Asset Allocation and a Low Interest Rate Environment

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Abstract

This study analyses the effect of an expansionary monetary policy on risk-taking of investors in Sweden. By studying net money flows to mutual funds in Sweden we aim to provide an explanation to what variables affect investors' asset allocation decisions and how asset allocation changes in a low interest rate environment. We find that the change in short-term interest rate is a significant decisions parameter for investments in some asset classes but that the return on the Swedish stock market is the main determinant for asset allocation among investors in Sweden. Furthermore we find that investors shift their capital towards riskier investments and away from safe money market investments in times of extraordinary low interest rates. We explain this behaviour through a direct effect of low interest rates, in the form of a *search for yield*, as well as an indirect effect through low interest rates positive effect on the stock market return. Our findings support our thesis that the expansionary monetary policy pursued by the Riksbank causes investors to take on more risk. Further we argue that the Riksbank is currently threatening the stability of the Swedish financial market and caters for the emergence of a new financial crisis.

Keywords: Aggregated mutual fund flows, risk-shifting, search for yield, monetary policy, risk-taking channel

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1. INTRODUCTION

1.1 BACKGROUND

After a long period of low inflation in Sweden the Swedish central bank, the Riksbank, announced on the 11th of February 2015 that it would lower the repo rate to -0.1 percent in order to avoid deflation and boost the economic activity. With this historical decision, Sweden joined a small group of countries that has ever had a negative policy rate. Even though a negative policy rate is still very rare, the largest central banks in the developed world have pursued an expansionary monetary policy with low interest rates on and off for more then a decade. Since the burst of the dot-com bubble in the beginning of the 21st century, policy rates in the United States and the European union - as well as smaller countries such as Sweden - has been historically low with only a few exceptions. Nonetheless, with the lowering of the repo rate into negative territory, the attention in Sweden on the effect of this low interest rate environment, on primarily the financial market, is greater than ever.

When the repo rate goes down, the yield on fixed-income securities drops due to the transmission mechanism of monetary policy. When yields becomes extraordinary low or even negative on fixed-income securities, expected future return could in fact be negative, implying that investors lose money by investing in these assets. At the same time prices for other asset classes such as stocks and real estate in Sweden reaches new all-time highs. This forms an unprecedented investor climate that investors in Sweden have to handle when allocating their capital between asset classes. We want to analyse how investors chose to allocate their capital when the returns on safe investments are extraordinary low or even negative.

1.2 PURPOSE & RESEARCH QUESTIONS

With the purpose of our study being to understand how an expansionary monetary policy affects investors' in Sweden allocation of capital, we formulated the following research questions:

i. Does a change in the short-term interest rate affect asset allocation on the Swedish financial market?
ii. Does a low interest rate environment induce risk-shifting among investors in Sweden?

The research questions were formulated in order to test our hypothesis that an expansionary monetary policy pursued by the Riksbank causes investors in Sweden to take on more risk.

1.3 THE STUDY

As previously pointed out, the purpose of our study is to examine how investors change their asset allocation in reaction to a change in interest rate, as well as how they chose to reallocate their capital in a low interest rate environment. Since examining all transactions on the financial market would be too colossal of a task, aggregated net money flows to mutual funds has been used as a proxy for changes in investors' asset allocation. Furthermore, the study exclusively looks at aggregated net money flows to three different mutual fund categories: equity funds, bond funds and money market funds. These mutual fund categories were chosen since they invest in the three most basic asset classes traded on financial markets. Inspired by the methodology used by Warther (1995), the flows were tested for serial correlation and the predictable part of the flows was removed from the total flows. The unpredictable part of the flows, referred to as unexpected flows, was then used as a dependent variable in the regressions throughout the study.

The method for our study was a three-stage approach. In the first stage the unexpected flows were regressed on several explanatory variables in order to see, what in general, determines investors' change in asset allocation. In the second stage, a single variable regression was performed on the unexpected flows with only the change in short-term interest rate as an explanatory variable in order to see whether a change in short-term interest rate has a significant effect on the asset allocation decisions of investors. In the third stage a dummy variable approach was used. A dummy variable was created for all data points corresponding to a repo rate of 1.25 percent or less and the unexpected flows were then regressed solely on this variable. This was done in order to see how a low interest environment affects asset allocation of investors.

In our study we find that there is a statistically significant correlation between the unexpected net money flows to equity funds and bond funds as well as money market funds. This indicates that investors substitute equity for fixed-income investments and vice versa depending on market conditions, as seen in previous research as well (see for example Hau & Lai, 2014). Furthermore, we find that the return on the Swedish stock market in the concurrent and previous month is the main determinant for how investors in Sweden make their asset allocation decisions. The results are not surprising since this is in line with research made on aggregated net money flows to mutual funds in other countries (see for example Warther, 1995; Van Campenhout, 2004). Compared to the return on the stock market a change in interest rate, long or short, does not seem to drive a noteworthy change in asset

allocation. However, looking at the isolated effect of a change in the short-term interest rate, we find a weakly statistically significant negative relationship between net money flows to bond funds and a change in the concurrent short-term interest rate. Changing the explanatory variable to the lagged change in short-term interest rate instead we also find a weakly statistically significant negative relationship between change in short-term interest rate and net money flows to equity funds. Our results provide evidence for a *search for yield,* based primarily on the negative relationship to equity funds.

Shifting the focus from the effect of a change in the interest rate towards the effect of a low interest rate environment, we find clear evidence for a *search for yield* thus also the risk-taking channel of monetary policy. A low interest rate environment drives a significant outflow of safe money market funds and a significant inflow into equity funds. This suggests that investors, in times of extraordinary low interest rates, shift their asset allocation from safer to riskier investments and thereby take on more risk. Furthermore, we find that there is a stronger correlation between stock market return and the unexpected flows to equity funds and unexpected flows from money market funds than in the full sample. This suggesting that investors are more affected by the return on the stock market in a low interest rate environment. We also observe in our study that the average return on the stock market is higher in months corresponding to an extraordinary low interest rate.

Based on our findings of an increased risk-taking among investors when interest rates are low we conclude that a risk-taking channel of monetary policy does exist. This risk-shifting in low interest rate environment can be partly attributable to a *search for yield* effect of an expansionary monetary policy based on the results of our study. However, our findings suggest that the increased risk-taking due to expansionary monetary policy is primarily attributable to the low interest rate's positive effect on the stock market. The primary determinant for investors' asset allocation decisions is the return on the stock market. Thus the positive effect on the stock market return drives investors to riskier equity investments when interest rates are low, as seen in the increased correlation between stock market returns and the unexpected flows.

With evidence supporting our hypothesis that an expansionary monetary policy pursued by the Riksbank causes investors in Sweden to take on more risk, the unprecedented expansionary monetary policy currently pursued by the Riksbank, calls for concern. With financial crisis usually following excessive risk-taking and inflated asset prices we argue that the Riksbank is currently undermining the stability of the Swedish financial market.

1.4 STRUCTURE

The rest of the paper is outlined as follows The second section provides a theoretical basis for further analysis in the form of important conceptual frameworks and a review of previous literature related to our field of study. The third section follows with a detailed description of the data sample as well as the data modification procedure. The fourth section provides a description of the methodology used in our study. The fifth section presents the results of the econometric and statistical analysis performed. The sixth section provides a discussion of the results obtained in the study followed their implications. The seventh section contains a conclusion and the eighth section a list of references.

2. THEORY

2.1 CONCEPTUAL FRAMEWORK

THE TRANSMISSION MECHANISM AND SWEDISH MONETARY POLICY

Monetary policy pursued by a central bank affects the economic activity and price level through a process named the transmission mechanism. The European Central Bank has described the concept of the transmission mechanism of monetary policy as follows. The central bank provides the banking system with capital and charges interest on this capital. Due to the fact that the central bank is the only institution allowed to issue money, this official interest rate can be determined with accuracy. This rate in turn affects the interest rate environment in society through its effect on short-term interest rates and expectations of future short-term interest rates. The interest rate environment furthermore affects savings and investments as well as the supply of credit, which in turn affects aggregated demand and prices hence also the economic activity and price level (European Central Bank, n.d.). See Figure 1 in appendix for a graphical illustration of the transmission mechanism of monetary policy.

The Riksbank is the central bank of Sweden and is thereby in charge of the monetary policy. The Riksbank is required by Swedish law to pursue a monetary policy that ensures price stability through low and stable inflation. The official interest rate, policy rate, in Sweden is the repo rate and it is determined independently by the Riksbank. The target rate of inflation for the Riksbank is set at a 2 percent increase in the consumer price index, CPI. In addition of ensuring price stability, the Riksbank has also been assigned by the Swedish

parliament, the Riksdag, to promote stability in the financial system as a whole (The Riksbank, 2011)

SEARCH FOR YIELD

The search for yield theory is a general concept implying that investors and financial intermediaries take on more risk when interest rates are low in order to yield a higher return on their investments (Rajan, 2006). The search for yield theory implies that investors substitute safe investments for longer fixed-income securities, with higher interest rate risk or riskier asset classes (Johansson, 2013). The search for yield theory has been one of the primary explanations to the link between monetary policy and risk in the financial markets, a link coined the risk-taking channel of monetary policy (Borio & Zhu, 2008). The search for yield theory can be understood through the behavioural concept of loss aversion originally proposed by Kahneman & Tversky (1979). They argue that investors have a tendency to seek risk when faced with possible losses and to avoid risk when a certain gain is possible. In times of extraordinary low interest rates no certain gain is possible and 'risk-free' investments might even yield negative returns. Then the theory suggests that investors seek investments with more risk in order to earn a sufficient return. The search for yield theory can also be explained by more practical reasons brought forward by Rajan (2006). When interest rates are low insurance companies with fixed-rate commitments are likely to default on their contractual obligations if they do not yield a sufficient return by taking on more risk. Furthermore, low interest rates might also induce hedge fund managers with performance fees to take on more risk in order to keep compensation at desired levels.

2.2 PREVIOUS LITERATURE

The effect of an expansionary monetary policy on the stability of financial markets, known as the *risk-taking channel*, has been of great interest since the burst of the dot-com bubble in the beginning of 21st century. This burst sent shock waves through the global economy and forced central banks to lower interest rates in order to stop the economic downturn and boost the domestic economy. Since then, financial markets have experienced a roller coaster ride with periods of exceptional growth in the stock and housing market as well as periods of recession in the wake of financial crises. This has spawned researchers to examine whether there is a link between an expansionary monetary policy and the instability of the financial markets, with the risk-taking channel hypothesis being the point of departure for the majority.

The risk-taking channel hypothesis implies that there is a link between monetary policy and risk-taking in the financial market due to its effect on risk perception and risk tolerance (Borio & Zhu, 2008). This risk-taking channel in turn affects asset prices, investor's asset allocation and risk-taking capacity of financial intermediaries (Hau & Lai, 2014; Shin & Adrian, 2009 among others). This subsection of the paper will examine the research made on the various dimensions of the risk-taking channel. It will also provide the background to our methodological approach with aggregated net money flows to mutual funds as we use this data as a proxy for investors' asset allocation.

MONETARY POLICY AND BANKS' RISK-TAKING

The policy rate of a central bank defines the interest rate environment in society through its effect on the short-term interest rate, which among other factors also affects the long-term interest rate. A large part of the research on the risk-taking channel of monetary policy has been focused around the effect of the resulting low interest rates on the risk-taking of banks. In an empirical analysis, Gambacorta (2009) found that the probability of default of an average bank increased when interest rates were below benchmark for an extended period of time.

