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Financial Literacy is associated with Stock Market Expectations but not with Forecast Accuracy: Evidence from Germany

René Buschong

Abstract

Using a representative panel dataset, this study focuses on stock market expectations as well as the accuracy of forecasts made by private households in Germany. First, I find evidence that higher financial literacy is associated with lower stock market expectations. However, there is no evidence that financial literacy is associated with the accuracy of forecasts. Second, the findings suggest that individuals form their expectations based on past performance: The three-month stock market return prior to being surveyed is associated with stated expectations and this association is heterogeneous by financial literacy levels.

Keywords: Financial literacy, stock market expectations, forecast error, stock market participation

JEL Codes: **G53** (Financial Literacy), **G41** (Role and Effects of Psychological, Emotional, Social, and Cognitive Factors on Decision Making in Financial Markets), **G51** (Household Saving, Borrowing, Debt, and Wealth)

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1 Introduction

Understanding heterogeneity in household expectations is an important avenue of research. Financial literacy, i.e., sophistication of consumers to assess financial news and macroeconomic conditions, may be an important driver of heterogeneous household expectations. Regarding inflation expectations, Rumler and Valderrama (2020, p. 12) show that individuals with higher inflation literacy have lower inflation rate expectations. Similarly, Tsuchiya (2022) also finds lower inflation expectations at higher levels of education. Moreover, Burke and Manz (2014) show that economic literacy is positively associated with inflation forecast accuracy. Relatedly, Zhu et al. (2018) show that academic performance is positively associated with financial forecasting performance. While a positive association between financial literacy and stock market *participation* is well-documented (e.g., van Rooij et al. 2011, Calcagno and Monticone 2015, Clark et al. 2017), evidence on a potential link between financial literacy and stock market *expectations* is missing. The negative association between economic/financial literacy and *inflation* expectations gives reason to study the hypothesis whether an association can also be found for financial literacy and *stock market return expectations* as well as forecasting errors.

Thus, this paper studies the association between financial literacy, stock market participation, stock market expectations, and the forecast accuracy of private households in Germany using data from a representative panel dataset. I rely on survey responses regarding the stated expected return of the ‘Deutsche Aktienindex’ (DAX) over a one-year period.¹ The sample consists of two waves which allows to apply a first-difference approach. This approach allows to deal with time-invariant personal characteristics which are not observable but may have an effect on expectations. As the interviews are not conducted the same day, a potential (interaction-)effect of the DAX performance in a certain period prior to the interview can be considered.

The results show that while financial literacy is positively associated with stock market participation, the first-difference estimation suggests that higher financial literacy is associated with

¹ The DAX is the leading German stock market index, consisting of the 30 (expanded from 30 to 40 in 2021) major companies with stocks traded on the Frankfurt Stock Exchange.

lower stock market expectations. Moreover, a rise in the DAX three months before the date of the interview is associated with a lower expectation for the subsequent 12 months. This effect is mitigated by higher financial literacy. However, there is no evidence that individuals with higher financial literacy have superior forecast accuracy.

2 Empirical Strategy, Data and Survey Items

The data used in this study stem from the Socio-Economic Panel Innovation Module (SOEP-IS) which is provided by the German Institute for Economic Research (DIW Berlin). The SOEP-IS is a representative panel dataset, documenting various characteristics, behaviors and attitudes of German households. Waves 2016 and 2018 are used for this analysis, as both, the DAX forecast as well as questions concerning financial literacy, are only included in these waves. The interviews were conducted from October 10th, 2016, to April 3rd, 2017 and from September 12th, 2018, to March 5th, 2019. The DAX data were downloaded from finance.yahoo.com on June 28th, 2022.

Respondents are asked whether they expect an increase or decline for the subsequent 12 months: ‘First of all, we are looking at the next year, i.e., the next 12 months: Do you expect the DAX to gain or lose over the next year compared to today’s value? [rather gain | rather loss | not specified]’. Subsequently, respondents can state their numerical forecast: ‘Expressed in figures, how high is your expected [gain/loss] in percent for the next year as a whole?’. The given answer to this question is used for the analysis. The variable *forecast* is the return for the next 12 months, predicted by the respondents. The descriptive statistics in table 1 show that the mean forecast is a return of about 0.44 % in 2016 and about 2.63 % in 2018. Hence, the mean forecast of the respondents seems to be rather conservative.

The *forecast error* of a respondent is obtained by calculating the absolute value of the realized return for 12 months after the interview minus the individual’s forecast. By using the absolute value, negative and positive deviations are treated equally. The mean forecast error in 2018 is about 13.9 % and reaches from an almost perfect forecast (forecast error of 0.051 %) to 118.519 %.

