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The consumption-wealth channel:

Monetary policy transmission in the case of Sweden

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1. Introduction

Monetary policy and its impact on aggregate household demand is a subject that has been given a lot of attention in macroeconomic research since the beginning of the 20th century. One reason for this being that household consumption is a central factor behind GDP-growth, where the size of it is almost fifty percent of Swedish GDP.[1] Furthermore, consumption is a very important link between monetary policy and its goal variable, the rate of inflation.

The path through which the interest rate affects consumption is called the transmission mechanism and it is well known that this mechanism works through several different channels. Commonly denoted the interest rate channel, the exchange rate channel and the credit channel. All three channels have been extensively studied but there is one relationship that has been given less attention than the others, namely the so called consumption-wealth channel. A channel some researchers count as a fourth channel whereas others count it as a part of the interest rate channel. This channel explains the way monetary policy is transmitted to consumption via household wealth, wealth being defined as both financial wealth as well as wealth in the form of housing.

The aim of this paper is to examine to what extent monetary policy has had an impact on household consumption via household wealth in the Swedish economy since the change of exchange rate regime in the 1990s. That is, to find out how effective the consumption-wealth channel has been in Sweden since 1994 when the repo rate was first introduced, if it exists at all that is. A study that does not seem to have been performed using Swedish data before.

Following in the footsteps of Ludvigsson et. al. the method used in order to answer the above question is a structural vector autoregressive model (SVAR), where impulse response functions will trace out the effects of interest rate changes on consumption via its impact on household wealth.[2] Using Swedish data between 1994 Q2 – 2011 Q4 I find no indications of any presence of a consumption-wealth channel in the Swedish

[1] See for example Statistics Sweden (2012:1)
[2] Ludvigson, S., Steindel, C. & Lettau, M. (2002)

economy during the period examined. Indicating that the effect of monetary policy on consumption is transmitted mainly via the other channels of the transmission mechanism.

The rest of this paper is structured as follows. Chapter two gives an overview of the previous research. Chapter three then covers the theory and structures behind monetary policy, wealth and consumption. After this, chapter four gives an explanation and a description of the SVAR methodology as well as describing the data used. In chapter five the results are presented and in chapter six and seven the results are discussed and the conclusions summarized.

2. Previous research

The relationship between interest rates, wealth and consumption can be divided into two separate topics. The first being the link between consumption and wealth, the so called wealth channel, and the second being the link between interest rates and consumption and its implications for monetary policy. Both topics have been extensively studied during the 20th and beginning of the 21th century and research can be traced back to as early as 1936. The year John Maynard Keynes published his "General Theory of employment, interest and money" where the link between consumption and income, as well as its connection to the interest rate, was discussed.[3]

Concerning the first topic, the link between consumption and wealth, a large number of papers has been published since 1936. Many studying the marginal propensity to consume out of a given change in wealth. In 2009 for example, the European Central Bank (ECB) published a paper written by Ricardo Sousa where the wealth effects on consumption in the euro area is examined. Sousa finds relatively large wealth effects concerning financial wealth where "a 10% increase in financial wealth leads to an increase of between 0.6% and 1.5% in consumption." whereas "housing wealth effects

[3] Keynes, J. M. (1936)

are virtually nil".[4] A large number of papers reaching similar conclusions for other countries are also available, however with varying results concerning the strength of the wealth effects and whether or not housing effects are significant. See for example Chirinko et. al. (2008), Ludwig & Sløk (2004) or Altissimo et. al. (2005).[5] In the case of Sweden one can for example look at a study done by Carol Bertaut (2002) as well as the previously mentioned paper by Chirinko et. al.[6] Both studies find positive, although in some cases small, wealth effects in Sweden. The literature is thus rather uniform concerning the fact that consumption is positively affected by wealth, even though the size of the wealth effects varies.

When it comes to the second topic, the link between interest rates and consumption, the results are not as uniform. In 1936 Keynes, for example, mentions a possible connection but concludes that "the short-period influence of the rate of interest on individual spending out of a given income is relatively unimportant, except, perhaps, where unusually large changes are in question".[7] The earliest, more extended, studies can be traced back to the works of Brumberg and Modigliani (1954) as well as by Ando and Modigliani (1963). The authors present a life-cycle theory of consumption where the role of household assets and income play an important role.[8]

The above mentioned papers include the role of the interest rate but full analysis of the consumption-wealth channel of monetary policy is a more recent subject. It is also a subject where the results are varied and the existence of the channel thus being debated. Using a SVAR model and US data from 1966 to 2000, Ludvigson et. al. finds rather weak support for the role of the consumption-wealth channel. Using the same method as Ludvigson et al., Siokis (2005) find that changes in wealth, induced by interest rate changes, "have little impact on consumption" when using data from the Euro area from 1977 to 2002.[9] The same method is later on used by MacDonald, Mullineux and

[4] Sousa, R. M. (2009), p.18.
[5] Chirinko, S. R., de Haan, L. & Sterken, E. (2008), Ludwig, A. & Sløk, T. (2004) and Altissimo, F. et. al. (2005)
[6] Bertaut, C. C. (2002)
[7] Keynes, J. M. (1936), p. 94.
[8] Modigliani, F. & Brumberg, R (1954) and Ando, A. & Modigliani, F. (1963)
[9] Siokis, F. M. (2005), p. 349

Sensarna (2011). Using UK data they conclude that, as opposed to the other authors, there is a statistically significant impact of the consumption-wealth channel.[10]

