HEC PARIS

Master in International Finance

ESTIMATION OF RISK AND RETURN AT LONG HORIZONS:

Are stocks really less risky than bonds in the long run?

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Abstract

This thesis investigates the time diversification hypothesis by analyzing equity and government bond returns across six regional index pairs and fifteen developed nations from 1870 to 2020. Using a stationary block bootstrap approach in real terms, we demonstrate that the probability of equity outperformance increases with the horizon, reaching nearly 80% at ten years in developed markets. However, long horizons do not eliminate absolute risk: real equity loss probabilities remain at 18% in developed regions and 37% in emerging ones. Furthermore, structural exceptions like France and Italy underscore that the equity premium is fundamentally country-dependent.

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Introduction

The question of whether stocks outperform bonds over long investment horizons is a key topic in finance and portfolio management. A widely accepted view, popularized by Jeremy Siegel in Stocks for the Long Run, argues that stocks become relatively less risky than bonds as the investment horizon increases. This idea, known as time diversification, has influenced investment advice for decades, encouraging younger investors to hold more stocks and gradually shift toward bonds as they approach retirement.

However, this view is based mainly on evidence from the United States, which has been one of the best-performing stock markets over the last century. It also relies on historical periods that may not fully reflect recent changes in financial markets. As a result, it is still unclear whether stocks consistently outperform bonds over long horizons across different regions of the world and whether investing for longer truly reduces the risk of losing money.

This paper examines the risk and return characteristics of stocks and government bonds across six geographic market groups: global markets, developed markets, global markets excluding the United States, Europe, Asia Pacific, and Emerging Markets. For each group, we compare a major stock index with a corresponding government bond index using monthly total return data covering up to twenty-seven years of history. We analyze returns in real terms, since inflation has an important impact on long-term investment outcomes.

Furthermore, to strengthen our analysis and test whether our findings hold beyond the regional index level, we complement it with a country-level benchmark drawn from the **Jordà-Schularick-Taylor (JST) Macrohistory Database**, which provides annual real returns for fifteen developed countries across different geographies, with histories reaching back to the nineteenth century. It allows us to extend our comparison to horizons that the index sample cannot reach, and especially to check whether the equity-bond relationship observed at the regional level still holds country by country.

Our methodology combines descriptive statistics, rolling return analysis, and a stationary block bootstrap approach. Since the historical data available for some regions, especially Emerging Markets and Asia Pacific, are limited, the bootstrap method helps us create many simulated return scenarios that reflect the behavior of past returns. This provides more reliable estimates of long-term outcomes than a simple historical analysis alone.

The paper is organized as follows. Section 1 reviews the academic literature on the time diversification debate, from Siegel's original arguments and Bodie's critique to recent international studies. Section 2 presents the data, index selection, and methodology. Section 3 reports the index-level results in real terms across the six regional pairs, covering horizons up to ten years, including descriptive statistics, rolling-horizon returns, frequen-

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cies of equity outperformance, and block-bootstrap simulations. Section 4 extends the analysis to individual countries using the JST database, pushing the horizon out to thirty and fifty years and testing whether the regional findings hold at the country level.

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1 Literature Review

Before examining the data and results, it is important to understand how academics have approached the question of whether stocks outperform bonds in the long run. This section reviews the main contributions to this debate, from the theoretical arguments that first shaped the discussion to the most recent empirical findings.

1.1 Theoretical Foundations: The Time Diversification Debate

The idea that stocks become less risky when held for a long time is known as the time diversification hypothesis. It is based on a simple intuition: short-term ups and downs tend to balance out over time. If stock returns tend to recover after bad periods, a year with poor performance is often followed by better returns. As a result, the overall risk of investing in stocks may decrease when the investment horizon becomes longer. This suggests that investors who plan to keep their money invested for many years may be less likely to experience large losses than investors with a short-term horizon, which is why long-term portfolios are often more heavily weighted in stocks.

One of the strongest supporters of this idea is Jeremy Siegel, in his influential book Stocks for the Long Run (1994). By studying almost 200 years of US financial market data, Siegel found that stocks outperformed bonds over every rolling 30-year period in his sample.

His main conclusion was straightforward: investors who are able to stay invested through difficult periods are usually rewarded with higher returns in the long run, while the risk of stocks relative to bonds decreases as the investment horizon becomes longer. This finding had a major impact on both academic research and practical investment advice, forming the basis of lifecycle investing strategies where younger investors hold mostly stocks and gradually move toward bonds as they approach retirement. The most important limitation is that Siegel's analysis relies almost entirely on US data, the most successful equity market of the past century, and whether his conclusions apply to other countries, other time periods, or other asset class pairings is precisely the question that more recent research has sought to answer.

This popular view has not gone unchallenged. One of the most direct critiques comes from Bodie (1995), who approaches the question from a practical angle. He examines the cost of protecting a stock portfolio against underperforming bonds, using a financial instrument called a put option, which works like an insurance policy. If stocks truly became less risky over time, this insurance should become cheaper as the investment horizon grows longer. Bodie finds the opposite: the longer the horizon, the more expensive the insurance becomes. Financial markets therefore do not treat long-term stock investing as intrinsically safer, and the risk of stocks underperforming bonds does not disappear

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with time. This finding directly challenges the time diversification hypothesis, and sets the stage for other studies reviewed in the sections that follow.

1.2 What the Broader Literature Shows

The most comprehensive historical evidence across countries comes from Dimson, Marsh, and Staunton (2002), who assembled return data for more than twenty countries going back to 1900. Their central finding broadly supports the equity-outperformance story: stocks have outperformed bonds over long periods in almost every country they study, with a global average annual advantage of roughly four percentage points. However, they also document important exceptions. In countries that experienced wars, hyperinflation, or political upheaval, for instance, Germany and Japan in the first half of the twentieth century, stocks delivered catastrophically poor real returns over multi-decade horizons. The long-run equity premium is real, but it is not guaranteed everywhere and at all times.

