Wall Street Crosses Memory Lane: How Witnessed Returns Affect Professionals' Expected Returns[§]

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Abstract

Witnessing stock market history in the making leaves behind a vivid story, but does not provide valuable information. Nevertheless, well-versed finance professionals extrapolate from witnessed returns when forming beliefs about expected returns which we show by using a unique dataset regarding professionals' career start in the finance industry. This result is robust to controlling for all publicly available information and interpersonal differences. Additionally, we find that returns witnessed early on in a career are more formative than those witnessed recently. Among the potential channels through which witnessed returns might affect professionals' expectations, a judgmental bias appears the most plausible.

JEL-Classification: D83, D84, G02, G17

Keywords: Finance Professionals, Expected Returns, Witnessed Returns, Non-Informative Observations, Early Career Experiences

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Witnessing stock market history in the making leaves behind a vivid story, but does not provide valuable information. Nevertheless, well-versed finance professionals extrapolate from witnessed returns when forming beliefs about expected returns which we show by using a unique dataset regarding professionals' career start in the finance industry. This result is robust to controlling for all publicly available information and interpersonal differences. Additionally, we find that returns witnessed early on in a career are more formative than those witnessed recently. Among the potential channels through which witnessed returns might affect professionals' expectations, a judgmental bias appears the most plausible.

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1 Introduction

When forming expectations of the future, we often instinctively look back to the past. But who would you get information about the past from? Your grandmother who has witnessed history's many twists and turns first hand, or a historian who has read all the books in the national library? The story of your grandmother would be vivid and memorable. The story of the historian would be exhaustive and objective. Most of us would like to believe that we would choose the exhaustive objective information, especially when we make professional judgments and decisions. But when our grandmothers take us on a stroll down memory lane, we like to follow them down the path, and their vivid stories leave an impression on us. Do these stories from memory lane also affect the professional judgment of the Wolves of Wall Street?

We show that the expected returns of finance professionals with decades of professional experience are affected by previous stock market returns they have witnessed first hand. Just like your grandmother's story, witness accounts of past stock market returns omit a lot of information which was not witnessed, but they are more vivid and memorable than an objective and exhaustive description of the stock market statistics. Unlike your grandmother's story, however, witness accounts of stock market returns do not contain any information which is not publicly available. Moreover, relying on witness accounts of stock market returns might be detrimental for two reasons. Firstly, they are restricted to short periods of the past, leading to a small sample bias and underweighting of the probability of rare events (see, e.g., Hertwig, Barron, Weber, and Erev, 2004; Hogarth and Soyer, 2015). Secondly, if information efficiency holds - at least in its weak form - all of the historical information should already be factored into the level of the stock market index, hence no past returns, including witnessed returns, should have any predictive power for the future. That is why stock markets are an environment where one would not expect witnessed returns to have an effect on expected returns, especially when examining professionals. Evaluating the process of expectation formation is particularly important in the case of finance professionals, because their expected returns are linked to their own investments (Gennaioli, Ma, and Shleifer, 2016) and those of their clients (see, e.g., Höchle, Ruenzi, Schaub, and Schmid, 2016). In addition, the expectations of the finance professionals we analyze are available

internationally to a broad range of investors through various information providers (e.g. Bloomberg and Thomson Reuters). Press releases regarding these professionals' expectations induce a price reaction on highly liquid stock and bond markets, as shown by event studies (see, e.g., Entorf, Gross, and Steiner, 2012). If highly liquid financial markets react to the expectations of these financial professionals, one would expect these professionals to have more accurate information or a better model to evaluate the public information. One would *not* expect these professionals to be affected by the stock market returns they have witnessed. Hence, in this paper, we set out to trace a novel effect of witnessed returns which should not exist according to normative finance theory.

Our main findings can be summarized as follows. Firstly, we show that finance professionals extrapolate from witnessed returns when forming beliefs on expected returns. This result is robust to controlling for information which is publicly available by means of time-fixed effects and when controlling for interpersonal differences by means of subject-fixed effects. Moreover, this finding cannot be explained by a rational perception that there is valuable information contained in the witnessed returns, since there is no correlation between witnessed stock market returns and future stock market returns. The results are unique for witnessed returns over the course of the professionals' career and cannot be explained by the subjects simply becoming aware of the stock market when reaching adulthood. Secondly, we show that returns witnessed in the first years of the professional's career are more formative than more recently witnessed returns. Among the possible explanations for the effect of witnessed returns on expected returns we rule out the hypotheses that (i) witnessed returns might be informative for the future or (ii) might affect professionals' risk preferences. Instead, our results are consistent with the effect of witnessed returns being a subconscious judgmental bias.

Our paper builds on two major strands of literature. One strand of literature on personal experiences in finance empirically examines the effect of experiencing (especially by doing) on various aspects of professionals' judgments and expectations. Some studies in this area examine the impact of life experiences. Along those lines, Malmendier and Tate (2005) and Malmendier, Tate, and Yan (2011) show that CEOs who grew up during the Great Depression are more cautious in their corporate financing decisions. Malmendier, Nagel, and Yan (2016) show that the voting and the inflation expectations of Federal Open Market Committee (FOMC) members are affected by the inflation they

have personally experienced in their lifetime. Other studies examine the impact of professional experiences. For instance, Dittmar and Duchin (2016) show that the experience of corporate distress makes corporate managers more cautious towards taking on external debt. Schoar and Zuo (2016) find a link between the economic conditions at the time of the career start and the respective managerial style. Greenwood and Nagel (2009) and Kempf, Manconi, and Spalt (2016) show that professional investment experience leads to better market timing and portfolio allocation by mutual fund managers. We contribute to this strand of literature by showing that even experiencing through observation (i.e. witnessing), which is evidently the weakest form of experiencing (see, e.g., Hertwig, Barron, Weber, and Erev, 2004; Hogarth and Soyer, 2015), has an effect on professionals. Witnessed stock market returns constitute non-informative historical observations, hence they should not have an effect on professionals' expected returns. Our paper thus builds on prior experimental studies, which examine how personally witnessed or otherwise experienced information is integrated in the process of judgment and decision-making, when exhaustive descriptive information is also available. Lejarraga and Gonzalez (2011) show that exhaustive descriptive information is neglected when the subjects also experience the information by doing. Peiran (2016) ascribes part of the overweighting of personal experiences to biased beliefs. Kaufmann, Weber, and Haisley (2013) provide evidence that simulated experiences, which are closer to the notion of witnessing than experiencing through action, are also overweighted in the face of descriptive information. One explanation why experiences or witnessed observations are so formative is because they are memorable and come to mind quickly (Lejarraga, 2010).

If witnessed returns leave a mark on expected returns, an important question is whether this trace is long-lasting or whether stock market returns witnessed early on are quickly overwritten by new observations. Experimental studies show that information obtained by witnessing is memorable, hence its effect on expected returns might be long-lasting (Lejarraga, 2010). Consistent with that hypothesis, Schoar and Zuo (2016) show that the early work environment plays an important role for the formation of the managerial style of CEOs. Several empirical and experimental studies, however, hold an opposing view. Langer, Sarin, and Weber (2005) provide experimental evidence of a recency bias. Consistent with that experimental finding, Malmendier and Nagel (2011) empirically find a recency bias in the financial risk-taking of individual investors. A recency bias is also prevalent in

the inflation expectations of individual investors (Malmendier and Nagel, 2016; Kuchler and Zafar, 2015), in the stock market expectations of individual and institutional investors (Greenwood and Shleifer, 2014), and in the house-price expectations of households (Kuchler and Zafar, 2015). There are several explanations for the inconsistent evidence in prior literature. Firstly, a recency bias may be characteristic for situations where the early episodes are not as salient as the recent episodes because of relatively little awareness or involvement of the subject in the respective decisions. For instance, both awareness and involvement in financial and economic matters are likely lower during childhood than in the early years of one's finance career. Hence, the results of a comparison between early and recent episodes may depend on whether the analysis focuses on private or professional experiences. Secondly, the recent episodes may be overweighted in situations where personal experiences are a valuable source of information, as subjects may consciously consider the recent past as more informative than the distant past. Thirdly, previous empirical studies comparing the effect of recent versus early episodes of the experience face the challenge of accurately measuring the early episodes of the experience. In the case of professional experiences, previous studies face the following trade-off. On the one hand, they could use accurate data on the exact career start to measure professional experience, but face the issue of endogeneity in case it is possible for professionals to time their market entry (Schoar and Zuo, 2016). On the other hand, if they approximate the beginning of the professional experience through exogenous timing, such as by birth year or a certain age, they introduce a measurement error which leads to an underestimation of the effect of the early episodes of the experience, but not the recent episodes of the experienced past. Hence, previous studies face a trade-off between endogeneity and the ability to run a fair horserace between early and recent episodes. We contribute to the existing body of literature (i) by focusing on the stock market and (ii) by making use of a unique dataset on the actual timing of the professionals' career start. Focusing on the stock market allows us to rule out potential endogeneity because witnessed returns are exogenous to the subjects' decision about the timing of their career start in the finance industry given well-documented difficulties to forecast future returns. Making use of a unique dataset on the actual timing of the professionals' career start allows us to reduce the measurement error of the returns witnessed early on.

There are several potential explanations for the influence of personal experience in previous studies.

Firstly, through experience, subjects may close an information gap resulting from high search costs for historical information. Secondly, personal experiences may change preferences, such as the willingness to take risks. Thirdly, subjects may (erroneously) extrapolate from the past even in the face of accurate and exhaustive information sources, because first-hand experiences come to mind more easily and quickly while they also last longer in memory. In an attempt to find an explanation, Kuchler and Zafar (2015) argue that consumers are likely to learn from personal experiences because the objective data is not available or costly (as in the case of regional housing prices) or does not perfectly cover the relevant variable (as in the case of unemployment). In line with this, Kempf, Manconi, and Spalt (2016) argue that having experience with investing in a particular industry increases the fund manager's alpha. In contrast, Guiso, Sapienza, and Zingales (2013) and Malmendier and Nagel (2011) make the case for a change in investors' risk aversion. Furthermore, based on a study of retail investors, Kaustia and Knüpfer (2008) argue that the effect of experience is driven by reinforcement learning - the tendency to repeat an action which resulted in a favorable outcome in the past. Peiran (2016) identifies experimentally that both reinforcement learning and biased beliefs mediate the effect of personal experiences. In this paper, we rule out several alternative explanations, and argue that a subconscious judgmental bias is the most plausible channel through which witnessed returns affect professionals' expected returns.

The remainder of this paper proceeds as follows: Section 2 introduces the panel of finance professionals who we study and describes the data as well as the measures we use. Section 3 addresses the question whether finance professionals rely on witnessed returns when forming return expectations. Section 4 analyzes whether early career observations leave a long-lasting mark on professionals' expected returns or not. Section 5 discusses potential channels through which witnessed returns may affect professionals' expected returns. Finally, Section 6 concludes.

2 Data

2.1 Panel of the ZEW Financial Market Survey

Data on professionals' stock market expectations comes from the monthly ZEW Financial Market Survey. This survey has been conducted in Germany since December 1991 among roughly 300 financial market professionals. These professionals provide their medium-term expectations (6 months ahead) on macroeconomic variables, interest rates, national and international stock market indices and foreign exchange rates.[1] The survey results have a price impact on highly liquid financial markets as shown by event studies on the German stock and bond market (see, e.g., Entorf, Gross, and Steiner, 2012). These market movements provide evidence that the survey results affect the actual trading behavior of a sizeable fraction of investors. The survey participants are employed in banks, insurance companies and financial departments of some of the largest companies in Germany. Many of them are opinion makers, such as economists, stock market analysts and financial advisors. Hence, expectations are a typical output of their occupational activity rather than an inconsequential by-product. The real-world forecasts that professionals conduct on a regular basis outside the scope of the ZEW survey are reportedly used to assist in the decisions of both retail investors and institutional investors.[2] Hence, biases in the expectations of these highly influential opinion makers can potentially affect the decisions of various groups of investors. This paper examines one particular bias: the distorting effect of reliance on witnessed stock market returns when forming beliefs about expected returns.