3. Theory

3.1 The transmission mechanism of monetary policy

In Sweden it is the Swedish central bank, the Riksbank, that is the authority in charge of the country's monetary policy. Since the change of exchange rate regime in 1992 the goal of the monetary policy has been price stability, in 1993 defined as an inflation target of two percent.[11] A target that is to be reached by adjusting the policy rate, the so called repo rate, when found necessary. When the economy is expected to go into a boom the repo rate is raised, thus cooling the economy down and the opposite if the economy is expected to go into recession. The repo rate affects the rate of inflation via the so called monetary transmission mechanism where a change in the repo rate directly affects the day-to-day money rate, the interest rate to which the banks lend money to and from each other on the interbank market. Thus also, indirectly, affecting the interest rates towards the general public. This in turn, affects total supply and demand in the economy as shall be further explained below. A change in demand also involves a change in aggregate household consumption and when consumption is lowered this reduces pressure on prices in the economy which in turn leads to lower inflation. Normally, an interest rate change is expected to have full effect on the economy after about two years. This since there is a lag between the repo rate change and altered household consumption behavior.

The monetary transmission mechanism can be divided into three different channels through which the market interest rates affect supply and demand in the economy. These channels are *the exchange rate channel*, *the credit channel* and *the interest rate channel*. Shortly, (i) the exchange rate channel affect the economy via the value of the county's currency, the exchange rate.

[10] MacDonald, G., Mullineux, A. & Sensarna, R. (2011), p. 1991
[11] See for example The Riksbank (2012:1)

Where a higher repo rate normally leads to an appreciation of the currency, thus making exports more expensive and imports less expensive. (ii) The credit channel, in turn, affects the banks' lending which in turn affects consumption and investment possibilities for both consumers and corporations. When it comes to (iii) the interest rate channel the repo rate affects the economy in several ways. Higher interest rates makes saving more attractive and conversely borrowing less attractive, thus lowering household demand. Furthermore, it also makes current loans more expensive thus lowering the households' disposable income after interest rate expenditures as well as lowering the value of financial and real assets. In the end, all these effects leading to both reduced consumption and lower inflation. As stated in the introduction, the focus of this paper will be on the interest rate channel and more specifically the wealth effects therein.[12]

3.2 The consumption function and wealth

One of many starting points concerning consumption is Keynes and a simple form of the classical consumption function as it is stated below. It shows a simple relationship where aggregate consumption (C) is a function of aggregate disposable income (Y) and is affected by the marginal propensity to consume (b) out of a given change in income. A function where higher disposable income leads to higher consumption.

$$C_t = a + bY_t$$

Despite its simplicity this function is not optimal, why several other theories have developed over time. One being the permanent-income theory developed by Milton Friedman as well as the life-cycle theory previously mentioned, developed by Franco Modigliani with collaborators. Both theories emphasize that individuals are forward-looking and plan for the future, intertemporal budget constraints where individuals are life time consumption smoothers are thus key aspects of these models. These models contribute to the analysis of consumption by adding both wealth as well as the role of the interest rate to the equation. A commonly used consumption function in this setting

[12] See for example The Riksbank (2012:2)

is for example the one stated below, g being expected income growth, r the real interest rate and V private wealth.

$$C_t = C(Y_t, g, r, V_t)$$

In this setting both income, wealth as well as income growth has a positive effect on consumption whereas the effect of an interest rate change can both lower and raise consumption. Depending on whether or not the substitution or income effect is the strongest one. According to the substitution effect a higher interest rate will make individuals save more today, and consume more in the future thus lowering consumption today. The income effect works the other way around and raises consumption today, this since a higher interest rate allows the individual to consume more today without having to consume less in the future.

When it comes to the relationship between wealth and the interest rate this is to be seen as a negative one. According to theory a higher interest rate reduces financial wealth since the price of financial assets goes down when the interest rate is raised, this since the current value of future returns is lowered. When it comes to housing wealth this is also affected negatively from a rise in the interest rate since it, according to theory, reduces the market price of housing. Given that there are loans on housing these will also be more expensive to pay when the interest rate is raised.

According to theory we can thus expect that a higher repo rate will affect household wealth negatively, thus also affecting consumption negatively. And the contrary when the repo rate is lowered.[13] This paper assumes a Keynesian behavior of individuals rather than a full life-time consumption behavior. Individuals do of course plan ahead for a shorter period but if assuming full life-time consumption smoothing, individuals will not be affected by short term changes in the interest rate.

[13] Sørensen, P. B. & Whitta-Jacobsen, H. J. (2005), ch. 15-16

4. Method

4.1 The (S)VAR-model

There are several methods available when studying the effects of monetary policy, one of the most commonly used one being the usage of structural VARs and impulse response functions. As previously mentioned this paper follows the method of Ludvigson et. al., later on used by Siokis as well as by MacDonald et. al. This involves the usage of a structural vector autoregressive model (SVAR), where impulse response functions are used to trace the total effect of an interest rate shock on consumption via the transmission mechanism. In order to estimate this effect two models are estimated, this since one model will not completely isolate the effect of the consumption-wealth channel. The first model estimated will give us the total effect of a repo rate change on consumption, including a possible effect via the consumption-wealth channel. The second model will have a restriction imposed that shuts off the wealth channel. When comparing the impulse responses of an interest rate shock on consumption from the two models the difference can then be interpreted as the impact of the consumption-wealth channel in transmitting monetary policy.

