Waiting for Wealth Accumulation: The Investment Experience in Time

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Abstract

We investigate how the passive equity investment experience unfolds in time. We introduce the concept of a "wealth plateau" which we define as the minimum time interval during which accumulated wealth remains above a pre-set level. We estimate the waiting times needed for diverse plateau objectives to be reached, and analyze the influence of factors like the CAPE ratio, unemployment, inflation, and the yield curve on achieving these objectives. Our results highlight how these variables' effects vary based on plateau goals and investment styles. We also emphasize the trade-offs investors encounter when making intertemporal choices to shorten the time required to achieve their plateau objectives. Our findings provide insights for academics and retail investors, acknowledging the significance of time-based framing on the analytics and practice of goals-based investing.

Keywords: Waiting Times, Wealth Plateau; Passive Investment; Investment Horizon; Intertemporal Choices.
JEL Codes: G1; G11; G17.

Key highlights:

- The paper offers a first-of-its kind practical analysis of the temporal experience of wealth accumulation by estimating waiting times needed to achieve various wealth accumulation objectives
- The length of these waiting periods varies considerably over time and investment styles
- Such variation in waiting times can be partially predicted using economic indicators
- Heuristics based on these insights can shorten the waiting times but come with significant risks

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"*An investor with $10,000 at the start of 1977 (when the first index fund became available) would have a portfolio with $2,143,500 at the start of 2022, assuming all dividends were reinvested. A second investor who instead purchased shares in the average actively managed mutual fund would have seen the investment grow to $1,477,033. The difference is astonishing.*"

Berton G. Malkiel, *A Radom Walk Down Wall Street*, 2022 Edition

1. Introduction

The enduring outperformance of the stock market, as noted by Ellis (2002) and Siegel (2021), is encapsulated in the timeless investment advice of Vanguard's Jack Bogle: "Buy everything and hold it forever" (Bogle, 2001). Bogle's advice emphasizes diversification and has led to a substantial body of literature that focuses on refining stock selection and diversification techniques (Arnott, Hsu, and Moore 2005; Levy and Duchin 2010; Levy and Roll 2010). However, the latter part of Bogle's advice warrants a closer look. While the prolonged success of a diversified market portfolio is well-documented, prospective investors, particularly retail ones, seek more nuanced guidance for realistic and achievable wealth accumulation within finite time frames.

It is worth noting that the investor described by Berton Malkiel at the beginning of this article waited for considerable periods before reaching relatively stable wealth accumulation objectives. For instance, following an initial investment in the S&P 500 in January 1977, this investor waited for forty months, until the end of April 1980, to enter a phase where the investment value stayed for the first time above the breakeven level for a full year. Furthermore, as of September 2023, an investor aspiring to maintain a level of wealth that is at least double the capital investment for a minimum of three years would need to have initiated the investment no later than October 2013. Given that retail investors typically hold exchange-traded funds (ETFs) for less than two years (Barrot et al., 2016; Vlastelica, 2017), there is a compelling need for a more comprehensive empirical analysis of the waiting times required to achieve specific wealth objectives.

While waiting times are acknowledged as crucial factors influencing areas such as healthcare (Riganti et al., 2017), marriage (Gould and Paserman, 2003; Stevenson and Wolfers, 2007), and occupational choices (Carrillo-Tudela & Visschers, 2023) their explicit recognition in the context of portfolio investment choices is comparatively less emphasized. This recognition is highly merited given the recent paradigm shift towards

acknowledging the role of personal horizon-dependent goals. In their seminal paper, Das et al., (2010) refrain from treating mental accounting as a wealth-limiting behavioral bias, and instead examine how mean-variance analysis can be modified to accommodate the needs of investors with various goals across separate investment accounts. More recently, this concept has been further refined through Goal-Based Portfolio Theory (GBPT), an explicit investment approach focused on achieving specific financial goals rather than merely optimizing risk and return. GBPT involves identifying and prioritizing individual goals and then tailoring investment strategies to meet these goals. Each goal is assigned a specific risk tolerance and time horizon, allowing for personalized asset allocation (Brunel, 2015; Parker, 2022).

Considering the acknowledged impact of framing prior performance on investment decisions (Diacon & Hasseldine, 2007; Kumar & Seongyeon, 2008), portraying historical performance in terms of waiting times can directly influence investment decisions. Experimental evidence indicates that in risky environments, decision-makers become significantly more risk-averse when choices are framed in the time domain rather than the returns domain (Leclerc et al., 1995). Given the increasing demand for enhanced transparency in investment communication (FCA, 2017; Hillenbrand et al., 2022), we posit that providing a more detailed account of how the investment experience unfolds over time, and how multiple financial objectives are realized, can guide investors in (a) formulating realistic investing goals, and (b) assessing relevant heuristics that bring them closer to achieving these goals.

This paper seeks to enhance comprehension of the investing experience, centering on a pertinent but often neglected dimension: the time needed to attain a subjective wealth goal after the initial investment. The first section of our paper is predominantly expository, evaluating historical market returns by addressing the question: On average, what is the probability, and how much time elapses after an initial one-dollar investment, before an investor enters a period where their accumulated wealth remains above $1 + x$ dollars for at least y months? For a given combination of x and y, we label the plateau objective as $PO(x, y)$.

We begin by estimating the waiting times required to achieve specific wealth POs through investments in the S&P 500, the most closely monitored index by ETFs (VettaFi, 2023). Our analysis reveals a key insight: even seemingly modest wealth accumulation

targets that are highly likely to be achieved necessitate holding periods considerably longer than the commonly reported average of two years. To illustrate, an investor with a goal of maintaining accumulated wealth consistently higher than 50% of the initial investment over a four-year period (i.e., $PO(0.5, 48)$) – an objective that is achieved 79% of the time – would need to wait approximately six years before achieving this objective. Similarly, an investor targeting a plateau where their wealth remains at least 100% higher than the initial investment for five years (i.e., $PO(1, 60)$) would anticipate waiting around nine years before reaching the initial month of this plateau period. Highlighting the differences in waiting times, our demonstration reveals that the waiting period for moderately sized purchase orders can range from less than a year to over 10 years.

In the second part of our analysis, we use our initial estimations as a baseline for a sensitivity analysis, illustrating how waiting times vary with higher and lower predicted performance. We particularly quantify in the time domain the relatively stronger impact of losses on achieving wealth accumulation objectives. For instance, consider investors aiming to maintain accumulated wealth 50% higher than the initial capital for at least a year (i.e., $PO(0.5, 12)$). A 25bp increase in monthly stock market returns shortens these investor's waiting period by roughly a year and a half, from 67 months to 50 months. Conversely, a 25bp decrease in monthly stock returns extends the waiting period by approximately 29 months. For investors targeting accumulated wealth consistently above 200% of the initial capital for five years (i.e., $PO(2, 60)$), a 25bp decrease in stock returns extends the waiting period by up to 5.5 years, while a 25bp rise in monthly returns shortens this period by 2.8 years.

In the third part of our analysis, we delve into the variation in waiting times for POs. Our findings reveal a distinctive pattern where waiting times show a spike when initial investments are made during periods of robust economic performance and high market valuation. Conversely, waiting times gradually decrease for investments initiated during periods of economic decline. Building on these insights, we employ a series of Cox Proportional Hazard models to estimate the potential contribution of market valuation and macroeconomic factors to the odds of achieving plateau objectives. These models enable us to incorporate both the time required to reach a plateau objective and the likelihood that the plateau might not be reached. The factors considered in our Hazard analysis include those widely examined in the literature, such as Shiller's Cyclically

Adjusted Price-Earnings Ratio (CAPE) (Shiller, 2001), unemployment (Atanasov, 2021), inflation, and the yield curve (Chen, 2009).

Our Hazard-based analysis demonstrates a consistent and economically significant impact of Shiller's CAPE and the unemployment rate on the likelihood of attaining plateau objectives. Specifically, the odds of achieving a plateau objective more quickly significantly rise when the investment is initiated during periods of (a) low market valuation and (b) high unemployment. On average, a one percentage point increase in the unemployment rate at the time of initial investments leads to a substantial up to 30% increase in the rate of accomplishing ambitious plateau objectives. Additionally, a one-unit increase in the CAPE ratio at the time of the investment correlates with a 10% to 20% decrease in the rate of achieving these objectives. For highly ambitious POs, we find the initiating investments during periods of flattening yields significantly reduces the odds of PO achievement. In particular, a one percentage point decrease in the difference between the ten- and two-year bond yields increases the rate of achieving these objectives by 44% and 61%,

Our results underscore the benefits of initiating investments amid economic uncertainty and refraining from investing in periods of strong market performance. They represent the initial attempt to quantify, in terms of waiting times, the advantages of following Warren Buffet's advice of being fearful when others are greedy, and greedy when others are fearful. It is also worth noting that the explanatory power of our models strengthens with more ambitious plateau objectives. For instance, when focusing on doubling the initial capital for at least a year, the explanatory power is approximately 8%, while it increases to 17% when the plateau aims to triple the invested capital for at least 5 years.

We capitalize on insights from our macroeconomic analysis to evaluate how heuristics related to the timing of investments can influence the speed of achieving plateau objectives (POs). We specifically examine how an investor can make intertemporal choices, such as delaying all or part of their initial investment, to reduce the waiting time needed to achieve specific plateau objectives. Ideally, an investor would avoid investing during periods of high market valuation and instead defer investments until valuations are low. However, there is significant uncertainty regarding how long it will take for valuations to become low, which could cause the investor to miss substantial

periods of wealth accumulation. Our results highlight the trade-offs faced by investors when making these intertemporal choices. Simple heuristics, where the investor delays all or part of the investment until periods of low valuation, can significantly shorten the waiting period to achieve the plateau objectives by up to three years. However, these shorter periods come at the expense of a significant reduction in the probability of achieving the objectives by 10% to 30%.