When working with survey data, there might be concerns about strategic response behavior or response fatigue amongst subjects. To avoid traditional reasons for strategic response behavior, such as rational herding arising from rank-dependent remuneration (see, e.g., Lamont, 2002; Hirshleifer and Hong Teoh, 2003), ZEW publishes the results strictly anonymously and there are no monetary incentives for participating in the survey. Independent of their response, all professionals in the ZEW survey panel receive a monthly report of the survey results as a non-monetary incentive to participate.

[1] Recent survey data and information on the survey can be found at `http://www.zew.de/economicsentiment`.

[2] A supplementary survey conducted in June 2013 among 122 of the professionals from the ZEW pool reveals that more than half of them conduct stock market forecasts as a part of their occupational activity. The purpose of the forecasts is client advisory for 55% of the professionals and support of the institutional trading strategy for 79% of the professionals.

To reduce the impact of response fatigue, the professionals are asked to only respond to questions which are in their area of expertise (there are no mandatory questions). Furthermore, both strategic response behavior and response fatigue are arguably unrelated to the witnessed returns since the career start. Therefore, if such issues would affect expected returns, they would only make it harder to empirically trace the effect of witnessed returns, thus biasing against the results we find.

2.2 Witnessed stock market returns

We define witnessed returns as the stock market returns over a particular period of the past, namely the period, which the professional has witnessed in person. We refer to witnessing as *experiencing through observation*. We measure witnessed returns by the witnessed returns of the German stock market index DAX. The DAX is a stock market total return index, which covers the 30 largest companies in Germany. Our measure of witnessed returns is most likely related to the concept of experiencing by observation rather than experiencing by action (see Andersen, Hanspal, and Nielsen, 2015), although in theory, the witnessed stock market returns might be correlated with the professionals' portfolio returns. This would be the case if the professionals only invested passively in the stock market, both as a part of their institutional strategy and in their private portfolio allocation. In Section 5, we argue that our results cannot be explained by professionals' own portfolio returns. Since our measure of witnessed stock market returns is most likely related to experiencing by observation, and not by action, it is particularly challenging to empirically trace any effect. This is because observing is an arguably low-impact form of experience (see Simonsohn, Karlsson, Loewenstein, and Ariely, 2008; Andersen, Hanspal, and Nielsen, 2015). Furthermore, explaining the effect represents a challenge. Whereas the potential influence of experienced outcomes of previous actions can be explained by shifts in risk aversion, the impact of merely witnessed returns is harder to rationalize.

We assume that the professionals start witnessing the stock market when they start their career in the finance industry. Our measure differs from previous work, which assumes that experiencing the stock market starts at birth or at a certain age (see, e.g., Malmendier and Nagel, 2011). Our measure thus relates to *professional experiences* (see, e.g., Dittmar and Duchin, 2016), and not private experiences. We argue that childhood experiences are unlikely to be very relevant for stock markets,

in contrast to economic variables such as inflation and unemployment. Most children are unlikely to be affected by financial market developments and stock markets are also rarely discussed with or tracked by children.[3] In Section 3 we verify our assumption that witnessing the stock market begins at the career start and show that our results are driven by the witnessed returns from the career start onwards, and not by the witnessed returns from a certain age onwards. Accurately measuring when professionals start consciously witnessing the stock market ensures a fair comparison between the effect of recently witnessed returns and early witnessed returns. A measurement error in the timing of the career start gives a technical advantage to recently witnessed returns, because the latter are always measured precisely.

To estimate witnessed returns, we make use of a unique dataset on the timing of the individual professional's career start in the finance industry. Our dataset contains information on the year of the professionals' career start in the finance industry as well as their birth year, which we use for the robustness checks described in Section 3.[4] A definition of witnessed returns as well as an overview of all variables used throughout the paper is provided in Table 1.

[Insert Table 1 approximately here.]

Because the data only contains information on the year, but not the month of the career start, we assume a career start on January 1st of the year following the self-reported career start year. This way we exclude potential endogeneity, which might arise if stock market returns witnessed shortly before the career start were correlated with unobserved factors related to the subject's decision to enter the finance industry. For the empirical analyses, we require the subject to have at least two

[3]Financial literacy is not part of the general curriculum in German schools, which was one reason why Germany did not participate in the Programme for International Student Assessment (PISA) module on financial literacy elicited in 2012: `http://www.oecd.org/pisa/`

[4]Data on the professionals' career start in the finance industry and birth year has been collected on several occasions. The first data source are the ZEW registration forms for new survey participants introduced in 2010. The registration forms ask the survey participants to report their birth year and the year in which they started their career in the finance industry. The same question was included in a supplementary questionnaire, which was conducted in 2006 and which constitutes the second data source. The third data source was a supplementary questionnaire conducted in 2003, which asked the professionals about their tenure (years since career start) in the finance industry and their age. We exclude observations where the data from the three data sources is conflicting, as this suggests that the timing of the career start would not be well-defined. We further exclude one professional, who reportedly entered the finance industry before the age of 14, which is likely incorrect.

years of experience in the industry. Sample descriptives are provided in Table 2.

[Insert Table 2 approximately here]

The average professional in our sample was born in 1965 and entered the finance industry at the age of 24. The distribution of ages for career starts peaks twice - around the ages of 20 and 26, respectively. Career starts around age 20 is likely for people with an apprenticeship, whereas career starts around the age of 26 suggests the completion of a university degree. The average professional on the panel has a tenure of 21.5 years in the finance industry and 90% of the survey responses are submitted by professionals with a tenure of more than 10 years.

Our main variable measures witnessed returns as the equally-weighted average annual log DAX returns between January 1st in the year after the self-reported career start until the day of the submission of the survey response. As an alternative measure for the purposes of robustness checks, we estimate witnessed *excess* returns. Excess returns are measured as equally-weighted average annual log DAX returns in excess of the annualized money-market rate. Data on the money market rate spans from December 1959 until May 2012 and is collected by the German Central Bank (Bundesbank) based on reports of Frankfurt-based banks.[5] For data on a risk-free rate after May 2012, we use the annualized 1-month Euribor, as available on Datastream. Table 2 displays the distribution of the witnessed (excess) returns by the professionals.

Besides the equally weighted average, we further measure witnessed returns as a weighted average of the returns since the career start onwards in sensitivity analyses in Section 4. We use a monotonic weighting function analogous to Malmendier and Nagel (2011), where a parameter λ determines the difference in the weights of the early versus recent periods of the career. Details on the weighting function are provided in Section 4 and in Appendix B.

It could be argued that the decision to start a career in the finance industry is affected by the market returns which are observed prior to the career start. To address this concern, Figure 1 plots the development of career starts over time.

[5]The data and description are available on the Bundesbank website `www.bundesbank.de/en/` under time-series code BBK01.SU0104.

[Insert Figure 1 approximately here]

Figure 1 shows that the number of professionals from the ZEW panel starting their careers increases from the beginning of the sample period until 1997 and drops thereafter. This increase is in line with the historical growth of the finance industry during this period. The drop after 1997 can be explained by the target cohort of the ZEW survey. As the ZEW survey targets professionals with long tenure in the finance industry, professionals who have recently started their finance career do not yet satisfy this condition. Figure 1 shows that based on descriptive analysis of the career entries, it is unlikely that the decision to start a career in the finance industry is determined by prior market returns. The correlation between the number of career starts and the realized DAX returns over the year of the career start and over the three years leading up to the career start is around 0.2 and not statistically significant at the 10% level.

2.3 Expected stock market returns

In this paper, we ask how witnessed stock market returns affect professionals' stock market expectations. We examine professionals' expectations regarding DAX returns. Expectations are elicited through a numerical question. The question on the expected DAX returns was included in the survey in February 2003 for the first time and we gather data until March 2016, thus covering a period of over 13 years. Specifically, the wording of the numerical question on DAX expectations is as follows:

"I expect the DAX in 6 months to be at ... points."

We convert the responses to the above survey question into expected stock market returns using the DAX opening level on the day of the response.[6] If the response is submitted during a bank holiday or during the weekend, we use the closing level on the last trading day. The daily market data is

[6]It is a commonly used approach in real-world surveys to elicit price/index levels and calculate expected returns from the survey responses. Beside the ZEW Financial Market Survey, for example, the Livingston Survey of the Federal Reserve Bank of Philadelphia asks about price levels. A limitation of an indirect elicitation is that the subjects may not think about expected returns when asked about expected index levels, as shown by Glaser, Iliewa, and Weber (2016). The study further shows that when asked about expected index levels subjects extrapolate only from the very recent price developments. Hence, the wording of the survey question makes it harder for us to find an effect of distant-past returns such as the witnessed returns early in the career.

obtained from Thomson Reuters' Datastream. For the purpose of the empirical analysis we take the natural logarithm of expected returns. In order to prevent extreme outliers from affecting our results, we winsorize expected returns at the 1% and 99% level.[7] For comparison purposes, expected returns are annualized.

Descriptive statistics on the expected returns are provided in Table 2. Our panel covers the monthly observations of 326 individual professionals. The panel structure is unbalanced, with the average professional submitting about 65 responses over the sample period of 158 months. Professionals who have left the panel during the sample period are also included in our analysis to avoid survivorship bias. The average expected annual return is 5.7%. The cross-sectional dispersion (13.0%) is higher than the time variation (9.4%). The higher cross-sectional dispersion suggests that individual differences influence professionals' expectations beyond market-wide factors.

[Insert Figure 2 approximately here]

Figure 2 shows that the cross-sectional dispersion in expected returns changes considerably over time. Our main explanatory variable, witnessed returns, potentially drives this variation, at least partly. The intuition is as follows. Consider two professionals - a novice and an advanced professional. Assume that both of them behave like witnesses and hence underweight the history which they have not observed in person and extrapolate from what they have witnessed. The advanced professional and the novice would disagree most of the time, leading to cross-sectional dispersion. The disagreement will vary over time, as the novice will change his mind over time to a greater extent than the advanced professional. The disagreement will be particularly high after extreme market returns, because a recent extreme market return is only a blip on the long-term radar of an advanced professional, but constitutes a sizeable fraction of the observation set of a novice. Furthermore, the disagreement within the group will increase as soon as new novices join.

[7] The results of our empirical analyses remain qualitatively unchanged when we use non-winsorized expected returns.

3 Witnessed returns affect finance professionals' expected returns

To obtain a model-free first impression of how witnessed returns affect expected returns, consider again the disagreement between two generations of professionals: novices and advanced professionals. Assume that all professionals behave like witnesses - extrapolating from the returns they have witnessed during their career, and ignoring the data before their career start. Under these circumstances, advanced professionals and novices would disagree most of the time, because the stock market returns they have witnessed would be different most of the time. Figure 3 provides evidence of such disagreement in our data. The figure shows that when the differences in witnessed returns are large, disagreement is also high. Hence, the cross-sectional dispersion of witnessed returns is positively correlated over time with the cross-sectional dispersion of expected returns.

[Insert Figure 3 approximately here]

In the following, we describe our empirical model and present our results. Remember that our objective is to uncover an effect of witnessed returns which should not be there according to standard finance theory. Therefore, we choose model specifications which measure the lower bound of the effect of witnessed returns on expected returns.

$$y_{it} = \beta\, R_{s,t} + \gamma'\, x_{it} + \eta_i + \nu_t + \epsilon_{it} \tag{1}$$

The dependent variable, y_{it}, measures expected DAX returns. Expected returns are elicited on a monthly basis and are annualized and logarithmized in accordance with the other variables. The main independent variable is witnessed returns ($R_{s,t}$) over each professional's career in the finance industry. The start time s, is the 1st of January following the year the professional reported to have started his career. We consider all returns until the day of the submission of the survey response t. In our main regressions, all returns witnessed during the professional's career are weighted equally. We take advantage of the panel structure of our dataset and include month-year fixed effects and subject-fixed effects as suggested by a Hausman test. This way, we circumvent endogeneity arising

from correlation of witnessed returns with time-level variables and subject-level variables. Specifically, month-year fixed effects cover the entire historically available information on the past average DAX return as well as all other forward-looking information about the DAX companies, which is publicly available. Furthermore, the month-year fixed effects remove time trends in expectations such as seasonal variations in optimism (see, e.g., Goetzmann, Kim, Kumar, and Wang, 2015). Analogously, subject-fixed effects cover personal traits such as time-independent risk aversion or time-independent optimism. It should be noted that the fixed effects already capture two extreme scenarios of the relevance of witnessed returns, hence our model setup identifies a lower bound of the potential effect of witnessed returns. Firstly, month-year fixed effects cover recent returns, which are witnessed by every professional in the sample. Hence, extreme cases where the professional bases his predictions entirely on returns realized over the past several months to up to the last two years are not identifiable as they are covered by the time-fixed effects. Secondly, subject-fixed effects cover returns which are observed at the start of the career and are never forgotten. Hence, we only capture the effect of witnessed returns which varies over time because of (i) new episodes being witnessed and (ii) a decrease of the relevance of the previously witnessed past. For the purposes of comparison with previous studies (e.g., Malmendier and Nagel, 2011; Kuchler and Zafar, 2015), we also report the results of model specifications where we replace the subject-fixed effects with available demographic control variables (gender, having a doctorate degree and tenure in the finance industry).

