Monetary policy and investment decisions of households: Evidence from the stock market

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Abstract

I analyze the effect of monetary policy on the investment behavior of U.S. households in the stock market. I focus on the post-2009 period, when the federal funds rate reached the zero lower bound. On the one hand, households of the top 25% wealth distribution sell their stocks after an expansionary monetary policy shock and thus seem to profit from the valuation of their assets. On the other hand, households of the bottom 75% distribution not only invest more in stocks, but also increase the proportion of risky assets of their total financial asset portfolios when interest rates decrease. The results suggest that while wealthy households understand the relationship between interest rates and asset prices correctly, the poorer households seem to be rather driven by yield-searching behavior in a low interest rate environment.

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1 Introduction

In the aftermath of the Global Financial Crisis of 2008, the federal funds rate not only decreased to a historic low, but the severity of the crisis induced the Federal Reserve to maintain this low level until December 2015. This extraordinary monetary policy environment in the U.S. economy led to a widely discussed debate of whether such low interest rates can boost investors' appetite for risk taking, a phenomenon often referred to as "searching for yield" or the "risk-taking channel" of monetary policy.

A well-established strand in the literature provides evidence of how monetary policy influences the risk taking behavior of financial institutions (Jiménez et al., 2014; Bruno and Shin, 2015; Choi and Kronlund, 2017; Di Maggio and Kacperczyk, 2017). However, there is hardly any evidence which confirms an effect of monetary policy on the risk taking behavior of households, mostly due to the fact that households are considered as inattentive and driven by inertia (Brunnermeier and Nagel, 2008; Andersen et al., 2015). Nevertheless, in a long-lasting low interest rate environment, expansionary monetary policy could have a significant impact on household investment behavior by minimizing investment risk and boosting confidence of households regarding future economic outlook. This can have large effects on the economy since households' investment decisions are linked not only to household welfare (Dynan and Maki, 2001; Cocco et al., 2005; Calvet et al., 2007; Rognlie et al., 2018), but also to asset price developments (Shleifer and Vishny, 1997; Hirshleifer, 2001).

In this paper, I focus on the effect of monetary policy on the investment behavior of U.S. households in the stock market. To capture investment behavior, I consider not only how much households actively invest in stocks, but also the proportion of liquid assets invested in stocks. My analysis provides evidence that households do adjust their investment behavior after a monetary policy shock during the zero lower bound period, however, in a heterogeneous manner. While households of the bottom 75% wealth distribution invest more in stocks after an expansionary monetary policy shock, households of the top 25% rather seem to sell their stocks.

For the analysis, I use the data of the Panel Study of Income Dynamics (PSID) to examine the effect of monetary policy on stock market investment behavior of households. Since 1999, the PSID gathers every other year data on wealth and other relevant economic variables of U.S. households. In particular, the data set provides detailed information regarding stock market investments. For the analysis, I construct two variables, which are (i) the active savings of stocks, and (ii) the proportion of liquid asset portfolio invested in stocks.

Monetary policy shocks are identified using the high-frequency identification approach of Nakamura and Steinsson (2013). They use a broad range of money market futures and federal funds futures in order to capture the exogenous change in the prices around a monetary policy announcement date. The high frequency of the data ensures that any change in the financial variables at that time can be attributed to the unexpected component of monetary policy revealed by the announcement itself. An additional advantage of this shock measure is the fact that it captures forward guidance of Fed monetary policy, which plays an important role since the zero lower bound period. Afterwards, I exploit households' cross-sectional heterogeneity in their exposure to monetary policy in two ways. First, I make use of the heterogeneous exposure depending on the household's financial wealth. The intuition is that the more financial wealth households hold, the more they are affected by monetary policy changes due to the valuation effect. Thus, my empirical analysis analyzes how an exogenous change in the financial wealth due to monetary policy passes through to investment behavior of households. Second, I exploit the different survey interview dates of households to aggregate the daily monetary policy shock measures into biennial frequency. Interviews are conducted over the approximate time window of April to November every wave. Thus, each household is exposed to a different information set of monetary policy shocks in the time period between two interviews.

My study contributes to a very new strand in the literature that examines the impact of monetary policy on individuals' investment behavior. Ma and Zijlstra (2018) and Lian et al. (2019) show within randomized investment experiments that individual investors have a greater appetite for risk taking when interest rates are low. However, they do not explicitly examine the effect of monetary policy on investment behavior and do not account for heterogeneity across households. In my paper, I can confirm their findings of the risk-taking channel of monetary policy, however (i) only during the post-2009 period, which is characterized by the long-enduring low interest rate environment and (ii) only for "poorer" households.