Our paper makes significant dual contributions to both academic literature and investment practices. Our first and most direct contribution is to the emerging field of goals-based investing. Our temporal framework provides investors with a new tool to set realistic investment goals. A key observation made by Parker (2022) is that retail investors often lack a clear understanding of time horizons and their significance for wealth accumulation. A direct recommendation from our research is that advisors should inform their clients about the probabilities and waiting times associated with a large set of objectives, along with sensitivity analyses. This approach ensures that investors have a realistic expectation of how their investment journey will progress over time. Equally important, our temporal framework allows investors and their advisors to evaluate the trade-offs involved in waiting for periods of low market valuation to begin investments. This contribution adds to a small but growing body of literature on the costs and benefits of intertemporal choices in influencing the likelihood of achieving investment objectives (Das et al., 2022).

Our duration analysis also sheds light on the influence of market valuation and macroeconomic factors on shaping investment performance (Atanasov, 2021; Rangvid, 2017; Sakkas & Tessaromatis, 2022). By shifting the focus away from arithmetic returns towards pre-set POs, our approach offers a promising framework for investors and advisors to capitalize on their assessment of the macroeconomic outlook at the time of the investment to provide meaningful insights into the odds of achieving wealth accumulation objectives. We contend that our findings establish a foundation for future, more detailed forecasting of plateau achievement rates, which can be accomplished by considering the market's relative valuation and macroeconomic indicators at the time of the initial investment.

Our paper contributes to a growing effort to explicitly highlight the unique role of time in economic and financial analysis (O'Driscoll & Rizzo, 2002; Peters, 2019;

Spitznagel, 2021). Through the reporting and evaluation of historical performance using explicit time-based measures, our goal is to offer a more realistic and relatable depiction of historical performance. This approach aims to guide retail investors toward investment choices that better align with their risk preferences. The implications of our findings extend directly to the allocation decisions regarding market index stocks and factor investing relative to fixed-income securities in a diversified portfolio.

This paper is structured as follows: Section 2 presents an analysis of waiting times for achieving plateau objectives through investments in the S&P 500. In Section 3, we explore the variation in goal- achievement probabilities and waiting times. We utilize a series of Cox Proportional Hazard models to quantify the effects of macroeconomic conditions and market valuation on the attainment of wealth plateaux. Section 4 evaluates the possibility of intertemporal choices to shorten the waiting times needed to achieve investment objectives. Finally, Section 5 provides concluding remarks.

2. Waiting Times for the Investments in the Market Index

Table 1 presents the probability of a POs being achieved through investments in the S&P 500, spanning from January 1977 to September 2023. The starting date is aligned with the above quote by Malkiel, referring to the first year for which a passive index fund became available. This ensures that our analysis covers a practical assessment of the passive investment experience. Documenting the probabilities of PO achievement is essential because, in the context of Goal-Based Portfolio Theory (GBPT), investors aim to maximize the probabilities of attaining their investment goals (Parker, 2022). Equally important, goals-based portfolio analysis treat the probability of failing to attain the goal, rather than the standard deviation of returns, as the primary measure of risk. The evidence from Table 1 suggests that relatively moderate plateau objectives (POs) have a high probability of being achieved. For instance, an investor aiming to ensure that their capital stays above the break-even level for at least 12 months is likely to achieve this objective 95% of the time. However, the odds decrease for more ambitious POs. By the end of the sample, the objective of tripling the invested capital for at least 60 months is achieved only 44% of the time.

(Insert Table 1 here)

Table 2 presents the average waiting times for various PO combination, conditional on the PO being achieved. A key observation from Table 2 is the notable variability in waiting times across different plateau objectives. In our estimations, for the least ambitious objective, $PO(0,12)$, investors had to wait an average of 12 months before entering the first year without the accumulated wealth falling below the initial investment. When combining the estimated waiting time with the duration of the plateau period, the total time extends to 24 months, already surpassing the average ETF holding period. These average waiting times substantially increase with more ambitious objectives. For instance, for *PO(2,60)*, the average waiting period is 161 months. Investors aspiring for their investment to consistently remain 200% higher than the initial investment for at least five years had to wait, on average, for approximately 13.4 years before reaching the first month of this plateau period.

Expanding on existing evidence that retail investors tend to be hesitant to hold investments for extended periods (Barber & Odean, 2013; Seasholes & Zhu, 2010), our analysis pinpoints a range of realistic wealth accumulation objectives achievable within practical investment horizons. Notably, our work builds upon an earlier contribution by Hickman (2012) which has been unjustly overlooked. Hickman examined waiting times required for an investor to gain higher statistical confidence in breaking even, demonstrating that investing in the S&P 500 at a random point necessitates waiting up to eight years to be 95% confident of breaking even.

(Insert Table 2 here)

Table 3 builds upon the framework introduced in Tables 1 and 2 by conducting a sensitivity analysis to examine the variation in the probabilities of PO achievement. In Panel A of Table 3, we evaluate the impact of a 25 basis points (bp) increase in each monthly return on the odds of achieving POs. The effects of this change are more pronounced for the most ambitious POs. For instance, for *PO(2,60)* a 25bp monthly increase in returns increases the probability of PO achievement from 44% to 64%. In Panel B, we evaluate the effects of 25bp monthly decrease in the returns of the S&P 500, and show that the probability of achieving *PO(2,60)* decreases to 30%.

(Insert Table 3 here)

In Table 4, we extend the analysis to the realm of waiting times conditional on the PO being achieved. In Panel A, as anticipated, higher average returns result in a noticeable reduction in waiting times. For example, for the least ambitious wealth objective, $PO(0,12)$, the average waiting period decreases by 25%, moving from 12 to 8 months. Similarly, for the most ambitious wealth objective in our sample, $PO(2,60)$, the average waiting period decreases by approximately two and a half years, dropping from 161 months to 127. In Panel B, we examine the effects of a 25 basis points (bp) monthly decrease in market returns and underscore the consequential impact of these decreases on waiting times. Notably, for $PO(0,12)$, the waiting period increases by 50% to 18 months. For the most ambitious wealth objective, $PO(2,60)$, this period increases by roughly 5.5 years. The rise in waiting periods is also pronounced for moderate wealth objectives. For example, the average waiting period for $PO(1,36)$ increases to 135 months from 111 months in response to a 25bp decrease in monthly returns.

(Insert Table 4 here)

Tables 1 to 4 provide an initial evaluation of waiting times from the viewpoint of an investor who has achieved their wealth accumulation objective. It's essential to recognize that waiting times for each plateau objective may vary significantly across different investment periods. Moreover, the likelihood of achieving the plateau objective is diverse across multiple periods and market conditions. Table 5 introduces the standard deviations in waiting times for different plateau objectives. The dispersion in these waiting times begins with a two-year span for $PO(0,12)$ and gradually increases, reaching levels within the 50- to 60-month intervals for more ambitious plateau objectives.

(Insert Table 5 here)

Figures 1 and 2 visually depict how waiting times vary for $PO(0,12)$ and $PO(1,24)$, respectively. Both figures reveal a consistent pattern where waiting times experience spikes when investments are initiated in periods of high stock market valuation, followed by a gradual decline in the aftermath of market corrections. Notably, for both plateau objectives, the spikes are more pronounced during investments initiated in the dot-com bubble period when waiting times spiked from less than a year to more than 100 months for *PO(0,12)*. The observed pattern of frequent spikes followed by gradual declines in waiting times is more prominent for the less ambitious $PO(0,12)$ compared to $PO(1,24)$.

In the case of the latter objective, waiting times begin to increase for investments in the early stages of the dot-com bubble, and the subsequent decline after this bubble is notably slower. These patterns underscore the significance of examining the effects of stock market valuation and the macroeconomic outlook at the time of the initial investment on the waiting times for plateau objectives.

(Insert Figures 1 and 2 here)

Table 6, reflecting data as of September 2023, presents the latest initial investment date that enabled investors to achieve the POs by the end of our sample period. Notably, while the latest initial investment to achieve $PO(0,12)$ is in April 2021, achieving $PO(2,60)$ required an initial investment made in May 2009, approximately 14 years before the end of the sample period. Equally significant is the observation that the achievement of plateau objectives is not continuous over time.

(Insert Table 6 here)

Figure 3 accentuates this discontinuity in the case of *PO(2,60)*. While it is anticipated that achieving such an ambitious objective is less likely for investments initiated toward the end of the sample period, Figure 3 reveals an interesting nuance. An investor entering the market in 2004, for instance, managed to reach the plateau objective before 2023, in contrast to an investor who entered the market in 2000 or 2001. In summary, our emphasis on both (a) the variation in waiting times for investors who achieved the plateau objectives, and (b) the likelihood of achieving these objectives, underscores the importance of adopting a comprehensive framework that incorporates these factors into our analysis. This approach also highlights the influential role of key macroeconomic indicators in driving these effects. This challenge is tackled in the next section.