Further controls are given as follows. We include day-of-week fixed effects to capture possible calendar effects, which are not covered by the month-year fixed effects. This is important, because in each monthly survey, professionals do not respond on the same day but instead the responses are spread over a period of around 11 trading days. We include measures of economic expectations, which should determine expected returns according to standard finance theory. Specifically, our panel dataset contains measures of professionals' expectations for the development of the German economy over the next six months and professionals' assessment of the current economic situation.[8] These measures of economic expectations are similar to the measures used by Greenwood and Shleifer (2014) and Amromin and Sharpe (2014). In some model specifications, we additionally control for a potential

[8]For the exact wording of the respective survey questions, see Table 1.

non-linear impact of tenure by including tenure squared. We report double-clustered standard errors at the subject level and the time level.

[Insert Table 3 approximately here]

Witnessed returns affect expected returns, as shown in Table 3. This result is robust to alternative model specifications with and without subject-fixed effects. The results also pertain to witnessed excess returns as shown in columns (v)-(viii). All model specifications include time-fixed effects, which means that witnessed returns have an impact on expected returns over and above the impact of the objective historical development, as well as any other public information which is available to all professionals. This result is consistent with the experimental findings of Lejarraga and Gonzalez (2011) and Peiran (2016), who show that information learned from description is neglected in favor of information learned from personal experience. We show that this result holds in situations when it would not be expected to hold - for professionals with decades of experience and in situations where personally witnessed "information" is non-informative and of no value for the completion of the task.

Panel A displays our baseline results with subject-fixed effects. According to the coefficient estimate in the fully specified model in column (iv), a decrease of the within-subject witnessed returns by 1 percentage point would reduce the professional's expected return by 0.325 percentage points. In the presence of subject-fixed effects and time-fixed effects, the coefficient estimate captures the effect of within-subject time variation of witnessed returns resulting from (i) "fading memory" of the more distant past and (ii) different "attention" to recently witnessed episodes. To illustrate the economic effect of "fading memory", consider a professional who started his career in January 2008 and in the first year of his career witnessed a 40 percent decrease of the DAX. Independent of what happens to the market after 2008, the memory of the first year "decays" over time as the weight of the first year is reciprocal to the professional's tenure. Because of the "fading memory", in 2015 the 2008 crisis will account for 1 percentage point less negative witnessed return than it did in 2014, independent of the market returns in the following years. Hence, following the coefficient estimate in column (iv), in 2015 the professional will be less pessimistic than he was in 2014 by 0.325 percentage points. Analogously, in 2008, the professional was paying all of his attention to contemporary market developments, whereas

in 2015, the contemporary returns only make up for one eighth of his set of witnessed past returns.

For the purpose of comparison with previous studies (especially Malmendier and Nagel, 2011), *Panel B* reports the results of model specifications where the subject-fixed effects are replaced by available demographic control variables. Without subject-fixed effects, the regression coefficients in *Panel B* additionally capture cross-sectional differences in the timing of the career start, which shape the professionals' average expected returns once and for all. Most importantly, they capture variations in expected returns which are attributed to the fact that, for example, one professional started his career in 2008 and another, in 1998. This is the main source of variation in previous studies, which use repeated cross-sectional data (see, e.g., Malmendier and Nagel, 2011). *Panel B* shows that our findings are qualitatively unchanged when we replace the subject-fixed effects with available demographic control variables. Nevertheless, for the remainder of this paper, we report the results of model specifications with subject-fixed effects in order to avoid potential endogeneity concerns.[9]

Our measure of witnessed returns differs from previous work. Previous studies, focusing on experiencing in general, assume that experiencing starts at birth or at a certain age (see e.g., Malmendier and Nagel, 2011). In contrast, we assume that for professionals witnessing the stock market begins at the career start in the finance industry. We argue that awareness during childhood may be a plausible assumption for some economic variables (such as inflation or unemployment), but most children are unlikely to be aware of stock market developments as the topic of financial markets is rarely discussed with or understood by children. Hence, the lack of accurate information on the exact beginning of the time frame of personal experiences introduces noise in the measures of experienced returns used in previous studies. This noise leads to an underestimation of the impact of the early episodes. In Section 2, we argued that our unique dataset allows us to measure witnessed returns with less noise compared to previous studies because we can more accurately capture the stock market returns at the beginning of the time frame of witnessing. In the following, we verify the validity of our measure of witnessed returns. To this end, we compare our measure with previously used proxies which estimate

[9]Whereas previous studies use life experience, which is an episode of the past with an unequivocally exogenous starting point, our measure of witnessed returns starts at a point in time which is partly decided by the professional himself. Hence, this time of entry may be endogenous if professionals were able to time their job entry, for example to avoid starting shortly before a stock market burst. If subjects were able to time their career start, the subsequently witnessed returns would be potentially correlated with personal characteristics as suggested by Oyer (2008) and Schoar and Zuo (2016).

experienced returns (here: witnessed returns) from a certain age onwards. We calculate different proxies of witnessed returns for a wide range of ages between 18 and 27. This range covers important age thresholds. The age of 18 is the legal age of majority in Germany, which is presumably when people start living on their own budget, and eventually start getting involved in financial and investment matters. The distribution of age at career start of the professionals in our sample peaks twice - around the age of 20 and 26 respectively, so we also include these ages in our proxies for assumed different career start times. The median age at career start is 25. Table 4 displays the correlation between our measure of witnessed returns and the different proxies. Table 4 further replicates our baseline regressions using the different proxies.

[Insert Table 4 approximately here]

Table 4 shows that there is a relatively low correlation (less than 0.6) between the witnessed returns based on age-based proxies and our measure of witnessed returns since the career start (see *Panel C*). The correlation is low, because professionals start their career in the finance industry at very different ages. Table 4 further shows that when data on the exact age of the career start is not available, the results on the effect of witnessed returns on expected returns vanishes due to an underestimation of the effect of the early episodes (see *Panel A*). Our results are robust to the inclusion of control variables such as macroeconomic expectations (see *Panel B*). Robustness checks without subject-fixed effects are included in Appendix A, Table A.1.

4 Returns witnessed early in the career leave a long-lasting mark

In Section 3, we traced the effect of witnessed returns in professionals' expected returns. In this section, we further examine this result, and examine whether the effect of witnessed returns is short-lived and returns witnessed early on are quickly overshadowed by the most recent stock market returns or whether instead returns witnessed early on in the career leave a long-lasting mark on professionals' expected returns. On the one hand, the effect of early witnessed returns might be long-lasting, because the long-term memory favors witnessed information (Lejarraga, 2010). Along these lines, Schoar and

Zuo (2016) show that the early work environment plays an important role in the formation of the managerial style of CEOs. On the other hand, there is reason to believe that recent experiences overshadow earlier experiences (see, e.g., Langer, Sarin, and Weber, 2005; Malmendier and Nagel, 2011). However, empirical studies comparing the effect of recent versus early episodes of experience face the challenge of accurately measuring the early episodes of the experience. As discussed in Section 3, accurately measuring the early episodes of experience is particularly challenging in the case of financial market variables. A measurement error in the approximation of the early episodes leads to an underestimation of their effect, and thus gives a technical advantage to the more recent episodes. As shown in Section 3, our unique data on the exact timing of professionals' career starts provides us with a more accurate measure of the early episodes than conventional proxies, thus allowing us to compare the effect of early versus recent episodes of the past on more equal grounds than previous studies. In the following, we thus revisit the question of whether recent versus early episodes of the past matter more for shaping finance professionals' beliefs about expected returns by making use of our unique data.

4.1 Linear regression analysis

To find out whether witnessed returns leave a long-lasting mark on professionals' expected returns, we first re-examine our main analyses of the impact of witnessed returns on expected returns. In particular, we estimate the same linear regression model as described in Section 3, but focus on the contribution of early witnessed returns by excluding the very first years of a professional's career from the measure of witnessed returns.

[Insert Table 5 approximately here]

[Insert Figure 4 approximately here]

Table 5 shows how the regression results of our linear models from Section 3 change when we sequentially exclude the early years of a professional's career. We estimate the baseline model with two-way fixed effects (see *Panel A*) and the full model with two-way fixed effects and control variables

(see *Panel B*). In this table, as well as in the remainder of the paper, witnessed returns are measured as nominal returns, although our findings remain qualitatively the same if we instead use witnessed *excess* returns.[10] The different columns display the coefficient estimates for different measures of witnessed returns depending on how many early years of the career are included in the measure of witnessed returns. The leftmost column in Table 5 and the leftmost bar in Figure 4 display the regression results when deliberately leaving out the first four years of the career. Analogously, the rightmost column in Table 5 and Figure 4 consider four years prior to the year of the career start. Table 5, column (v) plots the benchmark regression results, which are obtained when we measure witnessed returns as in Section 3 - starting in January 1st in the year after the reported year of career start. We call this timing s. As argued in Section 2, we exclude the year of the career start in order to exclude possible endogeneity in our measure of witnessed returns. When we now include the entire year of the career start in the measure of witnessed returns ($s-1$, column vi), the coefficient estimate of witnessed returns is similar to the one in the baseline analysis. Going in the opposite direction and ignoring the first year after the career start ($s+1$, column iv), witnessed returns still have a statistically significant, albeit smaller, effect on expected returns. However, when we ignore the first two years of the career, witnessed returns no longer have a statistically significant effect on expected returns (see columns i-iii). Hence, we conclude that the effect of witnessed returns on expected returns is driven by the long-term memory of returns which are witnessed in the first few years of the professional's career.

The effect of witnessed returns not only vanishes when we ignore its most important part - the early career returns. It also vanishes when we add parts which do not belong to it. In particular, when witnessed returns are measured including several years prior to the career start, which are presumably not witnessed first hand (see columns vii-x), the effect of witnessed returns is likewise not statistically significant at the 10% level. This result provides justification for our assumption that witnessing the stock market starts at the beginning of the professional's career in the finance industry, and not earlier (see Section 2). Furthermore, the apparent jump in the magnitude of the coefficient estimates at the

[10] We choose to display the findings for nominal returns for two reasons: First, the measurement of excess returns requires a further assumption about the risk-free rate, which might be arbitrary, and hence connected to an unquantifiable measurement error. Second, the witnessing of excess returns requires a higher level of mental calculations for the aggregation of two separate time-series. Previous research on hedonic experiences has shown that the experience of disaggregated data is different than the experience of the aggregate (Ariely and Zauberman, 2000).

timing of the career start suggests that the effect of witnessed returns on expected returns is causal. The discontinuity in our results is consistent with the evidence of Anagol, Balasubramaniam, and Ramadorai (2015), who use IPO lotteries in India to show that the impact of investors' experience on future investment decisions is causal.