Five variables will be used in the model; household consumption (c_t), household labor income ($y_{t,}$), household net asset wealth (a_t), the repo rate (rr_t), and inflation (π_t). The first three variables, consumption, income and asset wealth, are included since they are clearly essential to the level of consumption as well as for the assessment of the link between wealth and consumption. The repo rate is included as a measurement of the Swedish monetary policy, this since it is the tool used by the Riksbank in order to affect the rate of inflation. Inflation is then included since it is the goal variable of the central bank, a variable monetary policy thus clearly depends upon.

The five variable SVAR to be estimated is specified as follows:

$$\beta_0 z_t = k + \beta_1 z_{t-1} + \beta_2 z_{t-2} + \cdots + \beta_p z_{t-p} + u_t$$

Where $z_t = (\pi_t, y_t, c_t, a_t, rr_t)'$, k a constant and u_t a vector of error terms assumed to be uncorrelated. Note that the variables specified in vector z_t is in the correct order, otherwise the matrix β_0 will not make sense later on.

In order to identify the model and the parameters a number of restrictions are needed. The matrix β is to be specified and only the number of restrictions needed in order to get an exactly identified model will be used. Using the matrix formulation below we firstly remove the effects on inflation and income of the other variables by setting the upper right parameters to zero. This since these variables are not directly involved with the consumption-wealth-interest rate relationship in the same period.

$$\beta_0 = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ \beta_{21} & 1 & 0 & 0 & 0 \\ \beta_{31} & \beta_{32} & 1 & \beta_{34} & \beta_{35} \\ \beta_{41} & \beta_{42} & \beta_{43} & 1 & \beta_{45} \\ \beta_{51} & \beta_{52} & \beta_{53} & \beta_{54} & 1 \end{bmatrix} \qquad \begin{bmatrix} inflation \\ income \\ consumption \\ wealth \\ repo\ rate \end{bmatrix}$$

Three more restrictions are however needed for exact identification. The first restriction being setting $\beta_{35} = 0$. This because of the assumption that the repo rate does not affect consumption in the same period. The second restriction is setting $\beta_{43} = 0$. This by assuming that wealth is not influenced by consumption in the same period. The third restriction involves setting $\beta_{54} = 0$ thus assuming that the repo rate is not affected by wealth in the same period. Implying that the central bank does not take current household asset wealth into account when setting the repo rate. When imposing these restrictions we get the matrix defined on the next page, a matrix that is now exactly identified with ten parameters to be estimated. With this formulation we are assuming that the repo rate is allowed to affect wealth and that wealth is allowed to affect consumption in the same period. We are also letting inflation, income and consumption

affect the repo rate as well as allowing inflation to affect all other variables in the same period.

$$\beta_0 = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ \beta_{21} & 1 & 0 & 0 & 0 \\ \beta_{31} & \beta_{32} & 1 & \beta_{34} & 0 \\ \beta_{41} & \beta_{42} & 0 & 1 & \beta_{45} \\ \beta_{51} & \beta_{52} & \beta_{53} & 0 & 1 \end{bmatrix}$$

The optimal number of lags is then determined by using Akaike, Schwarz and Hannan-Quinn criterion, after which the model is estimated. Impulse response functions are then produced by imposing a one-standard-deviation shock to the variables, ultimately showing the dynamic response of consumption to an interest rate shock. However, as previously mentioned the above method only gives us the total effect on consumption induced by an interest rate shock. In order to trace the possible effects of wealth on consumption the consumption-wealth channel is shut off by setting $\beta_{34} = 0$ and then comparing the new impulse response functions with the original ones. If the impulse responses from both models lie very close to each other or lie within the confidence bands this is interpreted as there being no effect from the consumption-wealth channel.[14]

The advantages of this VAR modeling technique is its simplicity as well as the fact that several interactions can be introduced. The impulse response functions are also rather intuitive and easy to interpret. There are of course negative aspects as well, one being that increasing the number of variable rapidly increases the number of coefficients that needs to be estimated. Because of this, a VAR will most often contain a smaller number of variables and as a consequence adding risk of missing important data or relationships.[15]

[14] For further details see Ludvigson, S., Steindel, C. & Lettau, M. (2002)
[15] Webb, R. H. (1999), p.29-30

4.2 Data

Most time series used in this study is available as quarterly series from at least 1993 and onwards. The repo rate was however first set in June 1994. Due to this, all data will be quarterly over the period of 1994 Q2 – 2011 Q4. Including earlier periods in the study, and thus covering two different monetary policy regimes, is to be considered beyond the scope of this paper. Especially since quarterly data of the other variables is lacking before 1993. All data is openly available and collected from Statistics Sweden (SCB), apart from the repo rate which is collected from the Riksbank.

As a measure of (i) inflation the 12-month change in consumer price index (CPI) is used. The reason for using this particular measurement of inflation is the fact that this is the goal variable of the Riksbank, as well as it being the most commonly used measurement of inflation.

As a measure of (ii) consumption the natural log of real household spending on consumption is used. The data is seasonally adjusted by SCB and denoted in constant terms with 2010 as the base year.

(iii) Income is measured as the natural log of real household net disposable income, net income being income after tax. The series is denoted in constant terms with the base year of 2010. The original income time series was not seasonally adjusted and showed highly seasonal movements with clear spikes in the second quarter of each year. Seasonal adjustment was thus performed using the TRAMO/SEATS method, the method most often used by SCB. Another commonly used method for seasonal adjustment is X12-ARIMA but since both methods resulted in very similar seasonal adjustments in this case the choice of adjustment method should not affect the results in any significant way. [16]

[16] For further information about the two seasonal adjustment methods see Statistics Sweden (2003)

The (iv) interest rate measure used is the repo rate. This since it is to be considered a good measure of the monetary policy implemented by the central bank. During the crisis a lot of attention has been given to the fact that the gap between the repo rate and the interest rates offered to the households has widened since the beginning of the crisis.[17] Taking this into account is however to be considered to be out of scope for this paper why further studies might want to take this into consideration.