Low policy rates increases banks risk appetite through its effect on their risk-taking capacity. Lowering the policy rate drives growth in banks balance sheets due to an increase in profitability stemming from a rise in net interest rate margin. This growth in balance sheets consequently expands the risk-taking capacity of banks and leads to lower risk premiums (Adrian & Shin, 2009). An expansionary monetary policy also makes banks want to take on more credit risk. A low interest rate encourages banks to increase credit supply to borrowers with worse credit history and higher probability of default (Jimenez et al., 2008).

Other studies has found that banks become riskier since risk budgets are released, position taking is encouraged and that a search for yield pressure is present in times of low interest rates (Delis & Kouretas, 2011). They find a strong negative relationship between banks risk-taking and the interest rate. And they argue that central banks should take the risky behaviour of banks, in a low interest environment, into account when setting policy rates.

Studying the link between monetary policy and banks' risk, Altunbas et al. (2014), find evidence that relatively low levels of interest rates increases banks' risk. They argue that monetary policy has implications for financial stability and suggest that it is possible that monetary policy has been the main driver of recent credit crisis.

MONETARY POLICY AND RISK-TAKING OF FINANCIAL INTERMEDIARIES

Research looking at the effect of an expansionary monetary policy on other financial institutions, as well as banks, also suggests that risk appetite increases due to increased risk-capacity and decreased perceived risk when the policy rate goes down (Gambacorta, 2009; Rajan, 2006). There is a strong positive correlation between the expected volatility on the stock market (S&P 500), VIX, and the real Fed funds rate, implying that when the short-term rate goes down risk-aversion goes down as well (Bekaert et al., 2013). When volatility is high the margin requirement on leverage is higher, reducing the risk-taking capacity of financial institutions. A decline in volatility on the contrary encourages *position- taking* since it expands financial institution's risk budgets and thus increases the risk in the market further, i.e. a lower policy rate corresponds to higher risk-taking capacity, which increases risk appetite for financial intermediaries as well (Gambacorta, 2009).

A low interest rate environment also affects valuation models, which are modified to use the lower interest rate. This will both lower the probability of default and inflate the value of an asset since future cash flows will have a higher present value. Higher asset prices and lower volatility will most likely imply higher stock prices, which in turn will increase the value of equity in relation to debt. Hence the perceived risk of holding stocks will decline and make a reallocation from fixed-income to equity seem less risky and legitimise the search for yield (Gambacorta, 2009). Inflated assets prices, due to the aforementioned, might be perceived as a decline in overall financial risk but it actually builds up a situation where the probability of a sharp fall in asset prices increases (Rajan, 2006). A link between monetary policy and asset prices suggesting a negative relationship has been established by Rigobon & Sack (2004).

MONETARY POLICY AND ASSET ALLOCATION

In addition to the effect of a loose monetary policy on risk-taking capacity and risk perception of financial intermediaries, it has also been shown to increase *search for yield* in asset allocation. A study by (Hartelius et al., 2008) found that a lowering of the interest rate in the US induced lower emerging market bond spreads, which provides support for the concept of investors searching for yield by investing in more risky securities. Furthermore, when policy rates are extraordinary low, money market fund managers search for yield by investing in riskier asset classes and holding less diversified portfolios (Di Maggio & Kacperczyk, 2014). A risk-shifting among investors due to lower short-term interest rates has also been observed

by Hau & Lai (2014), who found that mutual fund investors substitute money market funds for equity funds when interest rates goes down.

INTEREST RATE AND AGGREGATED NET MONEY FLOWS TO MUTUAL FUNDS

In order to examine the link between monetary policy and investors' risk-shifting, Hau & Lai (2014) have analysed quarterly net money flows to mutual funds as a proxy for investors' change in asset allocation from the beginning of 2003 to the end of 2010. They find that a lowering of the policy rate make investors in the Euro area reallocate their capital from money market funds to more risky equity funds, supporting a *search for yield*. Their data sample was made out of the eight Eurozone countries Austria, Finland, France, Germany, Italy, the Netherlands, Portugal, and Spain.

On both the US and European market evidence is brought forward that in times of changing long-term interest rates there is a statistically significant substitution between long-term fixed income securities and equity, based on fund flows. Santini & Aber (1998) investigated the US market with quarterly data from the first quarter 1973 until the third quarter in 1985. Van Campenhout (2004) on the other hand has investigated monthly money flows to equity funds on the European market between June 1996 and May 2001. Both studies find a statistically significant negative correlation between changes in the long-term interest rate and net money flows to equity funds. No statistically significant relationship is found changes in short-term interest rates for net money flows to equity funds.

DETERMINANTS OF AGGREGATED NET MONEY FLOWS TO MUTUAL FUNDS

Warther (1995) was the first to analyse net money flows to mutual funds on a macro level. In his paper he investigates the effect of security returns on aggregated net money flows to mutual funds. The main focus of his study is to investigate the effect of stock returns on equity fund flows in particular. This is done through separating the unexpected part of the flows by predicting the expected part of the flows using an autoregressive (AR) model and removing this part from the total net money flows. Warther then applies several regression models with either monthly or weekly flows and different concurrent and lagged return measures. In his study he finds a statistically significant relationship between unexpected net money flows to equity funds and the concurrent and one-month lagged stock return. Since his study, several studies have followed and regardless of what market the data has been retrieved from, the results are alike. Methodology-wise most studies made on aggregated net money

flows to mutual funds have used the fundamental approach suggested by Warther. Studies like the one of Van Campenhout (2004) has in addition to Warthers approach included more explanatory variables as changes in interest rates and changes in CPI.

3. DATA

This section covers the data retrieving process, our primary sources of data and a description of the data used in the study. This section will be divided into four subsections describing first the dependent variables, second the explanatory variables, third the correlation between the variables and fourth the data modification.

3.1 DEPENDENT VARIABLES

This paper aims to investigate the effect of an expansionary monetary policy on asset allocation. Due to the fact that Sweden has experienced two periods of extraordinary low interest rate during the last decade, we have decided to look at this market exclusively. Sweden furthermore has a developed financial market and a fund industry that represents a large part of the market in total. Something that makes it possible to use the aggregated net money flows to mutual funds as a proxy for the change in asset allocation among investors. Sweden is the country with the largest percentage of its population saving in mutual funds, 80 percent to be exact (Swedish Investment Fund Association, n.d.). A proxy was necessary to use since it would be impossible to analyse data on single trades in the different asset classes studied in this paper.

Not all mutual fund categories are included in this paper. Hedge, mixed and other funds are excluded due to the fact that the assets in these funds are of many asset classes and would therefore not contribute to the answering our research questions. The three mutual funds categories represent 75 percent of the total fund market in Sweden, calculated using the asset under management value of mutual funds as of February 2015 (Swedish Investment Fund Association, 2015).

The data set consists of data on monthly net aggregated fund flows to equity funds, bond funds and money market funds from January 2000 to February 2015, a total of 182 months. The data is retrieved from the Swedish Investment Fund Association, which collects data on fund flows from its member funds. Approximately 90 percent of all investment funds in Sweden are members in the Swedish Investment Fund Association, based on the asset

under management of funds (Hård af Segerstad, 2015). The net aggregated money flows are calculated as the difference between the aggregated money inflow and aggregated money outflow of the funds with a particular investment objective; equity, bond and money market. The flows are hence net new savings and do not include reinvested dividends or return on investments.

Furthermore, we have decided to exclude money flows attributable to the premium pension system that is a part of the Swedish national retirement pension. The reason for excluding the premium pension flows is based on the fact that the payout occurs once a year, in December and therefore has a large impact on the money flows to mutual funds since the payout is in the magnitude of SEK 35 billion (Pensionsmyndigheten, 2013). Since these flows are rather unaffected by the interest rate level in society, due to the fact that the payout occur once a year, they would undermine the explanatory power of our explanatory variables. Therefore the flow attributable to the premium pension will not contribute with any explanatory value for our thesis. One could on the other hand argue that the elimination of flows attributable to the premium pension could create a sample selection bias since not all money flows to mutual funds are included in our data set. Also, another sample selection bias could be present due to the fact that the data set covers approximately 90 percent of the Swedish fund market hence about 10 percent is not covered in our data (Hård af Segerstad, 2015).

During the time period chosen, the world has seen one of the most volatile developments on the global financial markets to date, with the dot-com bubble in 2000/2001, the financial crisis in 2007/2008 and the following European debt crisis. The last two crises described have forced the Swedish Riksbank to provide extraordinary low interest rates, 1.25 percent or lower, in Sweden during two periods. The first period being February 2009 to January 2011 and the second period being September 2012 to February 2015, with a repo rate during the second period even being negative. Analysing this particular time period provides us with the opportunity to observe the effect of extraordinary low interest rates on asset allocation. Furthermore, our observation period has also incurred changes in interest rate environment that have been so large that they should have induced investors to change their asset allocation. Hence by analysing this particular time period we expect to see explicit effects in the fund flows.

Table 1 displays descriptive statistics of the net aggregated fund flows to the three fund categories analysed in this study. All three mutual fund categories have an average positive net money flow during the observed period, which could be expected since the popularity of

funds has increased among investors during the sample period. Average net money flows are largest for bond funds and smallest for money market funds. Equity funds have experienced average net money flows in parity with those of bond funds, but the money flows to this fund category have been much more volatile than those of the other two mutual fund categories. Thus implying a much greater median as seen in Table 1. Bond funds on the other hand have the least volatile net money flows compared to the other two mutual fund categories. Money market funds experienced the single largest net money inflow during one month and equity funds the single largest money outflow during one month.

Table 1
Descriptive statistics for monthly net money flows to mutual funds in Sweden over the period 2000:1 to 2015:2. Data was obtained from the Swedish Investment Funds Association and are in millions of SEK.

FUND CATEGORY	N	mean	sd	min	max	p25	p50	p75
Equity	182	867	6,324	-32,673	14,392	-667	1,636	3,947
Bond	182	872	2,217	-5,236	13,620	-202	409	1,712
Money market	182	728	3,705	-7,712	20,294	-935	758	2,282

In order to test for non-stationarity in our sample, the Dickey-Fuller test for the presence of a unit root were performed on the net money flows to the different fund categories (see Table 14 to 16 in the appendix for details). The null hypothesis that a unit root was present could be rejected for all fund categories on all confidence levels. This leaves us with the conclusion that the net money flows to mutual funds to and from all three fund categories follow a stationary process.

3.2 EXPLANATORY VARIABLES

The explanatory variables used in the first stage of the study are the monthly change in the short- and long-term interest, the stock market return and two monthly dummy variables. This subsection will provide an extensive description of these variables as well as explaining why they were used. All the data for the explanatory variables has been collected from Bloomberg.