Campbell and Viceira (2002) offer a theoretical argument for why long-term investors may reasonably choose to hold more stocks. Their idea rests on the possibility that stock returns are somewhat predictable over time: periods of poor performance may often be followed by periods of stronger returns. If this is true, investors with a long investment horizon benefit from this tendency because temporary losses may be partly offset by future gains, whereas short-term investors may be forced to sell before any recovery occurs. This mechanism suggests that long horizon stock returns may be less volatile than short-horizon returns, providing theoretical support for the common belief that stocks are better suited to long-term investing.

Lubos Pastor and Robert Stambaugh (2012) provide a more cautious perspective. They question the idea that stocks automatically become safer over long investment horizons. Their argument is simple: investors do not know with certainty how stock returns will behave in the future and must rely on imperfect historical data to make predictions. When this uncertainty is taken into account, the benefits of long-term investing become less clear. In fact, the risk of stocks may increase rather than decrease as the investment horizon grows, because uncertainty about future returns accumulates over time. Their findings suggest that the case for time diversification depends heavily on the assumption that historical patterns will continue in the future.

1.3 Recent Research: A More Nuanced Picture

The three studies reviewed in this section represent some of the most recent contributions to the debate. Together they add important qualifications to the commonly held view

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and directly guide the approach taken in this paper.

1.3.1 Most Individual Stocks Underperform Treasury Bills — Bessembinder (2018)

A natural starting point for the question of whether stocks beat bonds is an even more basic question: do most individual stocks beat the safest possible alternative, US Treasury bills, which are essentially risk-free short-term government loans? Henrik Bessembinder's 2018 paper, published in the Journal of Financial Economics, gives a striking answer: no.

Bessembinder examined the complete return history of every stock ever listed on US exchanges, more than 25,000 companies over nearly a century. His central finding is that the majority of individual stocks, approximately 58%, produced lower total returns than Treasury bills over their entire listed lifetimes. More stocks destroyed wealth relative to the risk-free rate than created it.

How is this consistent with the well-known fact that the stock market as a whole has delivered strong long-run returns? The answer lies in a statistical property called skewness. A small number of extraordinarily successful companies like Apple, Amazon, and Microsoft, generate such enormous returns that they pull the average market return upward, even as the majority of stocks deliver mediocre or negative outcomes. Bessembinder finds that the entire net gain of the US stock market relative to Treasury bills over the past century was attributable to the best-performing 4% of listed stocks.

The implication for our study is direct. When we compare broad market indexes, the MSCI ACWI, MSCI World, or MSCI Asia Pacific, against bond benchmarks, we are comparing diversified portfolios that, by construction, capture these exceptional winners. A passive investor holding the entire market does benefit from the extraordinary performers. Bessembinder's findings show that strong long-term stock market performance does not come from most individual stocks outperforming, but from a small number of exceptional companies generating extraordinary returns. Investors benefit from these winners only if they hold a broadly diversified portfolio. Therefore, the long-run advantage of equities over bonds depends largely on diversification through market indexes, which is exactly the focus of our analysis.

1.3.2 International Evidence Against Stocks for the Long Run — Anarkulova and Cederburg (2022)

One of the strongest recent challenges to the conventional view comes from Viktoriya Anarkulova and Scott Cederburg (2022). They question whether the conclusions drawn from US stock market history can be applied to investors in other parts of the world. Their concern is straightforward: the United States has been one of the most economically successful and politically stable countries of the last century. Studying only US data may therefore give an overly optimistic view of what long-term stock investing looks like elsewhere. This problem is known as survivorship bias, drawing conclusions from successful cases while overlooking less fortunate ones.

To address this, Anarkulova and Cederburg analysed stock and bond returns across many developed countries rather than focusing on the United States alone. Their results suggest that the long-term superiority of stocks is far less certain than commonly believed. Looking beyond the United States, stocks do not systematically outperform bonds even over investment periods of thirty years. The likelihood of stocks beating bonds remains well below 100%, and varies significantly across countries and historical periods, directly challenging the idea that a long investment horizon alone is sufficient to guarantee better outcomes from stocks.

These findings are particularly relevant for our paper. Several of the index pairs studied here focus explicitly on non-US markets; the MSCI ACWI ex US, MSCI Europe, MSCI Asia Pacific, and MSCI Emerging Markets pairs all exclude US equities. Anarkulova and Cederburg's work warns against expecting these regional markets to replicate the US experience. By separating each geographic universe and comparing it to its natural bond benchmark, our analysis can test directly whether the long-run equity story holds across regions, or whether it remains largely a US phenomenon.

1.3.3 Why Long Horizon Equity Risk Is Not What It Seems — Lettau and Wachter (2007)

Most investors think of risk in terms of volatility, that is, how much an investment's value fluctuates over time. From this perspective, stocks may appear less risky over long horizons because short-term gains and losses can partly offset one another. Martin Lettau and Jessica Wachter (2007), however, argue that volatility alone provides an incomplete picture of risk for long-term investors.

Their key insight is that investors care not only about the size of potential losses but also about when those losses occur. A decline in portfolio value is far more harmful during a recession, when investors may simultaneously face unemployment, lower income, falling house prices, and tighter credit conditions, than during periods of economic prosperity. The economic environment in which losses occur therefore plays a crucial role in determining how risky an investment truly is.

Lettau and Wachter show that stock returns are particularly exposed to adverse economic conditions such as recessions, financial crises, and periods of higher uncertainty. As a result, equities tend to perform poorly precisely when investors are most vulnerable and most likely to rely on their savings. The authors describe this exposure as long-run cash-flow risk and argue that the higher expected returns offered by stocks are compensation for bearing it.

Their findings provide an important perspective on the time diversification debate. Even if stock return volatility appears to decline over longer horizons, the underlying economic risks faced by investors do not necessarily disappear. A limitation of this approach is that long-run cash-flow risk cannot be observed directly and must be inferred through asset-pricing models. Nevertheless, the study highlights that evaluating equities only through average returns or volatility may underestimate the risks associated with economic downturns. This perspective is particularly relevant for our analysis, as it suggests that higher long-term equity returns should be interpreted alongside the economic conditions under which those returns are earned.