Finally, as a measure of (v) wealth the natural log of household net financial assets is used, denominated in current 2010 prices. Since we are using net financial wealth, defined as assets minus liabilities, we are also taking household debt into account. The wealth measurement also includes housing where term housing is equal to tenant-owned apartments, single-family homes and second homes. Using this measure of wealth is favorable since it includes the possibility that consumption is also affected by the value of non-financial assets. One can however argue for both the inclusion as well as exclusion of housing. This since some research finds no or very small wealth effects from housing,[18] whereas others find significant wealth effects from housing.[19] By including housing we are however not missing out on any effects.

5. Results

Beginning with a graphical presentation of the original time series one can see that there are clear indications of several time series being non-stationary (see appendix A). An augmented Dickey-Fuller test confirms this by not being able to reject the null hypothesis of non-stationarity for consumption, disposable income, the repo rate and wealth on a five percent level. This is a problem since model estimation with non-stationary variables might lead to spurious regression, a wrongly significant regression caused by a common trend.

[17] The Riksbank (2012)
[18] See for example Sousa, R. M. (2009)
[19] See for example Chirinko, S. R., de Haan, L. & Sterken, E. (2008)

The ACFs and PACFs of the same four series shows that they are all AR(1) indicating that the problem of non-stationarity can be solved by differencing the data once ($x_t - x_{t-1}$). Differencing the same series and again using the augmented Dickey-Fuller test shows that the differenced time series are now stationary, see Table 1 below. [20]

Table 1: Augmented Dickey-Fuller test

	p-value original variable	p-value differenced variable
Inflation	0.0040	
Income	0.9945	0.0312
Consumption	0.6981	0.0000
Wealth	0.3326	0.0000
Repo rate	0.0845	0.0082

Null hypothesis: variable has a unit root (non-stationary)

The next step involves looking for a possible cointegration relationship between the original non-stationary variables. If estimating a VAR using differenced non-stationary variables when cointegration is present this can lead to a misspecified model where the long-run equilibrium relationship is excluded. The preferred model is then a vector error correction (VEC) model. However, if cointegration is not present it is preferable to use the differenced variables in a VAR-model, as originally planned. [21] In this case a Johansens group cointegration test shows that two cointegration relationships are present, thus implying that a VEC-model is more appropriate.

Unfortunately, this outcome results in some estimation difficulties since none of the, to me, available statistical software can implement the structural restrictions needed for a structural VEC (SVEC). Neither Eviews 7 nor Stata 10 has this option implemented yet, a limitation probably due to the fact that SVEC-modeling is still a relatively new time series technique if compared to SVAR modeling. In an attempt to overcome this difficulty a VAR with the cointegration relationship added manually was estimated, a so called cointegrated VAR. This solves the issue of cointegration while still allowing for structural restrictions as well as impulse response functions. However, this model proves to have very poor statistical properties making it inappropriate to use at all. For

[20] For discussion and information on statistical methods etc. see Enders, W.(2010), p. 297-338
[21] Enders, W.(2010), p. 396-397

comparison a VEC was also estimated, but also proving to be a bad modeling choice. As opposed to a VAR, as we shall see further on.

Because of the fact that both a VEC and a cointegrated VAR proves to be inferior models the decision is made to continue using a (S)VAR as originally planned. Ignoring the cointegration relationship is obviously not the optimal choice since this means ignoring a long run relationship. It also limits the final impulse response analysis somewhat since all numbers has to be interpreted with caution. The model is also to be considered a short term one since we are ignoring the long run relationships. A SVAR model will however still be able to give us the graphical difference between two estimated models needed in order to answer the question formulation.

Once choosing the VAR the next step is to determine the optimal number of lags used. Using eight lags as the limit, both the Schwartz-Bayesian (SC) and Hannan-Quinn (HQ) criterion suggests two lags as optimal while the Akaike (AIC) criterion suggests eight lags. Using two lags does however make more economic sense why this number of lags will be used. The reasoning behind this is that the present economic state is more likely to be linked to the state of the economy two quarters back as opposed to two years back. For comparison, the corresponding number of lags in previous papers lies between two and five.[22]

The two lag VAR is then estimated and the statistical properties tested, five percent being the level of significance in all testing. Se appendix B for VAR-output and Table 2 on the next page for test results. If beginning with the residual analysis one can conclude that the residuals look normally distributed according to a histogram, which is also confirmed by the Jarque-Bera statistic. They also seem to have zero means according to a graphical presentation. Test statistics such as the t-statistic are thus acceptable to use and interpret. The Breusch-Godfrey test then confirms that there is no autocorrelation, that is no correlation of the residuals over time. Whites test, both with and without cross term, confirms that the residuals have the same variance, that is no

[22] See Ludvigson, S., Steindel, C. & Lettau, M. (2002), MacDonald, G., Mullineux, A. & Sensarna, R. (2011) and Siokis, F. M. (2005)

heteroscedastisity. Standard errors, and t-statistics are therefore to be considered correctly estimated and unbiased. A test specific for VAR-modeling is testing the inverse roots of the AR polynomial graphically in an AR roots graph. Since no root lies outside the unit circle the model is to be considered stable, this is important since a non-stable model can result in invalid impulse response standard errors.