Since the purpose of our study is to examine the effect of an expansionary monetary policy on investors' asset allocation, the logical approach would have been to use the change in repo rate as an explanatory variable. However, the repo rate is characterised by being changed infrequently and abruptly, which makes it unfit as an explanatory variable in the regressions on the monthly net money flows. Therefore, we used a more dynamic proxy for

the repo rate in the form of the three-month Stockholm Interbank Offered Rate (Stibor). It is the reference interest rate at which Swedish banks are willing to lend to each other for three months without collateral. Basically it can be viewed as the interest rate that practitioners in financial markets believe the repo rate will be in three months. As seen in Table 2 the descriptive statistics reveals a mean for the whole time period of -1.72 percent indicating a decreasing short-term interest rate on average during the observed period. The standard deviation of 11.88 percent indicates a rather high volatility but is consistent with rapidly changing market conditions during the time-period. The minimum and maximum values of -81.44 percent and 22.17 percent, representing the largest changes from one month to another, are of great magnitude but consistent with interest rate levels being close to zero at times. A comparison of the values of the upper and lower quartile and the minimum and maximum values reveals that the majority of changes in the interest rate are of lower magnitude and far from the extreme values. This view is also supported by the median change being equal to zero.

Basic portfolio composition is based around the trade-off between equity, bond and money market investments in the portfolio. Hence a change in the long-term interest rate should affect the investors' asset allocation, which has also been proven by previous studies made on net aggregated money flows to equity funds (Santini & Aber, 1998). Therefore the monthly change in long-term interest rate has been included as an explanatory variable. The Bloomberg Generic Yield of the 10-year Swedish Government bond has been used as the long-term interest rate in this study. This is the average yield computed by Bloomberg from at least three market maker bid-side quotes that have priced the Swedish Government bond that is closest to having a 10-year yield to maturity. In Table 2 the descriptive statistics shows a mean of -0.79 percent for the long-term interest rate indicating a declining interest rate on average during the period. The standard deviation of 8.32 percent indicates large swings in the long-term interest rate. Further on, the minimum and maximum value along with the upper and lower quartiles indicate that the time-period has been volatile and rather uncertain.

The OMX Stockholm PI index (OMXSPI), which includes all listed shares on the regulated Swedish stock market, has been used as a proxy for equity return in our study. This decision was based on the fact that the single largest equity investment made by equity funds in Sweden is on the Swedish stock market. The OMXPI index can also be said to correlate with global markets since Swedish stock market is a relative small stock exchange and its companies are to a great extent dependent on exports and global market conditions. In Table 2 one can see that the mean is 0.45 percent indicating an average positive return on the Swedish

stock market during the observed time period. The standard deviation of 5.68 percent, a minimum value of -17.89 percent and a maximum value of 18.73 percent indicates that market conditions has shifted rather rapidly from one month to another during the sample period.

Since the data analysed in this study is on a monthly level there is a risk that there is seasonality in the series. This implies that part of the flows in a particular month could be explained by what month it is attributable to. The unexpected net money flows, used as a dependent variable in regressions for all fund categories, was therefore tested for seasonality using a dummy variable approach with dummy variables for each month. The seasonality test showed that dummy variables for April and July was significant in explaining part of the flows to equity funds and these dummy variables will hence be included as explanatory variables in the regressions on the flows to equity funds. For the other two fund categories none of the monthly dummy variables were significant.

Table 2
Descriptive statistics for monthly change in three-month Stibor, monthly change in yield on the 10-year Swedish Government Bond and the monthly return on the OMX Stockholm PI index. Data covers the period 2000:1 to 2015:2. All variables are in percent and the data was obtained from Bloomberg.

VARIABLES	N	mean	sd	min	max	p25	p50	p75
ΔShort-term	182	-1.723	11.876	-81.443	22.171	-2.597	0.000	3.059
ΔLong-term	182	-0.785	8.320	-32.289	28.915	-4.789	-1.088	3.456
Stock return	182	0.448	5.680	-17.885	18.731	-2.043	0.672	3.636

3.3 CORRELATIONS

Table 3 is a correlation matrix displaying the pairwise correlation of the net money flows to the different fund categories and the explanatory variables. The aggregated net money flows to equity funds is significant negatively correlated with the aggregated net money flows to bond and money market funds. In other words, when there is a net money inflow to equity funds there is on average a net money outflow from bond and money market funds during the month. However, based on the degree of correlation it is clear that the substitution is greatest between equity funds and money market funds. Bond fund flows on the other hand displays a rather low correlation with the net money flows to and from the other two fund categories, suggesting a degree of substitution between the two asset classes.

The monthly change in short-term interest rate is negatively correlated (-0.19) with the net money flows to bond funds and positively correlated (0.16) with the monthly change in long-term interest rate. In line with previous research the monthly change in short-term interest rate is negatively correlated (-0.11) with the monthly return on the stock market, though not statistically significant. Correlations between monthly change in short-term interest rate and net money flows to equity funds (-0.08) and money market funds (0.11) are not statistically significant either. The monthly stock market return is negatively correlated with net money flows to bond funds (-0.14) and money market funds (-0.42). The stock market return is on the contrary positively correlated with both net money flows to equity funds (0.50) and the monthly change in long-term interest rate (0.23).

Table 3
Pairwise correlations for monthly total net money flows to mutual funds in Sweden, the monthly change in three-month Stibor, the monthly change in yield on the 10-year Swedish Government Bond and the monthly return on the OMX Stockholm PI index over the period 2000:1 to 2015:2. Data was obtained from the Swedish Investment Fund Association and Bloomberg. P-values for the pairwise correlations are shown in the parentheses.

	Equity	Bond	Money market	ΔShort-term	ΔLong-term	Stock return
Equity	1.00					
Bond	-0.28 (0.00)	1.00				
Money market	-0.74 (0.00)	0.19 (0.01)	1.00			
ΔShort-term	-0.08 (0.28)	-0.19 (0.01)	0.11 (0.15)	1.00		
ΔLong-term	0.23 (0.00)	-0.27 (0.00)	-0.17 (0.02)	0.16 (0.03)	1.00	
Stock return	0.50 (0.00)	-0.14 (0.05)	-0.42 (0.00)	-0.11 (0.14)	0.23 (0.00)	1.00

3.4 DATA MODIFICATION

Previous research analysing net aggregated money flows to mutual funds have modified the data in different ways. Several of these studies have used normalised data generated by dividing the monthly net money flows with the total market cap of the stock market at the end of the previous month, in that particular country. However since the change in market cap is a result of the stock return, normalising the flows in this manner might lead to results that overestimate the explanatory significance of the stock return. Due to this potential bias, the decision was made not to normalise the flows.

Furthermore, Warther (1995) modified his data on the US market by removing the predictable component from the money flows. This because he found large serial correlation

in the money flows, implying that a large part of the money flows could be predicted based on the money flows in previous months. We therefore tested our money flows for serial correlation using time-series regressions with lagged flows and the Box-Pierce' Q statistic tests of the null hypothesis that all correlation up to k lags are equal to 0 (see Table 17-22 in appendix). Just like Warther, we found that a large part of the flows could be predicted based on the net money flows to the particular fund category in the preceding months. Having a large predictable component in the net money flows could potentially reduce the observed effect of other variables on the net money flows. Therefore, in order to increase the probability of generating viable results relevant to answering our research question and testing our hypothesis there was a need to modify the data for the dependent variable. Hence Warther's approach to use the unpredictable (unexpected) net money flows as a dependent variable, instead of the total net money flows, was adopted.

To predict the expected net money flows we used an (AR) model and removed this part from the total flows, resulting in only the unexpected part. The number of lags used to predict the expected flows was chosen based on a joint interpretation of several lag-order selection statistics. These selection statistics include the final prediction error (FPE), the Akaike's information criterion (AIC), the Hannan and Quinn information criterion (HQIC) and the Schwarz Bayesian Information Criterion (SBIC) (see Table 23-25 in appendix for details). This resulted in the use of an AR(1) model to predict the expected net money flows to equity and money market funds. For bond funds on the contrary, an AR(2) model was used to predict the expected net money flows. As aforementioned the expected flows was then removed from the total flows in order to generate the unexpected flows used as a dependent variable in the regressions throughout the study. Observing the pairwise correlation for the unexpected flows shown in Table 4, the differences from the correlations for the total flows are only marginal. Table 26 in the appendix provides descriptive statistics for the unexpected flows to the different fund categories. Figure 2 to 4 in the appendix shows a graphical plot of both the expected and unexpected net money flows to the different fund categories.

Table 4
Pairwise correlations for monthly unexpected net money flows to mutual funds in Sweden, the monthly change in three-month Stibor, the monthly change in yield on the 10-year Swedish Government Bond and the monthly return on the OMX Stockholm PI index over the period 2000:1 to 2015:2. Data was obtained from the Swedish Investment Fund Association and Bloomberg. P-values for the pairwise correlations are shown in the parentheses.

	Equity	Bond	Money market	ΔShort-term	ΔLong-term	Stock return
Equity	1.00					
Bond	-0.36	1.00				
	(0.00)					
Money market	-0.76	0.29	1.00			
	(0.00)	(0.00)				
ΔShort-term	-0.07	-0.13	0.09	1.00		
	(0.34)	(0.09)	(0.21)			
ΔLong-term	0.21	-0.24	-0.16	0.16	1.00	
	(0.00)	(0.00)	(0.03)	(0.03)		
Stock return	0.50	-0.21	-0.43	-0.11	0.23	1.00
	(0.00)	(0.00)	(0.00)	(0.14)	(0.00)	

4. METHODOLOGY

This section describes the methodology used in this study to test our hypothesis that an expansionary monetary policy pursued by the Riksbank increases risk-taking among investors in Sweden. The methodology used in this study was a three-stage approach. The first stage was performed in order to see what in general determines investors' change in asset allocation. The subsequent stages were based on two different approaches to examine the research questions about how an expansionary monetary policy affects investors' asset allocation and through that test our hypothesis. The second stage was conducted in order to investigate the effect of an expansionary monetary policy through looking at the effect of a change in the policy rate, proxied by the Stibor. The third stage was in addition conducted in order to examine the effect of an expansionary monetary policy through looking at the effect of an extraordinary low repo rate level. The empirical analysis, including descriptive statistics, regressions and econometric modelling was conducted in Stata, a data analysis and statistical software.

The primary aim of the first stage in the research process was to analyse the effect of a change in investors' asset allocation in a broader context, looking at several different variables that could potentially possess explanatory significance. This since we wanted to examine the magnitude of the effect of the change in short-term interest rate on investors'

asset allocation compared to the influence of other variables. By determining the relative significance of the interest rate change we provide a more solid foundation for the subsequent stages in the process of answering the research questions. Standard ordinary least square (OLS) regressions using White-Huber standard errors were applied to determine the relationship between the unexpected net money flows and the explanatory variables. For each of the fund categories a set of five different regressions were conducted for each mutual fund category, all modifications of the regression model framework described below:

$$\widetilde{f_{t,t}} = \beta_1 \Delta SR_t + \beta_2 \Delta SR_{t-1} + \beta_3 \Delta LR_t + \beta_4 \Delta LR_{t-1} + \beta_5 MKT_t + \beta_6 MKT_{t-1} + \beta_7 APR + \beta_8 JUL + CONS + \varepsilon$$

$\widetilde{f_t}$ denotes the monthly aggregated unexpected net money flow. SR_t and SR_{t-1} denotes the concurrent and one-month lagged monthly change in short-term interest rate. LR_t and LR_{t-1} denoted the concurrent and one-month lagged monthly change in long-term interest rate and MKT_t and MKT_{t-1} the concurrent and one-month lagged return on the OMXPI. Dummy variables for the months April and July is included in the basic model, denoted APR and JUL respectively, since aforementioned seasonality test indicated significant results for these two months for the net money flows to equity funds.