1.4 The Index Pairs and Their Regional Context

The existing literature provides extensive evidence on the long-run performance of equities and bonds across countries and time periods. This paper complements that literature by focusing on a set of widely used market benchmarks and by comparing equity and bond returns within the same geographical universe. Specifically, we analyze six pairs of equity and bond indexes: global markets (MSCI ACWI Net Index versus FTSI World Government Bond Index), developed markets (MSCI World versus FTSE WGBI), global markets excluding the United States (MSCI ACWI ex US versus FTSE Non-US Bonds), Europe (MSCI Europe versus FTSE World Government Bonds), Asia Pacific (MSCI AC Asia Pacific versus FTSE Asian Bonds), and Emerging Markets (MSCI Emerging Markets versus FTSE Emerging Market Government Bonds).

For each pair of indexes, we compare the performance of stocks and bonds over different investment horizons using total return data, which include both price changes and reinvested dividends or coupons. Since these benchmarks are commonly used in practice, the results are directly relevant for investment decisions.

The inclusion of the MSCI ACWI ex US index provides an additional perspective by separating the performance of international markets from that of the United States, which has historically been one of the strongest-performing equity markets. This allows us to assess whether the long-run relationship between equities and bonds remains similar when US equities are excluded from the analysis.

Examining Europe, Asia Pacific, and Emerging Markets separately also makes it possible to investigate whether the equity premium is consistent across different regions of the world. These markets differ substantially in terms of economic development, growth opportunities, interest rate environments, and exposure to financial crises. Comparing equity and bond returns across these regions therefore provides a broader perspective on the long-standing question of whether stocks outperform bonds over the long run.

To complement and extend the regional index analysis, we further investigate the equity-bond relationship at the individual country level using the Jordà-Schularick-Taylor (JST) Macrohistory Database. This second layer of analysis serves two purposes.

First, it allows us to push the investment horizon well beyond the ten years accessible in the index sample, examining outcomes at twenty, thirty, and fifty years horizons that are more directly relevant for pension savers and long-term institutional investors.

Second, it provides a robustness check on the regional findings by testing whether the patterns observed in broad market indexes hold when examined country by country, across fifteen developed economies with return histories stretching back to the nineteenth century.

Together, the two analyses form a single, coherent account of how the equity-bond comparison evolves as the investment horizon lengthens

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2 Data and Methodology

2.1 Index Pairs

Our analysis rests on a single comparison repeated across six geographic universes: **a broad equity index set against a government bond index covering the same investable region and on the same time horizon**.

We deliberately avoided collapsing everything into one global stock-versus-bond comparison. The whole motivation of this thesis is that the long-run case for equities may be a largely American, or at least a developed-market, phenomenon, and a single global aggregate would hide exactly the regional differences we set out to measure. Pairing each equity index with a bond benchmark drawn from the same universe lets us ask, region by region, whether the relationship between the two asset classes holds up.

The first and broadest pair sets the **MSCI ACWI Net index** against the **FTSE World Government Bond Index (WGBI)**. The ACWI spans large and mid-cap equities across both developed and emerging markets, the widest investable equity universe available, while the WGBI is the standard benchmark for investment-grade sovereign debt in developed markets. The second narrows the equity side to developed markets only, through the **MSCI World index** against the same WGBI, so that we can see whether adding emerging-market equities to the broader ACWI changes anything. The third takes a European view, and here we pair the **MSCI Europe Net index** with the **FTSE EMU Government Bond Index (EGBI)** which tracks fixed-rate sovereign bonds denominated in euros and issued by eurozone governments, the largest issuers being France, Germany, Italy and Spain. We use it because the WGBI is dominated by US and Japanese debt, so pairing a European equity index against it would compare European stocks to a bond universe that is mostly not European, defeating the purpose of a regional comparison. The fourth turns to emerging markets, combining the **MSCI Emerging Markets index** with the **FTSE Emerging Markets Government Bond Index**. The fifth captures Asia-Pacific, pairing the **MSCI AC Asia Pacific index** with the **FTSE Asian Government Bond Index**. Finally, the **MSCI ACWI ex US index**, set against the **FTSE Non-US World Government Bond Index**, removes the United States from both sides of the comparison giving us a separate view of the comparison Equity vs. Bonds without an US bias.

2.2 Data Sources

The construction of a suitable dataset based on indexes that represent a geographic area was one of the most challenging aspects of this study. We were unable to find data

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combining a long historical record with the qualities we required: in the rare cases where a long history was available, it came at the expense of either the reliability of the data or the breadth of its geographic coverage, neither of which we were willing to compromise. We therefore had to accept for our indexes vs bonds comparison a shorter sample in exchange for series we could trust and that spanned all the regions we wished to compare.

Every **Index series** used in this thesis was extracted from **Refinitiv LSEG Workspace** as end-of-month observations of monthly total return indices. Given the importance of data reliability and comparability, we chose not to combine series from multiple providers, even when doing so could have extended the sample period. Differences in index construction, benchmark composition, return calculation, and currency treatment can create artificial discrepancies that undermine cross-regional comparisons. To avoid this issue, we relied on a single provider throughout our analysis. Among the available alternatives, Refinitiv offered the best balance between data quality, geographic coverage, and methodological consistency across all six regions. This choice came at the expense of some historical depth but ensured a more robust and coherent dataset.

The constraint bites harder for two regions, and not by accident. For emerging markets, equity data reach back to 1998, but the matching emerging-market government bond series only starts in 2008, which pins the emerging-market pair to about eighteen years. Asia-Pacific is tighter still: the Asian government bond series only begins in 2011, leaving roughly fifteen years. This is a structural feature of these markets rather than a gap in Refinitiv's coverage. Investable, index-quality sovereign debt simply emerged later in the developing world than in the advanced economies. We keep these shorter pairs in the analysis for completeness, but we read their results with real caution, because their samples happen to exclude the major crises that would test them, in particular the 1997 Asian financial crisis and, for Asia-Pacific, the 2008 global financial crisis. A sample that never sees a bad decade will not show one.