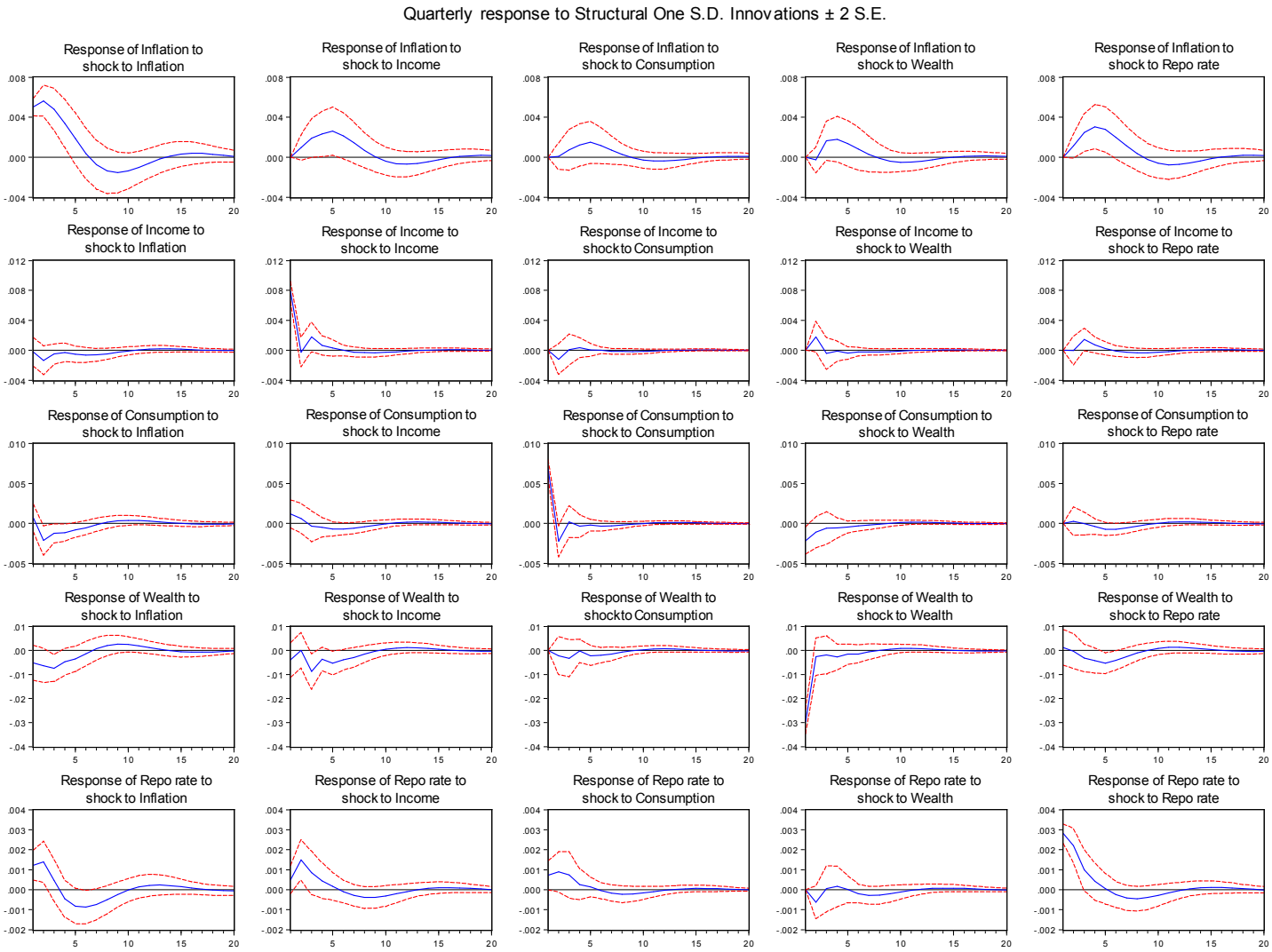
Table 2: Residual testing

	p-value
Residual normality test, Jarque-Bera	0.5115
Breusch-Godfrey autocorrelation LM-test (lag 1-3)	0.0605 0.5610 0.2862
Whites heteroscedasticity test (with cross term)	0.4271
Whites heteroscedasticity test (no cross term)	0.1867

Null hypothesis: residuals are normally distributed/no autocorrelation/no heteroscedasticity

The next step involves imposing the structural restrictions as well as generating the impulse response functions of our five variables to a one standard deviation shock on the same five variables. The results are presented in Chart no 1 on the next page, the dotted lines being one standard error confidence intervals. Interpreting impulse response functions might however not be completely intuitive, why this will be explained. Every graph traces out the response of one variable to a positive shock on a second variable; a rise in the impulse response thus equals a positive response of the first variable. The confidence bands then show whether or not the response is statistically significant by either covering or not covering the zero-line. Also, note that the graphs have different scales on the left axis and that the numbers are fairly small.