My findings also provide interesting insights for studies that examine household heterogeneity and its effect on the economy. According to my results, households respond differently to monetary policy announcements and the risk-taking channel seems to only apply for households of the bottom 75% wealth distribution. This can have positive long-term effects for households since stock market participation can help households to accumulate financial wealth in the long-run (Dynan and Maki, 2001; Cocco et al., 2005; Calvet et al., 2007; Rognlie et al., 2018). However, my result also indicates that only the wealthy households seem to be able to understand the relationship between interest

rates and asset prices. This can have distributional effects, since the wealthy households know how to invest correctly, while the poorer households lose their money by investing when they should consume and vice versa.

The remainder of the paper is organized as follows. In section 2 I describe the U.S. households survey data that I use for my analysis and the identification strategy of my monetary policy shock measure. In section 3, I introduce the econometric framework of my empirical analysis and the results are presented. The last section concludes the paper.

2 Data

2.1 Panel Study of Income Dynamcis

I use data from the Panel Study of Income Dynamics (PSID), which is one of the most comprehensive source of data on U.S. households' asset holdings. A special feature of the PSID is its very long panel nature, where the PSID follows not only their first interviewed households in the year 1968, but also the members of families who moved away from their original households. While interviews were conducted annually between 1968 and 1997, since 1997 interviews have been biennial. Since I am interested in the low interest rate environment, I consider the time period from 2007 to 2015, which are five waves.

The main objective of my analysis is to examine the stock market investment behavior of households. Therefore, I use the information provided for the asset class *non-IRA stock*, which comprises of any shares of stock in publicly held corporations, stock mutual funds, or investment trusts, which do not include stocks in employer-based pensions or IRAs. I construct two variables to measure stock market investment behavior. First, I use information on the households' purchases and selling of stocks and construct a variable of active savings of stocks. Active savings is defined as the net purchase of stocks, i.e. the amount of household i's investment in stocks subtracted by the amount of stocks that the household sell at time t:

$$AS\_STOCK_{i,t} = INVEST\_STOCK_{i,t} - SELL\_STOCK_{i,t}. \tag{1}$$

Second, I also calculate the proportion of liquid assets that is invested in stocks. Besides stocks, PSID also gathers data on "riskless assets", which is defined as checking or savings accounts, money market funds, certificates of deposit, government bonds, and Treasury bills.[1] I make use of this asset class and define the sum of riskless assets and

[1]PSID also has an additional financial asset class, which comprises of the value of other savings or

stocks (which is defined as risky assets) as the liquid asset portfolio of households. The proportion invested in stocks is thus the ratio between the value of stocks and the sum of the value invested in stocks and riskless assets:

$$RATIO_{i,t} = \frac{STOCK_{i,t}}{STOCK_{i,t} + RISKLESS_{i,t}} \times 100. \tag{2}$$

I restrict my dataset to the following characteristics of households. First, households are defined as family units in which the head of the household did not change over the period. This does not restrict the sample to households without changes in family composition (e.g. divorce). Since getting married or separated can have a large impact on the balance sheet if for no other reason than the combining (or dividing) of two people's assets, changes in marital status are taken into account. Second, I exclude families which have household heads that are younger than 25 years or older than 85 years.

For the analysis, I use demographic variables such as the age, sex, education level and marital status of the family unit head, and also economic variables such as total family income, labor employment, value of liquid- and illiquid wealth, net worth, and mortgage ownership. All income, wealth, and asset holdings variables are deflated.

2.2 Identification of monetary policy shocks

The identification of monetary policy poses three main issues. First, the observation period includes the time period, when the federal funds rate drastically decreased and reached the effective lower bound. Second, the biennial frequency of the data can lead to endogeneity issues and omitted variable bias. Third, households are not interviewed at the same date within a certain wave, such that they are exposed to monetary policy shocks.

I follow the method of Nakamura and Steinsson (2013) to identify exogenous monetary policy shocks, which they name "policy news shocks". They apply a principal components analysis and estimate a composite measure of changes in a range of interest rates at different maturities. Compared to other identification strategies that only use the federal funds rate, this measure captures the effects of forward guidance, which has played an important role since the federal funds rate reached the zero lower bound.

assets such as cash value in a life insurance policy, a valuable collection for investment purposes, or rights in a trust or estate, which the households could not classify within the aforementioned two asset classes (stocks and savings). Nevertheless, the empirical results are consistent even if I include this asset class for my analysis.