To keep the comparison honest, each equity index is aligned with its paired bond index on the months for which both are simultaneously available, so that every pair is analysed over the exact window where the two series truly overlap. Table 1 summarises the resulting periods.

However, to complete our study, and to check whether the results obtained at the regional index level still hold when we move down to individual countries, we rely on a complementary dataset. The Refinitiv index pairs described above give us trustworthy and regionally consistent series, but only twenty-seven years of history, which in practice limits reliable inference to horizons of up to ten years. The horizons that matter most for long-term investors, twenty, thirty, and fifty years, lie beyond what this sample can reach. To study them we turn in Section 4 to the **Jordà-Schularick-Taylor Macrohistory (JST)** Database, which extends back to the nineteenth century for fifteen developed economies, at the cost of the regional granularity that the index pairs provide.

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The two analyses are deliberately built on the same framework, descriptive statistics, rolling-window holding-period returns, and a stationary block bootstrap, so that their results read as one continuous account of how the equity-bond comparison evolves with the horizon rather than as two separate studies.

2.3 Why Net Indexes

A less visible but equally important methodological choice concerns the treatment of dividends in the equity indices. Throughout the analysis, we rely on *net total return* indices rather than their gross counterparts. While price indices capture only capital appreciation, total return indices assume that dividends are reinvested. The difference between gross and net total return indices lies in the treatment of withholding taxes: gross indices assume full reinvestment of dividends, whereas net indices account for the taxes that international investors typically incur on cross-border dividend income.

The net version was preferred because it provides a more realistic representation of the returns available to a global investor. By assuming away withholding taxes, gross indices tend to overstate the wealth that can actually be accumulated over time. Although the difference may appear modest on an annual basis, its impact becomes meaningful when returns are compounded over several decades. Using net total return indices therefore offers a more conservative and economically relevant measure of long-run equity performance, which is particularly important in a study aimed at reassessing the magnitude of the historical equity premium. Bond indices, in contrast, are taken on a standard total return basis, reflecting both price changes and reinvested coupon payments, in line with common practice in the fixed-income literature.

2.4 Computing Returns

From the monthly index levels, we build holding-period returns at each horizon. If $I(t)$ is the index level at the end of month t, the cumulative return over an h-month holding period ending at t is

$$R(t,h) = \frac{I(t)}{I(t-h)} - 1. \tag{1}$$

To compare horizons of different lengths on the same footing, we annualise this cumulative figure:

$$r(t,h) = \left[\,1 + R(t,h)\,\right]^{12/h} - 1. \tag{2}$$

We study horizons of one, five, and ten years, that is $h \in \{12, 60, 120\}$ months. At the one-year horizon we use non-overlapping intervals, which gives us statistically independent observations. At longer horizons non-overlapping intervals become impractical, to avoid this problem we use overlapping rolling windows to wring as much information as possible

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out of the limited history. Overlapping windows share data and are therefore serially correlated, so we treat the statistics they produce as descriptive rather than as grounds for formal inference. This tension, a short sample on one side and a long horizon on the other, is precisely what motivates the bootstrap introduced later in our thesis.

2.5 From Nominal to Real Returns

Up to this point the returns we have described are nominal, they only record how many dollars an investment is worth, as the indexes report them. However, for a study built around long horizons, nominal returns tell the investor how much larger their account has become, but not whether they are actually better off, and over a decade the two can diverge sharply. If an index rises while consumer prices rise by the same percentages, the investor's wealth has not grown at all in any meaningful sense. What an investor ultimately cares about is purchasing power, the quantity of goods and services their wealth commands, and purchasing power is captured only by real returns.

This raises an immediate question of measurement: real from which perspective? Inflation is not a universal constant but a quantity specific to a consumption basket and a currency, so the deflator one applies is not a neutral technical choice; it embeds an assumption about whose purchasing power is being measured. We adopt throughout the perspective of a US-based investor, and the object of measurement is accordingly the purchasing power, expressed in US consumer terms, that each index delivers to such an investor. For that reason every equity and bond index is denominated in US dollars.

Concretely, we deflate each monthly index level by the US Consumer Price Index for All Urban Consumers (CPI-U). Let P_t denote the nominal index level in month t, CPI_t the price index in that month, and CPI_0 its value in the first month of the pair's sample. We first form the cumulative inflation factor since the start of the sample,

$$\pi_t = \frac{\mathrm{CPI}_t}{\mathrm{CPI}_0}, \tag{3}$$

which measures how much the general price level has risen since the investment began. Dividing the nominal index by this factor strips out that price-level growth and leaves the level expressed in constant purchasing power:

$$P_t^{\mathrm{real}} = \frac{P_t}{\pi_t}. \tag{4}$$

Since $\pi_0 = 1$, the real and nominal series begin at the same value and separate only as inflation accumulates over time. Real holding-period returns are then obtained by applying Equations (1) and (2) to the deflated series P_t^{real} rather than to the nominal level $I(t)$, which is equivalent to adjusting each nominal return by the inflation realised over

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the same window through the exact relation $1 + r^{\text{real}} = (1 + r^{\text{nominal}})/(1 + \pi)$. Under this construction a five percent real return has a single, unambiguous reading: the investor's purchasing power has risen by five percent.

3 Index level evidence

Before presenting the results, it is important to recall that all returns discussed in this section are expressed in real terms. The regions we compare, together with the length of history available for each, are those summarised in Table 1.
We build our arguments in stages. We start first with the comparison at its most tangible, in Section 3.1, by asking what became of a single dollar invested in equities and in bonds, and how that gap behaves as the horizon stretches from one year to ten. From there we look beneath the totals, in Section 3.2, at the distributions of monthly returns themselves: how volatile each asset class is, and how far its returns depart from the bell curve. That second step is not merely descriptive. The returns turn out to be markedly non-normal and our samples markedly short, and between them these two facts rule out the obvious shortcuts, both the parametric models that assume normality and the historical frequencies that, over a ten-year horizon, rest on only a handful of genuinely independent windows. This is what leads us, in *Section 3.5*, to the stationary block bootstrap, which sidesteps both problems and supplies the probability estimates that sit at the centre of our findings.