The first regression model applied was the basic model. In order to better see the effect of the interest rate, two regressions with stock market return and either the concurrent short or long term interest rate variable included was then performed. Lastly, the same two regressions using either the lagged short or long term interest rate in combination with lagged stock market return was performed in order to see if there was a potential feedback-trader effect present. Table 5-7 in the result section display the results of these five different regressions for each mutual fund category.

Previous research has found that the variables for the stock market return have a significant effect in explaining net money flows. We therefore expected that a large part of the flows predicted from our models would be attributable to this variable, reducing the explanatory significance of the interest rate variables. Hence in the second stage of our research process, we decided to drop the market return, long-term interest rate and dummy variables and look solely at the effect of a change in the short-term interest rate. This was done through two different single-variable OLS regression, applied to all mutual fund categories. The first one regressing the net aggregated money flows on the concurrent monthly change in short-term interest rate and the second one the one-month lagged monthly

change in short-term interest rate. The results of these regressions are shown in Table 8 and Table 9 in the result section.

The core interest of this paper is to analyse the asset allocation among investors in times with extraordinary low interest rates. Consequently, in the final step of the analysis approach we changed the focus from determinants of net money flows and the effect of a change in the interest rate, to the effect of an extraordinary low interest rate on the net money flows previously examined in this paper. In order to define a period of extraordinary low interest rate the repo rate has been used as a proxy for the interest rate level in society. A period with a repo rate of 1.25 percent or lower is defined as an extraordinary low interest rate environment for investors. This level is approximately 1 percentage point below the repo rate mean during the 182 months sample period. Such an interest rate environment was observed during two separate time periods in the sample, February 2009 until January 2011 and September 2012 until February 2015.

First, to investigate the effect on investors risk shifting, a dummy variable approach was employed. The months in the two selected time periods were assigned a dummy variable with the value of 1 and the rest of the months with a higher interest rate prevailing were assigned the value 0. The unexpected net money flows, posing as a proxy for the change in investors' asset allocation, was then regressed on the dummy variable for the low interest rate environment. As in earlier stages a standard OLS regression was used. By doing this, we expected to observe significant results describing whether investors moved their money in or out of riskier asset classes in a low interest rate environment. The result of this regression is shown in Table 13 in the result section.

Second, to examine the investment climate that investors have to consider when making investments in a low interest rate environment, we also analysed the descriptive statistics and correlations for the variables during these periods. See Table 10 to 12 in the results section.

5. RESULTS

This section is divided into three subsections after our three-stage method. The first subsection describes the results of our tests of determinants for unexpected net money flows to equity, bond and money market funds. The second subsection describes the results from the test for the isolated effect of a change in short-term interest rate on the unexpected net money flows to the three mentioned mutual fund categories. The third subsection describes the result

from our test of the effect of a low interest rate environment on the unexpected net money flows to the three mentioned mutual fund categories.

5.1 DETERMINANTS OF UNEXPECTED NET MONEY FLOWS TO MUTUAL FUNDS

In this subsection we look at determinants of unexpected net money flows to the different fund categories in general. The objective is to see whether a change in the short-term interest rate is significant and compare the coefficient to the ditto of other variables. The general results from the regressions performed show a significant relationship between the concurrent return on the Swedish stock market and the flows to all three fund categories. However, the interest rate variables are only significant in a few regressions with small corresponding coefficients.

5.1.1 EQUITY FUNDS

Focusing on flows to equity funds, the variable for the concurrent return on the Swedish stock market shows a large positive coefficient that is strongly significant. This suggests that a 1% positive return on the stock market corresponds to an inflow of SEK 491 million the same month. As displayed in Table 5 the adjusted R^2 drops considerably when the concurrent stock return is excluded from the regression, suggesting that the explanatory significance of this variable is grand. Furthermore, in regressions 4 and 5, where only all variables except the dummies are lagged one month, the return on the Swedish stock market is also statistically significant with a rather large positive coefficient. The presented results also show statistically significant evidence for seasonality in the unexpected flows to equity funds since the coefficients for the April-dummy and July-dummy are significant and of great magnitude. When it comes to the interest rate on the other hand, the one-month lagged change in the short-term interest rate is the only variable that displays a statistically significant coefficient. The coefficient is -63 in regression 1, which indicates that if there was a 1% drop in the short-term interest rate the preceding month there is a small unexpected inflow of SEK 63 million to equity funds the concurrent month. In regression 4, where only the lagged value of stock return and change in short-term interest are included, the one month lagged change in short-term interest rate shows a more statistically significant negative relationship of SEK 75.9 million.

Table 5:
Multivariable regressions of unexpected net money flows to equity funds in MSEK during the period the period 2000:1 to 2015:2. Unexpected net money flows are total net money flows minus expected net money flows generated using an AR(1) model. L. denotes one-month lagged explanatory variable. P-values are shown in parentheses.

	(1)	(2)	(3)	(4)	(5)
Stock return	490.9***	530.8***	503.7***		
	(0.00)	(0.00)	(0.00)		
L.Stock return	71.9			167.3**	174.5**
	(0.27)			(0.01)	(0.01)
ΔShort-term	1.2	-9.9			
	(0.98)	(0.79)			
L.ΔShort-term	-63.0+			-75.9**	
	(0.08)			(0.01)	
ΔLong-term	77.3		85.1		
	(0.13)		(0.12)		
L.ΔLong-term	59.6				5.1
	(0.29)				(0.93)
APRDUM	2170.0*	2084.8+	2139.8*	3528.9**	3462.4**
	(0.05)	(0.05)	(0.05)	(0.00)	(0.00)
JULDUM	1959.5*	1667.0*	1942.4*	2644.3**	2526.1**
	(0.02)	(0.02)	(0.01)	(0.00)	(0.00)
Constant	-550.5	-560.9	-489.6	-676.8	-562.7
	(0.26)	(0.25)	(0.30)	(0.23)	(0.31)
Observations	181	181	181	181	181
R-squared	0.293	0.262	0.274	0.069	0.054
Adjusted R-squ~d	0.261	0.245	0.257	0.048	0.032

p-values in parentheses
+ p<0.10, * p<0.05, ** p<0.01, *** p<0.001

5.1.2 BOND FUNDS

Shifting focus to the regressions on unexpected net money flows to bond funds instead, the results are slightly different. The coefficient for the return on the Swedish stock market is significant as aforementioned, but in contrast to equity funds the coefficient is negative and only equal to SEK -63.7 million. Moreover, there is a statistically significant positive coefficient of SEK 47.3 million for the one-month lagged return on the Swedish stock market when the concurrent return is also included in the regression. However, when only lagged variables are included the coefficient is not statistically significant. The coefficient for the long term-interest rate variable is statistically significant and negative in all regressions where it is included.

Looking at regression 2 in Table 6 where only the concurrent stock return and concurrent change in short-term interest rate is included the coefficients for the change in short-term interest rate shows a weak significant negative coefficient of SEK -23.9 million. However, this coefficient is not significant in regression 1 where all explanatory variables are

included. The adjusted R^2 for regressions 1 -5 are much lower than for the equity funds, nonetheless they also drop significantly when the concurrent stock return is excluded.

Table 6
Multivariable regressions of unexpected net money flows to bond funds in MSEK during the period the period 2000:1 to 2015:2. Unexpected net money flows are total net money flows minus expected net money flows generated using an AR(2) model. L. denotes one-month lagged explanatory variable. P-values are shown in parentheses.

	(1)	(2)	(3)	(4)	(5)
Stock return	-63.7**	-75.3**	-52.9*		
	(0.00)	(0.00)	(0.01)		
L.Stock return	47.3*			22.3	30.6
	(0.02)			(0.26)	(0.12)
ΔShort-term	-16.1	-23.9+			
	(0.38)	(0.07)			
L.ΔShort-term	4.2			-6.0	
	(0.83)			(0.72)	
ΔLong-term	-45.1*		-45.5*		
	(0.05)		(0.02)		
L.ΔLong-term	-26.8				-23.6
	(0.21)				(0.21)
Constant	-80.3	-17.1	-18.0	-16.7	-33.2
	(0.55)	(0.91)	(0.89)	(0.91)	(0.81)
Observations	180	180	180	180	180
R-squared	0.122	0.067	0.083	0.006	0.016
Adjusted R-squ~d	0.092	0.056	0.073	-0.005	0.005

p-values in parentheses
+ p<0.10, * p<0.05, ** p<0.01, *** p<0.001

5.1.3 MONEY MARKET FUNDS

The results from the regressions on unexpected net money flows to money market funds provides no indication that the interest rate is a factor accounted for when shifting capital to and from this fund category. None of the variables for the change in interest rate display statistically significant coefficients in the regressions on the unexpected flows to money market funds shown in Table 7. In spite of this, the coefficient for the concurrent return on the Swedish stock market – as well as the one-month lagged ditto – are both strongly significant. As shown in Table 7 the coefficient for the concurrent stock market return have a coefficient between SEK -253.9 million and SEK 273.9 million and the lagged stock market return a coefficient between SEK -93.2 million and SEK -134.4 million. Both coefficients are negative and rather large in absolute terms, compared to the results from regressions on unexpected flows to bond funds. Compared to the results for unexpected flows to equity funds, which had positive coefficients, the stock market return coefficients for this fund category are smaller in

absolute terms. Furthermore, the adjusted R^2 of these regressions are smaller than the ones for the same regressions on equity funds but higher than those of bond funds.

Table 7
Multivariable regressions of unexpected net money flows to money market funds in MSEK during the period the period 2000:1 to 2015:2. Unexpected net money flows are total net money flows minus expected net money flows generated using an AR(1) model. L. denotes one-month lagged explanatory variable. P-values are shown in parentheses.

	(1)	(2)	(3)	(4)	(5)
Stock return	-253.9***	-273.9***	-267.6***		
	(0.00)	(0.00)	(0.00)		
L.Stock return	-93.2*			-115.3**	-134.4**
	(0.02)			(0.01)	(0.00)
ΔShort-term	10.5	14.2			
	(0.69)	(0.50)			
L.ΔShort-term	5.4			30.9	
	(0.88)			(0.31)	
ΔLong-term	-22.9		-28.4		
	(0.55)		(0.40)		
L.ΔLong-term	29.6				47.3
	(0.44)				(0.25)
Constant	181.5	145.2	94.0	86.4	95.4
	(0.50)	(0.59)	(0.71)	(0.76)	(0.72)
Observations	181	181	181	181	181
R-squared	0.213	0.187	0.189	0.041	0.045
Adjusted R-squ~d	0.186	0.178	0.180	0.031	0.034

p-values in parentheses
+ p<0.10, * p<0.05, ** p<0.01, *** p<0.001

5.3 Effect of change in short-term interest rate

The previous section showed that the return on the Swedish stock market is the main determinant of unexpected flows to all three fund categories analysed. In relation to the effect of the stock market, the change in both short-term interest rates turned out to be rather insignificant. Therefore, this section will cover the results of the isolated effect of a change in the short-term interest rate on the unexpected flows to the fund categories.

In the regressions presented in the previous section, the coefficient for the concurrent change in short-term interest rate was only weakly statistically significant in explaining unexpected flows to bond funds when regressed together with the market return. For the other two fund categories there was no statistically significant relationship. The one-month lagged change in the short-term interest rate did however display a statistically significant negative relationship to equity fund flows. Testing the effect of the concurrent change in short-term interest rate in a single-variable regression generates fairly similar results.

