765774
Max	2,178423	0,365511	0,074531	0,228852
Min	0,026355	0	-0,229246	-0,062423

Response of Riksbank QE:

Period	ECB QE	ECB repo	Riksbank QE	Riksbank repo
1	0,415033	0,005053	2,258825	0
2	-0,065446	0,016917	0,241371	0,014649
3	0,006431	0,340462	0,008335	0,031292
4	-0,10605	0,100573	0,055405	-0,02362
5	0,249772	0,335294	0,018786	-0,013376
6	0,070283	0,225315	-0,022211	-0,003203
7	0,108776	0,214352	-0,005631	0,056509
8	0,055371	0,184911	-0,061551	-0,021483
9	0,050702	0,048751	0,024084	-0,011824
10	0,042668	0,136552	-0,028846	-0,03427
Mean	0,082754	0,160818	0,2488567	-0,0005326
Max	0,415033	0,340462	2,258825	0,056509
Min	-0,10605	0,005053	-0,061551	-0,03427

Response of 10-year bond: Period	ECB QE	ECB repo	Riksbank QE	Riksbank repo
1	0,015504	0,000605	-0,002922	-0,00482
2	0,014176	-0,024579	0,002394	0,007377
3	0,003791	0,001495	-0,010553	0,007236
4	-0,012877	0,000941	0,004805	-0,004706
5	-0,011762	-0,022902	0,016635	0,000118
6	-0,009247	0,001198	0,00384	-0,00183
7	-0,010017	-0,004994	0,011582	-0,001304
8	-0,010187	-0,008945	0,012878	-0,002873
9	-0,003699	-0,007805	0,004716	0,001384
10	0,001845	0,001271	-0,003706	0,005086
Mean	-0,0022473	-0,0063715	0,0039669	0,0005668
Max	0,015504	0,001495	0,016635	0,007377
Min	-0,012877	-0,024579	-0,010553	-0,00482

Response of NEER: Period	ECB QE	ECB repo	Riksbank QE	Riksbank repo
1	0,118401	0,324423	-0,084932	0,016449
2	0,143318	-0,007169	-0,027332	0,095707
3	0,004623	-0,177543	-0,034611	-0,064497
4	0,034941	-0,130121	-0,114917	-0,012599
5	0,051938	-0,087032	-0,08149	0,024945
6	-0,004338	-0,017346	-0,002665	-0,027983
7	-0,037783	-0,116993	0,063374	-0,032629
8	-0,016863	-0,104752	0,026741	0,036637
9	-0,036245	-0,079044	-0,014383	-0,013941
10	-0,016164	-0,090619	0,009905	0,002819
Mean	0,0241828	-0,0486196	-0,026031	0,0024908
Max	0,143318	0,324423	0,063374	0,095707
Min	-0,037783	-0,177543	-0,114917	-0,064497

Response of OMXPI: Period	ECB QE	ECB repo	Riksbank QE	Riksbank repo
1	0,496503	0,923472	0,460941	-0,146697
2	-0,28849	-0,250503	-0,393934	-0,489757
3	-0,014937	-0,063794	0,255276	0,24376
4	-0,324438	0,209336	-0,028132	-0,485408
5	0,085602	-0,5763	-0,364394	-0,053196
6	-0,006192	-0,330427	-0,03327	0,053536
7	-0,199948	-0,302681	0,179177	0,036743
8	-0,106348	-0,573197	-0,081989	-0,186007
9	0,068134	-0,589788	0,003381	0,160618
10	0,102461	-0,237314	-0,094853	0,123786
Mean	-0,0187653	-0,1791196	-0,0097797	-0,0742622
Max	0,496503	0,923472	0,460941	0,24376
Min	-0,324438	-0,589788	-0,393934	-0,489757

Response of Govermental expenditure: Period	ECB QE	ECB repo	Riksbank QE	Riksbank repo
1	0,002919	0,001455	0,002633	0,00037
2	0,005941	0,005294	0,00289	0,00347
3	0,008718	0,010185	0,000886	0,005043
4	0,005596	0,007771	-0,000742	0,001104
5	-0,001288	-0,002194	0,002088	-0,008367
6	-0,00852	-0,014744	0,005932	-0,013713
7	-0,011317	-0,02024	0,00748	-0,010568
8	-0,009728	-0,015511	0,006906	-0,001514
9	-0,005027	-0,004208	0,006075	0,006518
10	-0,000593	0,005978	0,005434	0,008496
Max	0,008718	0,010185	0,00748	0,006518
Min	-0,011317	-0,02024	-0,000742	-0,013713
Mean	-0,0013299	-0,0026214	0,0039582	-0,0009161