(Insert Figure 3 here)

3. Market Valuation, Macroeconomic Conditions, and PO Achievement

In this section, we apply the Cox Proportional Hazard model as a framework that integrates both waiting times and achievement of wealth objectives. Introduced in a seminal paper by Cox (1972) – and popularized Cox and Oakes (1984), Therneau and Grambsch, 2000) and others – the Cox proportional-Hazards regression model is perhaps

the most extensively used method of survival analysis focusing on the distribution of survival times and modelling the time it takes for events to occur. Rooted in epidemiology and biostatistics, its scope extends across diverse disciplines such as event-history analysis in sociology, duration models in political science and economics, and reliability analysis and failure-time models in Engineering. In finance research, the Cox Proportional Hazards Model has been used to investigate bank (Lane et al., 1986) and small-and-medium (SME) enterprises failures (Gupta et al., 2018), post-IPO survival (Derouiche et al., 2018), among others.

We re-contextualize the standard description of the Cox Proportional Hazard model to fit our analysis of waiting times and wealth objectives. Suppose T is a non-negative random variable that refers to the time to reach a specified PO, and t represents any specific value of interest for the random variable T. We present the probability of the wealth plateau *not* being reached beyond some time t as:

$$S(t) = 1 - F(t) = \Pr(T > t) \tag{1}$$

The Hazard rate, in the context of our analysis, is defined as the limiting probability of the PO being reached within a given time interval (assuming that the PO has not already been reached) divided by the width of the shrinking time interval. Formally, the Hazard rate is presented as:

$$h(t) = \lim_{\Delta t \to 0} \frac{Pr(t + \Delta t > T > t | T > t)}{\Delta t} = \frac{-dlnS(t)}{dt} \tag{2}$$

Empirically, the Cox model posits that the Hazard function, representing the likelihood of reaching the wealth plateau at month t for an investment initiated in month m, is the result of multiplying a baseline Hazard function (applicable to all investments) by an investment-specific vector of covariates observed by the investor in month m, when the investment was initiated, based on data for month $m - 1$. This vector is linked to the Hazard rate as follows:

$$h_d(t) = h_0(t).\exp(x'_{d-1}\beta) \tag{3}$$

Unlike traditional survival analysis that typically necessitates a linear-like model for the log Hazard, the semi-parametric Cox proportional-Hazards model keeps the baseline Hazard function unspecified This characteristic allows for greater flexibility in application. The coefficients for Equation (3) are determined through the partial likelihood method, a technique specific to survival analysis. Unlike traditional likelihood

methods, the partial likelihood considers only the investments that reach the plateau, focusing on the order of events rather than the baseline Hazard. In this context, the Hazard ratio for a specific covariate i in the x_{d-1} vector is represented by the exponential of its corresponding coefficient $\beta_{D,i}$.

$$HR_{x_{d-1},i} = \exp\left(\beta_{x_{d-1,i}}\right) \quad (4)$$

To adjust our dataset, for every initial investment date, we assign the corresponding waiting time if the objective is reached. If the objective is not reached by the end of our sample in September 2023, we assign the difference between September 2023 and the date of the initial investment. Table 7 presents the results of Cox Proportional Hazard models, evaluating how market valuation and macroeconomic conditions before the initial investment influence the likelihood of achieving POs with $y = 1$ (Panel A) and $y = 2$ (Panel B). The estimates apply to a subsample with the most recent initial investment date being September 2013. Notably, the effects illustrated in Table 5 remain consistent even if the latest initial investment date is shifted forward or backward by two years.

Our focus is on macro factors previously examined in research and easily recognizable from the perspective of a retail investor. To gauge the relative market valuation, we utilize Robert Shiller's CAPE ratio (Shiller, 2001; Shiller & Campbell, 1988). This metric has stood the test of time and is extensively discussed by both academics and practitioners (Philips & Ural, 2016; Siegel, 2016).

In terms of proxies for the macroeconomic environment, we incorporate controls for unemployment, inflation rate compared to the same month in the prior year, and the yield curve preceding the initial investment month (Chen, 2009). Both the unemployment rate and the Consumer Price Index level are compiled by the U.S. Bureau of Labor Statistics, while the yields are retrieved from the Board of Governors of the Federal Reserve System. As a proxy for the slope of the yield, curve, we estimate the difference between the yield on the 10-year zero-coupon bond and the yield on the two-year equivalent. All variables are made available on the Federal Reserve Bank of St Louis (FRED) database.

The results from Table 7 suggest that, among the independent variables, the unemployment rate and CAPE consistently exhibit significant effects on the attainment of

POs. Depending on the specific POs, there is a noteworthy increase in the PO achievement rate, ranging from 4% for $PO(2,60)$ to 38% for $PO(1,12)$, for every one percentage point increase in the unemployment rate at the time of the initial investment. In contrast, there is a decrease in the rate of achieving the objective, ranging from 10% for $PO(1,12)$ to 20% for $PO(2,60)$, for every one-unit increase in CAPE at the time of the initial investment.

The impact of the yield curve on plateau objective achievement is relatively less consistent. For moderately ambitious objectives, a steepening yield curve predicts a higher likelihood of reaching the goal. Specifically, a one percentage point increase in the 10-year yield relative to the two-year yield at the time of the initial investment increases the rate of plateau objective achievement by roughly 26% for $PO(1,36)$. However, more ambitious wealth objectives such as $PO(2,48)$ and $PO(2,60)$ are more likely to be achieved when investments are initiated during periods of flattening yield curves. In this context, a one percentage point decrease in the difference between the ten- and two-year bond yields increases the rate of achieving these objectives by 44% and 61%, respectively. Given that the periods of flattening yield curve usually reflect concerns about the macroeconomic outlook (Chauvet & Potter, 2005; Estrella, 2005; Estrella et al., 2003), our findings reaffirm the view that the speedier achievement of ambitious wealth objectives requires initiating investments in periods of general market uncertainty.

(Insert Table 7 here)

In further analysis in the appendix, we extend our examination of waiting times to investment strategies centered on book-to-market valuation, prior performance, and size. Quantifying the reduction in waiting periods for various plateau objectives compared to the S&P 500, we demonstrate that these strategies abbreviate the waiting periods for ambitious goals by two to five years. Value investing emerges as the most effective among the strategies, notably shortening waiting periods relative to S&P 500 investments.

Our Hazard models, incorporating macroeconomic factors, reveal that the odds of achieving POs are notably shorter when investments are initiated in unfavorable economic environments. For instance, we demonstrate that the realization of POs through investments in value, small, strong-performing firms becomes more probable when the investment initiation occurs during periods characterized by flattening yield

curves, which are indicative of concerns about the future economic outlook (Chauvet & Potter, 2005; Estrella, 2005).

4. Intertemporal Choices, Risks, and Trade-Offs

A direct implication of our hazard-based analysis is that, to shorten the time needed to achieve wealth-building objectives, investors are better off investing during periods of low equity valuation and generally poor economic performance. Accordingly, an investor who has accumulated savings during periods of high market valuation might benefit from delaying most or part of their investments until the market enters a period of low valuation. However, such intertemporal decisions do not come without trade-offs. Given the uncertainty in the time required for the market to transition to a low valuation period, an investor delaying their investment might miss substantial periods of wealth accumulation, thereby reducing the odds of achieving their wealth objective.

In this section, we present two simple heuristics that illustrate the trade-offs governing the intertemporal choices made by an investor aiming to time her initial investments in the S&P 500 during periods of low market valuation, as indicated by a low Shiller CAPE ratio. The first heuristic involves the investor deferring all her investment by avoiding periods of high market valuation and waiting until the market reaches a period of low valuation. Specifically, we highlight the scenario where the investor refrains from investing if the CAPE ratio exceeds its 5-year 75th percentile in at least three out of the last six months and only invests when the CAPE ratio falls below its 5-year median level.

The evidence in Table 8 strongly supports the existence of a trade-off between the speed of achieving the POs and the probabilities of achieving them. For instance, while our heuristic fails to shorten the waiting times for short-term objectives, it is largely successful in shortening the waiting periods for ambitious long-term objectives like *PO(1.5, 36)* by 20 months (from 137 to 117) and *PO(2, 60)* by more than 30 months (from 161 to 131), even after accounting for the waiting time needed for the market to reach a low valuation period. These shortened conditional waiting times come at the expense of a higher risk of not achieving the investment objective. In the case of *PO(1.5, 36)*, the probability of achieving the objective decreases from 70% to 38%. This trade-off

becomes relatively less pronounced for *PO(2, 60)* where it decreases from 45% to 34%m making it relatively more appealing to risk-averse investors.

(Insert Table 8 here)

Further analysis suggests that the approach of fully deferring investment until the market enters a low valuation regime is more advantageous to the approach of partially deferring investments. In Table 9, we present the outcome of a different heuristic which consists of investing only 50% of the capital and delaying the investment of the remaining 50% when the CAPE level exceeds the 75th percentile of the past five years for at least three of the last six months. The delayed investment is then made once the CAPE level falls below its 5-year median level. Compared to the outcomes depicted in Tables 1 and 2, the evidence from Table 9 suggests that the partial deferral approach fails to significantly shorten the waiting times for reaching PO objectives, while it significantly lowers the probabilities of achieving these objectives.

(Insert Table 9 here)

Overall, our analysis suggests that the goal achievement period can be significantly shortened by intertemporal choices, especially when investors fully defer their investments until the market enters a low valuation period. Such shortening, however, comes at the expense of a higher risk of failing to achieve the investment objective. Our temporal framework allows investors and their clients to jointly assess these trade-offs and to identify the POs that are most likely to offer the best balance between waiting time and probability of success.