As seen in Table 8 there is still a negative relationship with unexpected flows to equity and bond funds and a positive relationship with unexpected flows to money market funds.

The coefficients for equity funds and money market funds are larger in absolute terms but they are not significant. For bond funds the coefficient is SEK -19.5 and and it is also less significant than in the regressions with the stock market return included. In Table 9 the net regressions on unexpected flows to mutual funds on the one-month lagged change in short-term interest rate yields a weakly statistically significant coefficient of SEK -77.8 million in the regression on unexpected flows to equity funds. Overall the results are congruent with the ones from the multivariable regressions in the previous subsection.

Table 8
Regressions of unexpected net money flows to equity, bond and money market funds in MSEK on monthly percentage change in three-month Stibor. Data covers the period 2000:1 to 2015:2 and p-values are shown in parentheses.

	Equity	Bond	Money market
ΔShort-term	-37.2	-19.5+	28.8
	(0.34)	(0.09)	(0.21)
Constant	-66.1	-35.6	51.2
	(0.89)	(0.80)	(0.85)
Observations	181	180	181
R-squared	0.005	0.016	0.009
Adjusted R-squared	-0.001	0.010	0.003

p-values in parentheses
+ p<0.10, * p<0.05, ** p<0.01, *** p<0.001

Table 9
Regressions of unexpected net money flows to equity, bond and money market funds in MSEK on one-month lagged monthly percentage change in three-month Stibor. Data covers the period 2000:1 to 2015:2 and p-values are shown in parentheses.

	Equity	Bond	Money market
L.ΔShort-term	-77.8+	-6.8	35.3
	(0.08)	(0.61)	(0.18)
Constant	-99.7	-9.1	45.2
	(0.83)	(0.95)	(0.87)
Observations	181	180	181
R-squared	0.017	0.001	0.010
Adjusted R-squared	0.011	-0.004	0.004

p-values in parentheses
+ p<0.10, * p<0.05, ** p<0.01, *** p<0.001

Examining the descriptive statistics for the change in short-term interest rate in Table 2, it can be concluded that a large part of the observations are rather close to zero. Working from the hypothesis that only a large change in the interest rate affects asset allocation, this could be

the explanation to why we do not find a strong statistical significance in our regressions. However, using only the upper and lower quartile values of the change in short-term interest rate did not improve the significance of our results.

5.4 Effect of a low interest rate environment

In this section the focus is shifted from the effect of a change in the short-term interest rate to the effect of a low interest rate environment on asset allocation. A low interest rate environment is – as mentioned in the method section of this paper – a time period when the Swedish repo rate is 1.25 percent or lower. In our sample of 182 months, a total of 54 months in two separate periods correspond to the definition of a low interest rate environment. The descriptive statistics for the dependent variables during this sub-sample is presented in Table 10 and the explanatory variables in Table 11. During these months, the stock market showed a average monthly return of 2.23 percent compared to 0.45 percent in the total sample. On the contrary, both short- and long-term interest rates showed a negative median monthly change of -5.14 percent and -0.52 percent respectively. The stock return was also less volatile during these months while the interest rate variables experienced a larger standard deviation.

Table 10
Descriptive statistics for total monthly net money flows to mutual funds in Sweden. Data covers months in the period 2000:1 to 2015:2 when the repo rate was 1.25 percent or lower. Data were obtained from the Swedish Investment Funds Association and are in millions of SEK.

FUND CATEGORY	N	mean	sd	min	max	p25	p50	p75
Equity	54	2,776	6,145	-22,066	14,392	-244	2,638	6,729
Bond	54	1,920	3,311	-5,236	13,620	-61	1,241	4,028
Money market	54	-641	3,668	-7,712	11,139	-2,509	-628	1,388

Table 11
Descriptive statistics for monthly change in three-month Stibor, monthly change in yield on the 10-year Swedish Government Bond and the monthly return on the OMX Stockholm PI index. Data covers months in the period 2000:1 to 2015:2 when the repo rate was 1.25 percent or lower. All variables are in percent and were obtained from Bloomberg.

VARIABLES	N	mean	sd	min	max	p25	p50	p75
ΔShort-term	54	-5.144	19.264	-81.443	22.171	-8.540	-1.132	2.521
ΔLong-term	54	-0.521	10.783	-32.289	28.915	-7.271	-0.672	4.462
Stock return	54	2.274	4.029	-7.370	18.731	0.017	1.661	3.483

Turning the focus towards the correlations of the different variables in this sub-sample, see Table 12, a general observation is that the correlation between the two fixed-income flows and equity goes down. At the same time the correlation between the bond and money market flows (0.34) is slightly higher than the 0.29 correlation between the two in the full sample (see Table 4). Nonetheless, the most prominent difference is the negative correlation between stock return and the unexpected flows from money market funds (-0.61), which is 18 percentage points stronger in the low interest rate environment compared to the whole sample time period. Likewise, the stock market return and unexpected flows to equity fund correlation is 7 percentage points stronger. Perhaps the most notable difference from the full sample is the fact that in a low interest rate environment the negative correlation between the stock return and the short-term interest rate increases dramatically and is in contrast to the full sample statistically significant.

Table 12
Pairwise correlations for monthly unexpected net money flows to mutual funds in Sweden, the monthly change in three-month Stibor, the monthly change in yield on the 10-year Swedish Government Bond and the monthly return on the OMX Stockholm PI index. Data covers months in the period 2000:1 to 2015:2 when the repo rate was 1.25 percent or lower. Data was obtained from the Swedish Investment Fund Association and Bloomberg. P-values for the pairwise correlations are shown in the parentheses.

	Equity	Bond	Money market	ΔShort-term	ΔLong-term	Stock return
Equity	1.00					
Bond	-0.34	1.00				
	(0.01)					
Money market	-0.69	0.34	1.00			
	(0.00)	(0.01)				
ΔShort-term	-0.04	-0.10	0.07	1.00		
	(0.76)	(0.45)	(0.60)			
ΔLong-term	0.22	-0.27	-0.16	0.19	1.00	
	(0.11)	(0.05)	(0.25)	(0.18)		
Stock return	0.57	-0.19	-0.61	-0.30	0.16	1.00
	(0.00)	(0.16)	(0.00)	(0.03)	(0.24)	

The results from our dummy variable regression in Table 13, show a statistically significant unexpected inflow of SEK 2327.8 million per month to equity funds and a significant unexpected outflow of SEK -1671.7 million per month from money market funds due to the low interest rate environment. For unexpected flows to bond funds on the other hand the results are not statistically significant, though the positive coefficient suggests that there is unexpected inflows to bond funds resulting from a low interest rate environment.

Table 13
Regressions of unexpected net money flow to equity, bond and money market funds in MSEK on a dummy variable for low interest rate environment. Data covers the period 2000:1 to 2015:2 and p-values are shown in parentheses.

	Equity	Bond	Money market
Low rate	2327.8*	499.0	-1671.7**
	(0.02)	(0.20)	(0.00)
Constant	-694.5	-149.7	498.8
	(0.21)	(0.18)	(0.12)
Observations	181	180	181
R-squared	0.029	0.015	0.044
Adjusted R-squared	0.024	0.010	0.038

p-values in parentheses
+ p<0.10, * p<0.05, ** p<0.01, *** p<0.001

6. DISCUSSION AND IMPLICATIONS

In this section we will provide a discussion on the outcome of our study as well as the economic interpretation and implications of the results generated. The section will first discuss our results from the first research question point of view, being how a change in short-term interest rate affects asset allocation. We will then move on to discuss the results based on the second research question, being how a low interest rate environment affect asset allocation. Lastly the implication of our results will be presented and discussed.

6.1 DISCUSSION

Our study covers the three most fundamental asset classes: equity, bonds and money market investments. In a simple comparison between the riskiness of the three asset classes, money market investments are to be considered the least risky. Equity on the other hand is the asset class that poses the largest risk for the investor according to basic financial theory. This is due to the volatility of the returns being considerably higher for equity than bonds and money market investments, a phenomenon that implies that the probability of a large loss is higher for equity investments than for fixed-income securities. Bonds are less risky than equity investments but are more risky than money market investments due to the interest rate risk stemming from the longer duration. This risk-rating of the three fund categories will be the foundation of our discussion regarding the effect of the change in interest rate and a low interest rate environment on investors' risk-shifting through their change in asset allocation.

6.1.1 Does a change in short-term interest rate affect asset allocation on the Swedish financial market?

In our study we expected to find evidence for a risk-taking channel of an expansionary monetary policy in the form of a *search for yield* among investors. Intuition and the concept of *search for yield* suggest that investors shifts towards more risky investments in a search for return when the interest rate declines, since in those periods expected returns on low-risk assets drops, as also identified by Di Maggio & Kacperczyk (2014).

In our regressions we find further evidence for a *search for yield* by looking at the effect of a change in short-term interest rate on the flows to the different fund categories. The primary evidence is in the form of a negative relationship between the one-month lagged change in the short-term interest rate and the money flows to equity funds. A result, which implies that when the short-term interest rate goes down, investors, shifts their capital into riskier assets in the form of equity the following month. A risk-shift also observed by Hau & Lai (2014) in their study on European market. They also found a significant positive relationship between the change in short-term interest rate and flows to money market funds, which provides evidence for substitution between the two asset classes. In our study we observed a positive relationship between the two variables as well, though it was not significant. Concluding, our study confirms a search for yield effect of an expansionary monetary policy by suggesting that investors increases equity investments due to a change in short-term interest rate.

Shifting the focus to bond fund investments, additional evidence supporting a search for yield effect of an expansionary monetary policy in Sweden is observed. The negative relationship between flows to bond funds and changes in the short-term interest rate suggests that investors move into fixed-income securities with longer maturities when short-term interest rates goes down. This is in line with theory since the expected value for a bond fund drops with rising interest rates. The magnitude of the effect increases with the duration of the fund holdings Williams (2014). Longer maturities imply a higher interest rate risk and the observations are thus in line with the theory that investors search for return by taking on more risk when interest rates goes down. The intuition might suggest that investors switch between equity and fixed-income securities depending on market conditions, seen as a substitution that was observed with flows to equity funds and money market funds. However what we find does not support a substitution between equity and bond funds due to a change in the short-term interest rate. What we find is better understood through the concept of *search for yield*.

There are two choices available for investors when wanting to increase return taking on more risk. Either they switch from safe money market investments and invest in a more risky asset class such as equity or they can keep investing in fixed-income securities but with longer duration. Both behaviours are observed in our data.

Overall, the changes in the short-term interest rate brought us rather inconclusive results even though evidence in line with a *search for yield* was found. The small and rather low coefficients obtained for the change in short-term interest rate in the regressions on fund flows suggest that the change in short-term interest rate is not a primary variable considered by investors when allocating their capital between asset classes. What we instead find in our study is that the return on the stock market is the major determinant for how investors choose to change their allocation of capital. This conclusion is based on the results of our regressions where several explanatory variables were included and the stock market return proved to be the one with the greatest explanatory significance.