3.1 A Dollar Invested: Equities and bonds over the full sample

The simplest way into the data is also the most concrete. Take a single dollar, place it in each asset class at the start of the sample, leave it untouched, and ask what it is worth at the end in terms of what it can actually buy. In the global pair, that dollar invested in equities at the end of 1998 had grown, in purchasing power, to approximately three dollars by the end of 2025, a cumulative real gain of 205%, or 4.2% a year; the developed-market pair is marginally stronger again at 4.3 %. The equity premium that the literature has documented for a century is plainly there in our sample, and inflation does not make it disappear.

The bond side is where the real-terms lens changes the picture entirely. The same dollar placed in global government bonds came back, after twenty-seven years, essentially as it left: a cumulative real gain of 1.4% over the whole period, which annualises to barely more than zero, about five hundredths of one percent a year. The developed-world bondholder, in other words, spent a quarter of a century treading water, with coupons and price gains arriving only to be swallowed almost entirely by inflation. Step outside the core developed

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markets and the result turns negative outright: both the ACWI ex US and the emerging-market bond series ended their samples below where they started in real terms, down 2.2% and 2.8% cumulatively, so that the holder of what is conventionally called the safe asset finished poorer in purchasing power than when they began.

Asia-Pacific is the one pair that escapes this, and it is worth saying why rather than letting it stand. Its bond index returned a positive 1.9% a year in real terms, the only bond series in the study to manage anything convincing. But this is also our shortest sample, opening only in 2011, and that window happens to miss every serious bond-market dislocation of the modern era. The figure is a property of the period, not of Asian bonds, and we read it accordingly.

One last observation before leaving the totals. Inflation compresses the ranking of equities as much as it punishes bonds. Emerging-market equities returned only 1.4% a year in real terms over their sample, against the 4.2 to 4.3% of the global and developed pairs, so the distance between the strongest and the weakest equity market is wider in real terms than a nominal account would suggest, not narrower. The full set of total and annualized real returns is given in Appendix Table 2, and the cumulative growth paths are plotted in Appendix Figure 3.

3.2 Real returns distribution

Totals say where the money ended up, not how rough the ride was. For that we turn to the distribution of monthly returns, reported in full in Appendix Table 3. Three features stand out, and the third dictates how the rest of this section is built.

First, equities stay far more volatile than bonds everywhere: annualized real equity volatility runs from about 14% in Asia-Pacific to 20% in emerging markets, against 4% to 10% for bonds. This is the whole premise of the time-diversification question: if equities are this much rougher month to month, only a long horizon could redeem them.

Second, real equity returns are far from normal, negatively skewed in every region and fat-tailed, most sharply in emerging markets. This is not a detail but a constraint on method: with tails this heavy, mean and variance no longer capture the risk, and any model assuming normality understates the extremes that matter most.

Third, the geometric mean sits well below the arithmetic one, and the gap widens with volatility. Emerging-market equities show it starkly: a 3.6 % average real return, but only 1.4% actually compounding. That shortfall is the cost of volatility, which a long horizon magnifies rather than dilutes. Together with the non-normality, it is what pushes us off any parametric model and toward a method that resamples the history as it was.

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3.3 Comparison across different horizons

We now ask the question the thesis was built around: does a longer holding period change the equity-bond comparison, and by how much? The rolling real holding-period returns, at one, five, and ten years, are in Appendix Table 4. They confirm the intuition behind time diversification and, in the same breath, mark its limit.

The encouraging half is real. At ten years, the median real equity outcome is firmly positive in the developed world: 59.6% for global equities and 59.2% for developed markets. An investor landing near the middle of the distribution would, more often than not, have grown their real wealth substantially, and as the horizon lengthens the spread of outcomes tightens, exactly the fingerprint time diversification should leave.

But the median is one point, and the place to look is the bottom of the distribution. The worst ten-year rolling real return was a loss of 39.7% for global equities and 42.5% for developed markets, not one-year frights but losses carried across a full decade in purchasing power. Whatever a long horizon does, it lays no floor beneath the equity investor. The regional split refuses to flatten: the ten-year median falls to 28.7% for the ACWI ex US pair and 28.5% for Europe, and to just 12.6% in emerging markets. Asia-Pacific shows no negative ten-year real return at all, the worst being a gain of 2.2%, which reads as reassuring until one recalls that its sample opens in 2011 and never meets a crisis; the missing bad decade is a feature of the window, not of the market.

3.4 How often equities did outperform bonds ?

A more direct way to compare between equity and bonds is to count in what share did equities actually beat bonds in real terms across all historical investment windows.
Equities outperformed bonds in 77.2% of ten-year windows in both the global and developed pairs, slipping to 71.4% for the ACWI ex US pair and 65.5% for Europe, the same developed-to-emerging gradient that keeps reappearing. The full set of frequencies, across every horizon and for both overlapping and non-overlapping windows, is in Appendix Table 5.

Two warnings come attached, and the second is the one that shapes what comes next. The emerging-market and Asia-Pacific pairs post ten-year outperformance frequencies of 99.0% and 98.4%, figures almost designed to mislead. With samples this short, the ten-year windows overlap so heavily that they reduce to one or two genuinely independent decades; the near-certainty is an accident of the overlap, not a probability anyone should trust, and we carry it only for completeness. This is the trouble with any frequency drawn from a short, overlapping record, and it is the direct reason the analysis cannot stop here.

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3.5 Bootstrap estimates of long-horizon probabilities

The two previous subsections leave us with a method problem. The historical frequencies are the natural way to estimate how often equities beat bonds. However, over a ten-year horizon they rest on only a handful of non-overlapping windows, and the overlapping ones are so heavily autocorrelated that the apparent precision is biased. What we tried to do is to find a parametric alternative, fitting a distribution and simulating from it, is ruled out by the non-normality documented above: any model built on the normal curve would misstate precisely the tails that decide a long-horizon outcome. And so we were pushed to use a procedure that neither assumes a distributional form nor depends on the scarce independent decades in the raw record.