4.2 Non-linear regression analysis

So far, we have estimated linear regressions, which have the advantage that the coefficient estimates are efficient and unbiased in the presence of heteroscedasticity. As an alternative, we follow previous studies in comparing the impact of early career returns and recent returns by estimating the parameter of a monotonic weighting function as in Malmendier and Nagel (2011). A monotonic weighting function is sufficient for answering the question whether witnessed returns have a long-lasting effect, because we need to compare only the extremes - the early witnessed returns and the recently witnessed returns. Furthermore, an experimental study by Baucells, Weber, and Welfens (2011) shows that subjects are much more affected by these two extreme episodes of the past - the early episodes and the recent episodes - than they are by the rest of the experience. Hence, it seems plausible to focus our empirical comparison on those most overweighted episodes of the past. Last but not least, estimating the benchmark monotonic weighting function by Malmendier and Nagel (2011) allows us to compare our results to previous empirical studies on the impact of personal experiences in the field of finance (see, e.g., Malmendier and Nagel, 2011; Kuchler and Zafar, 2015).

We use non-linear least squares regressions to estimate the following generic regression model:

$$y_{it} = \beta\, A_{it}(\lambda) + \gamma'\, x_{it} + \eta_i + \nu_t + \epsilon_{it} \tag{2}$$

In this model, $A_{it}(\lambda)$ is the average witnessed DAX return, weighted by the monotonic weighting function proposed by Malmendier and Nagel (2011). The rest of the model closely matches the linear regression described in Section 3. The exact specification of the weighting function is provided in Table 1 and Appendix B. The form of the weighting function depends on a single parameter, λ. When λ is 0, this implies an equal weighting among all experienced returns, a positive λ implies a recency bias

and a negative λ corresponds to putting a high weight on returns that have been witnessed early on in the career. For negative values of λ, witnessed returns vary more in the cross-section, whereas for positive values of λ, the variation over time dominates. To illustrate the effect of λ on the weighting of realized returns, Table 2 presents the distribution of weighted witnessed returns for different values of λ. We set the weighting parameter value to 1.5, 0.5 (based on Malmendier and Nagel, 2011) and -0.5.

In the non-linear regressions, we again include two-way fixed effects as we did in Section 3, to capture the influence of stable personal characteristics and publicly available information. It should be noted, however, that the fixed effects suppress extreme estimates of the parameter λ, because they capture the two extreme forms of the weighting function: extreme overweighting of early career returns and extreme overweighting of the most recent returns. Furthermore, positive and negative values of the parameter λ of the same magnitude are not comparable in their effect. Even small negative values of λ lead to a long-lasting dwelling on the witnessed past, whereas small positive values of λ reflect a negligible recency bias. This asymmetry is illustrated in Appendix B. Because of this asymmetry, a model with two-way fixed effects distinguishes early career returns more strongly than it distinguishes recent returns, as small negative values of lambda are more difficult to identify empirically.

[Insert Table 6 approximately here]

[Insert Figure 5 approximately here]

The results of our non-linear least squares regressions are displayed in Table 6. Panel A comprises the results of the baseline model with two-way fixed effects and Panel B additionally includes control variables. The positive coefficient estimates on witnessed returns corroborate the impact of witnessed returns on expected returns, as documented in Section 3. The different columns of Table 6 display the parameter estimates for different data frequencies of the annualized past returns. The data frequency affects the form of the weighting function alongside the parameter λ: in the case of discrete past returns, the weighting function resembles a step function. The higher the data frequency, the closer the estimated weighting function comes to the theoretical (continuous) weighting function. Furthermore, a lower data frequency leads to more moderate λ estimates. Intuitively, in case of low frequency data,

possibly extreme weights of the outermost periods (i.e., the beginning and the end of the witnessed period of time) are counterbalanced by the moderate weights of the neighboring periods. As an illustration, Figure B.1 depicts the weighting functions implied by the λ estimates which we obtain from different data frequencies. For example, with monthly return data, the weight of the first month of the career is more than twice as high in comparison to when it is estimated using semi-annual data. For all return data frequencies, the estimate of the parameter λ is negative. Negative λ estimates imply that returns witnessed early in the career matter most. The findings from the non-linear regression estimates indicate robustness of the results from the linear regression analyses.

In conclusion, returns witnessed early on in the professional's career have a higher impact on expected returns than returns witnessed recently. To provide an economic interpretation of our λ estimates, consider a professional with a tenure of 21 years (which is the median tenure in our sample). The returns witnessed in the first year of the career make up in aggregate 12% (25%) of the weighted witnessed returns if the weighting function is estimated using annual (monthly) data frequency. If in the first year of their career, the professional had witnessed a shock in the DAX returns of -30%, this would lead to a downward bias in his perception of the past (see simulation described in Appendix B). The downward bias today, after 21 years of experiences, would on average amount to 5 percentage points (10.5 percentage points in the monthly estimation) if the stock market returns in the rest of the time are representative for the DAX distribution (i.e. $\mu = 12\%$).

In summary, we show that it is the early observations in a finance professionals' career that leave a long-lasting mark on their expected DAX returns. This result builds on psychological studies, which argue that information learned by witnessing leaves a long-lasting trace in the long-term memory and is consistent with the previous findings by Schoar and Zuo (2016) who show that early work experience affects the managerial style of CEOs. However, it contradicts previous studies, which examine the impact of personal financial market experiences on beliefs and economic behavior. The apparent contradiction between our findings and previous studies may be driven by differences in the setting of the analysis in terms of how the period of witnessing or experiencing is measured, as well as to the witnessed variable, which in our case is stock market returns. Firstly, witnessing the stock market is different from witnessing other economic variables, such as inflation and unemployment. The

latter are connected to important or regular household decisions such as spending on grocery items or discretionary goods and are thus likely to be passively experienced even during early childhood, while intensifying gradually with age. Hence, in the case of economic domains, there is no unambiguous starting point for the experience, and the intensity of the (early) childhood experience is arguably lower than the intensity of the experiences later in life. Secondly, our study contributes to the previous literature by measuring the exact timing when the subject starts intensively observing the underlying domain in question. In doing so, we reduce the measurement error which arises from approximating the timing of the career start with an assumed age.

5 Potential channels of the effect of witnessed returns

How do witnessed returns affect expected returns? Are they a valuable source of information which cannot otherwise be obtained? Do they change risk preferences and consequently the required risk premium? Or is the influence of witnessed returns on expected returns a persistent judgmental bias? In the following, we discuss each of these potential channels in turn.

Channel 1: Are witnessed returns informative?

The channel through which personal experiences affect beliefs and choices is discussed in the literature for different domains. For example, in the case of regional housing prices and inflation, Kuchler and Zafar (2015) argue that personal experiences constitute an accessible *source of information*. However, in the setting of our paper, witnessed returns have no marginal value as an information source. This is because we analyze subjects who have abundant information at their disposal, including information on the complete history of stock market returns, which is more data than the subset he could have personally witnessed. By estimating models with month-year fixed effects, we control among other things for the effect of the long-term average DAX return, which constitutes the objective base rate. Hence, our results show that witnessing the past has an effect over and above the objective information on the past, which is available to everybody. The effect of witnessed returns, which we trace in this paper, is an effect of non-informative observations. When exhaustive descriptive information is available and personal observations are non-informative, one would not expect subjects to

resort to the subsample of witnessed observations, because they cover only a short period of the past, leading to a small sample bias and underweighting of the probability of rare events (see, e.g., Hertwig, Barron, Weber, and Erev, 2004). Nevertheless, experimental studies show that witnessed observations are overweighted even if exhaustive descriptive information is available (Lejarraga and Gonzalez, 2011; Peiran, 2016). We show that this result holds even in the case of experienced finance professionals.

Even though witnessed returns are non-informative in the long run, in a small sample they can have a positive correlation with realized returns by chance. Following this line of reasoning, it can be hypothesized that professionals may have come to appreciate their witnessed returns because they might have coincidentally been an accurate predictor of future returns over the relatively short period of the professionals' careers. To test this hypothesis, we analyze whether the professionals in our sample have observed a positive correlation between their witnessed returns and actual realized returns over the course of their careers. Specifically, we calculate the aggregate witnessed return for all professionals in our panel in a given year and examine its correlation with the realized return over the next one to ten years.[11] For stability, we require that at least 50 subjects from our pool of professionals have already started their finance career for a year to be considered.

[Insert Figure 6 approximately here]

Figure 6 plots the correlation of the aggregate witnessed returns with the realized returns over the next one, five, and ten years respectively. A simple eyeball test suggests the correlation over time is not positive.

[Insert Table 7 approximately here]

In Table 7, we further control for the objective base rate as measured by the average DAX return over the longest available time horizon, which is from Datastream, and goes back to 1964. All model specifications report time-series regressions of annual witnessed returns. We report Newey-West standard errors to account for the autocorrelation stemming from the overlapping realization horizon of

[11] For professionals who are no longer in the sample because they have changed employer or have been promoted, we do not observe the actual retirement age. Therefore, we assume a latest retirement age of 65 years.

the dependent variables in columns (ii) and (iii). Witnessed returns are not predictive for the realized returns for any of the return realization horizons. Hence, we conclude that the professionals in our sample could not have observed a perceived predictive power of their witnessed returns, ruling out witnessed returns as a valuable information source.

Channel 2: Do witnessed returns affect risk preferences?

Another way in which past returns might affect investment behavior is through *risk preferences*. Risk preferences, as well as the behavior of investors, are found to be influenced by personal experiences. Guiso, Sapienza, and Zingales (2013) elicit the risk aversion of retail investors and report a significant decrease after the 2008-2009 financial crisis. Furthermore, Malmendier and Nagel (2011) link the retail investors' risk-taking to their experienced stock market returns and attribute this link to changes in risk aversion. Risk aversion would in theory affect expected returns through the required risk premium. However, according to previous studies, the risk premium is not reflected in professionals' expected returns. Evidently, professionals do not think about the required risk premium when thinking about expected returns (Kaustia, Laukkanen, and Puttonen, 2009). Even if professionals' expected returns reflected a risk premium, the risk premium should be determined by the aggregate risk preferences of all investors in the market. These aggregate risk preferences are unrelated to the timing of the career start of the individual professional. Let us nevertheless assume that the professional exhibits a false consensus bias (see, e.g., Ross, Green, and House, 1977) and perceives his own risk aversion as a proxy for the risk aversion of the representative investor. Further let us assume that professionals' risk aversion is driven by their privately or institutionally experienced wealth changes. Aggregate stock market returns are not a good proxy for institutional portfolio returns, because institutional investors are neither restricted to investing in the stock market, nor do they have to take long-only positions. Apart from that, the majority of the professionals in our sample, being economists, analysts, advisors, etc., do not trade as part of their professional occupation. However, the wealth changes they have experienced may be correlated with past DAX returns to the extent that outside of work, professionals might act as retail investors in the stock market. If returns experienced in their own retail portfolio were the driving factor of a risk premium in expected returns, it is unlikely that the period of highest importance would be exactly at the career start, as shown in

Section 4, but rather months or years later. The reason for this is that professionals will likely only start investing any economically significant amount of money as retail investors after they have had the chance to accumulate some wealth from their salary. Taken together, our results are inconsistent with an explanation which attributes the effect of witnessed returns to a change in risk preferences.

Channel 3: Judgmental bias

A possible explanation of how witnessed returns affect expected returns is through a judgmental bias. Although judgmental biases are typically ascribed to retail investors, a handful of studies suggest that professionals are even more susceptible to judgmental biases than retail investors (see, e.g., Haigh and List, 2005; Gilad and Kliger, 2008; Kaustia, Alho, and Puttonen, 2008). Psychological studies provide a possible explanation for this claim: Judgmental biases are characteristic of an intuitive thinking mode (see, e.g., Kahneman, 2011). Professionals have a higher tendency to rely on intuitive thinking because they have accumulated a lot of information to feed their intuition. However, if professionals act in an environment where developing a skillful intuition is unfeasible, intuitive thinking could lead to mistakes. Kahneman and Klein (2009) argue that financial markets are one example for such an environment. Consequently, when forecasting the stock market, professionals should instead use deliberate forecasting models, such as those from econometrics, and disregard their intuition. Intuition makes use of information which comes to mind quickly and effortlessly, such as information obtained first-hand through witnessing (Lejarraga, 2010). It would be hard for professionals to ignore the witnessed past because intuitive thinking happens automatically and subconsciously and with the comfort of high confidence. Experimental studies test the boundaries of the effect of witnessing and show that its effect is strong enough to survive even if descriptive information is available (see, e.g., Kaufmann, Weber, and Haisley, 2013; Peiran, 2016). To the best of our knowledge, we are the first to show that this result also holds for experienced and well-versed finance professionals.