Chart 1: Impulse response functions

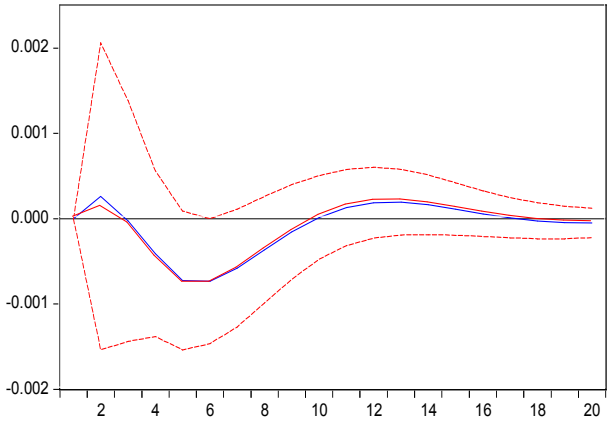


When it comes to the most important relationships regarding this paper, one can see that an increase in the repo rate does result in lowered consumption after about three quarters. And that the repo rate affects wealth negatively for a period of about two years. When looking at the graph viewing the response of consumption to wealth, one can see that higher wealth indeed leads to higher consumption. Furthermore, inflation is lowered nine quarters after a repo rate shock, consistent with the period the Riksbank estimates monetary policy to get full effect on inflation. However, before inflation is lowered it rises, contrary to what would be expected according to theory. An effect

called the price puzzle.[23] Additionally, inflation is lowered after consumption has been lowered for a period of time, consistent with theory. Also worth commenting on is that inflation rises as a response to higher income, consumption and wealth and that the response of the repo rate is upwards as a result of higher inflation implying that the Riksbank acts according to what is expected. Based on the above results, the impact of a repo rate shock does seem to be in line with the expected results as well as economic theory. However, one must also take the confidence bands into account and according to this a majority of the responses are to be considered non-significant.

In order to be able to answer the essential question of the paper the above result is to be compared to the same SVAR as above but with the consumption-wealth channel shut off. Graph 1 below shows the impulse response of consumption to a one standard deviation shock to the repo rate, the blue line showing the response with the consumption-wealth channel in place and the red line showing the response with the consumption-wealth channel shut off. As can be seen, the difference between the two lines is very small and the confidence bands indicate that the effect is also non-significant. Apart from a decline about five quarters in which is right on the zero-line. Indicating that the consumption-wealth channel is not a major channel through which monetary policy affects consumption, if consumption is to be considered affected by the repo rate at all.

Graph 1: Impulse response of consumption to shock to repo rate, the consumption-wealth channel



[23] For more information about the price puzzle see Castelnuovo, E. & Surico, P. (2010)

Many other studies have also taken housing versus financial assets into account, acknowledging that there might be differences in the effects on consumption depending on which definition of wealth that is being used. A quick model where housing was excluded from the wealth variable was thus estimated. There were however no differences concerning the results between this model and the main one.

6. Discussion

The above results show that the consumption-wealth channel is most probably not present in the Swedish economy during 1994-2011. Indicating that the effect of monetary policy on consumption is transmitted via the other channels of the transmission mechanism. Due to the previously mentioned cointegration difficulties we are ignoring long term relationships, why the results should be interpreted with some caution. However, the results are not even close of indicating the presence of the consumption-wealth channel. It is therefore doubtful that a SVEC would result in any different conclusions.

Considering that many previous studies can show strong links between both changes in wealth and consumption as well as wealth changing in response to interest rate changes, the results are somewhat surprising. Looking at the entire channel is however a different thing. There are obviously other channels within the transmission mechanism to take into account, and if these are big enough they will overshadow the wealth effects. Moreover, there are also other variables affecting both consumption and wealth meaning that there are several points in time where effects might be coming from other directions than from changes in the repo rate. In other words, there might be an issue of omitted variables in the model.

There are other explanations as well. One argument being that individuals are indeed life time consumers in accordance with the permanent income hypothesis, thus planning ahead to such extent that consumption is not affected by short-term changes in wealth. People might for example use their financial and real assets as long term savings, not

available for short term consumption. As a behavioral economist might put it, imposing mental accounting.

Furthermore, there might also be an income distribution effect. The wealthy individuals own a large part of the total wealth in the economy and since wealthy individuals are assumed to have a much smaller marginal propensity to consume out of a given increase in wealth this might also affect the outcome.[24] There might also be effects from the housing part of wealth, that is that individuals are not viewing an increase in housing value as a ground to increase consumption.

Another aspect to have in mind is that the model is not accounting for the general state of the economy and might thus be missing the households' outlook on the future as well as signaling effects from the Riksbank. If the economy is in recession, or in a crisis for that matter, this can have a large effect on individuals' propensity to consume for a long time. When the Riksbank lowers the repo rate people might thus start saving more instead of less because of general economic uncertainty. Changes in consumption might therefore not be directly connected to a change in the repo rate but instead other factors in the economy. In future research a model improvement might therefore be to include some measurement of uncertainty in the monetary policy variable. This by for example creating a new variable adding a measurement of the state of the economy to the repo rate.[25]

Furthermore, it would be very interesting to extend the study to also include other measures the interest rates, like for example by using the average mortgage rate faced by households. This since a widening gap between the repo rate and the interest rates offered by the banks has been observed after the beginning of the crisis.[26] Also concerning the financial crisis, in an extended model one might want to add a dummy variable to see whether or not there is any difference between the pre-crisis period and the current period.

[24] Statistics Sweden (2012:2)
[25] See for example Lyhagen, J. (2001)
[26] The Riksbank (2012)

Finally, are there any policy implications to derive from these results? Whether or not there are any policy implications of course depends on to what extent the Riksbanks direction depends on the consumption-wealth channel when setting the repo rate. If they, themselves, believe that this channel plays a minor part in transmitting monetary policy then the policy implications are to be considered small. There are signs within this study indicating that the policy implications are indeed minor. This since the results only imply a lack of a consumption-wealth channel, the transmission mechanism does however seem to be functioning as a whole according to the full set of impulse response functions. Further studies on all channels within the transmission mechanism are of course still welcome in order to increase understanding of the full set of effects derived from monetary policy.