5. Conclusion and Recommendations

Expanding on the temporal aspect of investment performance, we conducted an in-depth examination of the time required to achieve stable wealth accumulation goals. Augmenting initial findings, a sensitivity analysis quantified the impact of fluctuating stock returns on these timeframes. Recognizing variations in waiting times, we employed Cox Proportional Hazard models, revealing that investing during periods of low market valuations and high unemployment accelerates wealth accumulation. Our Hazard analysis underscored the significant influence of market valuation and macroeconomic indicators at the investment's onset on ambitious wealth accumulation objectives. We also highlighted the trade-offs investors face when trying to avoid initiating investments

during periods of high market valuation. Specifically, we show that while delaying investments until market valuations are low can shorten the time needed to reach investment goals, such delays can significantly reduce the probability of reaching these goals in the first place.

As discussed in Section 1, our temporal framework is best applied in a holistic manner, where advisors share with clients the probabilities and waiting times associated with various wealth plateaux to eventually settle on realistic wealth objectives. Additionally, our framework offers an intuitive approach for conducting relevant sensitivity analyses and assessing the trade-offs involved when attempting to time the initial investment.

Table 1: The probability of achieving POs through passive investment in the S&P 500

% ***of Wealth Gain*** $(x)\downarrow$	***Minimum # of Months*** $(y)\downarrow$				
	12	**24**	**36**	**48**	**60**
0.00	94.83	94.30	93.58	88.06	87.52
0.25	93.40	91.98	89.30	84.67	82.53
0.50	89.84	87.17	85.92	78.97	78.79
0.75	86.45	84.67	81.11	77.18	75.58
1.00	83.96	79.68	78.79	68.09	65.24
1.25	79.68	78.25	77.18	59.00	56.86
1.50	78.25	76.47	70.41	51.34	50.45
1.75	77.18	70.05	62.92	48.84	47.59
2.00	71.84	62.92	56.68	45.81	44.92

Note: For various plateaux objectives (PO) defined by the x and y levels, this table presents the probability of PO achievement through passive investments in the S&P 500. Each entry represents the percentage of months, from January 1977 to September 2023, during which an initial $1 investment in the S&P 500 resulted in accumulated wealth exceeding $1 + x for at least y months before the end of the sample.

Table 2: The estimated waiting times for achieving POs through passive investment in the S&P 500

$\boldsymbol{Wealth\ Gain\ (x)} \downarrow$	$\boldsymbol{Minimum\ \#\ of\ Months\ (y)} \downarrow$				
	12	**24**	**36**	**48**	**60**
0.00	11.93	17.49	20.71	24.63	28.17
0.25	40.87	47.13	50.49	53.21	55.37
0.50	67.42	71.99	74.08	75.87	77.57
0.75	86.98	90.60	93.63	95.67	95.80
1.00	102.86	109.38	111.49	104.80	105.99
1.25	119.14	122.98	125.54	114.00	118.45
1.50	132.48	135.10	137.53	129.32	133.40
1.75	141.77	141.22	150.50	144.03	147.31
2.00	148.87	154.88	160.24	154.02	160.67

Note: For various plateaux objectives (PO) defined by the x and y levels, this table presents the average waiting times for passive investments in the S&P 500, conditional on the PO being achieved. Each entry represents the average number of months required, after an initial $1 investment, for the accumulated wealth to exceed 1+x dollars for at least y months.

Table 3: Sensitivity analysis of the probability of PO achievement through the S&P 500

Panel A: Probability of PO achievement in response to increase in monthly returns by 0.25 bp					
$\boldsymbol{Wealth\ Gain\ (x)\downarrow}$	$\boldsymbol{Minimum\ \#\ of\ Months\ (y)\downarrow}$				
	12	**24**	**36**	**48**	**60**
0.00	94.29	93.39	88.75	87.32	86.96
0.25	93.04	91.79	85.18	84.82	84.82
0.50	90.89	88.21	81.43	80.18	79.82
0.75	86.96	85.89	78.75	78.21	78.04
1.00	85.36	84.29	77.32	76.79	76.79
1.25	83.93	80.89	76.43	75.54	75.54
1.50	80.89	78.93	74.46	72.32	71.61
1.75	79.29	78.04	70.89	68.57	67.86
2.00	78.21	77.14	67.32	65.71	64.46
Panel B: Probability of PO achievement in response to a decrease in monthly returns by 0.25 bp					
$\boldsymbol{Wealth\ Gain\ (x)\downarrow}$	$\boldsymbol{Minimum\ \#\ of\ Months\ (y)\downarrow}$				
	12	**24**	**36**	**48**	**60**
0.00	94.82	93.93	93.57	86.25	86.25
0.25	93.04	88.21	87.68	71.43	71.43
0.50	87.50	76.43	75.71	56.61	56.61
0.75	76.43	66.79	64.46	48.04	48.04
1.00	68.39	54.46	52.68	42.86	42.86
1.25	57.32	49.11	47.14	40.54	40.54
1.50	51.07	44.11	43.39	39.29	39.29
1.75	46.07	41.79	41.07	33.93	33.93
2.00	43.39	40.00	39.82	30.36	30.36

Note: This table reports the outcome of a sensitivity analysis carried on the S&P 500 to assess the probabilities of meeting various POs. In Panel A, for various plateaux objectives (PO) defined by the x and y levels, this table presents the probability of PO achievement through passive investments in the S&P 500 after increasing each monthly return by 25 bp. Each entry represents the percentage of months, from January 1977 to September 2023, during which an initial $1 investment in the S&P 500 resulted in accumulated wealth exceeding $1 + x for at least y months before the end of the sample. In Panel B, we report the equivalent effects of a monthly decrease in the S&P 500 returns by 25 bp.

Table 4: Sensitivity analysis of the waiting times for PO achievement through the S&P 500

Panel A: Waiting times effects of an increase in monthly returns by 0.25 bp					
$\boldsymbol{Wealth\ Gain\ (x)\downarrow}$	$\boldsymbol{Minimum\ \#\ of\ Months\ (y)\downarrow}$				
	12	**24**	**36**	**48**	**60**
0.00	8.25	9.81	12.72	16.60	19.59
0.25	29.10	33.50	37.30	39.67	41.34
0.50	50.15	53.24	55.81	58.42	58.95
0.75	66.14	68.34	70.35	72.33	73.43
1.00	79.25	80.52	82.80	84.56	85.69
1.25	89.51	91.81	93.89	95.83	96.82
1.50	100.91	102.84	104.91	107.07	109.11
1.75	110.02	111.56	113.28	116.94	117.61
2.00	117.78	119.63	123.39	125.34	126.83
Panel B: Waiting times effects of a decrease in monthly returns by 0.25 bp					
$\boldsymbol{Wealth\ Gain\ (x)\downarrow}$	$\boldsymbol{Minimum\ \#\ of\ Months\ (y)\downarrow}$				
	12	**24**	**36**	**48**	**60**
0.00	18.71	28.46	35.09	39.39	41.62
0.25	62.42	70.73	76.54	65.76	66.71
0.50	96.38	96.10	102.00	79.64	81.97
0.75	110.50	108.40	112.33	93.60	106.62
1.00	126.84	116.81	135.05	133.78	143.79
1.25	129.52	129.71	167.70	168.99	177.10
1.50	149.13	164.25	191.49	194.78	199.80
1.75	177.27	191.92	215.73	210.71	221.40
2.00	207.69	215.33	242.77	223.89	226.04

Note: This table reports the outcome of a sensitivity analysis carried on the S&P 500 to assess average waiting times for passive investments in the S&P 500, conditional on the PO being achieved. Panel A reports the average waiting times after increasing each monthly return by 25 basis points. Panel B reports the equivalent effects after decreasing each monthly return by 25 basis points.

Table 5: The waiting times dispersions for the S&P 500 plateau objectives

$\boldsymbol{Wealth\ Gain\ (x)\downarrow}$	$\boldsymbol{Minimum\ \#\ of\ Months\ (y)\downarrow}$				
	12	**24**	**36**	**48**	**60**
0.00	23.92	33.38	36.25	40.44	42.97
0.25	39.06	42.36	43.96	46.15	46.82
0.50	45.98	47.49	47.73	50.03	49.97
0.75	49.24	50.58	50.60	52.53	51.68
1.00	53.55	55.69	55.22	50.89	48.84
1.25	56.47	57.44	56.58	48.67	47.07
1.50	56.90	58.08	52.16	47.46	47.58
1.75	57.38	56.20	51.67	49.85	48.69
2.00	55.48	54.67	52.58	50.31	50.30

Note: For various plateaux defined by the x and y levels, this table presents the standard deviation of average waiting times for passive investments in the S&P 500. Each entry represents the standard deviation in the number of months required, after an initial $1 investment, for the accumulated wealth to exceed 1+x dollars for at least y months. Our investment period starts in January 1977.

Table 6: Last entry months before reaching plateaux objectives

$\boldsymbol{Wealth\ Gain\ (x)} \downarrow$	$\boldsymbol{Minimum\ \#\ of\ Months\ (y)} \downarrow$				
	12	**24**	**36**	**48**	**60**
0.00	2021.04	2021.01	2020.09	2019.02	2017.11
0.25	2020.08	2020.06	2020.04	2016.07	2016.04
0.50	2020.05	2017.09	2017.02	2013.11	2013.10
0.75	2017.05	2016.07	2016.03	2013.03	2013.01
1.00	2016.06	2014.03	2013.10	2012.07	2012.01
1.25	2014.03	2013.07	2013.03	2011.10	2010.10
1.50	2013.07	2013.02	2012.08	2009.10	2009.09
1.75	2013.03	2012.07	2011.12	2009.08	2009.07
2.00	2012.08	2011.12	2010.10	2009.05	2009.05

Note: For each plateau defined by the x and y levels, this table presents the last initial investment month, as of September 2023, for which this wealth plateau is reached.