Is it reasonable to expect professionals with decades of experience in the finance industry not to reflect critically on their expectation formation process nor to correct their judgmental biases? We already discussed how professionals could not have learned from the past that witnessed returns are a good predictor of the future returns. Alternatively, the effect of witnessed returns could persist because professionals are unaware of it. In order to test this hypothesis, in December 2015 we conducted a

supplementary survey, which asks professionals about their assessment of the importance of their financial market experiences for their financial market expectations.

[Insert Figure 7 approximately here]

Figure 7 shows that professionals are aware that their experience affects their expectations, but the majority of professionals claim that early experiences are not as important as recent experiences. This latter self-perception is in contrast to our findings outlined in Section 4, but is in line with the evidence of a recency bias documented in previous studies (see, e.g., Malmendier and Nagel, 2011; Kuchler and Zafar, 2015). One potential explanation for this finding is that the professionals are aware of the previous empirical result, but not of the specific pattern found in our data. Alternatively, since we ask professionals about experience in general, their responses may be related to the effect of informative experiences, not the effect of non-informative experiences, which is the type we trace in the main body of this study.[12] Professionals may be aware that informative experiences have an effect on their expected returns, but fail to realize that non-informative witnessed returns are formative as well.

6 Conclusion

Are the Wolves of Wall Street any different from the rest of us when it comes to forming their expectations of the future? In this paper, we show that even well-versed finance professionals take occasional walks down memory lane which leave a long-lasting mark on their professional judgment. In particular, when forming expectations, finance professionals with decades of experience in the finance industry extrapolate from the stock market returns they have personally witnessed during their career. To assess the impact of personally witnessed returns on professionals' expected returns, we compile a unique data set by matching data on the professionals' expected returns with supplementary data on their career start in the finance industry. Our results on the effect of witnessed returns on professionals' expected returns are robust to controlling for information which is publicly available by means of

[12] We were concerned that asking professionals more specifically about the effect of their non-informative experiences could be perceived as insulting and could lead to many of them abandoning the survey.

time-fixed effects and to controlling for interpersonal differences by means of subject-fixed effects. It is important to note that the professionals in our sample are highly influential opinion makers. Previous event studies provide evidence that these professionals' expectations have a significant price impact in highly liquid financial markets. One would, therefore, not expect them to be affected by irrelevant factors such as the stock market returns they have personally witnessed. In this paper, we thus document an effect of witnessed returns that is not consistent with normative finance theory. Importantly, we find that the effect of witnessed returns on professionals' expected returns is unique for returns witnessed over the course of the professionals' career and cannot be accounted for by the alternative explanation of subjects becoming conscious of the stock market when reaching adulthood. We further find that returns witnessed early on in the professional's career are more influential than more recently witnessed returns. Finally, we examine several channels through which witnessed returns might affect the expected returns of finance professionals. We argue that our results can neither be explained by witnessed returns being a valuable source of information nor by variations in risk preferences. Ruling out these two alternative channels, our evidence suggests that the effect of witnessed returns on professionals' expected returns constitutes a subconscious judgmental bias.

Our findings that finance professionals hold on to their personal experiences even when these are merely observational, highlights the potential for future research into discovering ways of effectively integrating observational experiences in the early career training of finance professionals. Much like flight-simulation training for prospective pilots, financial market simulation training might have the potential to deposit unbiased experiences into professionals' memory bank. Simulations are potentially valuable because they allow for drawing large samples as well as experiencing extreme events (e.g. crash-testing). Indeed, previous literature has shown that simulated experiences can improve investors' understanding of the return distribution (see, e.g., Kaufmann, Weber, and Haisley, 2013). Given our findings that returns witnessed early on in the professional's career have a greater effect on their expected returns than more recently witnessed returns, integrating simulated experiences into the early career training of finance professionals or when advising first-time investors might have the potential to educate financial market participants effectively and efficiently.

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7 Figures and tables

Figure 1: When did the professionals start their career in finance?

The grey columns show the number of professionals who started their career in the finance industry in a given year. The scale on the right-hand axis and the line graphs depict annual DAX returns. The solid line refers to the DAX return in the year of the career start, whereas the dashed line displays the average annual DAX return over the three years prior to the year of the career start. The correlation of the career starts and the contemporaneous returns (past returns) is 0.19 (0.21) with a p-value of 0.19 (0.24).

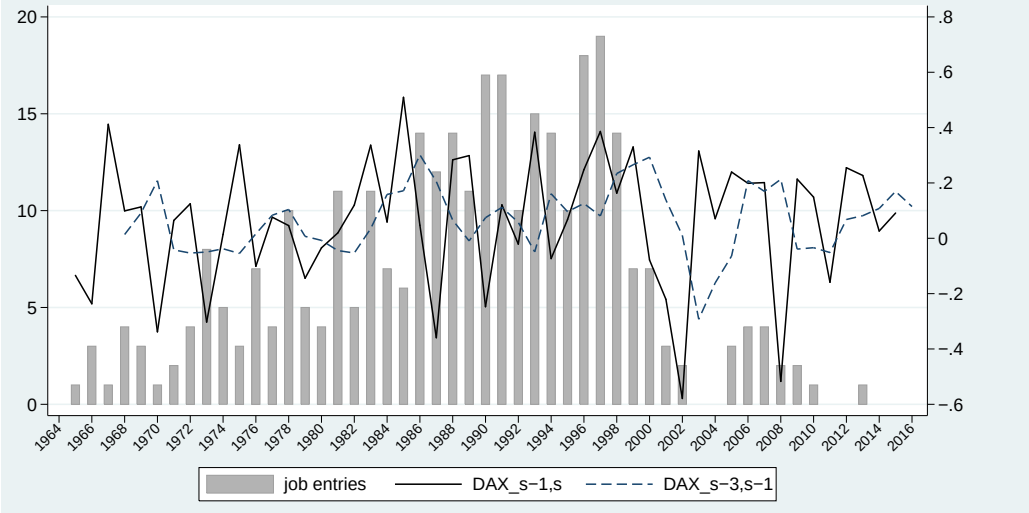


Figure 2: Expected returns by professionals over time

This figure displays professionals' expected returns over time. The solid line represents monthly averages, the dashed and dash-dotted lines refer to the 10^{th} and the 90^{th} percentiles of the expected return distribution respectively. Expected returns are annualized log expected DAX returns, winsorized at the 1% and the 99% level.

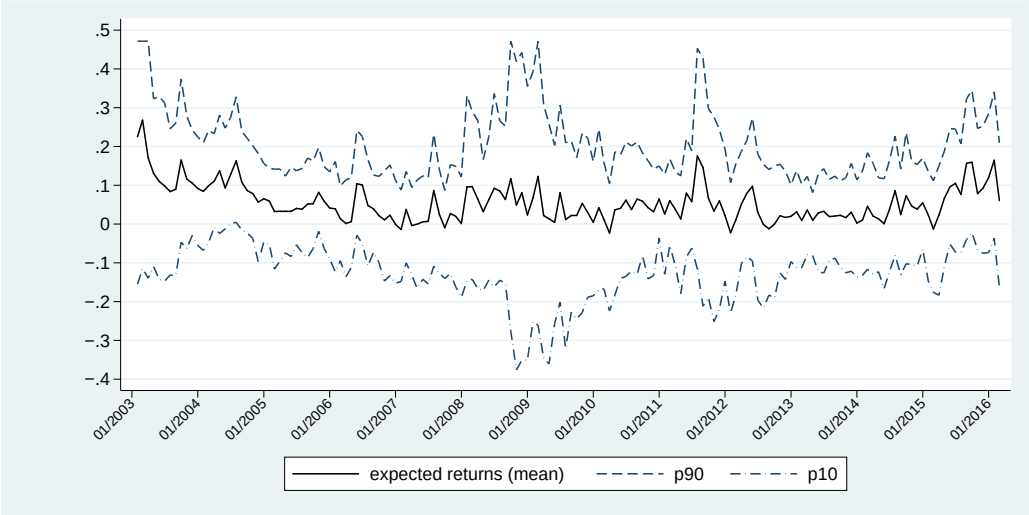


Figure 3: Disagreement and dispersion of witnessed returns

This figure displays the correlation between the cross-sectional dispersion of expected returns (i.e. *disagreement*) and the cross-sectional dispersion of witnessed returns. The dashed line (left axis) shows the development of the standard deviation of expected returns (i.e. annualized expected log DAX returns winsorized at the 1% and the 99% level). The solid line (right axis) shows the development of the standard deviation of the witnessed returns (i.e. annualized average DAX returns, equally weighted). The correlation between the two variables is 0.36 (p-value < 0.000).

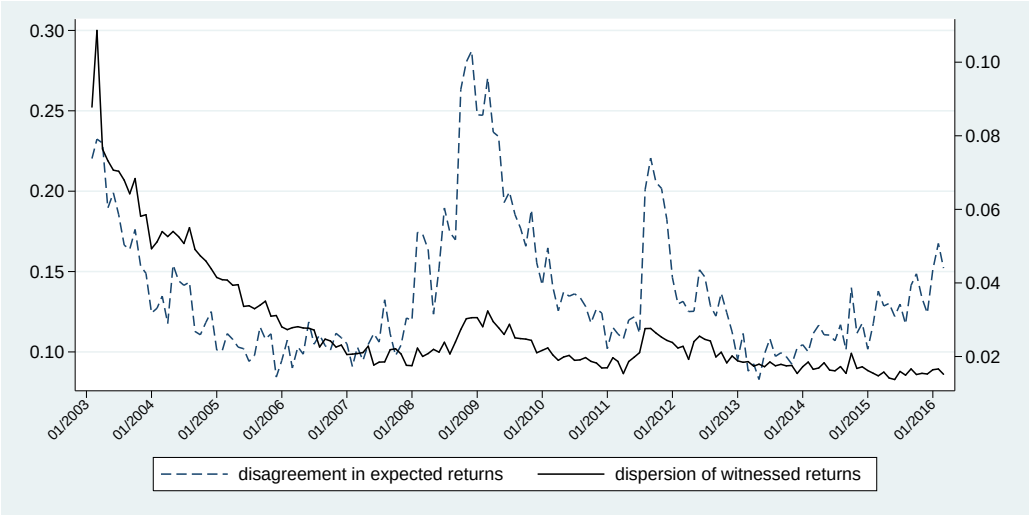


Figure 4: Importance of witnessed returns early in the career

This figure provides on overview of the regression coefficients of (equally-weighted) experienced returns and expected returns. Experienced returns are average annual log DAX returns for the period between a presumptive experience start relative to the career start s and the day of the submission of the response. In particular, the *light blue bars* (from $s+5$ to $s+2$) exclude the first several years of the career and weight the rest equally, the *dark blue bar* includes all returns starting from January 1st of the year following the year of the career start, the *grey bars* (from s to $s-4$) include the year of career entry as well as several years leading up to the career entry. The exact model specifications and further empirical results are displayed in Table 5.