7. Conclusions

The aim of this paper was to examine to what extent the consumption-wealth channel has had an impact on household consumption as a response of monetary policy in the Swedish economy since 1994 when the repo rate was first introduced. Using a structural vector autoregressive model and Swedish data between 1994 Q2 and 2011 Q4, impulse response functions were used in order to trace out the effects of interest rate changes on consumption via its impact on household wealth. The resulting impulse response functions did however show no indications of a presence of a consumption-wealth channel in the Swedish economy during the period examined. Indicating that the effect of monetary policy on consumption is transmitted mainly via the other channels of the transmission mechanism. The response of consumption from a repo rate shock were also statistically insignificant. There were however some estimation difficulties due to the presence of cointegration, why further studies is recommend. Future research might also want to include other measures of the interest rate as well as taking general economic uncertainty into consideration.

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A. Data appendix

Chart 2: Original data set

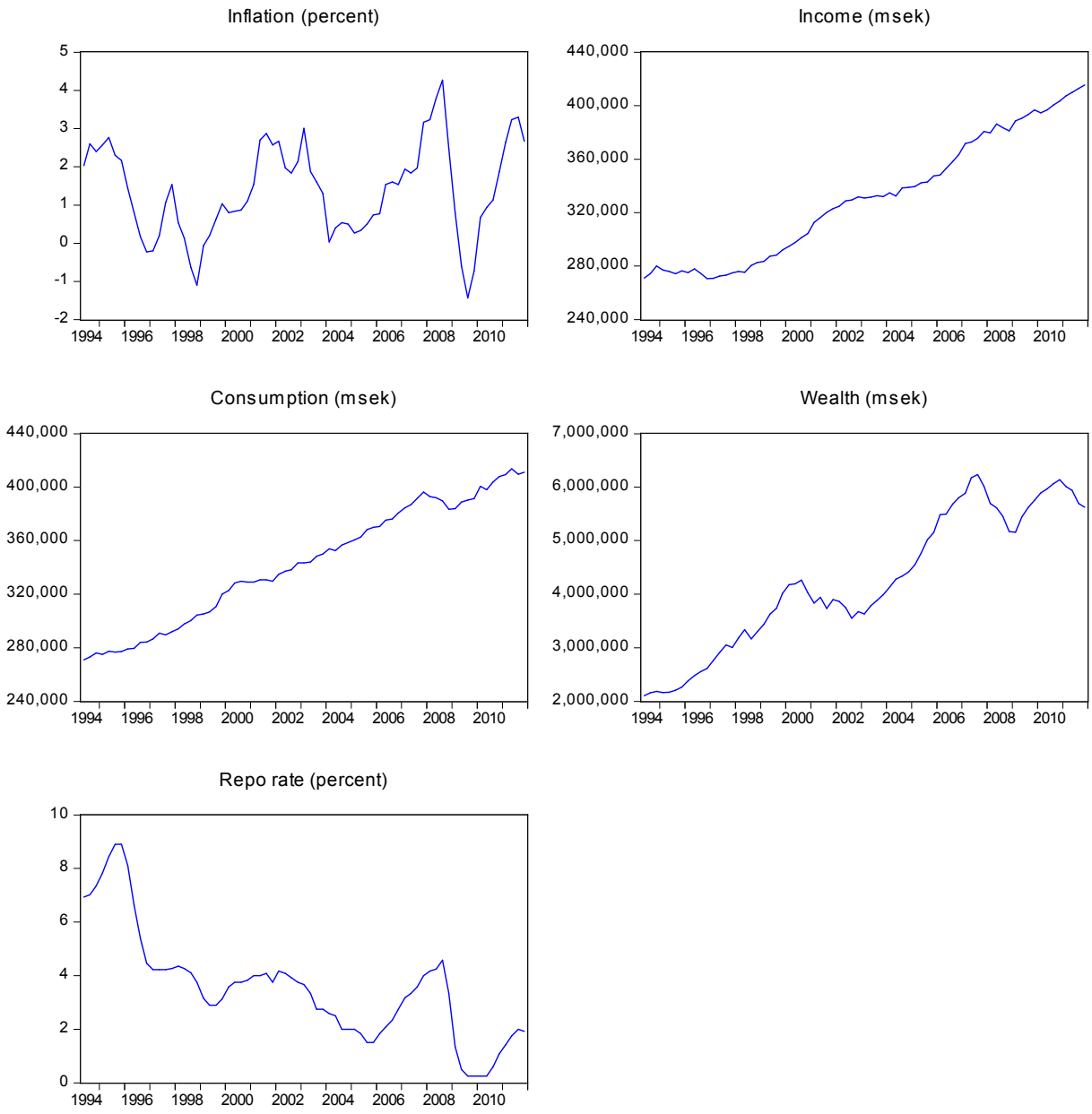
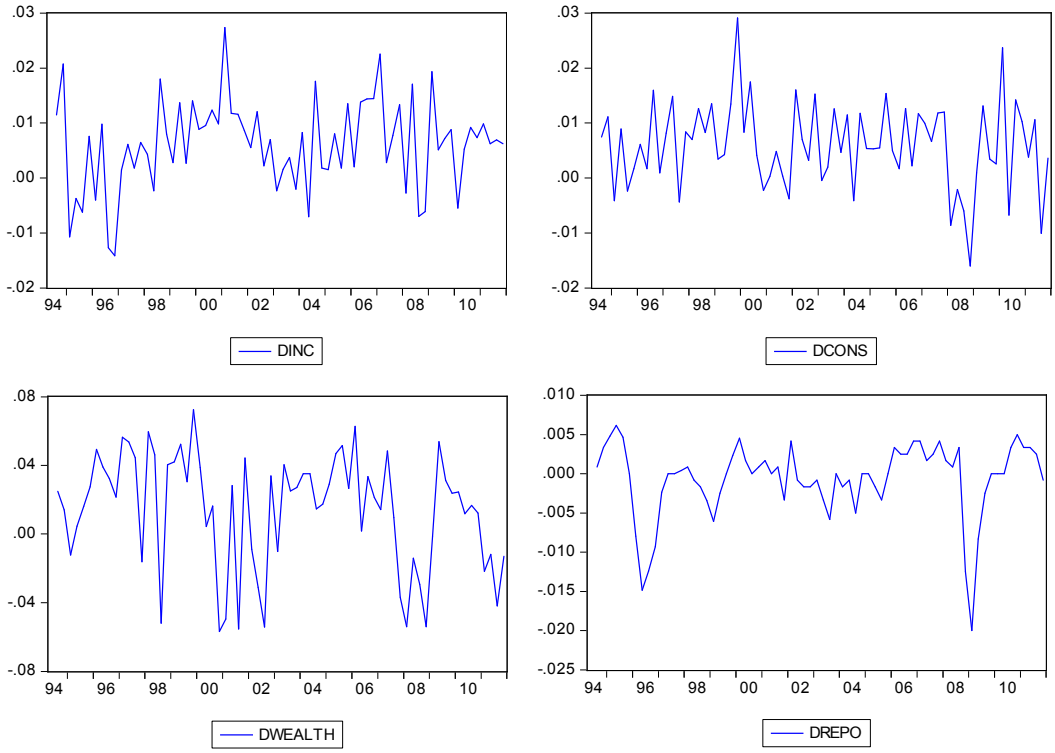