< Table 1 about here >

In this analysis, the age, gender, education, household net income, as well as risk attitude are used as covariates. Financial literacy is measured, based on an additive index, capturing the number of correct responses to the set of financial literacy questions. The index is calculated for six questions, including the Big Three (Lusardi and Mitchell 2006). The questions included in the questionnaire can be found in Appendix A.² The English translation of the questions asked in German is provided. The financial literacy index is standardized. In the regression analysis, the net income is implemented as natural logarithm. *Stocks* is a dummy variable that equals one for individuals declaring to possess shares of stock funds, stocks or reverse convertibles and zero for those declaring not to possess any of the above products or not answering to this question. This question is available only in the 2018 wave.

With regard to short-term fluctuations, the DAX returns for 1 day (1D), 5 days (5D), 20 days (20D) and 60 days (60D) before the interviews are calculated. The analysis shall reveal whether the actual prediction made by an individual is influenced by previous returns.

< Figure 1 about here >

Figure 1 illustrates the number of interviews as well as the DAX close from September 10th, 2016, to April 5th, 2019, given for the specific days. Most interviews were conducted in late 2016, early 2017 and late 2018. The availability of two waves allows to apply a first-difference approach in order to mitigate endogeneity concerns.

3 Results

The research question is whether financial literacy is associated with stock market participation, the individual's forecast as well as the individual's forecast accuracy (measured as the absolute forecast error). Furthermore, it is of interest whether the forecasts are likely to be influenced by fluctuations prior to the interview. The results of the regression analysis are outlined in table 2.

² To verify the appropriateness of the set of financial literacy questions, a 2-parameter-logistic model, similar to Knoll and Houts (2012), was estimated. The results are available from the author upon request.

The results are given for stock market participation, the individual's forecast as well as the absolute forecast error as dependent variable.

What concerns stock market participation, the results of the OLS regression (1) are in line with the results of van Rooij et al. (2011), Calcagno and Monticone (2015), or Clark et al. (2017) who also find a positive association between financial literacy and stock market participation. An increase in financial literacy of one standard deviation is associated with an increase in stock market participation of about 4.8 percentage points.³

< Table 2 about here >

Moreover, stock market participation increases with age, education, net income and risk attitude which is also concurring with previous studies.

What concerns the forecast made by respondents, the first-difference regression (using waves 2016 and 2018) in model (2) leads to a significantly negative coefficient for financial literacy. An increase in financial literacy of one standard deviation is associated with a decrease in the one-year DAX forecast of about 1.946 percentage points. Individuals seem to be at least to some extent influenced by previous returns when developing their expectation. The coefficient for the return three months before the interview (60D) is significantly negative. However, this effect is mitigated by higher financial literacy as the interaction of financial literacy and 60D leads to a significantly positive coefficient. The coefficients for 1D, 5D and 20D are insignificant. Looking at model (3) suggests that there is no evidence that financial literacy is associated with the one-year DAX forecast accuracy. The estimated coefficient of -0.799 is negative but insignificant. Not reported results using the two-year DAX forecast and the two-year DAX forecast error as dependent variable show that financial literacy no longer has predictive power. Moreover, the DAX return three months before the interview no longer has predictive power for the two-year DAX forecast.

³ Nevertheless, there are serious concerns about endogeneity with regard to financial literacy. In results not reported, a heteroskedasticity-based instrumental variable (IV) approach according to Lewbel (2012) was used for stock market participation. Using the augmented model (financial literacy in 2016 plus the generated IVs) leads to an estimated coefficient for financial literacy of 0.063, significant at the 1 %-level. However, due to the short time lag, the exogeneity of lagged financial literacy is questionable (see Angrist and Krueger 2001, p. 77, for instance).

4 Discussion and Conclusion

This study aims at contributing to a better understanding of stock market forecasts made by private households in Germany, while setting the focus on the role of financial literacy. While financial literacy is positively associated with stock market participation, there is no evidence that individuals with higher financial literacy fare better at forecasting the one-year or two-year DAX return. However, the estimate is not a precise zero and should be interpreted with caution. The results for stock market expectations are insightful. In light of the low average forecast, a decrease in the one-year DAX forecast of 1.946 percentage points for a one standard deviation increase in financial literacy is economically sizeable. Individuals with higher financial literacy seem to be over-pessimistic about future stock market developments. Nevertheless, this lower expectation does not keep them from investing in the stock market. Jointly considered, these results let assume that there are additional personality traits like farsightedness, patience or composure which may also play a role for stock market participation and stock market expectations. These factors could be identified in more detail in future research.