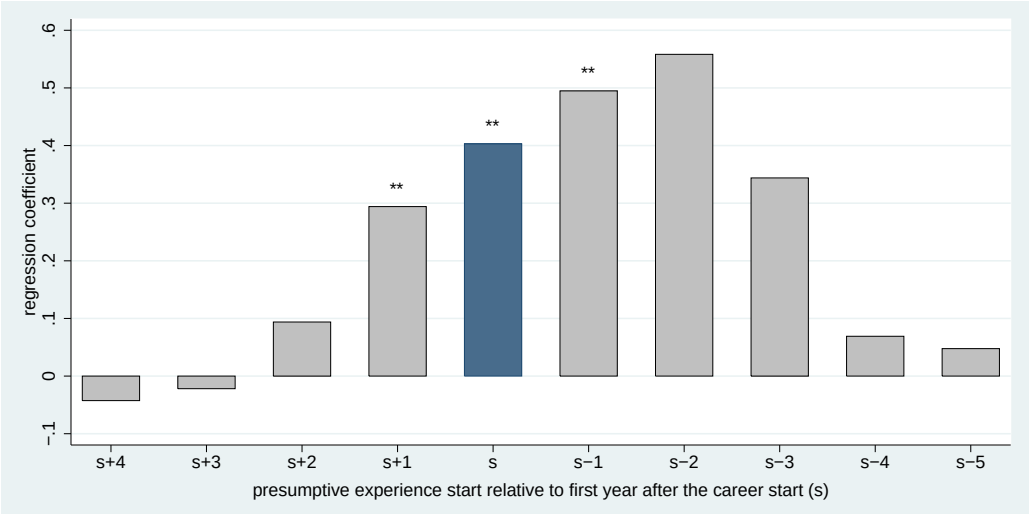


Figure 5: Impact of data frequency on the estimated weighting function

This figure displays the estimated weights of each career month when different data frequencies (monthly, semi annual and annual) are used to estimate the weighting function (i.e. λ). The weighting parameters λ for the different data frequencies correspond to the parameter estimates displayed in Table 6. The weighting functions are illustrated for a tenure of 5 years (left) and for the median tenure of 21 years (right).

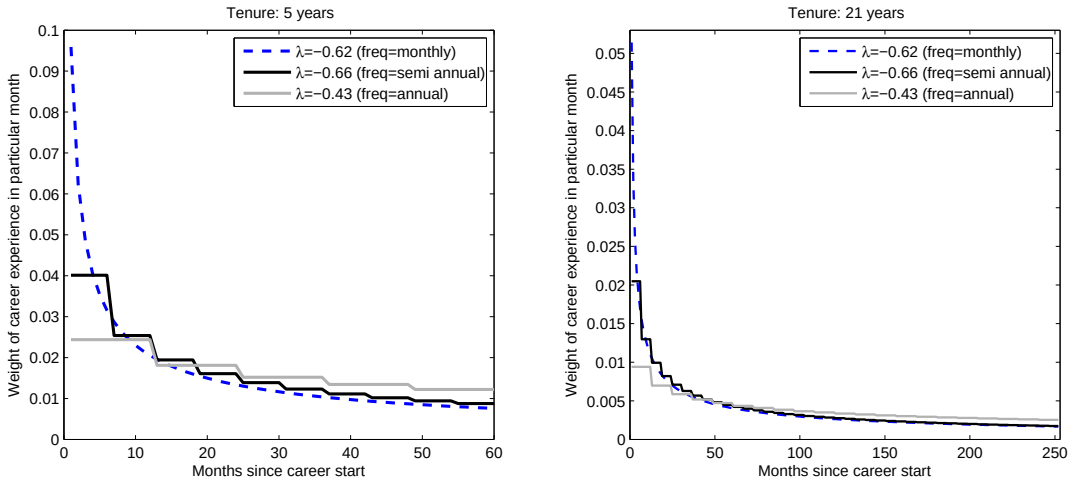


Figure 6: Information content of witnessed returns

This figure displays the correlation between witnessed returns and future returns. Witnessed returns are calculated as annualized average DAX returns (equally weighted) and are aggregated over all subjects from the panel of the ZEW Financial Market Survey in the given year. Excluded are years prior to 1980 because by this point fewer than 50 subjects from the panel have already started their finance career. Excluded are subjects above the retirement age of 65. We display the following future realized returns: return within the next year (dotted line), annualized return within the next five years (short-dashed line), annualized return within the next 10 years (long-dashed line). The correlation between witnessed returns and future realized returns is given as follows: with returns within the next year -0.27 (p-value 0.11), with returns within next five years -0.47 (p-value 0.007), with returns within next 10 years -0.47 (p-value 0.015).

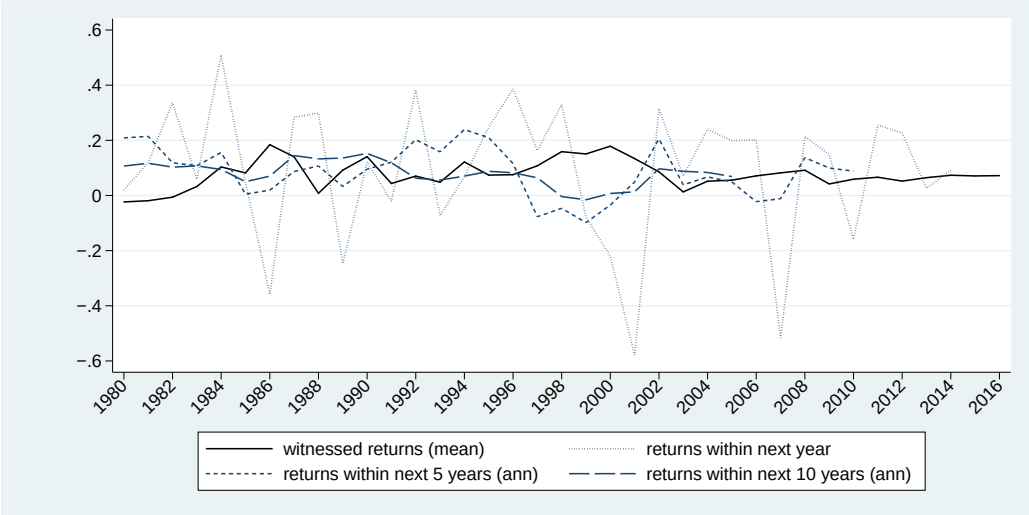
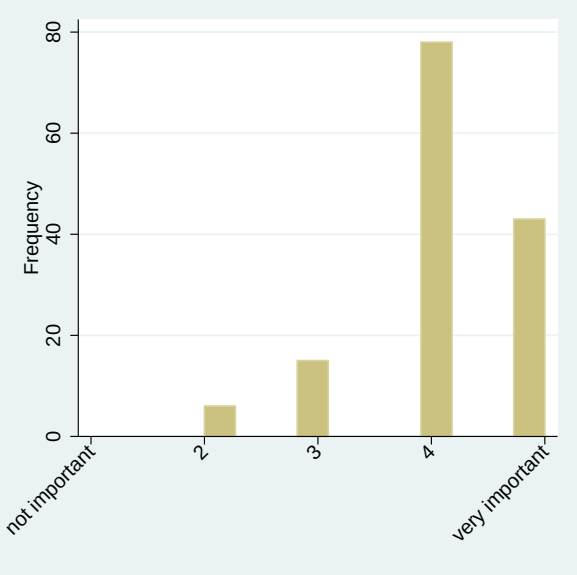
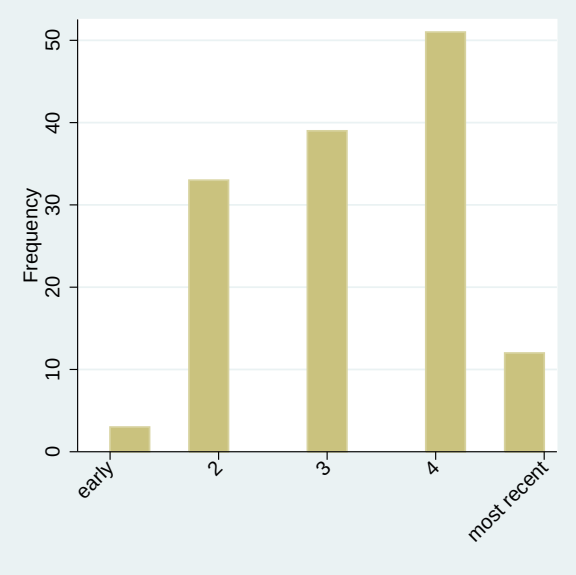


Figure 7: Awareness of effect of witnessed returns on expected returns

This figure displays the distribution of responses to a supplementary question responded by 142 professionals from the ZEW panel in December 2015. On the left, Figure (a) displays the responses to the question *"How important is your financial market experience for your financial market forecasts?"*. The responses were elicited on a five-point scale ranging from 1 (*"not important"*) to 5 (*"very important"*). On the right, Figure (b) displays the responses to the question *Which episodes of your financial market experience more strongly affect your financial market forecasts?*. The responses were elicited on a five-point scale ranging from 1 (*"early experiences"*) to 5 (*"most recent experiences"*).



(a) Importance of experience



(b) Relative importance of early versus recent experience

Table 1: Variable definitions

Expected returns	Expected returns are annualized log DAX return expectations elicited on a monthly basis. The survey question is given as follows: *"I expect the DAX in 6 months to be at ... points."* DAX level forecasts are converted into expected returns based on the DAX 30 performance index opening value on the day of the response submission. If the response was submitted on a bank holiday or a weekend we use the last available DAX level (closing level on the last trading day). Market data is downloaded from Datastream. Expected returns are winsorized at 1% and 99% levels.
Witnessed return (equally weighted)	Witnessed returns are average annual log DAX returns for the period between a point of time relative to the career start s and the day of the response submission.
Witnessed excess return (equally weighted)	Witnessed excess returns are average annual log DAX returns in excess of an annualized log risk-free interest rate. As a measure of the risk-free rate we take the annualized money market rate reported by Frankfurt banks and collected by Bundesbank until May 2012 (time series BBK01.SU0104). After June 2012 we take the annualized 1 month Euribor as available in Datastream.
Witnessed return, $A(\lambda)$	Witnessed returns are the annualized weighted average DAX returns, weighted by the weighting function proposed by Malmendier and Nagel (2011): $A_{it}(\lambda) = \sum_{k=1}^{tenure_{it}-1} w_{it}(k,\lambda) R_{t-k}$ where $w_{it}(k,\lambda) = (tenure_{it} - k)^{\lambda} / \sum_{k=1}^{tenure_{it}-1} (tenure_{iy} - k)^{\lambda}$ and R_{t-k} measures the log DAX return in period $t-k$. The definition of a period depends on the data frequency. We estimate the weighting function using three different data frequencies: annual, semi-annual and monthly.
Placebo witnessing	Placebo witnessed returns (i.e. placebo witnessing) are average annual log DAX returns for the period between a certain age and the day of the response submission.
Year of career start	The self-reported year the professionals started their career in the finance industry.
Birth year	The self-reported year of birth.
Tenure	We refer to tenure as years of experience in the finance industry. $tenure_{iy} = survey\ year_y - job\ entry\ year_i$ We use $tenure^2$ in some analyses to capture non-linear effects.
Economic expectations	Participant's expectation of the development of the German economy in the mid-term: $improve = 1$, $stay\ the\ same = 0$, or $worsen = -1$
Assessment economic situation	Participant's assessment of the current economic situation in Germany rated to be: $good = 1$, $normal = 0$ or $bad = -1$

Table 2: Descriptive statistics

The sample of forecasts runs from February 2003 to March 2016 and includes all finance professionals for which information on their career start into the finance industry is available. Witnessed returns are the annualized weighted average DAX log returns during each professional's career - either equally weighted or using the weighting function $A_{iy}(\lambda) = \sum_{k=1}^{tenure_{iy}-1} w_{iy}(k,\lambda) R_{y-k}$, where λ denotes the relative weight of witnessed returns early in the career versus recently witnessed returns. We display the distribution of witnessed returns for $\lambda = 1.5$, which corresponds to the estimated value by Malmendier and Nagel (2011), $\lambda = 0.5$ and $\lambda = -0.5$, which implies imposing higher weights for early career return as compared to recent returns. Expected returns are annualized log returns winsorized at 1% and 99% levels.