Table 7: Macroeconomic conditions, market valuation, and the achievement of wealth plateaux objectives through the S&P 500

Panel A: COX Proportional Hazard Model estimates for $y = 1$										
PO	**(1, 12)**	**HR**	**(1, 24)**	**HR**	**(1, 36)**	**HR**	**(1, 48)**	**HR**	**(1, 60)**	**HR**
$Unemployment_{m-1}$	0.322***	1.38	0.278***	1.32	0.304***	1.36	0.288***	1.33	0.269***	1.31
	(0.045)		(0.045)		(0.046)		(0.046)		(0.046)	
$CAPE_{m-1}$	-0.089***	0.92	-0.105***	0.90	-0.110***	0.89	-0.085***	0.92	-0.095***	0.91
	(0.010)		(0.011)		(0.011)		(0.010)		(0.011)	
$Inflation_{m-1}$	-0.026	0.97	-0.020	0.98	-0.014	0.99	0.022	1.02	0.018	1.02
	(0.024)		(0.024)		(0.024)		(0.024)		(0.025)	
$YieldCurve_{m-1}$	0.106	1.11	0.211***	1.23	0.234***	1.26	0.208***	1.23	0.149*	1.16
	(0.077)		(0.079)		(0.079)		(0.084)		(0.088)	
N	440		440		440		440		440	
Pseudo R^2	0.074		0.084		0.093		0.076		0.080	
Panel B: COX Proportional Hazard Model estimates for $y = 2$										
PO	**(2, 12)**	**HR**	**(2, 24)**	**HR**	**(2, 36)**	**HR**	**(2, 48)**	**HR**	**(2, 60)**	**HR**
$Unemployment_{m-1}$	0.181***	1.19	0.111**	1.10	0.117**	1.12	0.044	1.04	0.223***	1.25
	(0.047)		(0.053)		(0.058)		(0.064)		(0.066)	
$CAPE_{m-1}$	-0.112***	0.89	-0.144***	0.87	-0.171***	0.84	-0.233***	0.79	-0.190***	0.83
	(0.012)		(0.013)		(0.014)		(0.019)		(0.018)	
$Inflation_{m-1}$	-0.010	0.99	-0.056**	0.95	-0.063**	0.94	-0.088***	0.92	-0.004	0.99
	(0.024)		(0.026)		(0.028)		(0.030)		(0.029)	
$YieldCurve_{m-1}$	0.333***	1.40	0.142	1.15	-0.274***	0.76	-0.945***	0.39	-0.572***	0.56
	(0.083)		(0.092)		(0.095)		(0.120)		(0.108)	
N	440		440		440		440		440	
Pseudo R^2	0.083		0.094		0.114		0.166		0.165	

Note: This table presents a set of Cox Proportional Hazard models assessing the effects of macroeconomic conditions and market valuation at the time of the initial investment in the S&P 500 on the achievement of wealth plateaux. In Panel A, we report the Cox Proportional Hazard models for all wealth objectives with $y = 1$. In Panel B, we report equivalent models for all wealth objectives with $y = 2$. Next to each variable in each model, we report the Hazard ratios corresponding to a 1 unit increase in this variable. ***, **, and * represent significance at 1%, 5%, and 10% level, respectively.

Table 8: The effects of full deferral of investments on PO achievement

Panel A: Effects on the probability of PO achievement					
$\boldsymbol{Wealth\ Gain\ (x)} \downarrow$	$\boldsymbol{Minimum\ \#\ of\ Months\ (y)} \downarrow$				
	12	**24**	**36**	**48**	**60**
0.00	95.26	95.26	79.60	79.60	79.60
0.25	94.54	93.08	79.42	79.42	78.87
0.50	91.80	79.60	78.51	78.51	78.51
0.75	79.60	79.42	78.32	78.14	77.60
1.00	79.42	78.51	71.58	51.55	50.46
1.25	78.51	78.51	44.81	43.72	42.99
1.50	78.51	78.14	38.25	37.70	37.52
1.75	78.32	73.04	36.25	36.25	35.88
2.00	74.50	48.63	34.43	34.06	33.70
Panel B: Effects on the waiting times for PO achievement					
$\boldsymbol{Wealth\ Gain\ (x)} \downarrow$	$\boldsymbol{Minimum\ \#\ of\ Months\ (y)} \downarrow$				
	12	**24**	**36**	**48**	**60**
0.00	43.64	58.67	64.75	67.69	69.65
0.25	77.08	81.59	87.97	88.93	90.17
0.50	105.76	115.29	116.36	116.36	116.36
0.75	127.67	128.42	129.39	129.52	129.65
1.00	139.74	145.23	146.18	100.28	101.34
1.25	157.39	158.87	109.10	109.64	110.69
1.50	165.95	167.48	116.77	118.75	119.10
1.75	172.12	176.22	124.15	124.75	125.19
2.00	180.33	142.67	129.47	129.94	131.51

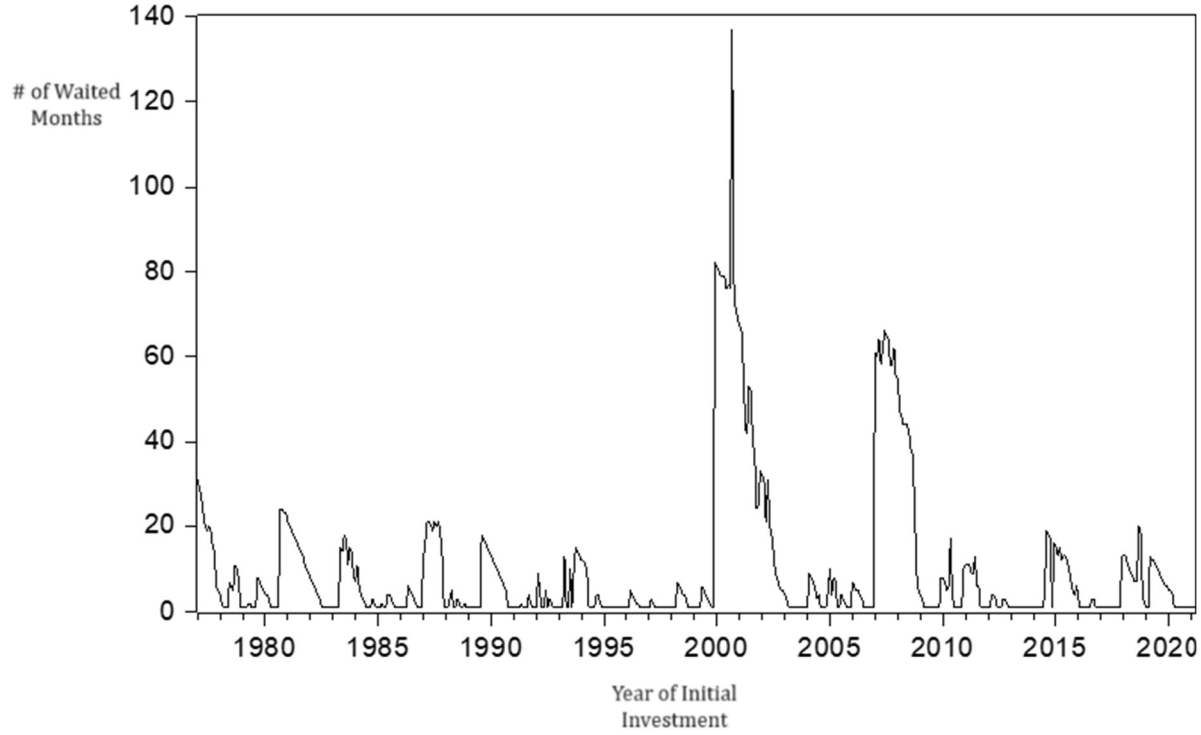
Note: This table presents the effect of a heuristic of full investment delay on the probability and waiting times associated with POs. This heuristic consists of the investor fully delaying investment when the CAPE level exceeds the 5-year 75th percentile for at least three of the last six months, until the CAPE level falls below its 5-year median level. In Panel A, we present the probability of achieving each PO. In Panel B, we report the waiting times, conditional on PO achievement. These waiting times also include the period of investor deferral until the CAPE level falls below the median.

Table 9: The effects of partial deferral of investments on PO achievement

Panel A: Effects on the probability of PO achievement					
$\boldsymbol{Wealth\ Gain\ (x)} \downarrow$	$\boldsymbol{Minimum\ \#\ of\ Months\ (y)} \downarrow$				
	12	**24**	**36**	**48**	**60**
0.00	95.44	95.44	79.74	79.74	79.74
0.25	94.71	93.25	79.56	79.56	79.01
0.50	91.97	87.23	78.65	78.65	78.65
0.75	86.31	80.84	78.47	77.92	76.82
1.00	80.66	78.65	69.34	67.15	65.69
1.25	78.65	78.65	58.21	57.12	55.84
1.50	78.65	77.92	49.82	49.09	48.91
1.75	78.47	71.53	46.90	46.72	45.99
2.00	74.45	63.32	43.98	43.25	42.15
Panel B: Effects on the waiting times for PO achievement					
$\boldsymbol{Wealth\ Gain\ (x)} \downarrow$	$\boldsymbol{Minimum\ \#\ of\ Months\ (y)} \downarrow$				
	12	**24**	**36**	**48**	**60**
0.00	31.02	37.07	39.87	44.09	47.40
0.25	56.56	62.46	66.48	68.55	71.83
0.50	80.33	87.80	91.33	94.30	94.63
0.75	104.91	109.70	111.76	113.85	116.30
1.00	123.34	129.90	127.62	127.06	127.73
1.25	141.75	145.41	136.11	137.04	137.16
1.50	153.66	155.42	143.55	144.94	145.30
1.75	161.10	162.84	151.20	151.24	150.90
2.00	170.64	171.11	158.05	157.70	162.91