Due to data availability, I estimate the daily change of federal funds futures, Eurodollor futures, and Treasury bond yields to the FOMC announcements between January 1999 to December 2015.[2] Afterwards, I compute a principal components analysis and extract the first principal component.

2.2.1 Household-specific information set

After the construction of the daily policy news shocks, I accumulate the monetary policy shocks into biennial frequency to match the frequency of the household survey data. By doing so, it is important to account for the heterogeneity in the interview timing of households. The PSID provides the exact date of the survey interview for each household, which shows that the interview dates are dispersed throughout all months of an interview year. Suppose household A has been interviewed in March 1997 and then again in March 1999, while household B has been interviewed in December 1997 and again in December 1999. In this case, household A and B were commonly affected by the monetary policy shocks that happened between December 1997 and March 1999, but household A was additionally affected by the monetary policy shocks between March 1999 and December 1997, and household B by shocks between March 1999 and December 1999. Therefore, using the same monetary policy measure for all households will lead to unreliable results.

I account for this heterogeneity and accumulate the monetary policy shocks that happened between two interview dates of each household i separately:

$$MP_{i,t} = \sum_{j=T_i-1}^{T_i} MP_j, \tag{3}$$

where T_i represents the individual-specific interview month and year of the current wave and $T_i - 1$ the interview date of the previous wave. MP_j is the monetary policy shock measure at time j, which is of daily frequency. This should not be confused with the time index t, which represents the biennial frequency of the survey data.

2.2.2 Interaction of monetary policy shocks with financial wealth

Besides the heterogeneous monetary policy information set of households according to the different interview dates, it is also important to understand that households are differently exposed to monetary policy shocks depending on their financial wealth. The

[2] Nakamura and Steinsson (2013) use a 30-minute window. Nevertheless, Piazzesi and Swanson (2008) and Gürkaynak et al. (2005) show that a high-frequency identification within a daily window provides sufficient estimates.

intuition is that the more financial households have, the more they are affected by monetary policy shocks due to the unexpected change in the value of their financial wealth. For instance, households with no financial wealth should not be influenced by monetary policy, simply because they do not care about interest rates.

Therefore, as an additional step I multiply the household-specifically aggregated monetary policy shocks with the value of their financial wealth of the previous period ($W_{i,t-1}$). Financial wealth is defined as the sum of risky and riskless financial assets the households report to the PSID. Since the wealth level of the previous wave is exogenous to the monetary policy shock in the current wave, I can ensure the exogeneity of my monetary policy measure:

$$MP^*_{i,t} = MP_{i,t_i} \times W_{i,t-1}. \tag{4}$$

By using $MP^*_{i,t}$, my empirical exercise has a straightforward interpretation: it shows how an exogenous change in the financial wealth due to a monetary policy shock passes through to the change in the households' investment behavior in the stock market.

3 Econometric framework and results

3.1 Active saving of stocks

In this section, I examine how monetary policy influences the investment behavior of households by looking at the active purchases or sales of stocks. I follow Juster et al. (2006) and Calvet et al. (2009) and employ a univariate model with fixed effects:

$$\Delta AS\_STOCK_{i,t} = \delta_i + \delta_t + \alpha HH_{i,t-1} + \beta_1 MP^*_{i,t} + \varepsilon_{i,t}, \tag{5}$$

where $\Delta AS\_STOCK_{i,t}$ is the active saving of stock investment of a household i in wave $t = \{2009, 2011, 2013, 2015\}$. The vector $HH_{i,t-1}$ contains lagged values of household financial- and demographic characteristics that reflect factors likely to influence investment decisions. This includes not only economic variables such as income, net financial- and non-financial wealth, and existence mortgage, but also demographic variables such as age, sex, marital status, and number of children. δ_i, δ_t, and represents individual-, and time fixed effects, respectively.

$MP^*_{i,t}$ is the interaction of the monetary policy shock measure with the value of financial wealth from the previous wave, which allows me to analyze how monetary policy shocks can influence household behavior by unexpectedly changing the value of

their financial assets. This monetary policy shock measure helps not only to capture the well-known fact that households' asset portfolios are very heterogeneous (Kuhn et al., 2017), but also that monetary policy will affect the households in a different manner, depending on their financial wealth. In order to capture this heterogeneity, I split the households into different groups according to the financial wealth distribution. For the analysis, I consider households up to the 50% and 75% of the financial wealth distribution and also households of the top 25% wealth distribution. Table 1 presents the results.