	N	Mean	Std.	10^{th} pct	Median	90^{th} pct
Birth year	321	1965	8.8	1952	1965	1976
Year of career start	326	1989	9.5	1975	1990	1999
Age at career start	321	24.2	4.0	18.0	25.0	29.0
# of survey responses per forecaster	326	64.9	48.9	9.0	53.0	142.0
# of participants per survey-wave	158	135.1	21.0	109.0	133.5	163.0
Tenure	21142	21.5	9.0	10.0	21.0	34.0
Expected return	21142	0.057	0.151	-0.135	0.066	0.228
Witnessed return, equally weighted	21142	0.065	0.036	0.033	0.073	0.091
Witnessed excess return, equally weighted	21142	0.022	0.042	-0.005	0.030	0.051
Witnessed return, $A(\lambda = 1.5)$	21142	0.045	0.059	-0.010	0.057	0.087
Witnessed return, $A(\lambda = 0.5)$	21142	0.056	0.044	0.021	0.066	0.087
Witnessed return, $A(\lambda = -0.5)$	21142	0.073	0.046	0.038	0.084	0.113

Table 3: Impact of witnessed returns on expected returns

This table shows regressions of expected returns on witnessed returns, witnessed excess returns and controls (as indicated). Expected returns are annualized log DAX return expectations elicited on a monthly basis, winsorized at the 1% and the 99% level. Witnessed (excess) returns are average annual log (excess) returns for the period between the individual professional's career start and the day of the submission of the response. All regressions include month-year fixed effects and calendar effects (day-of-week FE). *Panel A* further includes subject-fixed effects. In *Panel B* we replace the subject-fixed effect with the following demographic controls for the purposes of comparison with previous studies: gender, doctorate degree and tenure in the finance industry. We further include the following control variables measured at subject-time level (as indicated): squared tenure to capture possible nonlinear effects and macroeconomic expectations (economic expectations and the assessment of the current economic situation) to capture well-documented determinants of expected returns. Standard errors are double clustered. t statistics are provided in parentheses. Significance levels are indicated as *** (p<0.01), ** (p<0.05), * (p<0.10).

Panel A

	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)
Witnessed return	0.403**	0.416**	0.356**	0.325**				
	(2.413)	(2.334)	(2.181)	(2.231)				
Witnessed excess return					0.355***	0.372***	0.331***	0.314***
					(2.864)	(2.859)	(2.794)	(2.848)
Tenure^2		0.000	0.000	0.000		0.000	0.000	0.000
		(0.159)	(0.196)	(0.076)		(0.275)	(0.337)	(0.231)
Economic expectations			0.052***	0.054***			0.052***	0.054***
			(12.446)	(12.859)			(12.461)	(12.883)
Assessment economic situation				0.016***				0.016***
				(4.931)				(4.952)
Month-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Subject FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Day-of-Week FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj.R^2	0.350	0.350	0.385	0.387	0.350	0.350	0.385	0.388
N	21142	21142	21089	21063	21142	21142	21089	21063

Panel B

	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)
Witnessed return	0.305***	0.336***	0.330***	0.310***				
	(2.825)	(3.005)	(3.396)	(3.159)				
Witnessed excess return					0.275***	0.298***	0.299***	0.285***
					(3.126)	(3.192)	(3.792)	(3.543)
Tenure^2		0.000	0.000	0.000		0.000	0.000	0.000
		(0.302)	(0.252)	(0.189)		(0.279)	(0.253)	(0.201)
Economic expectations			0.071***	0.071***			0.071***	0.071***
			(10.656)	(9.218)			(10.700)	(9.302)
Assessment economic situation				0.014**				0.014**
				(2.536)				(2.545)
Tenure	-0.001	-0.002	-0.002	-0.001	-0.001	-0.001	-0.001	-0.001
	(-1.238)	(-0.710)	(-0.688)	(-0.592)	(-0.969)	(-0.592)	(-0.593)	(-0.520)
Man (D)	-0.044**	-0.044**	-0.034**	-0.034**	-0.044**	-0.045**	-0.034**	-0.034**
	(-2.274)	(-2.283)	(-2.056)	(-2.102)	(-2.273)	(-2.277)	(-2.053)	(-2.102)
PhD (D)	0.026	0.026	0.013	0.012	0.026	0.026	0.013	0.012
	(1.588)	(1.569)	(0.881)	(0.758)	(1.575)	(1.559)	(0.864)	(0.743)
Month-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Subject FE	No	No	No	No	No	No	No	No
Day-of-Week FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.123	0.123	0.204	0.207	0.123	0.123	0.205	0.207
N	21142	21142	21089	21063	21142	21142	21089	21063

Table 4: Importance of data on the actual career start: Truly witnessed returns versus proxies

This table shows regressions of expected returns on witnessed returns as measured by conventional proxies. Expected returns are annualized log DAX return expectations elicited on a monthly basis, winsorized at the 1% and the 99% level. "Proxy for witnessed return" refers to proxies as used in existing studies - average annual log DAX returns experienced from a certain age instead of since the actual career start. In particular, in column (i) we approximate the witnessed returns by the DAX return realized since the individual professional was 18 years old, in column (ii) we take the age of 19 as a starting point etc. Columns (vii) and (ix) display the results for the median career start age of 25 years and the modal career entry age of 26 years. *Panel A* displays the basic model specifications with two-way fixed effects and calendar effects (day-of-week FE). In *Panel B* we extend the model by the following control variables measured at subject-month level: squared tenure and macroeconomic expectations (economic expectations and the assessment of the current economic situation). Standard errors are double clustered. *Panel C* displays the pairwise correlation between the respective proxy for witnessed return and the actual witnessed return (i.e. using the actual timing of the career start). t statistics are provided in parentheses. Significance levels are indicated as *** (p<0.01), ** (p<0.05), * (p<0.10).

Panel A

	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(x)
Age:	18	19	20	21	22	23	24	25	26	27
Proxy for witnessed return	-0.673	-0.672	-0.468	-0.329	-0.219	-0.026	-0.025	0.232	0.221	0.133
	(-0.855)	(-1.128)	(-1.156)	(-1.011)	(-0.958)	(-0.154)	(-0.175)	(1.197)	(1.399)	(1.125)
Month-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Subject FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Day-of-Week FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	No	No	No	No	No	No	No	No	No
Adj.R^2	0.349	0.350	0.351	0.351	0.351	0.350	0.351	0.353	0.352	0.353
N	20717	20824	20834	20907	20987	20959	20908	20941	20865	20767

Panel B

	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(x)
Age:	18	19	20	21	22	23	24	25	26	27
Proxy for witnessed return	-0.744	-0.785	-0.554	-0.464	-0.306	-0.078	-0.058	0.155	0.126	0.050
	(-0.994)	(-1.269)	(-1.264)	(-1.304)	(-1.207)	(-0.447)	(-0.390)	(0.808)	(0.801)	(0.445)
Month-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Subject FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Day-of-Week FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj.R^2	0.387	0.387	0.388	0.388	0.387	0.387	0.387	0.389	0.389	0.390
N	20639	20746	20756	20828	20908	20880	20829	20862	20786	20689

Panel C

	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(x)
Age:	18	19	20	21	22	23	24	25	26	27
ρ	0.34***	0.33***	0.39***	0.37***	0.36***	0.40***	0.44***	0.51***	0.51***	0.57***
N	20717	20812	20822	20858	20887	20859	20808	20735	20657	20559

Table 5: The long-lasting impact of early witnessed returns: linear regressions

This table shows regressions of expected returns on witnessed returns calculated using different starting points. Expected returns are annualized log DAX return expectations elicited on a monthly basis, winsorized at the 1% and the 99% level. Witnessed returns are average annual log DAX returns for the period between a point of time relative to the career start s and the day of the submission of the response. In particular, columns (i)-(iv) exclude the first several years of the career and weight the rest equally, column (v) captures the entire career as in Table 3, column (vi) includes the year of the career start, columns (vii)-(x) include several years leading up to the career start. *Panel A* displays the basic model specifications with two-way fixed effects and calendar effects (day-of-week FE). In *Panel B* we extend the model by the following control variables measured at subject-month level: squared tenure and macroeconomic expectations (economic expectations and the assessment of the current economic situation). Standard errors are double clustered. t statistics are provided in parentheses. Significance levels are indicated as *** (p<0.01), ** (p<0.05), * (p<0.10).

Panel A

	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(x)
Timing of career start	$s+4$	$s+3$	$s+2$	$s+1$	s	$s-1$	$s-2$	$s-3$	$s-4$	$s-5$
Witnessed return	-0.043	-0.022	0.094	0.294**	0.403**	0.495**	0.558	0.344	0.069	0.048
	(-0.939)	(-0.278)	(1.103)	(2.313)	(2.413)	(2.282)	(1.590)	(0.684)	(0.101)	(0.061)
Month-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Subject FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Day-of-Week FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	No	No	No	No	No	No	No	No	No
Adj.R^2	0.351	0.349	0.349	0.350	0.350	0.350	0.349	0.350	0.348	0.347
N	20983	21079	21142	21142	21142	21142	21111	20859	20783	20658

Panel B

	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(x)
Timing of career start	$s+4$	$s+3$	$s+2$	$s+1$	s	$s-1$	$s-2$	$s-3$	$s-4$	$s-5$
Witnessed return	-0.047	-0.035	0.060	0.241**	0.325**	0.388**	0.382	0.066	-0.244	-0.228
	(-1.096)	(-0.465)	(0.809)	(2.078)	(2.231)	(2.064)	(1.288)	(0.156)	(-0.412)	(-0.334)
Month-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Subject FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Day-of-Week FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj.R^2	0.388	0.387	0.387	0.387	0.387	0.387	0.387	0.389	0.388	0.386
N	20906	21001	21063	21063	21063	21063	21032	20782	20706	20584

Table 6: The long-lasting impact of returns witnessed early in the career: non-linear regressions

This table shows regressions of expected returns on witnessed returns weighted by the weighting function proposed by Malmendier and Nagel (2011). Expected returns are annualized log DAX return expectations elicited on a monthly basis, winsorized at the 1% and the 99% level. We estimate the impact of weighted witnessed returns simultaneously with the weighting parameter λ by means of non-linear least squares regressions. The estimates depend on the data frequency we use for the calculation of the weighted witnessed returns. Therefore we vary the data frequency: monthly, semi-annual, and annual. All returns are annualized log returns. *Panel A* displays the basic model specifications with two-way fixed effects and calendar effects (day-of-week FE). In *Panel B* we extend the model by the following control variables measured at subject-month level: squared tenure and macroeconomic expectations. t statistics are provided in parentheses. Significance levels are indicated as *** (p<0.01), ** (p<0.05), * (p<0.10).

Panel A			
	(i)	(ii)	(iii)
Data frequency	monthly	semi-annual	annual
Weighting parameter λ	-0.623***	-0.660***	-0.429*
	(-8.955)	(-4.793)	(-1.896)
Witnessed return, $A(\lambda)$	0.999***	0.785***	0.477***
	(8.710)	(6.650)	(5.604)
Month-Year FE	Yes	Yes	Yes
Subject FE	Yes	Yes	Yes
Day-of-Week FE	Yes	Yes	Yes
Controls	No	No	No
N	21142	21142	21142

Panel B			
	(i)	(ii)	(iii)
Data frequency	monthly	semi-annual	annual
Weighting parameter λ	-0.767***	-0.767***	-0.380
	(-8.429)	(-3.850)	(-1.300)
Witnessed return, $A(\lambda)$	0.988***	0.708***	0.393***
	(7.121)	(5.023)	(4.868)
Month-Year FE	Yes	Yes	Yes
Subject FE	Yes	Yes	Yes
Day-of-Week FE	Yes	Yes	Yes
Controls	Yes	Yes	Yes
N	21063	21063	21063

Table 7: Aggregate witnessed returns and realized returns

This table test the information content of aggregate personal experiences. The future realized returns (dependent variables) are measured as follows: DAX return within the next year, average annual DAX return over the next five years, average annual DAX return over the next 10 years. Witnessed returns are calculated as annualized average DAX returns (equally weighted) and are aggregated over all subjects from the panel of the ZEW Financial Market Survey in the given year. Excluded are years prior to 1980 because for earlier periods fewer than 50 subjects from the panel had already started their finance career. Excluded are subjects above the retirement age of 65. We control for the historical average return (i.e. base rate) which can be calculated at each point of time taking into account all the available historical DAX level information. We report Newey-West standard errors to account for autocorrelation in the error term due to overlapping forecast horizons. t statistics are displayed in parentheses. Significance levels are indicated as *** (p<0.01), ** (p<0.05), * (p<0.10).