Response of D_HICP:

Period	ECB QE	ECB repo	Riksbank QE	Riksbank repo
1	-0,01592	-0,072416	-0,005616	0,034125
2	0,013235	-0,040166	0,031573	0,024989
3	0,001741	0,044137	-0,027051	-0,040549
4	0,047628	-0,022368	0,02074	0,030258
5	-0,012832	0,034448	-0,003916	-0,008719
6	-0,03483	-0,005531	0,016734	-0,0026
7	-0,002165	0,011499	0,015048	0,009575
8	-0,004446	0,01298	-0,013765	0,016494
9	0,013128	0,02384	-0,001116	-0,012407
10	0,020288	0,015754	-0,001402	-0,008501
Mean	0,0025827	0,0002177	0,0031229	0,0042665
Max	0,047628	0,044137	0,031573	0,034125
Min	-0,03483	-0,072416	-0,027051	-0,040549

Response of Industrial production:

Period	ECB QE	ECB repo	Riksbank QE	Riksbank repo
1	0,04464	0,026494	-0,085914	-0,027392
2	0,024351	-0,010839	-0,027099	0,021226
3	0,006434	0,06067	-0,070597	0,009889
4	0,023589	0,026164	-0,025526	-0,065687
5	0,020132	-0,006185	-0,017877	-0,007951
6	-0,002431	-0,049688	-0,028638	-0,01109
7	-0,02259	-0,047194	-0,027119	-0,033249
8	-0,005025	-0,09458	-0,020831	-0,022035
9	-0,010455	-0,070229	-0,01727	0,001752
10	-0,007363	-0,086018	-0,006098	-0,003387
Mean	0,0071282	-0,0251405	-0,0326969	-0,0137924
Max	0,04464	0,06067	-0,006098	0,021226
Min	-0,02259	-0,09458	-0,085914	-0,065687

Response of ECB repo:

Period	ECB QE	ECB repo	Riksbank QE	Riksbank repo
1	0,006629	0,103073	0	0
2	-0,00023	-0,0141	-0,00572	-0,007028
3	0,002143	0,035334	0,000237	-0,008945
4	0,009064	0,027916	-0,00025	-0,00308
5	-0,00074	0,020759	-0,00723	-0,001191
6	-0,00181	0,011892	0,005803	-0,005325
7	-0,0004	0,022113	-0,00334	-0,00319
8	0,003164	0,007596	0,00083	-0,005496
9	-0,00475	0,009587	-0,00346	-0,004619
10	0,000366	0,004845	0,001163	-0,00332
Mean	0,001343	0,022902	-0,0012	-0,0042194
Max	0,009064	0,103073	0,005803	0
Min	-0,00475	-0,0141	-0,00723	-0,008945

Response of Riksbank repo:

Period	ECB QE	ECB repo	Riksbank QE	Riksbank repo
1	0,011947	-0,01255	-0,01195	0,08085
2	0,010098	0,049856	-0,00098	-0,032298
3	-0,0099	0,007894	-0,00329	0,001802
4	0,012124	0,014317	-0,01189	-0,008331
5	0,012249	0,011977	-0,00538	0,008773
6	-0,00262	0,009586	-0,00981	-0,006586
7	-0,00288	0,011471	0,001504	0,00141
8	0,001223	0,011384	0,000453	-0,003367
9	-0,00346	0,00428	0,00174	-0,000127
10	-0,00608	0,005067	0,003423	-0,005526
Mean	0,00227	0,011329	-0,00362	0,00366
Max	0,012249	0,049856	0,003423	0,08085
Min	-0,0099	-0,01255	-0,01195	-0,032298

Response of 3-month t-bill:

Period	ECB QE	ECB repo	Riksbank QE	Riksbank repo
1	0,014211	0,03488	-0,0032	0,005565
2	0,001432	0,016695	-0,00281	-0,004759
3	-0,00058	0,008064		-0,010488
4	0,006842	0,007246	-0,00688	0,007018
5	-0,00409	0,007672	-0,00399	-0,002715
6	-0,00365	0,008445	-0,00155	-0,002614
7	-0,00405	0,005377	0,003479	-0,00355
8	-0,00713	-0,00163	0,005446	-0,001823
9	-0,00689	0,000417	0,00334	-0,00479
10	-0,00559	-0,0034	0,00267	-0,003367
Mean	-0,00095	0,008377	-0,00039	-0,0021523
Max	0,014211	0,03488	0,005446	0,007018
Min	-0,00713	-0,0034	-0,00688	-0,010488