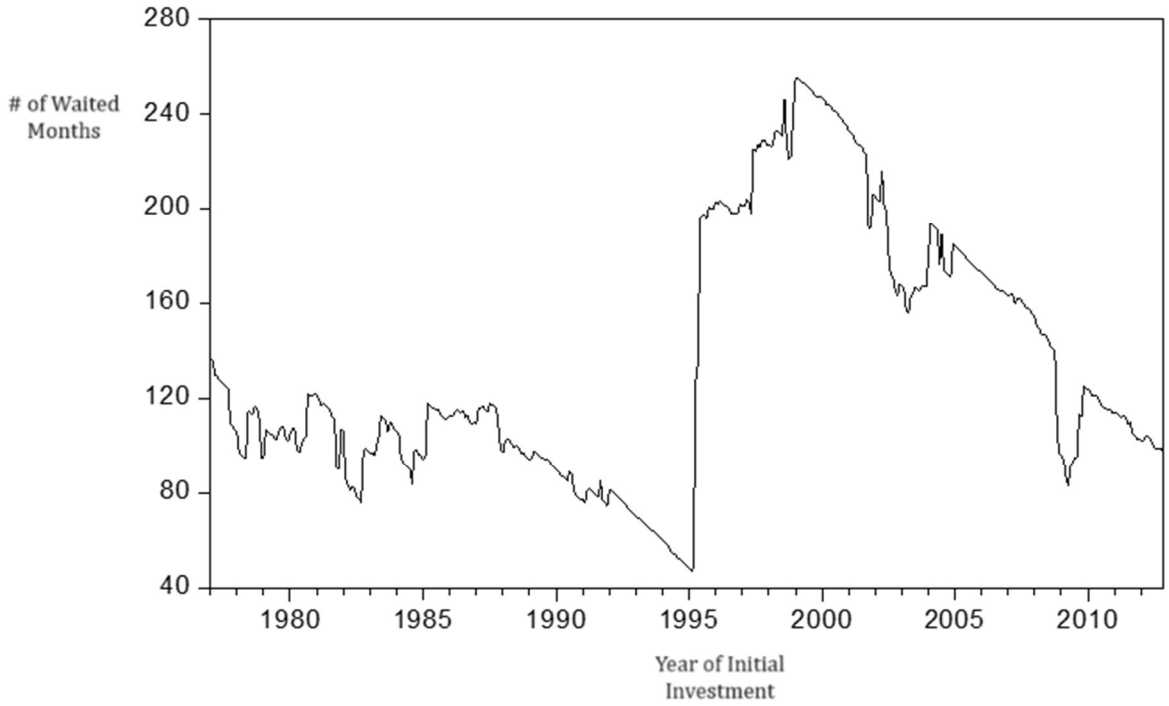
Note: This table presents the effect of a heuristic involving a partial investment delay on the probability and waiting times associated with POs. This heuristic consists of the investor initially investing only 50% of their capital and delaying the investment of the remaining 50% when the CAPE level exceeds the 75th percentile of the past five years for at least three of the last six months. The delayed investment is then made once the CAPE level falls below its 5-year median level. In Panel A, we present the probability of achieving each PO. In Panel B, we report the waiting times, conditional on PO achievement. These waiting times also include the period of investor deferral until the CAPE level falls below the median.

Figure 1: Waiting times for *PO(0,12)* through investing in the S&P 500



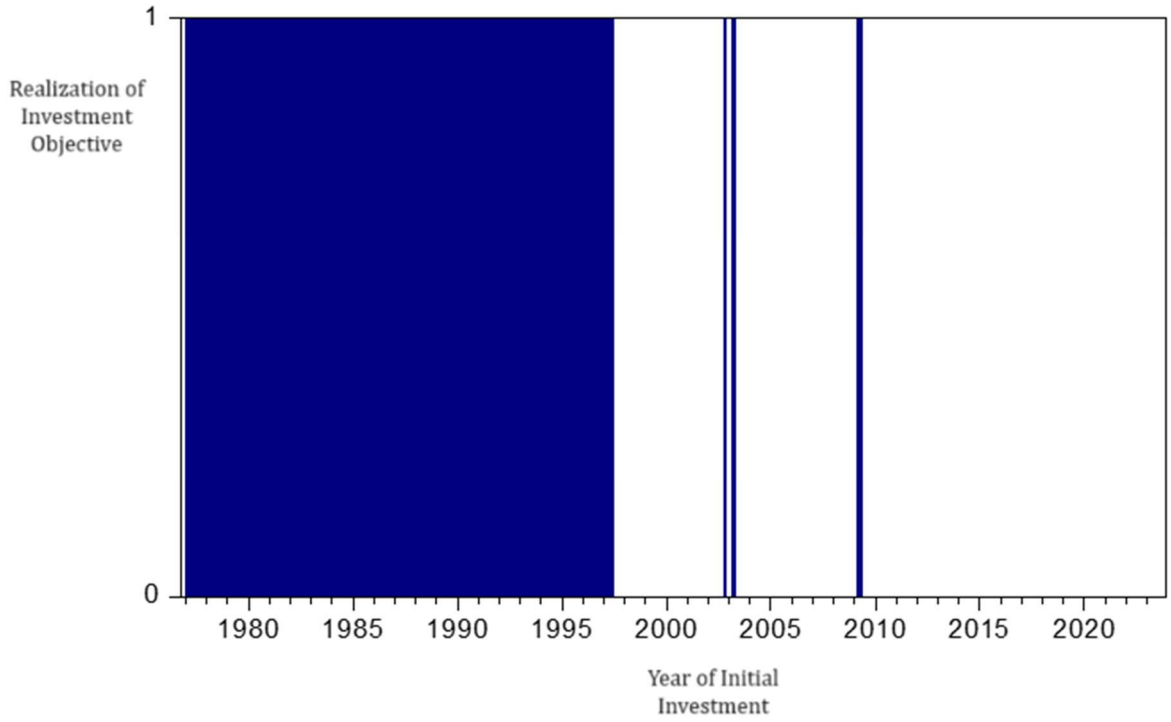
Note: This figure presents the time variation in the waiting times for *PO*(0, 12) for the S&P 500 up the latest initial investment date after which the objective was achieved before September 2023.

Figure 2: Waiting times for *PO(1,24)* through investing in the S&P 500



Note: This figure presents the time variation in the waiting times for *PO*(1, 24) for the S&P 500 up the latest initial investment date after which the objective was achieved before September 2023.

Figure 3: Tracking the achievement of $PO(2, 60)$



Note: This bar chart tracks the achievement of $PO(2, 60)$ through investments in the S&P 500. The value of 1 is only assigned to the initial investment dates after which the plateau objective was achieved.

Appendix: POs for Investment Styles

In this Appendix, we broaden our analysis beyond the scope of passive investment in the market index to encompass additional strategies aimed at creating value. Portfolios constructed through both random methods (Levy, 2016) and those based on specific characteristics (Asness et al., 2013; Chan & Lakonishok, 2004; Novy-Marx, 2013) have demonstrated improved risk-return trade-offs compared to the market index. Our expanded analysis guides practioners in assessing the differences between characteristics-based portfolios and the market index concerning both waiting times and the likelihood of achieving POs.

Our investigation centers on portfolios categorized as value firms, firms demonstrating strong recent performance, and small firms. These portfolios are sourced from Professor Kenneth French's website, encompassing NYSE, AMEX, and NASDAQ stocks. Value firms' portfolios are constructed based on book equity-to-market equity (BE/ME) at the end of each June, utilizing NYSE breakpoints and book equity values from the latest fiscal year. Portfolios for firms with strong recent performance are formed based on their performance over the prior 12 to 2 months. Concurrently, small firms' portfolios are created through market-weighting the bottom 10% of firms in terms of size at the end of each June, utilizing June market equity and NYSE breakpoints.

Table A1 reports the probabilities of achieving POs from the value portfolio. Table A2, in turn, reports the average waiting times conditional on the POs being achieved. Table A2 reports overwhelming evidence that, for each PO, value investing is characterized by shorter PO waiting times relative to the S&P 500. This difference in waiting times becomes considerably larger, in both absolute and relative terms, with more ambitious POs. For $PO(2, 60)$, the waiting period decreases by more than six years, 60% of the period needed for the S&P 500. Similar patterns, although smaller differences in waiting times, are reported for strong performers and small firms in Tables A3, A4, A5 and A6, respectively. Nevertheless, it is essential to highlight that the portfolio consisting of small firms yields nearly half the time savings relative to that of strong recent performers. To illustrate, considering the plateau objective $PO(2, 60)$, investing in small firms accelerates the attainment of the plateau period by 31 months compared to the S&P 500, constituting almost half of the 60-month savings achieved through the portfolio of strong performers.

(Insert Tables A1, A2, and A3 here)

In Table A7, we employ our Cox Proportional Hazard analysis to examine the plateau objectives (POs) associated with the value portfolio. While the impact of the unemployment rate on the rate of PO achievement aligns with the findings related to the S&P 500, the influence of CAPE is comparatively less consistent. The effect of CAPE exhibits a nonlinear relationship with the strength of the wealth objective. For moderate objectives like PO(1, 12), the effect of CAPE is small yet positive, indicating that investing during periods of high relative market valuation increases the rate of achieving the POs. However, this effect becomes insignificant and turns negative with more ambitious wealth objectives. Specifically, for $PO(2, 60)$, investing in periods of high CAPE reduces the rate of achieving the objective by 6% for every unit increase in CAPE.