The stationary block bootstrap by Politis and Romano (1994) meets both requirements. Rather than resampling individual monthly returns, which would destroy the serial dependence in the data, it resamples blocks of consecutive months and chains them into a synthetic return path of the desired length. Each block length is drawn from a geometric distribution with mean equal to the chosen average block length, and blocks are sampled from the series treated as a circle, so that a block reaching the end of the sample wraps back to its start; together these two features make the resampled series stationary by construction, with no artificial break at fixed block boundaries. Concatenating blocks in this way preserves the properties that matter over long horizons, volatility clustering and any mean reversion present in the series, while letting us generate as many independent ten-year trajectories as we wish from a sample that natively contains only one or two. For each pair and horizon we draw 100,000 trajectories, compound the monthly returns within each into a cumulative real payoff, and read the probabilities of interest directly off the resulting distribution: the probability that an equity investment ends in real loss, and the probability that equities outperform bonds.

The single free parameter is the average block length, set to **24 months** in our baseline. The choice reflects a real trade-off. Too short a block behaves almost like an i.i.d. resample and washes out the multi-year dependence we specifically want to keep; too long a block, given samples that run only to a few hundred months, leaves so few distinct blocks that the simulated paths become near-replicas of the historical one and the resampling adds little. An average of two years sits between these extremes: long enough to carry the medium-term mean reversion that operates over the business cycle and short enough to recombine the history into genuinely varied trajectories. Because this is a judgement rather than an estimate, we do not lean on it blindly; Section 3.6 re-runs the whole exercise at 12, 24, and 36 months and shows the conclusions to be insensitive to it.

One feature of our implementation should be stated openly, as it bears on the interpretation of one statistic. The equity and bond paths are resampled independently of each other, so the contemporaneous correlation between the two asset classes is not preserved

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in the simulations. This is immaterial for the loss probabilities, which depend on each series alone, but it means that our estimate of $P(\text{equity} > \text{bond})$ compares an equity decade with an independently drawn bond decade rather than two outcomes realised over the same simulated period. The figure should therefore be read as the probability that a randomly drawn equity path outperforms a randomly drawn bond path, a close but not identical question to same-period outperformance. We note this in particular because the breakdown of the usual stock-bond relationship, of the kind seen in 2022, is precisely the co-movement this independence assumption sets aside.

3.6 Robustness to the block length

The single judgement in the bootstrap is the average block length, so the natural test is whether the conclusions survive a different choice. We re-ran the entire procedure at 12, 24, and 36 months; the full output is in Appendix Table 6. They barely move. For the global pair, the ten-year probability of equity outperformance stays between 76.2 and 79.3 percent across the three settings, and developed markets hold equally steady between 77.0 and 79.1 percent. The regional ordering does not shift at all under any choice: developed markets lead, emerging markets trail.

One mild and economically sensible pattern does appear. Longer blocks nudge the outperformance probability up and the real loss probability down at the ten-year horizon, for the global pair the loss probability falls from 20.9 percent at twelve months to 16.1 percent at thirty-six. This is what one would expect: a longer block carries more of the medium-term mean reversion across into the simulation, and mean reversion is the mechanism that works in the long-horizon investor's favour. The effect is small and overturns nothing.

3.7 Conclusion

This section leads to a crucial distinction: time diversification works in one specific way, but fails in another.

If we look at things relatively, the strategy holds up well. In all six regions and for every investment horizon tested, the likelihood that stocks beat bonds increases the longer you invest. By the ten-year mark, that probability reaches 78 percent in developed markets.

Where the strategy fails is on an absolute basis. A ten-year horizon is no shield against losing purchasing power. In fact, the probability of walking away poorer in real terms is 18% in developed markets, and it jumps to a staggering 37% in emerging markets. And so equities might beat bonds more often as time goes on, but they still lose real value roughly one decade out of five. Existing literature often treats time diversification as a guarantee of safety, blurring these two concepts together. By separating them, we uncover the actual practical reality for investors.

4 Country Level Evidence

The index-level analysis in Section 3 is constrained by a sample of approximately twenty-seven years, which allows meaningful inference only up to ten-year investment horizons. Yet the most important practical question for long-term investors concerns horizons of twenty, thirty, or fifty years.

To address this, we use the Jordà-Schularick-Taylor (JST) Macrohistory Database, which provides annual real return series for fifteen countries covering up to 150 years of history, from 1870 to 2020. This section applies the same analytical framework as Section 4: descriptive statistics, rolling-window analysis, and stationary block bootstrap, but extends the investment horizons to 1, 5, 10, 20, 30, and 50 years. Consistent with the main analysis, the entire country-level section is conducted exclusively in real terms.

4.1 Data and Country Coverage

The JST Macrohistory Database (Release 6) is a publicly available academic dataset assembled by Jordà, Schularick, and Taylor. It covers a broad set of advanced economies with annual series for equity total returns, government bond total returns, consumer price indices (CPI), and several macroeconomic variables. The database is widely used in long-horizon finance research because it extends far further back in time than any commercially available index.

The sample covers fifteen countries: Australia, Belgium, Denmark, Finland, France, Germany, Italy, Japan, Netherlands, Norway, Spain, Sweden, Switzerland, the United Kingdom, and the United States.

The full sample periods for the fifteen retained countries are reported in Appendix Table 7.

Within the retained countries, Germany's observations for 1921 to 1924 are excluded; During those years, Germany experienced hyperinflation: consumer prices rose by more than 400% in a single year, reaching one trillion percent in total between 1921 and 1923. When the CPI inflation rate is this extreme, the Fisher deflation formula produces real return figures that dominate all other observations in the sample and distort every statistical measure: mean, volatility, skewness, bootstrap simulations. Therefore, removing these four years is necessary, not a choice that flatters the results.