Response of EURSEK:

Period	ECB QE	ECB repo	Riksbank QE	Riksbank repo
1	-0,1035	-0,20623	0,287046	-0,077117
2	-0,06753	-0,18257	-0,13959	0,003712
3	-0,06973	-0,05	0,037972	-0,05143
4	0,054866	0,168342	0,144053	0,160936
5	0,033983	0,12875	0,1409	-0,089551
6	-0,08878	-0,08673	0,03237	0,038208
7	0,032481	0,059488	-0,07269	0,03534
8	0,055853	0,121439	-0,01487	0,015911
9	0,029373	0,067342	-0,02257	0,002581
10	0,01868	0,132346	0,0248	0,036204
Mean	-0,01043	0,015217	0,041743	0,0074794
Max	0,055853	0,168342	0,287046	0,160936
Min	-0,1035	-0,20623	-0,13959	-0,089551

Response of OMX30:

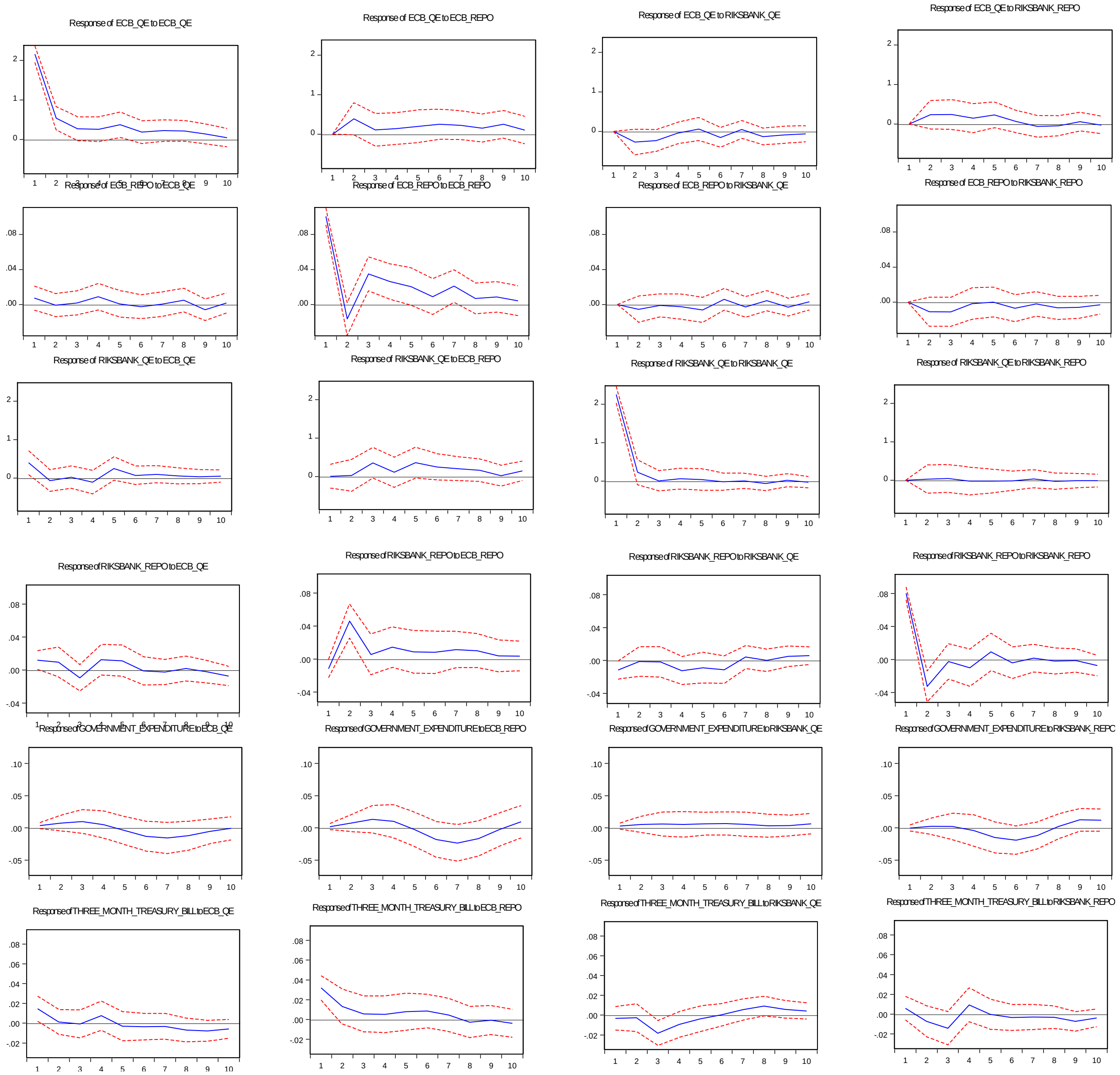
Period	ECB QE	ECB repo	Riksbank QE	Riksbank repo
1	0,363416	1,033405	0,097179	0,091061
2	-0,19357	-0,11961	-0,05491	-0,400367
3	-0,32323	-0,21075	0,016852	0,198714
4	0,042035	0,19687	0,112179	-0,4238
5	-0,0578	-0,84517	-0,32444	-0,194645
6	0,033396	-0,04383	-0,06839	0,122937
7	-0,10598	-0,32489	0,088475	0,045859
8	-0,13896	-0,62457	-0,02767	-0,164182
9	0,037369	-0,48679	0,05637	0,145423
10	0,101292	-0,25456	-0,19001	0,157885
Mean	-0,0242	-0,16799	-0,02944	-0,0421115
Max	0,363416	1,033405	0,112179	0,198714
Min	-0,32323	-0,84517	-0,32444	-0,4238