The findings let assume that individuals are at least to some extent influenced by mid-term (three months) prior returns when making their prediction for the subsequent year. The negative coefficient for the return three months prior to the interview could be interpreted as the expectation of a mean-reversion-effect by the respondents. However, this effect is mitigated by higher financial literacy, i.e., it is less pronounced for individuals with higher financial literacy.

Finding no evidence that individuals with higher financial literacy fare better at forecasting the one-year DAX return is not in line with the results of Rumler and Valderrama (2020) for the inflation rate forecast accuracy. However, macroeconomic time series like the inflation rate are hardly comparable with financial data. The substantially rising share of passively managed funds regarding total assets under management during the last two decades (Anadu et al. 2018, Tokic 2020, Zhao et al. forthcoming) does not let assume that skill plays an important role in predicting financial data. In the course of a shift from active to passive investing, the performance and forecast accuracy of

managers in actively managed funds is increasingly in doubt. Many studies such as Vidal-García et al. (2016), Blake et al. (2017) or Bessler et al. (2018) find evidence that actively managed funds cannot persistently outperform a passive benchmark. The results of this study give further evidence to assume that precise stock market forecasts depend rather on luck than on skill.

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Table 1: Descriptive Statistics

2016					
Variable	N	Mean	Std. Dev.	Min	Max
One-year forecast	1,045	0.439	13.364	-100	102
One-year forecast error	1,045	16.864	13.540	0.048	122.022
Age	1,064	51.369	17.416	17	94
Female	1,064	0.435		0	1
Financial literacy	1,064	4.706	1.313	0	6
Net income	996	3,193	1,919	300	22,000
Stocks	0	-			
Risk attitude	1,063	5.098	2.417	0	10
2018					
Variable	N	Mean	Std. Dev.	Min	Max
One-year forecast	615	2.626	13.671	-50	120
One-year forecast error	615	13.916	12.458	0.051	118.519
Age	892	53.703	18.149	17	96
Female	892	0.511		0	1
Financial literacy	892	4.465	1.635	0	6
Net income	854	3,023	1,638	350	10,000
Stocks	892	0.200		0	1
Risk attitude	891	3.952	2.287	0	10

Note: The one-year forecast as well the one-year forecast error are given in percent. The latter is considered in absolute terms. The variable female is binary and equals one for females. Financial literacy is given as additive index in the descriptive statistics and is standardized for the empirical analysis. Net income refers to the whole household. The personal risk attitude can be stated on a scale from 0 to 10, with 0 being totally risk averse.

Source: own illustration

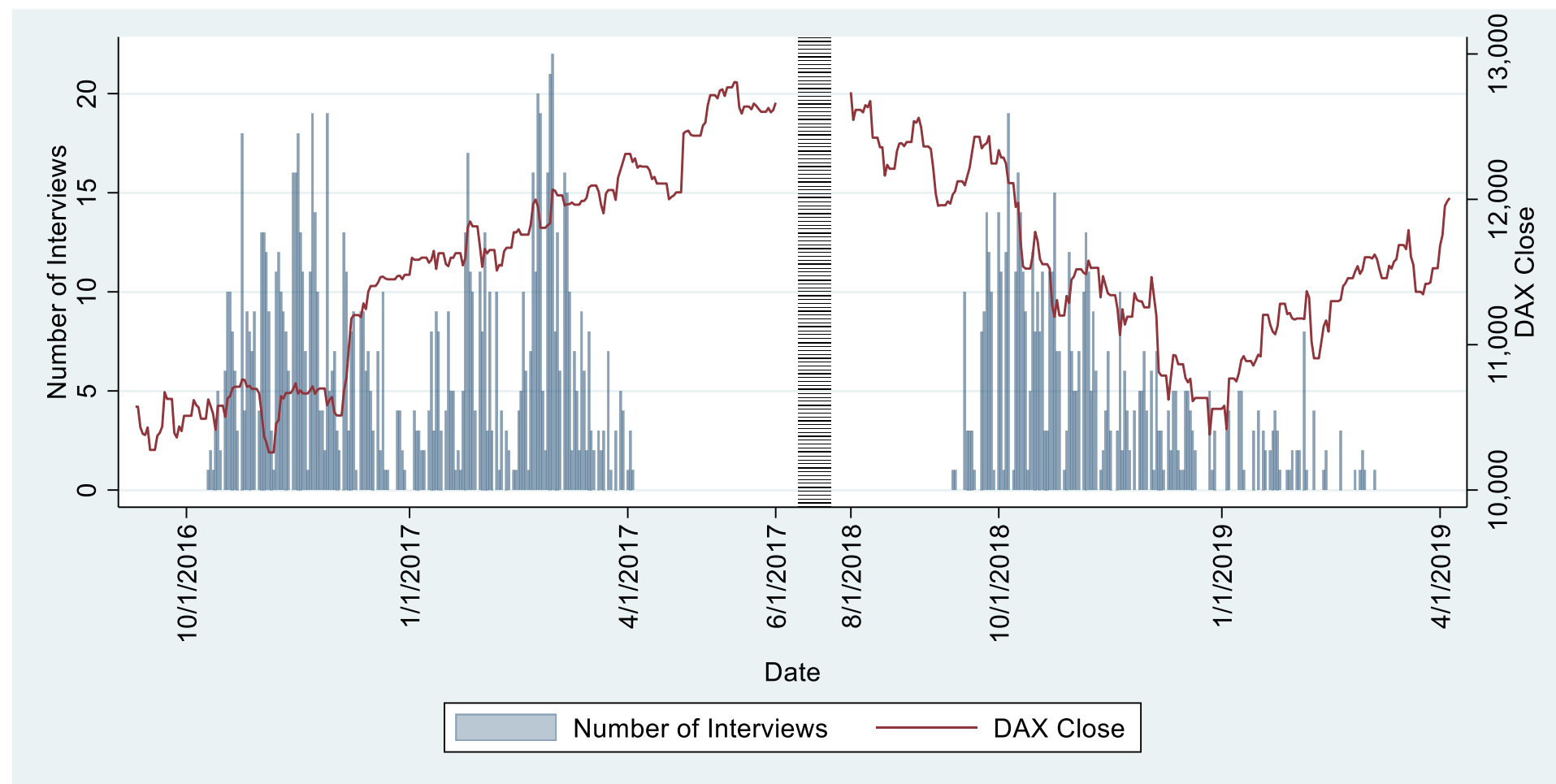
Table 2: Results of the Regression Analysis