The raw data from the JST database provide nominal total return indices for equities and bonds. Total return means that dividends (for equities) and coupons (for bonds) are assumed to be reinvested, so the series reflects the actual compound wealth growth of an investor who holds and reinvests all income. This is identical in concept to the net total return indices used in the main index analysis.

The real return for each country in each year is computed using the Fisher equation: the standard formula for converting a nominal return into a real one by removing the effect of inflation:

$$r_{\text{real},t} = \frac{1 + r_{\text{nominal},t}}{1 + \pi_t} - 1 \tag{5}$$

where $r_{\text{nominal},t}$ is the annual nominal total return of the asset in year t, and π_t is the annual CPI inflation rate of that country in year t.

Crucially, each country's returns are deflated by its own CPI, not by a common deflator such as U.S. CPI. This reflects what a domestic investor actually experiences. This country-specific deflation is what makes the real return analysis in this section directly comparable across countries.

We define a new benchmark for measuring inflation. The annual CPI inflation rate is computed from the raw CPI index provided in the JST database using the standard percentage change formula:

$$\pi_t = \frac{\text{CPI}_t}{\text{CPI}_{t-1}} - 1 \tag{6}$$

Any country year observation where the computed inflation rate exceeds 500 percent in absolute value is treated as an outlier and dropped from the data. This filter is deliberately very wide: it catches only truly extreme hyperinflation episodes (Germany 1921–1924) without removing any of the elevated-but-moderate inflation periods of the 1970s and 1980s, which are economically important and must remain in the sample.

4.2 Real return distributions

Before examining long-horizon outcomes, it is important to understand the basic statistical properties of annual real equity and bond returns for each country.These characteristics influence how returns compound over time and help explain why average returns can be misleading indicators of long-term wealth accumulation. The full descriptive statistics are reported in Appendix Table 8, and the distribution charts for all fifteen countries are shown in Appendix Table 8 (equity) and Appendix Figures 7 and 8 (bond), respectively.

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The first and most important feature is that equities are more volatile than bonds in every single country in the sample. Looking at the numbers from Table 8, equity volatility (measured as the standard deviation of annual real returns) ranges from 16.6% in Australia and Denmark to 30.0% in Finland, with most European countries sitting between 17% and 27%. Bond volatility, ranges from 7.9% in Switzerland to 15.1% in Finland. The equity to bond volatility ratio is therefore roughly 2:1 everywhere, meaning equity investors absorb approximately twice the annual return fluctuation of bond investors.

The second feature is the gap between the arithmetic mean and the geometric mean of equity returns, which is larger than the corresponding gap for bonds. This matters for long-run outcomes. The arithmetic mean is what you get by averaging all annual return observations. The geometric mean is what you actually earn as an investor who compounds returns over many years. The two are linked by volatility through the following formula:

$$r_{\text{geometric}} \approx r_{\text{arithmetic}} - \frac{\sigma^2}{2} \tag{7}$$

where σ^2 is the variance of annual returns. Because equities have higher variance than bonds, their average long-term growth is affected more by volatility.

In Finland, for example, the arithmetic mean equity return is 8.91% but the geometric mean is only 4.98%; a gap of nearly four percentage points. For Finnish bonds, the same gap is only about 1.3 percentage points. Over 125 years, the impact is considerable; fluctuations in returns greatly reduce the amount of wealth accumulated.

France offers the clearest example: despite an arithmetic mean real equity return of 3.40%, the geometric mean is only 1.13%, this is explained by the cost of extreme volatility sustained over 150 years of French economic history, including two world wars, currency reforms, and financial crises.

The distribution charts in Appendix Table 8 and Figure 7 show that equity returns across all fifteen countries are not normally distributed. Germany (skewness +1.70, excess kurtosis +5.70) and Finland (skewness +1.20, excess kurtosis +4.90) show the most extreme non-normality, driven by very large positive outliers in their return histories: recoveries from wartime and crisis lows.

France (skewness +0.83, excess kurtosis +3.88) and Italy (skewness +0.71, excess kurtosis +2.89) show the opposite pattern at the long-run level. In other words, they sometimes benefit from unusually high returns, but their typical long-term results remain weak.

Australia and the USA show a negative skewness (−0.32 and −0.17, respectively), meaning their worst years are somewhat more extreme than their best.

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These non-normalities are precisely why the bootstrap methodology, which makes no distributional assumptions, is more appropriate than any parametric model.

The bond distributions in Figure 7 are generally more symmetric and show fewer extreme returns than the equity distributions, but they are far from risk-free. Germany's bond distribution stands out clearly: skewness of −2.11 and excess kurtosis of 15.95, driven by the enormous bond market losses during the hyperinflation episodes of the 1920s.

Switzerland's bonds show the most extreme kurtosis (10.90), reflecting the unusual combination of very stable positive real returns in most years punctuated by a few sharp negative outcomes.

These findings suggest that bonds are not a reliable safeguard against inflation, particularly in countries with a history of high inflation.

4.3 Real holding period returns

The full-sample real performance of equities and bonds for each country over its entire available history is reported in Appendix table 9. These figures present the results in terms that are most relevant to long-term investors: the total wealth accumulated and the corresponding annualized return.

The equity premium, which is the gap in annualized real return between equities and bonds, is positive in every single country in the sample. The size of this premium, however, varies enormously.

At the top, Germany (6.74% equity vs 2.24% bonds, a 4.5 percentage point gap), Australia (6.46% vs 1.78%, gap of 4.7 percentage points), and the USA (6.82% vs 2.43%, gap of 4.4 percentage points) show the equity advantage that Siegel and Dimson, Marsh and Staunton have documented.

At the bottom, France (1.13% equity vs 0.05% bonds, gap of only 1.1 percentage points) and Italy (2.44% vs 0.49%, gap of 2.0 percentage points) show a much weaker advantage, and crucially, one where both asset classes barely beat inflation over 150 years.

In France, for example, one euro invested in equities in 1871 was worth only 440% more in real terms by 2020, compared to 194,795% in Australia and 1,864,542% in the USA.