In our multivariable regressions we found that the absolute value of coefficient for the stock market return was both larger and more significant than the change in short-term interest rate variable ditto. This evidence favour the view that investor, to a great extent, base their investment decisions on the stock return. Comparing the five regressions performed in the multivariable setting for each fund category, the adjusted R^2 drops sharply when the concurrent stock return is excluded, again favouring the view of the stock return being the most important explanatory variable. That the return on the national stock market is a determinant of fund flows in that specific country was not unexpected since previous studies have found evidence for this, e.g. Warther (1995). Though with large shifts in short-term interest rates during the time period in our study we expected that it would have a more significant effect on investors' asset allocation. Especially on the money flows to money market funds, based on the intuition that investors base their investment decision on the expected return of that asset class. Suggesting that money market investors should shift in and out of money market funds depending on the short-term interest rate. Yet we find that this was not the case and that these flows were only statistically significantly related to the stock market return. Not even when we only test the effect of large changes in the short-term interest rate the result was significant.

6.1.2 Does a low interest rate environment induce risk-shifting among investors in Sweden?

Finding that a change in the short-term interest rate is only marginally significant as a determinant of changes in investors' asset allocation provides only weak evidence for a *search for yield* effect of an expansionary monetary policy. However, when looking at the effect of a low interest rate environment instead we obtain conclusive evidence that suggest that a low interest rate do affect investors' asset allocation.

In our dummy variable regression we observe a significant outflow from money market funds when the interest rate is extraordinary low. Based on the generally accepted view that money market investment is the safest type of investment, the large outflow from money market funds in a low interest rate environment suggests that that the demand among investors for safe investments is lower when the interest rate is low. This is in line with the *search for yield* dimension of the risk-taking channel of an expansionary monetary policy. Furthermore, looking only at the effect of a low interest rate environment on money market investments is not sufficient to prove a *search for yield* effect of a expansionary monetary policy since investors can substitute this asset class for a risk-free savings account. And such a shift would not imply a risk-increase in the investor's portfolio. Nonetheless, in line with a *search for yield* we do find that there is a large significant inflow to equity funds in our dummy variable regressions. Since equity is to be considered the most risky asset class, the fact that investors choose to shift their asset allocation more towards equity when interest rates are low provides support for a risk increase in their portfolios.

Not surprisingly, we also observed a large, significant, negative correlation between flows to money market funds and flows to equity funds in the low interest rate environment. The negative correlation provides support for the intuition that when investors remove money from money market funds a large part of them are invested in equity funds. Analysed together with the aforementioned results from the dummy variable regressions this confirm that there is a clear risk-shift effect of low interest rate environment. In other words, when interest rates are extraordinary low investors take on more risk in their portfolio by divesting money market funds and investing in equity funds.

When shifting the focus toward the effect of a low interest rate environment on flows to bond funds, less conclusive results are obtained. In the dummy variable regression we do find that there is a large inflow to bond funds in a low interest rate environment. This result in combination with the large outflow from money market funds resulting from a low interest

rate environment, suggests that investors substitute investments in short-duration fixed-income securities for fixed-income securities with longer durations. This behaviour is in line with a *search for yield* since bonds have longer duration than money market investments and hence are more risky due to the larger interest rate risk. However, the dummy variable for the low interest rate environment is not significant when used in the regression on unexpected flows to bond funds. Moreover, the correlation between flows to money market funds and bond funds is positive but low. This leaves us with inconclusive results regarding a substitution between money market investments and bond investments among investors. Hence we cannot conclude that there is a *search for yield* effect of an expansionary monetary policy within the fixed-income segment.

Concluding the above reasoning on the effect of a low interest rate on the change in investor's asset allocation the results do point toward an increased risk-taking in the form of a *search for yield*. Thus confirming our hypothesis that that an expansionary monetary policy pursued by the Riksbank causes investors in Sweden to take on more risk. We see a clear negative correlation between flows to money market funds and equity funds, as well as between bond funds and equity funds. With a large and significant inflow to equity funds due to a low interest rate environment it suggests that investors primarily search for yield by switching fixed-income investments for equity. We do not find significant evidence supporting a *search for yield* effect of an expansionary monetary policy within the fixed-income segment.

6.2 IMPLICATIONS

6.2.1 GENERAL IMPLICATIONS

Elaborating on the preceding analysis from a more general point of view our findings suggest that the primary effect of an expansionary monetary policy on investors' allocation of capital is of a more indirect nature. In our study we fail to see clear evidence of a direct effect of a change in the short-term interest rate on the flows to the different fund categories. Instead we find that the stock market return is the major determinant for fund flows. Nevertheless we do find evidence that a low short-term interest rate in fact drives outflows from money market funds and inflows to equity funds, which are statistically significant. With negative correlation between the short-term interest rates and the stock market return - and an above average return on the stock market in times of extraordinary low interest rates - suggest that the primary risk-shifting effect of an expansionary monetary policy among investors is

through its effect on the stock market. This indirect effect is further supported by the stronger correlation between stock market return and flows to equity funds and flows from money market funds in a low interest rate environment. In other words, the expansionary monetary policy affects the stock market positively, which in turn drives an inflow to risky equity funds and consequently an outflow of less risky money market funds.

The link between an expansionary monetary policy and the stock market return has been examined thoroughly in previous literature and can be explained through several different concepts. First, companies' profitability is affected positively by an expansionary monetary policy since interest costs is lower which increases profits and hence the market value of the company. Secondly, companies with floating interest rate loans and companies taking on new debt will experience a lower burden of loan payments. Hence the financial stress of such companies will decrease and in turn lower the probability of default. Since the probability of default is an important factor in making valuations of companies, a consequence of a lower probability of default is that the valuation of the company will increase. Third, the volatility in the stock market - measured by the VIX - drops in times of decreasing interest rates as brought forward in papers by Rajan (2006) and Gambacorta (2009). A drop in volatility is also observed in rising markets. Since the VIX is measured on the US stock market its implications is not directly transferable to the Swedish stock market. Nevertheless, if comparing the monthly standard deviation of the returns on the Swedish stock market in our whole sample, 5.68 percent, it is much higher than the 4.03 percent ditto in the time period of a low interest rate environment. Thus our results are in line with the effect observed on the US stock market. In general the stock market becomes more attractive to investors with a prevailing expansionary monetary policy, which provide support for a risk-taking channel of monetary policy.

6.2.2 Implications of a risk-taking channel

With evidence supporting the existence of a risk-taking channel of monetary policy - implying that an expansionary monetary policy results in an increased risk-taking among investors - it is of importance to lift the objective and discuss the possible implications of such a risk-taking channel of the expansionary monetary policy currently pursued by the Riksbank. With evidence of a strong negative relationship between bank risk-taking and the interest rate, Delis & Kouretas (2011) argue that central banks must take the risky behaviour of banks into considerarion when setting policy rates.

An expansionary monetary policy with extraordinary low policy rates is generally pursued by a central bank in times of recession. In a recession there is a halt in the economic growth and a low inflation. Hence a low policy rate is employed in order to boost the economy and the inflation. Seeing that a recession is most often the result of a financial crisis, the conclusion can be drawn that financial crisis are the reason central banks have to pursue an expansionary monetary policy. Looking in retrospect it can be said that most financial crises in history were caused by excessive risk-taking and inflated asset prices seen in for example the dot-com bubble and the Global financial crisis in 2008. The combination of investors having a larger share of their portfolio in risky assets and the price of the risky assets being above its intrinsic value lay the foundation for a financial crisis when something triggers a fall in asset prices. With our study and previous studies providing evidence for a risk-taking channel of monetary policy - with increased risk taking and rising asset prices when policy rates are low - it seems that what is meant to curb the negative effects of a financial crisis is in fact catering for the emergence of a new one. Reasoning also put forward by Altunbas et al. (2014) and Taylor (2009) who argue that central banks' expansionary monetary policy contributed to the bulidup of the recent financial crises.

With this reasoning in mind, the current situation in Sweden where the Riksbank is pursuing an unprecedented expansionary monetary policy with a negative repo rate, calls for concern. In our study we find that an extraordinary low interest rate environment corresponds to risk-shift among investors towards risky equity investments and away from less risky money market investments. We derive this risk-shift from both a direct and an indirect effect of a low interest rate on changes in asset allocation among investors. First, the low expected returns on safe, fixed-income, investments due to low interest rate environment pushes investors to a *search for yield* by taking on more risk. Secondly, low interest rates have a positive effect on the stock market, which increases the attractiveness of equity investments and hence pulls investors towards this risky asset class. In other words an expansionary monetary policy by the Riksbank increases the overall risk-taking among investors as well as it corresponds to an increase in equity prices. Knowing that financial crisis is associated with excessive risk-taking and inflated asset prices and observing these effects of an expansionary monetary policy in our results, it can be argued that the Riksbank is currently threatening the stability of the Swedish financial market.

6.3 LIMITATIONS AND FUTURE RESEARCH

6.3.1 DATA LIMITATIONS

In financial research, narrow time frames between data points are preferred since it captures effects of explanatory variables on dependent variables with greater accuracy. Having data for net money flows to mutual funds on a monthly basis is a limitation considering that we possibly miss out on the most immediate effects of the observed market conditions on asset allocation. If available we would have preferred to use daily net money flows, but the Swedish Investment Fund Association was not able to provide such frequent data. But then again this is a common limitation in financial research.

Moreover, the data on net money flows to mutual funds is presented in absolute numbers, which does not illustrate the magnitude of the flow in relation to the aggregated asset under management of that fund category. A certain money flow from money market funds might be significantly larger in relation to that same money flow from equity funds since more money is invested in equity funds. The Swedish Investment Fund Association started presenting the aggregated asset under management of fund categories in 2010 so for future studies it would be possible to derive and use percentage net money flows to mutual funds. Furthermore, the net money flows are in nominal value, not adjusted for inflation, which means that a certain money flow in 2000 is proportionally larger in real terms than the same money flow in 2015.

Another data related issue is the interest rate levels, during the time period of our sample, being close to zero. Due to the proximity to zero, small basis point changes in the interest rate will be of great magnitude in percentage terms, sometimes as high as 81 percent from a month to another for the short-term interest rate. These extreme percentage changes limits our study since a corresponding fund flow cannot match such large swings, probably lowering the explanatory power of a change in the interest rate.

With an extraordinary low interest rate still being rather unusual in Sweden with only a modest number of months corresponding to a repo rate of 1.25 percent or lower historically. In order to draw stronger conclusions on the effect of an expansionary monetary policy a more extensive sample would have been preferred. Hence, for future research it would be interesting to replicate our study in other countries with extraordinary low interest rates such as Japan, the US, or in Sweden when a larger dataset is available.

6.3.2 METHODOLOGICAL LIMITATIONS

A methodological limitation is that a potential risk-shift within a mutual fund category cannot be deduced with our research approach. This limitation is prevalent because we only look at the aggregated shifts in investments between mutual fund categories and do not examine shifts in the holdings of the funds themselves. This means that there could be a risk-shift inside the fund category as well if fund managers increase the riskiness of the fund portfolio. Thereby increasing the risk-taking of investors, which cannot be extracted from only looking at the net money flows. In other words it is possible that our approach underestimates the risk-taking effect of an expansionary monetary policy.

Mutual funds on the Swedish market invest in different asset classes globally. Due to the fact that we are only using Swedish interest rates and stock returns our results could be distorted since other explanatory variables can explain money flows to and from better for mutual funds investing on other markets than the Swedish. A more advanced model including more variables could perhaps sort this problem out and would thus be a suggestion for future research.