Response of D_HOUSEP:

Period	ECB QE	ECB repo	Riksbank QE	Riksbank repo
1	0,704293	0,396759	0,326659	-0,033948
2	-0,60074	-0,53194	-0,30035	-0,032028
3	0,070993	0,305343	0,633934	-0,237115
4	-0,05476	-0,051	-0,42877	0,28932
5	-0,15	0,369443	0,152574	-0,11075
6	0,134183	-0,09042	-0,00051	-0,257951
7	0,062843	-0,05975	-0,06107	0,092217
8	-0,0596	-0,24674	0,101523	-0,042927
9	-0,28032	0,000525	-0,08276	-0,04102
10	0,054485	-0,10149	0,182978	0,212253
Mean	-0,01186	-0,00093	0,052421	-0,0161949
Max	0,704293	0,396759	0,633934	0,28932
Min	-0,60074	-0,53194	-0,42877	-0,257951

Response of Unemployment: Period	ECB QE	ECB repo	Riksbank QE	Riksbank repo
1	0,016848	0,004363	0,086648	-0,007424
2	0,012055	-0,01244	-0,01018	0,003437
3	-0,02595	-0,01529	-0,02193	0,023089
4	0,03443	0,001742	-0,00841	-0,033657
5	-0,0345	0,012107	-0,0122	-0,029056
6	-0,00056	-0,09474	0,016398	0,048506
7	-0,02302	-0,00316	-0,02534	-0,015107
8	0,011928	-0,01868	0,038287	0,010817
9	0,008399	-0,01399	-0,01575	-0,009998
10	-0,00873	-0,03263	0,002524	0,013338
Mean	-0,00091	-0,01727	0,005005	0,0003945
Max	0,03443	0,012107	0,086648	0,048506
Min	-0,0345	-0,09474	-0,02534	-0,033657