The impacts of the inflation rate and the yield curve are notably more consistent. Starting with inflation, a one-percentage point increase in the inflation rate ahead of the initial investment forecasts up to a 30% increase in the rate of achieving POs. Conversely, a one-percentage point increase in the difference between the 10-year and 2-year zero-coupon yields predicts a decrease in the likelihood of achieving POs through value investing, ranging between 30% and 50%. Both findings underscore the significance of initiating investments under challenging economic conditions. Specifically, the price instability resulting from higher inflation and concerns about the future economic outlook, as reflected in a flattening yield curve, create optimal conditions for initiating investments in relatively undervalued firms to achieve sustainable wealth objectives.

(Insert Table A7 here)

Table A8 provides similar insights from the perspective of investing in companies with strong recent performance, with the exception that the effects of the yield curve and inflation are more pronounced for the more ambitious long-term wealth accumulation objectives. In the case of investing in small firms, the evidence presented in Table A9 indicates that high inflation and a flattening yield curve are the most consistent predictors of achieving both moderate and ambitious POs.

It is noteworthy that the explanatory power of our models varies considerably across different investment styles. While these models explain up to 14% of the variation in the rate of plateau objective achievement for value investing, the explanatory power is

considerably smaller for strong-performing firms and smaller ones, not exceeding 2% in the latter case. These results offer practical insights into the effectiveness of macroeconomic factors in guiding decisions for advisors and retailers seeking to capitalize on a time-based approach for investment assessment. Moreover, these insights derived from in-sample analysis provide the initial framework for a more extended evaluation of the out-of-sample forecasting effectiveness of macroeconomic factors from a waiting-times-based perspective.

(Insert Tables A5 and A6 here)

Overall, our analysis, focused on waiting times in value-, momentum-, and size-based portfolios, contributes to a deeper comprehension of the style investing landscape (Barberis & Shleifer, 2003; Beck et al., 2016; Kok et al., 2016). Despite the established use of Sharpe ratios and alphas to evaluate the performance of portfolios based on specific characteristics (Asness et al., 2013; Carhart, 1997), these metrics offer limited guidance for selecting future investments (Levy, 2017; Levy & Roll, 2016). To the best of our knowledge, our paper is the first to provide an intricate analysis of the waiting times required to achieve wealth objectives in this field.

Table A1: The probability of achieving POs through passive value investing

Panel A: Waiting times for the portfolio of value firms					
$\boldsymbol{Wealth\ Gain\ (x)\downarrow}$	$\boldsymbol{Minimum\ \#\ of\ Months\ (y)\downarrow}$				
	12	**24**	**36**	**48**	**60**
0.00	95.00	94.46	86.25	75.00	71.43
0.25	91.79	87.68	77.14	67.86	65.71
0.50	86.96	83.21	70.54	61.43	59.82
0.75	79.64	75.36	66.61	58.75	57.50
1.00	73.57	70.36	61.43	57.32	55.36
1.25	70.00	66.79	59.29	54.82	53.39
1.50	66.79	63.75	58.04	53.21	50.54
1.75	63.93	60.54	56.61	50.54	48.57
2.00	61.25	59.11	54.64	48.57	46.07

Note: For various plateaux objectives (PO) defined by the x and y levels, this table presents the probability of PO achievement through passive investments in the value portfolio, defined as the value-weighted portfolio of firms in the top decile in terms of book-to-market valuation. Each entry represents the percentage of initial investment months, from January 1977 to September 2023, during which a $1 investment in the S&P 500 resulted in accumulated wealth exceeding $1 + x for at least y months before the end of the sample period.

Table A2: Waiting times analysis of investments in value firms

Panel A: Waiting times for the portfolio of value firms					
$\boldsymbol{Wealth\ Gain\ (x)\downarrow}$	$\boldsymbol{Minimum\ \#\ of\ Months\ (y)\downarrow}$				
	12	**24**	**36**	**48**	**60**
0.00	11.37	14.63	17.70	15.73	14.62
0.25	28.40	33.41	31.06	26.96	26.70
0.50	44.45	47.85	41.27	37.63	40.23
0.75	55.19	56.11	48.58	49.17	54.45
1.00	62.00	62.52	57.75	62.74	66.31
1.25	68.05	72.14	68.10	73.33	74.01
1.50	76.58	80.11	78.70	79.59	77.80
1.75	83.25	85.97	87.59	84.23	81.05
2.00	90.46	96.06	94.48	87.88	84.21

Note: For various plateaux defined by the x and y levels, this table presents the average waiting times, conditional on PO realization, for investments in the portfolio covering the top 10% of firms in terms of book-to-market valuation each year. Each entry represents the average number of months required, after an initial $1 investment, for the accumulated wealth to exceed 1+x dollars for at least y months.

Table A3: The probability of achieving POs through passive investment top performers

$\boldsymbol{Wealth\ Gain\ (x)\downarrow}$	$\boldsymbol{Minimum\ \#\ of\ Months\ (y)\downarrow}$				
	12	**24**	**36**	**48**	**60**
0.00	94.82	93.04	93.04	89.29	87.86
0.25	93.04	90.89	89.29	87.14	85.71
0.50	91.07	87.68	87.32	84.82	80.89
0.75	88.04	86.61	85.71	80.00	78.93
1.00	87.14	84.46	82.14	78.75	78.04
1.25	85.71	80.54	80.00	78.04	76.43
1.50	83.04	79.29	78.75	76.61	72.68
1.75	80.54	78.57	78.21	73.21	68.75
2.00	79.29	78.04	77.32	69.82	65.71

Note: For various plateaux objectives (PO) defined by the x and y levels, this table presents the probability of PO achievement through passive investments in the portfolio of firms with strong recent performance, defined as the value-weighted portfolio of firms in the top decile in terms of prior returns over the prior two- to twelve-month period. Each entry represents the percentage of initial investment months, from January 1977 to September 2023, during which a $1 investment in the portfolio of strong performing firms resulted in accumulated wealth exceeding $1 + x for at least y months before the end of the sample period.

Table 45: Waiting times analysis of investment in firms with strong recent performance

$\boldsymbol{Wealth\ Gain\ (x)\downarrow}$	$\boldsymbol{Minimum\ \#\ of\ Months\ (y)\downarrow}$				
	12	**24**	**36**	**48**	**60**
0.00	8.87	11.93	12.82	15.59	17.03
0.25	25.00	27.92	29.21	31.89	35.21
0.50	39.32	42.89	44.29	48.70	49.64
0.75	53.39	58.15	59.86	61.02	61.72
1.00	65.31	68.39	69.22	70.53	71.37
1.25	75.05	77.82	79.15	80.21	80.42
1.50	83.33	86.96	87.52	88.78	88.74
1.75	91.77	95.38	96.24	95.87	95.87
2.00	99.02	102.21	102.23	101.24	100.38

Note: For various plateaux defined by the x and y levels, this table presents the average waiting times, conditional on PO realization, for investments in the portfolio covering the top 10% of firms in terms recent stock market performance. Each entry represents the average number of months required, after an initial $1 investment, for the accumulated wealth to exceed 1+x dollars for at least y months.

Table A5: The probability of achieving POs through passive investment in small firms

Panel A: Waiting times for the portfolio of value firms					
$\boldsymbol{Wealth\ Gain\ (x)} \downarrow$	$\boldsymbol{Minimum\ \#\ of\ Months\ (y)} \downarrow$				
	12	**24**	**36**	**48**	**60**
0.00	94.29	94.11	89.64	78.57	78.21
0.25	94.11	90.00	80.54	76.25	73.57
0.50	92.14	82.50	77.86	68.57	65.54
0.75	86.25	78.75	73.57	61.43	60.00
1.00	80.54	77.50	68.57	58.93	58.93
1.25	78.21	72.50	63.21	58.39	58.04
1.50	77.50	68.93	59.64	57.68	57.14
1.75	74.46	64.11	58.93	56.79	56.43
2.00	69.82	60.89	58.39	56.43	55.36

Note: For various plateaux objectives (PO) defined by the x and y levels, this table presents the probability of PO achievement through passive investments in the portfolio of small firms. This portfolio is defined as the value-weighted portfolio of firms in the bottom decile in terms of equity valuation. Each entry represents the percentage of months, from January 1977 to September 2023, during which an initial $1 investment in the S&P 500 resulted in accumulated wealth exceeding $1 + x for at least y months before the end of the sample.

Table A6: Waiting times analysis of investment in small firms

Panel A: Waiting times for the portfolio of small firms					
$\boldsymbol{Wealth\ Gain\ (x)} \downarrow$	$\boldsymbol{Minimum\ \#\ of\ Months\ (y)} \downarrow$				
	12	**24**	**36**	**48**	**60**
0.00	12.91	17.26	20.91	23.15	24.03
0.25	33.09	38.42	40.15	39.22	37.85
0.50	50.60	55.57	58.33	54.06	52.53
0.75	66.84	72.91	74.19	67.61	67.86
1.00	82.33	87.74	84.92	79.47	82.02
1.25	94.36	96.72	95.42	93.31	94.40
1.50	104.41	108.14	105.92	106.28	108.29
1.75	112.39	116.04	116.42	117.76	119.65
2.00	121.24	122.82	125.71	127.82	129.62

Note: For various plateaux objectives (PO) defined by the x and y levels, this table presents the probability of PO achievement through passive investments in the portfolio of small firms, defined as the value-weighted portfolio of firms in the bottom decile in terms of equity valuation. Each entry represents the percentage of initial investment months, from January 1977 to September 2023, during which a $1 investment in the portfolio of strong performing firms resulted in accumulated wealth exceeding $1 + x for at least y months before the end of the sample period.