7. CONCLUSION

The purpose of this study was to examine the link between the monetary policy employed by the Riksbank and the risk-taking of investors in Sweden. This was done primarily in order to understand the effect of the current expansionary monetary policy - with historically low interest rates - on asset allocation and risk-taking in Sweden. The working hypothesis throughout this paper has been that the expansionary monetary policy currently being pursued by the Riksbank leads to an increased risk-taking among investors in Sweden.

In the first and second part of our empirical study we find that the change in short-term interest rate, a proxy for the repo rate, is a statistically significant determinant of unexpected flows to equity and bond funds. Suggesting that investors search for return by increasing their risk when the repo rate is lowered. However, we do find that the concurrent return on the stock market is in fact the major determinant for unexpected flows to all three fund categories analysed in this study. From this we conclude that investors in Sweden base their investment decision partly on the change in interest rate but primarily on the return of the Swedish stock market.

In the third part of our empirical study we find that an expansionary monetary policy corresponds to a statistically significant outflow from money market funds and a statistically significant inflow to equity funds. From this we conclude that investors in a low interest rate environment, due to an expansionary monetary policy, increase their risk-taking. We explain this behaviour through a *search for yield* as well as through the positive effect of an expansionary monetary policy on the stock market.

The risk-taking channel of monetary policy, to which we provide evidence in support of, is important to consider when employing an expansionary monetary policy. Looking only at the effect of the change in repo rate on economic growth and inflation when deciding on the repo rate level could potentially lead to instability in the financial market and increase the probability of a financial crisis.

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APPENDIX

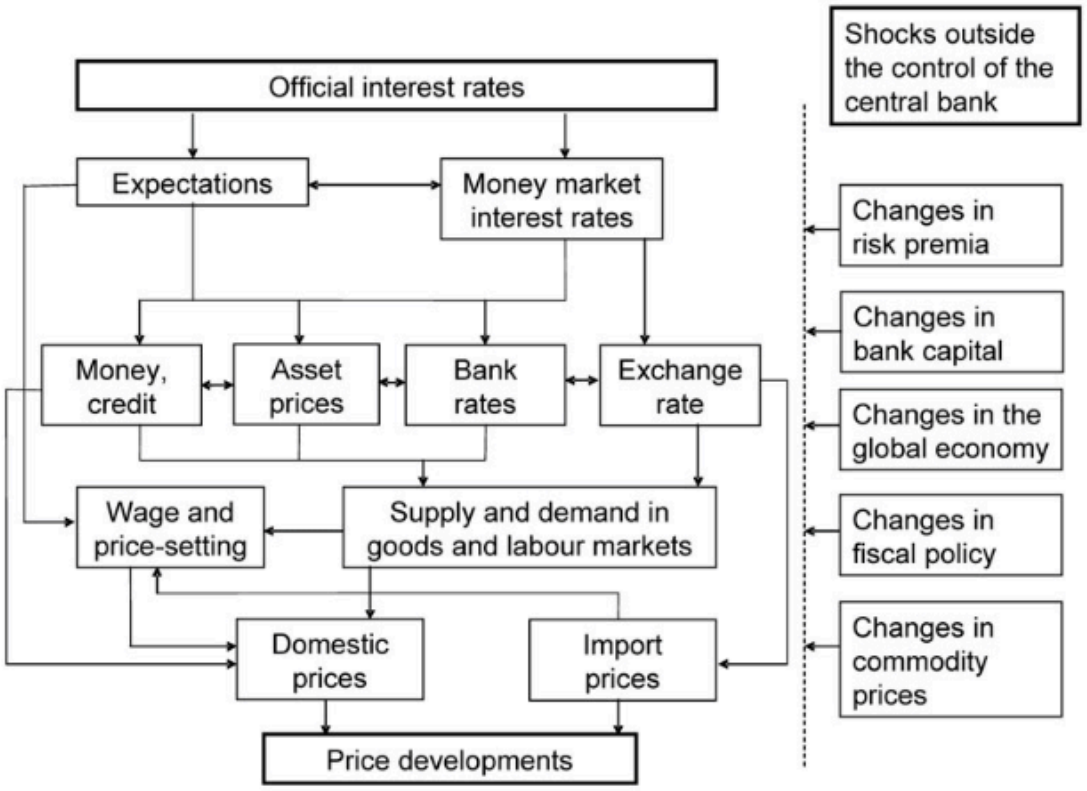

Figure 1 Graphical illustration of the transmission mechanism of monetary policy (European Central Bank, n.d.)

Table 14
Augmented Dickey-Fuller test for a unit root in net money flows to equity funds. The null hypothesis is that the variable contains a unit root and the alternative is that it follows a stationary process.

Dickey-Fuller test for unit root — Number of obs = **181**

	Test Statistic	Interpolated Dickey-Fuller: 1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	**-11.212**	**-3.483**	**-2.885**	**-2.575**

MacKinnon approximate p-value for Z(t) = **0.0000**

Table 15
Augmented Dickey-Fuller test for a unit root in net money flows to bond funds. The null hypothesis is that the variable contains a unit root and the alternative is that it follows a stationary process.

Dickey-Fuller test for unit root Number of obs = **181**

	Test Statistic	Interpolated Dickey-Fuller 1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	**-7.317**	**-3.483**	**-2.885**	**-2.575**

MacKinnon approximate p-value for Z(t) = **0.0000**

Table 16
Augmented Dickey-Fuller test for a unit root in net money flows to money market funds. The null hypothesis is that the variable contains a unit root and the alternative is that it follows a stationary process.

Dickey-Fuller test for unit root Number of obs = **181**

	Test Statistic	Interpolated Dickey-Fuller 1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	**-11.226**	**-3.483**	**-2.885**	**-2.575**

MacKinnon approximate p-value for Z(t) = **0.0000**

Table 17
Time-series regressions of monthly net money flow to equity funds in MSEK during the period 2000:1 to 2015:2. P-values are in parentheses.

	(1)	(2)	(3)	(4)
Lag 1	0.171*	0.164*	0.158*	0.166*
	(0.02)	(0.02)	(0.02)	(0.02)
Lag 2		0.0314	0.0140	0.0151
		(0.76)	(0.89)	(0.88)
Lag 3			0.0980	0.112
			(0.22)	(0.19)
Lag 4				-0.0880
				(0.26)
_cons	706.1	662.1	580.8	628.6
	(0.13)	(0.18)	(0.23)	(0.18)
N	181	180	179	178
R-sq	0.029	0.029	0.038	0.045
adj. R-sq	0.024	0.018	0.021	0.023

p-values in parentheses
+ p<0.10, * p<0.05, ** p<0.01, *** p<0.001

Table 18
Time-series regressions of monthly net money flow to bond funds in MSEK during the period 2000:1 to 2015:2. P-values are in parentheses.

	(1)	(2)	(3)	(4)
Lag 1	0.533***	0.426***	0.432***	0.435***
	(0.00)	(0.00)	(0.00)	(0.00)
Lag 2		0.198*	0.215*	0.194+
		(0.04)	(0.03)	(0.06)
Lag 3			-0.0391	-0.0830
			(0.66)	(0.40)
Lag 4				0.0999
				(0.22)
_cons	423.6***	355.7**	369.9**	338.8**
	(0.00)	(0.00)	(0.00)	(0.01)
N	181	180	179	178
R-sq	0.280	0.307	0.307	0.313
adj. R-sq	0.276	0.300	0.295	0.297

p-values in parentheses
+ p<0.10, * p<0.05, ** p<0.01, *** p<0.001

Table 19
Time-series regressions of monthly net money flow to money market funds funds in MSEK during the period 2000:1 to 2015:2. P-values are in parentheses.

	(1)	(2)	(3)	(4)
Lag 1	0.160*	0.157*	0.158*	0.171*
	(0.03)	(0.03)	(0.03)	(0.01)
Lag 2		0.0148	-0.00307	-0.00634
		(0.86)	(0.97)	(0.94)
Lag 3			0.124	0.141+
			(0.12)	(0.09)
Lag 4				-0.137+
				(0.08)
_cons	603.5*	591.7*	509.6+	607.1+
	(0.04)	(0.05)	(0.10)	(0.06)
N	181	180	179	178
R-sq	0.025	0.025	0.039	0.056
adj. R-sq	0.019	0.014	0.023	0.034

p-values in parentheses

Table 20
Autocorrelation, partial autocorrelation and portmanteau Q-statistics for monthly net money flows to equity funds. Table also show a character-based plot of the autocorrelations and partial autocorrelations for the monthly net money flows to equity funds.

LAG	AC	PAC	Q	Prob>Q	-1 0 1 [Autocorrelation]	-1 0 1 [Partial Autocor]
1	0.1700	0.1714	5.3456	0.0208		
2	0.0578	0.0314	5.9661	0.0506		
3	0.1083	0.0980	8.1616	0.0428		
4	-0.0497	-0.0880	8.6265	0.0711		

Table 21
Autocorrelation, partial autocorrelation and portmanteau Q-statistics for monthly net money flows to bond funds. Table also show a character-based plot of the autocorrelations and partial autocorrelations for the monthly net money flows to bond funds.

LAG	AC	PAC	Q	Prob>Q	-1 0 1 [Autocorrelation]	-1 0 1 [Partial Autocor]
1	0.5253	0.5330	51.063	0.0000		
2	0.4185	0.1983	83.648	0.0000		
3	0.2526	-0.0391	95.587	0.0000		
4	0.2468	0.0999	107.05	0.0000		

Table 22
Autocorrelation, partial autocorrelation and portmanteau Q-statistics for monthly net money flows to money market funds. Table also show a character-based plot of the autocorrelations and partial autocorrelations for the monthly net money flows to money market funds.

LAG	AC	PAC	Q	Prob>Q	-1 0 1 [Autocorrelation]	-1 0 1 [Partial Autocor]
1	0.1551	0.1596	4.4511	0.0349		
2	0.0373	0.0148	4.7106	0.0949		
3	0.1210	0.1241	7.4488	0.0589		
4	-0.0940	-0.1368	9.1115	0.0584		

Table 23
Lag-order selection statistics for (AR) model used in the generation of expected net money flows to equity funds. Table reports the final prediction error (FPE), Akaike's information criterion (AIC), Schwarz's Bayesian information criterion (SBIC) , Hannan and Quinn information criterion (HQIC).

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-1811.11				4.1e+07	20.3608	20.3681	20.3787*
1	-1808.66	4.9064*	1	0.027	4.0e+07*	20.3445*	20.359*	20.3802
2	-1808.58	.15124	1	0.697	4.1e+07	20.3549	20.3766	20.4085
3	-1807.74	1.6956	1	0.193	4.1e+07	20.3566	20.3856	20.4281
4	-1807.05	1.375	1	0.241	4.1e+07	20.3601	20.3963	20.4495

Table 24
Lag-order selection statistics for (AR) model used in the generation of expected net money flows to bond funds. Table reports the final prediction error (FPE), Akaike's information criterion (AIC), Schwarz's Bayesian information criterion (SBIC) , Hannan and Quinn information criterion (HQIC).