Appendix B



Response of ECB_QE to ECB_QE

Response of ECB_QE to ECB_REPO

Response of ECB_QE to RIKSBANK_QE

Response of ECB_QE to RIKSBANK_REPO

Response of ECB_REPO to ECB_QE

Response of ECB_REPO to ECB_REPO

Response of ECB_REPO to RIKSBANK_QE

Response of ECB_REPO to RIKSBANK_REPO

Response of RIKSBANK_QE to ECB_QE

Response of RIKSBANK_QE to ECB_REPO

Response of RIKSBANK_QE to RIKSBANK_QE

Response of RIKSBANK_QE to RIKSBANK_REPO

Response of RIKSBANK_REPO to ECB_QE

Response of RIKSBANK_REPO to ECB_REPO

Response of RIKSBANK_REPO to RIKSBANK_QE

Response of RIKSBANK_REPO to RIKSBANK_REPO

Response of GOVERNMENT_EXPENDITURE to ECB_QE

Response of GOVERNMENT_EXPENDITURE to ECB_REPO

Response of GOVERNMENT_EXPENDITURE to RIKSBANK_QE

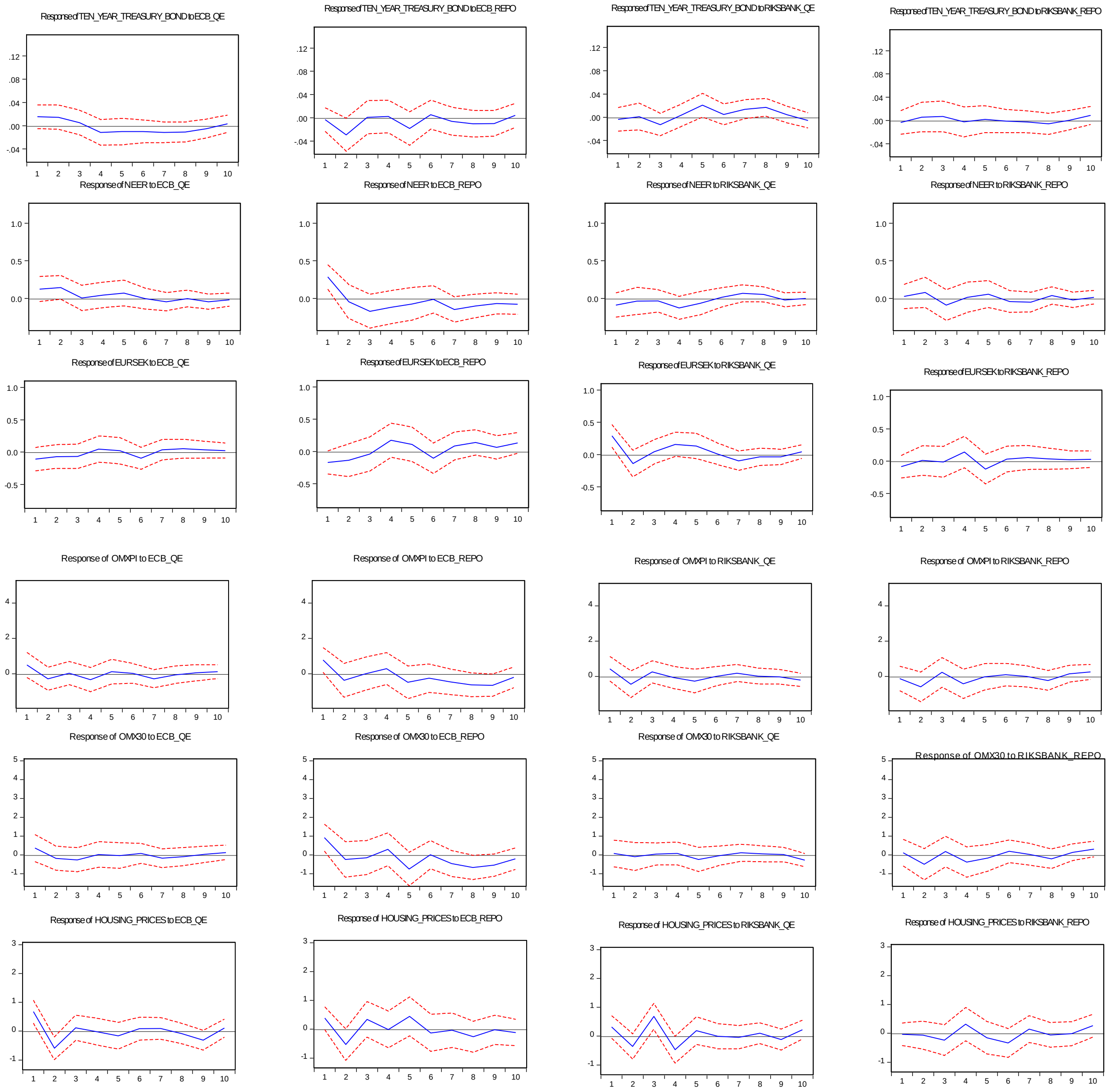
Response of GOVERNMENT_EXPENDITURE to RIKSBANK_REPC