Chart 3: Differenced data



B. Model output

Vector Autoregression Estimates
Included observations: 68 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	INFL	DINC	DCONS	DWEALTH	DREPO
INFL(-1)	1.045983	-0.296203	-0.323208	-1.064840	0.104961
	(0.12775)	(0.20066)	(0.18588)	(0.77199)	(0.08135)
	[8.18794]	[-1.47613]	[-1.73880]	[-1.37934]	[1.29019]
INFL(-2)	-0.416107	-0.003191	0.100268	0.101610	-0.119969
	(0.11815)	(0.18559)	(0.17192)	(0.71400)	(0.07524)
	[-3.52181]	[-0.01719]	[0.58323]	[0.14231]	[-1.59443]
DINC(-1)	0.105864	-0.029727	0.158148	0.123450	0.142282
	(0.07997)	(0.12562)	(0.11636)	(0.48328)	(0.05093)
	[1.32378]	[-0.23665]	[1.35909]	[0.25544]	[2.79379]
DINC(-2)	-0.005027	0.271950	0.032478	-0.766280	-0.055829
	(0.08208)	(0.12893)	(0.11943)	(0.49603)	(0.05227)
	[-0.06125]	[2.10926]	[0.27193]	[-1.54483]	[-1.06806]
DCONS(-1)	-0.027131	-0.174360	-0.335859	-0.297301	0.049021
	(0.09751)	(0.15317)	(0.14189)	(0.58929)	(0.06210)
	[-0.27822]	[-1.13832]	[-2.36704]	[-0.50450]	[0.78938]
DCONS(-2)	0.033888	-0.124662	-0.048392	-0.423881	0.082463
	(0.09862)	(0.15492)	(0.14350)	(0.59600)	(0.06281)
	[0.34361]	[-0.80471]	[-0.33722]	[-0.71121]	[1.31297]
DWEALTH(-1)	0.010718	-0.048702	0.061928	0.107809	0.017765
	(0.02279)	(0.03580)	(0.03316)	(0.13771)	(0.01451)
	[0.47034]	[-1.36057]	[1.86764]	[0.78286]	[1.22414]
DWEALTH(-2)	-0.068836	0.034497	0.042114	0.115064	-0.019726
	(0.02390)	(0.03754)	(0.03478)	(0.14443)	(0.01522)
	[-2.88013]	[0.91891]	[1.21100]	[0.79667]	[-1.29606]
DREPO(-1)	0.392137	0.009923	0.065707	-0.150802	0.776195
	(0.21245)	(0.33371)	(0.30913)	(1.28385)	(0.13529)
	[1.84580]	[0.02974]	[0.21256]	[-0.11746]	[5.73711]
DREPO(-2)	0.187054	0.616276	0.087380	-0.592796	-0.293060
	(0.19909)	(0.31273)	(0.28969)	(1.20315)	(0.12679)
	[0.93953]	[1.97062]	[0.30163]	[-0.49270]	[-2.31140]
C	0.005599	0.010770	0.008572	0.031184	-0.001536
	(0.00201)	(0.00316)	(0.00293)	(0.01216)	(0.00128)
	[2.78153]	[3.40635]	[2.92683]	[2.56355]	[-1.19851]
R-squared	0.858542	0.210798	0.283484	0.331054	0.633649
Adj. R-squared	0.833725	0.072342	0.157779	0.213695	0.569377
Akaike AIC	-7.610244	-6.707105	-6.860144	-4.012401	-8.512748
Schwarz SC	-7.251206	-6.348067	-6.501106	-3.653363	-8.153710
Akaike information criterion		-34.12738			
Schwarz criterion		-32.33219			