Realized average annual return:	(i) $R^{DAX}_{t,t+1}$	(ii) $\bar{R}^{DAX}_{t,t+5}$	(iii) $\bar{R}^{DAX}_{t,t+10}$
Aggregate witnessed returns	-0.926	-0.479	-0.117
	(-0.794)	(-1.642)	(-0.636)
Average past returns (base rate)	-1.466	-1.149*	-0.846**
	(-0.491)	(-1.884)	(-2.570)
N	35	31	26

Appendix

A Robustness checks

Table A.1: Robustness check without subject FE: importance of data on the actual career start

This table shows regressions of expected returns on witnessed returns as measured by conventional proxies. Expected returns are annualized log DAX return expectations elicited on a monthly basis, winsorized at the 1% and the 99% level. "Proxy for witnessed return" refers to proxies as used in existing studies - average annual log DAX returns experienced from a certain age rather than from the actual career start. In particular, in column (i) we approximate the witnessed returns by the DAX return realized since the individual professional was 18 years old, in column (ii) we take the age of 19 as a starting point etc. All model specifications include month-year fixed effects and calendar effects (day-of-week FE). Instead of subject-fixed effects we include demographic controls: gender, doctorate degree and tenure. We include further control variables measured at subject-month level: squared tenure and macroeconomic expectations (economic expectations and the assessment of the current economic situation). Standard errors are double clustered. t statistics are provided in parentheses. Significance levels are indicated as *** (p<0.01), ** (p<0.05), * (p<0.10).

	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(x)
Age:	18	19	20	21	22	23	24	25	26	27
Proxy for witnessed return	-0.115	-0.016	-0.022	0.063	0.064	0.173*	0.082	-0.035	-0.138	-0.119
	(-0.289)	(-0.047)	(-0.089)	(0.265)	(0.378)	(1.748)	(0.802)	(-0.276)	(-1.399)	(-1.492)
Month-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Subject FE	No	No	No	No	No	No	No	No	No	No
Day-of-Week FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Demogr. controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Further controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.204	0.203	0.204	0.204	0.204	0.204	0.204	0.203	0.204	0.205
N	20639	20746	20756	20828	20908	20880	20829	20862	20786	20689

Table A.2: Robustness check without subject FE: the long-lasting impact of early witnessed returns

This table shows regressions of expected returns on witnessed returns calculated using different starting points. Expected returns are annualized log DAX return expectations elicited on a monthly basis, winsorized at the 1% and the 99% level. Witnessed returns are average annual log DAX returns for the period between a point of time relative to the career start s and the day of the submission of the response. In particular, columns (i)-(iv) exclude the first several years of the career and weight the rest equally, column (v) captures the entire career as in Table 3, column (vi) includes the year of the career start, columns (vii)-(x) include several years leading up to the career start. All model specifications include month-year fixed effects and calendar effects (day-of-week FE). Subject-fixed effects are not included, therefore we include the following demographic controls: gender, doctorate degree and tenure in the finance industry. We include further control variables measured at subject-month level: squared tenure and macroeconomic expectations (economic expectations and the assessment of the current economic situation). Standard errors are double clustered. t statistics are provided in parentheses. Significance levels are indicated as *** (p<0.01), ** (p<0.05), * (p<0.10).

	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(x)
Timing of career start	$s+4$	$s+3$	$s+2$	$s+1$	s	$s-1$	$s-2$	$s-3$	$s-4$	$s-5$
Witnessed return	-0.039	-0.014	0.040	0.145**	0.310***	0.447***	0.373**	0.176	-0.264	-0.480
	(-1.001)	(-0.273)	(0.741)	(2.079)	(3.159)	(3.262)	(2.124)	(0.719)	(-0.724)	(-1.258)
Month-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Subject FE	No	No	No	No	No	No	No	No	No	No
Day-of-Week FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Demogr.controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Further controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.204	0.204	0.204	0.205	0.207	0.208	0.206	0.207	0.207	0.209
N	20906	21001	21063	21063	21063	21063	21032	20782	20706	20584

Table A.3: Robustness check without subject FE: non-linear regressions

This table shows regressions of expected returns on witnessed returns weighted by the weighting function proposed by Malmendier and Nagel (2011). Expected returns are annualized log DAX return expectations elicited on a monthly basis, winsorized at the 1% and the 99% level. We estimate the impact of weighted witnessed returns simultaneously with the weighting parameter λ by means of non-linear least squares regressions. The estimates depend on the data frequency we use for the calculation of the weighted witnessed returns. Therefore we vary the data frequency: monthly, semi-annual, and annual. All returns are annualized log returns. All model specifications include month-year fixed effects, calendar effects (day-of-week FE), and control variables. Subject-fixed effects are not included, therefore we include the following demographic controls: gender, doctorate degree and tenure in the finance industry. These control variables comprise: tenure and tenure squared, gender and whether the subject holds a PhD. We include further control variables measured at subject-month level: squared tenure and macroeconomic expectations (economic expectations and the assessment of the current economic situation). t statistics are provided in parentheses. Significance levels are indicated as *** (p<0.01), ** (p<0.05), * (p<0.10).

Data frequency	(i) monthly	(ii) semi-annual	(iii) annual
Weighting parameter λ	-0.443***	-0.350***	-0.753***
	(-7.173)	(-4.234)	(-6.010)
Witnessed return, $A(\lambda)$	0.224***	0.263***	0.187***
	(6.625)	(7.280)	(6.209)
Month-Year FE	Yes	Yes	Yes
Subject FE	No	No	No
Day-of-Week FE	Yes	Yes	Yes
Demogr. controls	Yes	Yes	Yes
Further controls	Yes	Yes	Yes
N	21063	21063	21063

B Non-linear regressions: methodology and interpretation

Concerning our non-linear regressions in Section 4, we closely follow the methodological approach of Malmendier and Nagel (2011). Specifically, we define witnessed returns as weighted average of historical market returns from the career start onwards. The weighting function allows the historical returns in different phases of the career to carry different weights. We can thus establish whether witnessed returns early in the career are particularly formative in their influence on professionals' expected returns or whether professionals may be prone to a recency bias. Malmendier and Nagel (2011) suggest a monotonic weighting function in which a parameter λ specifies whether the weights are declining, increasing, or constant over the professional's career. Negative λ indicates stronger weighting of returns witnessed early on in the career. Positive λ indicates higher weights for recently witnessed returns. The parameter is estimated simultaneously with the effect of witnessed returns on expected returns using non-linear least squared. This way the data reveals the optimal form of the weighting function, such that witnessed returns explain expected returns as well as they can. We calculate for each professional i in every time t the weighted average of witnessed DAX returns:

$$A_{it}(\lambda) = \sum_{k=1}^{tenure_{it}-1} w_{it}(k,\lambda) R_{t-k} \tag{B.1}$$

$$w_{it}(k,\lambda) = \frac{(tenure_{it}-k)^{\lambda}}{\sum_{k=1}^{tenure_{it}-1}(tenure_{it}-k)^{\lambda}} \tag{B.2}$$

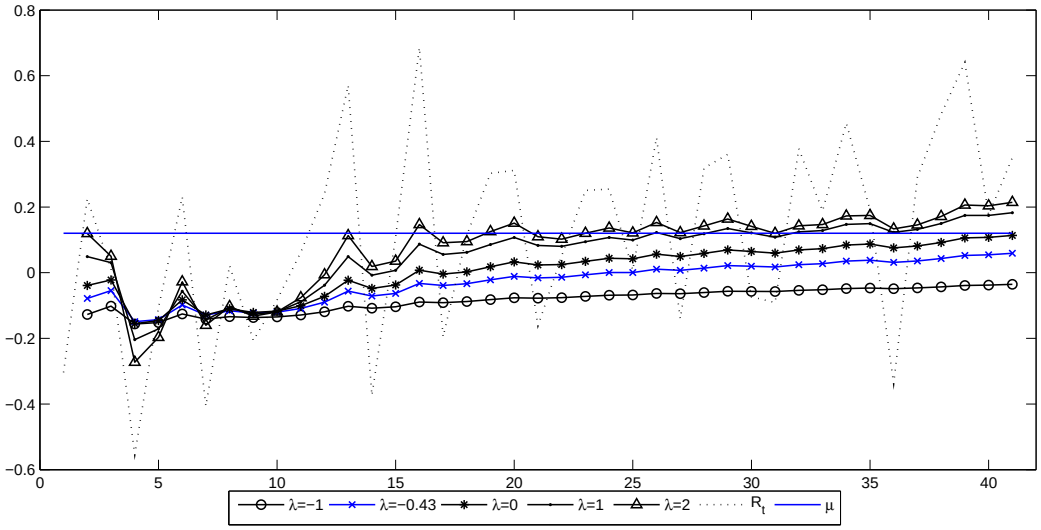
where R_{y-k} measuring the log DAX index return in period $t-k$. Because the estimation results depend on the frequency of the historical returns, we use three different data frequencies to verify the robustness of our results: annually, semi-annually and monthly. Correspondingly, $tenure_{it}$ measures the periods (i.e. years, half years, or months) of the professional's experience. Because the data only contains information on the year of the career start, we assume a career start on January 1st in the year following the self-reported career start year. This way we exclude potential endogeneity, which might arise if stock market returns witnessed shortly before the career start are correlated with unobserved factors, including factors related to the subject's decision to enter the finance industry. We assume that witnessed returns are returns observed over the course of the career and we make use of a unique dataset on the exact year of the career start in the finance industry. This assumption differs from previous studies (see, e.g., Malmendier and Nagel, 2011). We argue that in contrast to economic variables such as inflation and unemployment, subjects rarely discuss or track financial market developments in their childhood. In Section 5 we show that it is plausible to assume that witnessing the stock market begins at the career start.

Figure B.1 illustrates the impact of different values for the weighting parameter λ on the weighting

function specified in equation B.2. The figure displays years since career start (tenure) on the horizontal axis and witnessed returns since career start on the vertical axis. The dotted line represents simulated DAX index returns. Assume five fictitious forecasters, all starting their career at the same point of time ($t = 0$). Assume further that there is a stock market crisis in the first year of the forecasters' career indicated by an annual stock market return below - 30%. For the remainder of their career, the stock market follows the historical distribution of the German stock market index DAX, given by a mean of 12% p.a. and a standard deviation of 28%.

Figure B.1: Impact of the weighting parameter λ on experienced returns

The figure displays the simulated development of witnessed returns over the professionals' career depending on the weighting parameter λ. The stock market development is simulated using the sample mean annual return of the DAX 30 index ($\mu = 12\%$) and its standard deviation (28%). The figure further displays the simulated annual stock market returns as well as the mean (μ) of the underlying distribution. Negative λ coefficients indicate stronger weighting of early career experience. Positive λ coefficients indicate larger weights for recent experience. λ of -0.43 corresponds to the parameter estimate based on annual data frequency in the baseline regression displayed in Table 6.



Two fictitious subjects overweight their early career experience with λ = -1 and λ = -0.43, respectively. The latter corresponds to the parameter estimate from table 6 based on annual data frequency. Another two fictitious subjects overweight the recently experienced stock market development with λ = 1 and λ = 2 respectively. The fifth forecaster weights all experienced returns equally but ignores any data on the stock market development prior to his career start. Individuals who overweight their early career experience do not let go of the memory of a crisis period at the start of their career over the next 40 years. In contrast, individuals with positive weighting parameters λ, are mostly affected by recent returns. There is a notable asymmetry in the magnitude of the effect of positive and negative parameters λ on the weighted witnessed returns. For a crisis of a magnitude of around -30%, an

individual with a slightly negative λ of -0.43 will be overly pessimistic after 40 years and will expect a return which is around 5 percentage points lower than the long-term average of 12%. For an individual with negative λ of 1, the witnessed returns barely fluctuate over the course of the career, so they are thus close to an individual-fixed effect. Thus, in a model specification with individual-fixed effects a strongly negative parameter λ cannot be found. In contrast, the weighted witnessed returns of an individual with a strongly positive parameter λ of 2, largely depend on the tenure, hence strongly positive parameter estimates are possible in a model specification with time-fixed effects.