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-1624.48				5.0e+06	18.2639	18.2711	18.2817
1	-1595.6	57.765	1	0.000	3.7e+06	17.9506	17.9651	17.9863
2	-1592.1	6.9942*	1	0.008	3.6e+06*	17.9225*	17.9443*	17.9762*
3	-1591.97	.2676	1	0.605	3.6e+06	17.9323	17.9613	18.0038
4	-1591.1	1.7501	1	0.186	3.6e+06	17.9337	17.9699	18.023

Table 25
Lag-order selection statistics for (AR) model used in the generation of expected net money flows to money market funds. Table reports the final prediction error (FPE), Akaike's information criterion (AIC), Schwarz's Bayesian information criterion (SBIC) , Hannan and Quinn information criterion (HQIC).

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-1716.7				1.4e+07	19.3	19.3072	19.3179*
1	-1714.46	4.4662*	1	0.035	1.4e+07*	19.2861*	19.3006*	19.3219
2	-1714.45	.0384	1	0.845	1.4e+07	19.2971	19.3189	19.3508
3	-1713.12	2.6506	1	0.104	1.4e+07	19.2935	19.3225	19.365
4	-1711.54	3.1591	1	0.076	1.4e+07	19.287	19.3232	19.3764

Table 26
Descriptive statistics for monthly unexpected net money flows to mutual funds in Sweden over the period 2000:1 to 2015:2. Unexpected net money flows are total net money flows minus expected net money flows generated using an (AR) model. Data was obtained from the Swedish Investment Funds Association and are in millions of SEK.

FUND CATEGORY	N	mean	sd	min	max	p25	p50	p75
Equity	181	-0.00003	6,242	-34,083	14,004	-1,392	678	2,894
Bond	180	0.00001	1,850	-5,958	9,579	-855	-135	724
Money market	181	-0.00001	3,669	-8,562	19,751	-1,769	745	1,475

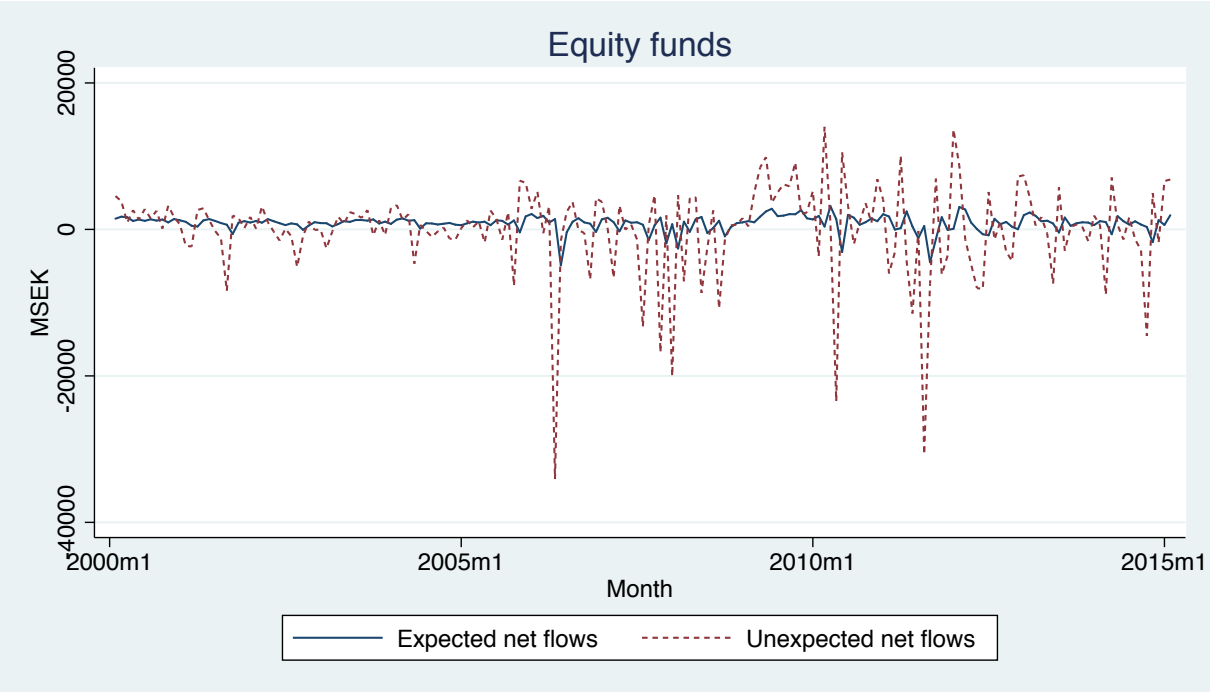

Figure 2 Graph displaying expected and unexpected net money flows to equity funds.

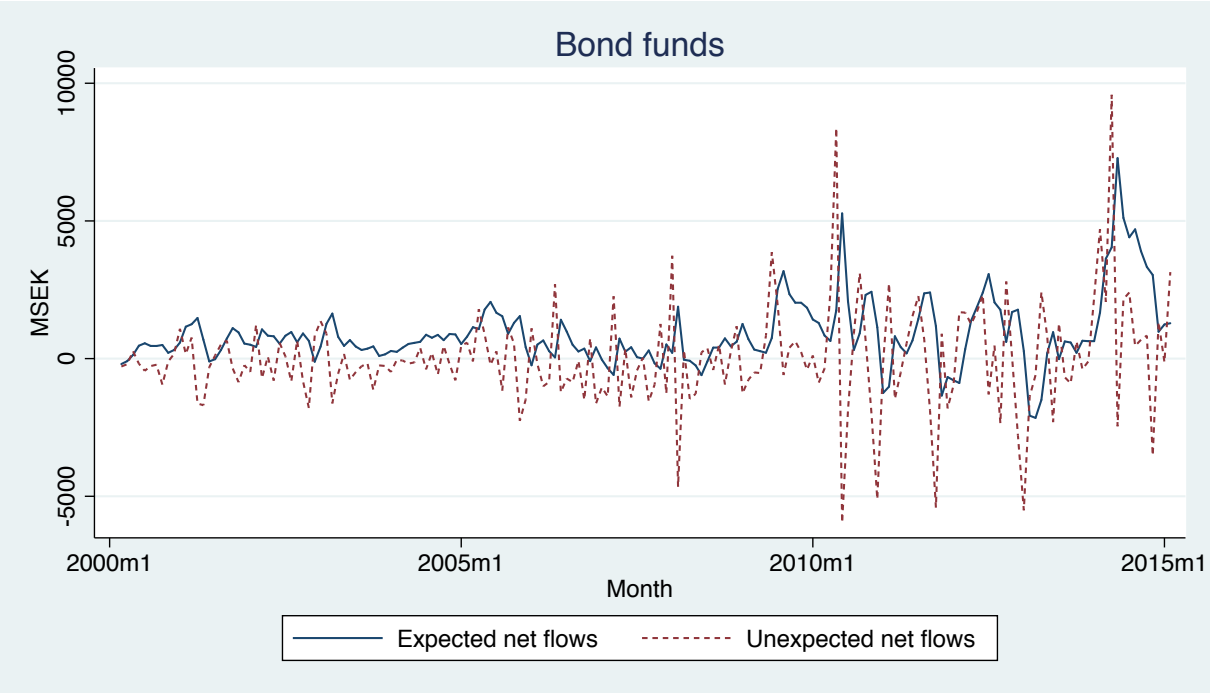

Figure 3 Graph displaying expected and unexpected net money flows to bond funds.

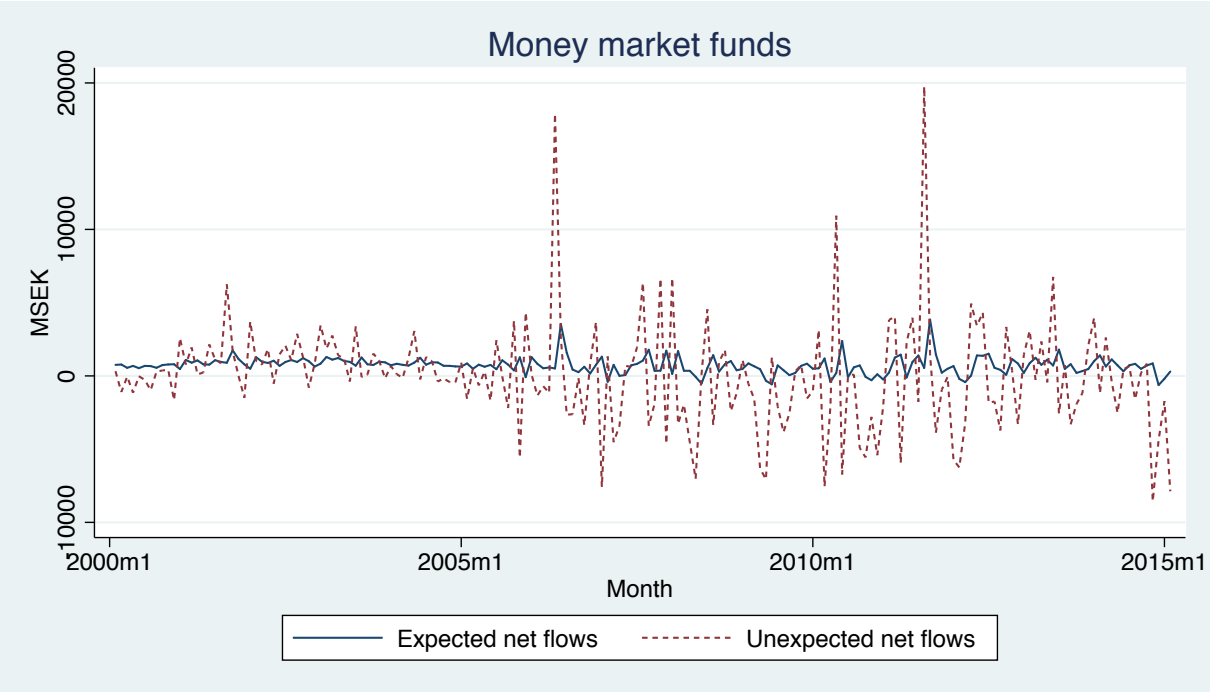

Figure 4 Graph displaying expected and unexpected net money flows to money market funds.

Table 27
Regressions of unexpected net money flow to equity, bond and money market funds in MSEK on dummy variable for each month. Data covers the period 2000:1 to 2015:2 and p-values are shown in parentheses.

	Equity	Bond	Money market
January	2155.4	1.6	426.5
	(0.24)	(1.00)	(0.66)
February	1592.2	389.3	-411.1
	(0.12)	(0.50)	(0.61)
March	-134.8	23.0	-559.6
	(0.93)	(0.94)	(0.47)
April	2904.6**	659.4	-848.8
	(0.00)	(0.37)	(0.30)
May	-3736.9	684.3	1419.2
	(0.20)	(0.29)	(0.38)
June	-1143.6	-88.1	973.8
	(0.44)	(0.88)	(0.22)
July	1676.8**	207.1	415.8
	(0.01)	(0.53)	(0.48)
August	-2712.5	-118.3	1042.5
	(0.24)	(0.48)	(0.48)
September	-1230.8	-41.6	-564.8
	(0.31)	(0.90)	(0.45)
October	-108.0	-364.3	-129.2
	(0.94)	(0.43)	(0.85)
November	-847.8	-526.3	-844.7
	(0.57)	(0.13)	(0.33)
December	1479.1+	-825.9+	-892.3
	(0.09)	(0.05)	(0.23)
N	181	180	181
R-sq	0.098	0.054	0.046
adj. R-sq	0.034	-0.013	-0.022

p-values in parentheses
+ p<0.10, * p<0.05, ** p<0.01, *** p<0.001