Table A7: Macroeconomic conditions, market valuation, and the achievement of wealth plateaux through value investing

Panel A: COX Proportional Hazard Model estimates for $y = 1$										
PO	**(1, 12)**	**HR**	**(1, 24)**	**HR**	**(1, 36)**	**HR**	**(1, 48)**	**HR**	**(1, 60)**	**HR**
$Unemployment_{m-1}$	0.402***	1.49	0.399***	1.49	0.325***	1.38	0.379***	1.46	0.422***	1.52
	(0.055)		(0.054)		(0.059)		(0.062)		(0.063)	
$CAPE_{m-1}$	0.023***	1.02	0.025***	1.03	0.018*	1.02	0.008	1.08	-0.006	0.99
	(0.009)		(0.010)		(0.010)		(0.011)		(0.011)	
$Inflation_{m-1}$	0.253***	1.29	0.262***	1.30	0.265***	1.30	0.287***	1.33	0.281***	1.32
	(0.027)		(0.027)		(0.028)		(0.030)		(0.030)	
$YieldCurve_{m-1}$	-0.325***	0.72	-0.381***	0.68	-0.505***	0.60	-0.778***	0.46	-0.871***	0.42
	(0.098)		(0.098)		(0.105)		(0.112)		(0.114)	
N	440		440		440		440		440	
Pseudo R^2	0.034		0.035		0.040		0.062		0.075	
Panel B: COX Proportional Hazard Model estimates for $y = 2$										
PO	**(2, 12)**	**HR**	**(2, 24)**	**HR**	**(2, 36)**	**HR**	**(2, 48)**	**HR**	**(2, 60)**	**HR**
$Unemployment_{m-1}$	0.400***	1.49	0.307***	1.36	0.291***	1.34	0.317***	1.37	0.243***	1.27
	(0.057)		(0.054)		(0.055)		(0.057)		(0.058)	
$CAPE_{m-1}$	0.017	1.02	-0.001	1.00	-0.013	0.99	-0.030**	0.97	-0.063***	0.94
	(0.011)		(0.011)		(0.011)		(0.012)		(0.013)	
$Inflation_{m-1}$	0.384***	1.47	0.380***	1.46	0.390***	1.48	0.378***	1.46	0.350***	1.42
	(0.031)		(0.031)		(0.032)		(0.033)		(0.033)	
$YieldCurve_{m-1}$	-0.568***	0.57	-0.512***	0.60	-0.621***	0.54	-0.786***	0.46	-0.669***	0.51
	(0.100)		(0.095)		(0.101)		(0.111)		(0.114)	
N	440		440		440		440		440	
Pseudo R^2	0.068		0.077		0.096		0.12		0.135	

Note: This table presents a set of Cox Proportional Hazard models assessing the effects of macroeconomic conditions and market valuation at the time of the initial investment in value companies on the achievement of wealth plateaux. In Panel A, we report the Cox Proportional Hazard models for all wealth objectives with $y = 1$. In Panel B, we report equivalent models for all wealth objectives with $y = 2$. Next to each variable in each model, we report the Hazard ratios corresponding to a 1 unit increase in this variable. ***, **, and * represent significance at 1%, 5%, and 10% level, respectively.

Table A8: Macroeconomic conditions, market valuation, and the achievement of wealth plateaux through firms with strong recent performance

Panel A: COX Proportional Hazard Model estimates for $y = 1$										
PO	**(1, 12)**	**HR**	**(1, 24)**	**HR**	**(1, 36)**	**HR**	**(1, 48)**	**HR**	**(1, 60)**	**HR**
$Unemployment_{m-1}$	0.097**	1.10	0.120***	1.13	0.112***	1.12	0.092**	1.09	0.061	1.06
	(0.041)		(0.041)		(0.041)		(0.041)		(0.041)	
$CAPE_{m-1}$	-0.065***	0.94	-0.073***	0.93	-0.078***	0.93	-0.090***	0.91	-0.100***	0.90
	(0.010)		(0.010)		(0.010)		(0.010)		(0.010)	
$Inflation_{m-1}$	-0.019	0.98	-0.024	0.98	-0.027	0.97	-0.035*	0.97	-0.043**	0.96
	(0.021)		(0.021)		(0.021)		(0.021)		(0.021)	
$YieldCurve_{m-1}$	-0.041	0.96	-0.069	0.93	-0.054	0.95	-0.008	0.99	0.012	1.01
	(0.072)		(0.071)		(0.071)		(0.072)		(0.073)	
N	440		440		440		440		440	
Pseudo R^2	0.031		0.039		0.042		0.049		0.053	
Panel B: COX Proportional Hazard Model estimates for $y = 2$										
PO	**(2, 12)**	**HR**	**(2, 24)**	**HR**	**(2, 36)**	**HR**	**(2, 48)**	**HR**	**(2, 60)**	**HR**
$Unemployment_{m-1}$	0.400***	1.04	0.307***	1.01	0.291***	1.06	0.317***	1.06	0.243***	1.03
	(0.057)		(0.054)		(0.055)		(0.057)		(0.058)	
$CAPE_{m-1}$	0.017	0.90	-0.001	0.89	-0.013	0.90	-0.030**	0.93	-0.063***	0.93
	(0.011)		(0.011)		(0.011)		(0.012)		(0.013)	
$Inflation_{m-1}$	0.384***	0.94	0.380***	0.93	0.390***	0.95	0.378***	0.98	0.350***	0.99
	(0.031)		(0.031)		(0.032)		(0.033)		(0.033)	
$YieldCurve_{m-1}$	-0.568***	1.01	-0.512***	1.04	-0.621***	0.96	-0.786***	0.86	-0.669***	0.95
	(0.100)		(0.095)		(0.101)		(0.111)		(0.114)	
N	440		440		440		440		440	
Pseudo R^2	0.068		0.077		0.096		0.120		0.035	

Note: This table presents a set of Cox Proportional Hazard models assessing the effects of macroeconomic conditions and market valuation at the time of the initial investment in portfolios containing strong recent performers on the achievement of wealth plateaux. In Panel A, we report the Cox Proportional Hazard models for all wealth objectives with $y = 1$. In Panel B, we report equivalent models for all wealth objectives with $y = 2$. Next to each variable in each model, we report the Hazard ratios corresponding to a 1 unit increase in this variable. ***, **, and * represent significance at 1%, 5%, and 10% level, respectively.

Table A9: Macroeconomic conditions, market valuation, and the achievement of wealth plateaux through small firms

Panel A: COX Proportional Hazard Model estimates for $y = 1$										
PO	**(1, 12)**	**HR**	**(1, 24)**	**HR**	**(1, 36)**	**HR**	**(1, 48)**	**HR**	**(1, 60)**	**HR**
$Unemployment_{d-1}$	0.046	1.04	0.024	1.02	-0.064	0.94	-0.123**	0.88	-0.117**	0.89
	(0.046)		(0.045)		(0.047)		(0.051)		(0.051)	
$CAPE_{d-1}$	0.033***	1.03	0.023**	1.02	0.009	1.01	-0.004	1.00	-0.009	0.99
	(0.011)		(0.011)		(0.011)		(0.011)		(0.011)	
$Inflation_{d-1}$	0.116***	1.12	0.093***	1.10	0.080***	1.08	0.071***	1.07	0.065***	1.07
	(0.025)		(0.025)		(0.024)		(0.024)		(0.024)	
$YieldCurve_{d-1}$	0.212***	1.23	0.137*	1.15	0.036	1.04	-0.253***	0.78	-0.267***	0.77
	(0.074)		(0.074)		(0.079)		(0.089)		(0.090)	
N	440		440		440		440		440	
Pseudo R^2	0.006		0.002		0.004		0.015		0.015	
Panel B: COX Proportional Hazard Model estimates for $y = 2$										
PO	**(2, 12)**	**HR**	**(2, 24)**	**HR**	**(2, 36)**	**HR**	**(2, 48)**	**HR**	**(2, 60)**	**HR**
$Unemployment_{m-1}$	0.100**	1.11	0.050	1.05	0.032	1.03	0.000	1.00	0.004	1.00
	(0.048)		(0.050)		(0.051)		(0.052)		(0.053)	
$CAPE_{m-1}$	0.029***	1.03	0.018	1.02	0.007	1.01	-0.004	1.00	-0.007	0.99
	(0.012)		(0.011)		(0.011)		(0.011)		(0.011)	
$Inflation_{m-1}$	0.069***	1.07	0.062***	1.06	0.067***	1.07	0.072***	1.04	0.075***	1.08
	(0.023)		(0.024)		(0.024)		(0.024)		(0.024)	
$YieldCurve_{m-1}$	-0.064	0.94	-0.215***	0.81	-0.255***	0.77	-0.308***	0.73	-0.357***	0.70
	(0.075)		(0.084)		(0.086)		(0.090)		(0.093)	
N	440		440		440		440		440	
Pseudo R^2	0.003		0.005		0.008		0.013		0.015	

Note: This table presents a set of Cox Proportional Hazard models assessing the effects of macroeconomic conditions and market valuation at the time of the initial investment in small firms on the achievement of wealth plateaux. In Panel A, we report the Cox Proportional Hazard models for all wealth objectives with $y = 1$. In Panel B, we report equivalent models for all wealth objectives with $y = 2$. Next to each variable in each model, we report the Hazard ratios corresponding to a 1 unit increase in this variable. ***, **, and * represent significance at 1%, 5%, and 10% level, respectively.

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