Response of THREE_MONTH_TREASURY_BILL to ECB_QE

Response of THREE_MONTH_TREASURY_BILL to ECB_REPO

Response of THREE_MONTH_TREASURY_BILL to RIKSBANK_QE

Response of THREE_MONTH_TREASURY_BILL to RIKSBANK_REPO


Response of TEN_YEAR_TREASURY_BOND to ECB_QE
Response of TEN_YEAR_TREASURY_BOND to ECB_REPO
Response of TEN_YEAR_TREASURY_BOND to RIKSBANK_QE
Response of TEN_YEAR_TREASURY_BOND to RIKSBANK_REPO
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Response of NEER to ECB_QE
Response of NEER to ECB_REPO
Response of NEER to RIKSBANK_QE
Response of NEER to RIKSBANK_REPO
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Response of EURSEK to ECB_QE
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Response of EURSEK to RIKSBANK_REPO
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Response of OMXPI to RIKSBANK_REPO
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Response of OMX30 to ECB_REPO
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Response of HOUSING_PRICES to ECB_QE
Response of HOUSING_PRICES to ECB_REPO
Response of HOUSING_PRICES to RIKSBANK_QE
Response of HOUSING_PRICES to RIKSBANK_REPO
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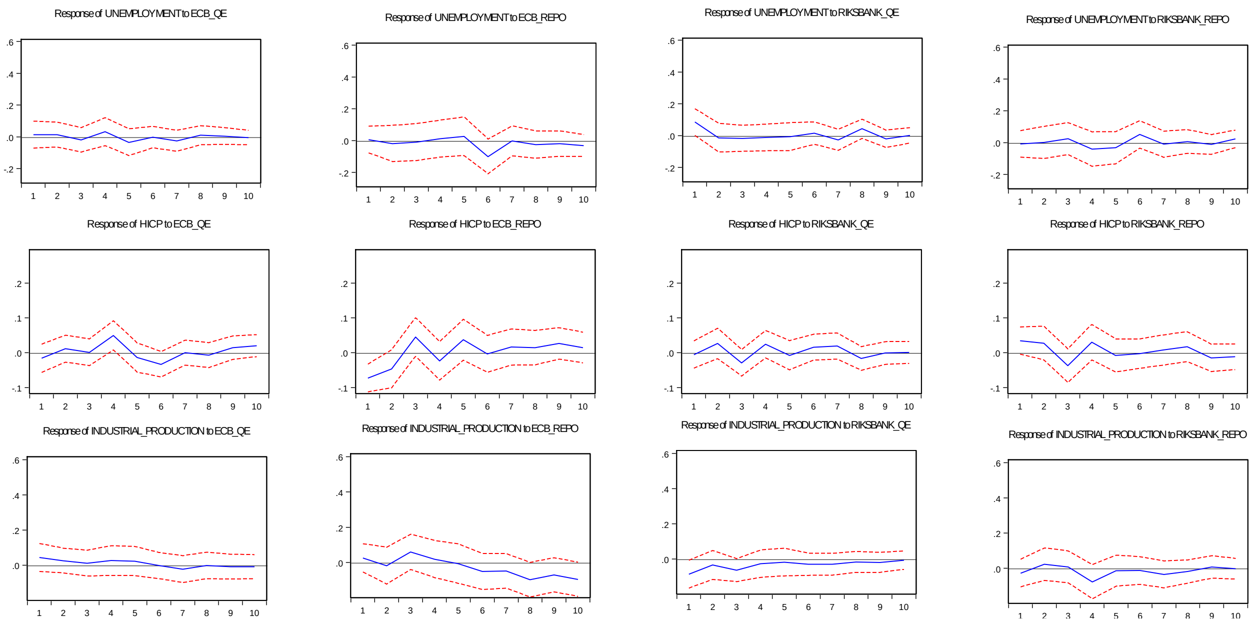
Response of UNEMPLOYMENT to ECB_QE
Response of UNEMPLOYMENT to ECB_REPO
Response of UNEMPLOYMENT to RIKSBANK_QE
Response of UNEMPLOYMENT to RIKSBANK_REPO
Response of HICP to ECB_QE
Response of HICP to ECB_REPO
Response of HICP to RIKSBANK_QE
Response of HICP to RIKSBANK_REPO
Response of INDUSTRIAL_PRODUCTION to ECB_QE
Response of INDUSTRIAL_PRODUCTION to ECB_REPO
Response of INDUSTRIAL_PRODUCTION to RIKSBANK_QE
Response of INDUSTRIAL_PRODUCTION to RIKSBANK_REPO
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