	Dependent variable		
	Stocks	One-year forecast	One-year forecast accuracy
	(1) OLS	(2) 1 st Diff	(3) 1 st Diff
Financial literacy	0.048*** (0.011)	-1.946** (0.862)	-0.799 (0.948)
Financial literacy × 60D		0.176** (0.071)	
Age	0.006* (0.001)		
Age ²	-0.000 (0.000)		
Female	0.005 (0.027)		
Education			
low	base		
intermediate	0.076*** (0.029)		
high	0.131*** (0.038)		
Ln(net income)	0.123*** (0.022)	-0.521 (2.305)	-3.541 (2.535)
Risk attitude	0.013** (0.006)	0.489 (0.317)	-0.387 (0.331)
1D		-0.050 (0.684)	
5D		-0.392 (0.307)	
20D		0.302 (0.228)	
60D		-0.269*** (0.101)	
Constant	-1.288*** (0.194)		
N	853	563	563
R-squared	0.121	0.047	0.008
Mean (year = 2018)			
Stocks	0.200		
One-year forecast		2.626	
One-year forecast accuracy			13.916

Note: Financial literacy is implemented as a standardized additive index using six questions. A first-difference estimation is not feasible for stock market participation, as stock market participation is only available for 2018. The variables 1D to 60D capture the DAX return one day (1D) to 60 days (60D) prior to the interview. The 2018 mean for the dependent variables is given in the last row. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source: own illustration

Figure 1: Number of Interviews and DAX Close



Source: own illustration; DAX data from finance.yahoo.com

Appendix – Financial Literacy Questions

1. *Numeracy*: Suppose you had 100 € in your savings account and the interest rate was 2 % per year. After 5 years, how much do you think you would have in your account if you left the money to grow?
 - More than 102 €
 - Exactly 102 €
 - Less than 102 €
 - Don't know
2. *Inflation*: Suppose that the interest rate on your savings account was 1 % per year and inflation was 2 % per year. What do you think: After one year, will you be able to buy as much, more or less than today with the balance of the savings account?
 - More
 - Exactly as much
 - Less
 - Don't know
3. *Diversification*: Is the following statement right or wrong: “An investment in stocks of a single company is less risky than an investment in an equity mutual fund?”
 - Right
 - False
 - Don't know
4. *Stock Market*: What is the main function of the stock market?
 - The stock market helps predicting stock gains.
 - The stock market leads to an increase in stock prices.
 - The stock market brings together buyers and sellers of stocks.
 - None of the above
 - Don't know
5. *Fluctuations*: Which of the following assets exhibits the highest return volatility over time?
 - Savings books
 - Fixed-income securities
 - Stocks
 - Don't know
6. *Compound Interest*: Suppose you had 100 € in your savings account. The interest rate was 20 % per year and you left it on the account for 5 years. What is the deposit account balance after 5 years?
 - More than 200 €
 - Exactly 200 €
 - Less than 200 €
 - Don't know