Table 1: The effect of monetary policy on active savings of stocks

	Baseline model	Bottom 50%	Bottom 75%	Top 25%
Monetary policy	-3.25^{***}	0.00015^{**}	11.43	-3.37^{***}
Constant	yes	yes	yes	yes
Demographics, lag	yes	yes	yes	yes
Time FE	yes	yes	yes	yes
Number of observations	15,116	7296	11,193	3923

Note: This table presents the results following a one unit *expansionary* monetary policy shock. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels.

For the baseline model with all households, I observe that households sell more stocks compared to the previous period following an expansionary monetary policy shock. This result is counter-intuitive since one might think that households are willing to buy more stocks when interest rates are low. By dividing the households according to their financial wealth, we observe that this adverse response is coming from the households of the top 25% distribution. Compared to this, households of the bottom 50% invest more in stocks, while when considering the bottom 75%, the households do not respond to a monetary policy shock.

The results provide two interesting insights regarding how monetary policy can affect investment behavior of households. First, the risk-taking channel of monetary policy seems not to apply for the financially wealthy households. Instead, it seems that these households are selling their stocks after an expansionary monetary policy shock, which is linked to higher capital gains through the appreciation of their financial assets. This can be interpreted as the fact that these households are cashing out their stocks to profit from the high asset prices. Second, compared to the financially wealthy households, the "poorer" households are willing to take more risk in the financial market. This group of households experience weaker capital gains from lower interest rates and thus may be driven from other factors. For instance, these households may be "searching for yield",

due to the fact that their riskless savings do not yield interest anymore. In order to examine this channel in a more detailed manner, in the next section I examine whether households change their total liquid asset investment towards a more riskier portfolio.

3.2 Portfolio rebalancing

Do "poorer" households seek for more yield? In order to examine a yield seeking behavior, I examine whether monetary policy shocks have motivated the households to rebalance their financial portfolio, i.e. changed the proportion of equities relative to their total financial investment. The econometric framework is the same as equation 5. Table 2 presents the results.

Table 2: The effect of monetary policy on the proportion invested in risky assets

	Baseline model	Bottom 50%	Bottom 75%	Top 25%
Monetary policy	-2.75e-07	-0.0004545^{*}	0.0000816^{***}	-2.68e-07
Constant	yes	yes	yes	yes
Demographics, lag	yes	yes	yes	yes
Time FE	yes	yes	yes	yes
Number of observations	11,324	3,812	7,333	3,991

Note: This table presents the results following a one unit *expansionary* monetary policy shock. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels.

Again, I observe heterogeneous results, depending on the financial wealth of households. On the one hand, the financial portfolio composition of the wealthiest households does not change after an expansionary monetary policy shock. This supports the previous results which shows that this group of households do not take more financial risk when interest rates are low. However, on the other hand, households of the lower wealth distribution seems to rebalance their portfolios. For households of the bottom 75%, the proportion of financial assets invested in stocks increases after an expansionary monetary policy shock.

4 Conclusion

In this paper, I examine the effect of monetary policy on the risk-taking behavior of households by analyzing their investment behavior in the stock market. I analyze the households separately depending on their different levels of financial wealth. My empirical analysis leads to the following conclusions. First, households of the top 25% financial

wealth distribution do not take more risk in the financial market when interest rates are low. Rather, they seem to sell their stocks. This behavior can be explained by the fact that households that possess a lot of financial assets achieve high capital gains in case of an expansionary monetary policy shock. By selling these assets, they are able to profit from the high asset prices and able to achieve higher consumption or investment. Compared to this, which leads to my second finding, the households of the bottom 75% buy more stocks after an expansionary monetary policy shock. Also, the proportion of their financial assets, which is invested in stocks, increases after an expansionary monetary policy shock. This provides evidence for the risk-taking channel of monetary policy, where households gain more confidence from the low interest rate environment and thus invest more in riskier assets.

My empirical results provide interesting insights for further research. Monetary policy actions are perceived differently by households. While rich households seem to understand the relationship between interest rates and asset prices, such that they are able to profit from the high asset prices after an expansionary monetary policy shock, the "poorer" households enter the risky asset market in times when assets are the most expensive. Even though stock market participation can be beneficial for the long-run financial well-being of households, it seems that this group of households is not able to clearly process the information of monetary policy announcements. This, in turn, can have severe consequences for the wealth inequality across households. Therefore, it may be very important to introduce this dimension of household heterogeneity when analyzing the effect of monetary policy on the wealth distribution of households.

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