4.4 Equity outperformance in real terms

The central question of this thesis, *does equity beat bonds?*, is now answered country by country and horizon by horizon using the rolling-window outperformance frequency.

For each country and each horizon h, we compute the fraction of all overlapping h-year windows in which the cumulative real equity return exceeds the cumulative real bond return. The formula is:

$$\text{Freq}(h) = \frac{1}{N_h} \sum_t \mathbf{1}[R_{\text{equity}}(t,h) > R_{\text{bond}}(t,h)] \tag{8}$$

where N_h is the total number of h-year rolling windows for that country, $R_{\text{equity}}(t,h)$ is the cumulative real equity return over the window starting at year t, and $\mathbf{1}[\cdot]$ is the indicator function equal to 1 when the condition inside is true.

The full country-by-horizon matrix is reported in Appendix Table A.5.

Three main findings emerge from Table 10.

First, at the one-year horizon, equity outperformance is far from certain in any country. The range runs from 52.0% in France to 68.6% in Australia. In other words, choosing equities over bonds would have been the wrong decision about one-third of the time, even in the strongest market in the sample.

Second, the frequency of outperformance increases with the horizon in almost every country, which is the empirical signature of time diversification. The United States moves from 61.7% at one year to 97.7% at twenty years and 100% at both thirty and fifty years; meaning that in this sample there is not a single rolling thirty-year window in which US bonds beat US equities in real terms. Australia and the UK show similarly strong patterns. Germany, Denmark, Finland, Spain, and Switzerland all reach 95% or above at thirty years.

Third, and most importantly, France and Italy are persistent exceptions. France reaches only 85.1% at fifty years, meaning that roughly one in six fifty-year periods in French history saw bonds outperform equities in real terms. Italy is even weaker: 67.8% at thirty years and 81.2% at fifty years. These two countries, both major developed economies with long financial histories, demonstrate that the long-run equity advantage documented in US-centric studies cannot be assumed to hold universally.

4.5 Block Boostrap Estimates

The rolling-window outperformance frequencies in the previous section count how often equities beat bonds in the historical record, but they rely on overlapping windows that are not statistically independent.

The stationary block bootstrap addresses this by generating 50,000 independent simu-

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lated return paths per country and horizon, resampling blocks of consecutive years from the historical data to preserve the time-series dependence structure, in particular, the tendency for good and bad years to cluster together in cycles. An average block length of 10 years is used throughout, appropriate for annual data spanning over a century. The bootstrap is run at the 30-year and 50-year horizons, which are the most relevant for pension savers, endowments, and other genuinely long-term investors.

From each set of simulations, three statistics are computed for each horizon:

- P(Eq Loss), the probability of a negative real equity return;
- P(Bond Loss), the probability of a negative real bond return;
- P(Eq $>$ Bond), the probability that the equity path outperforms the bond path.

The equity return distribution is also summarised through its median, 5th percentile (the typical bad outcome), and 95th percentile (the typical good outcome).

The results are shown on Table 11, they reveal a clear and consistent pattern across countries, with two notable exceptions. At the 30-year horizon, the probability that equities outperform bonds in real terms ranges from 62.4% in Italy to 97.5% in Australia. Every country except France (69.1%) and Italy exhibits a P(Eq $>$ Bond) above 74%. By the 50-year horizon, this range narrows significantly: Australia reaches 99.4%, Denmark 97.7%, and Germany 95.9%, while even Belgium and Norway exceed 80%. The improvement between the two horizons is both significant and consistent. For most countries, the probability of equity outperformance increases by between five and ten percentage points over the additional twenty years.

The probability of a real equity loss declines sharply with the investment horizon in the majority of countries. At 30 years, Australia already exhibits a near-zero equity loss probability of 0.5%, while Denmark records only 0.1%. Germany, Japan, and Switzerland each display equity loss probabilities below 7% at the 30-year horizon. By 50 years, equity loss probabilities effectively fall to zero in Australia, Denmark, and Germany, and decline below 3% in Japan, the Netherlands, Norway, and Switzerland. The typical outcome, measured by the median cumulative real equity return, is strongly positive at both horizons for most countries. Australia's median equity return reaches 571.8% over 30 years and 2,256.6% over 50 years, while Germany's corresponding medians are 519.9% and 2,126.6%. Even the 5th-percentile outcome: representing a one-in-twenty adverse scenario, remains positive for Australia, Denmark, and the United Kingdom at both horizons. In these markets, equity investors preserved real purchasing power in the majority of historical conditions, even over a 30-year investment period.

The picture is significantly different for bonds. The probability of a real bond loss remains high across many countries, even at long horizons. At 30 years, bond loss probabilities reach 43.6% in France, 40.7% in Finland, 39.6% in Italy, and 25.5% in Norway. Even after 50 years, the probability of a negative real bond return remains high in France (45.2%), Finland (41.4%), and Italy (40.5%). Government bonds, conventionally regarded as the safe asset, therefore retain a meaningful probability of destroying purchasing power over several decades.

France and Italy stand apart from every other country in the sample; In France, the probability of a real equity loss is 38.0% at the 30-year horizon and declines marginally to 36.3% at 50 years, the highest values in the dataset at both horizons by a considerable margin. The 5th-percentile 30-year equity outcome is −89.7%, implying that in one out of twenty simulated paths, a French equity investor loses nearly all of their real wealth over a generation. The 50-year 5th percentile is even more severe at −93.6%. Likewise, the probability of equity outperformance remains the lowest in the sample, increasing only from 69.1% at 30 years to 73.9% at 50 years. This improvement is very different from the strong increase in outperformance probabilities observed in Anglo-Saxon and Nordic markets

Italy displays a similar profile. The probability of a real equity loss reaches 26.2% at 30 years, while $P(\text{Eq} > \text{Bond})$ rises only from 62.4% at 30 years to 68.2% at 50 years. The 5th-percentile equity outcome is −73.7% at both horizons, indicating virtually no improvement in downside risk despite an additional twenty years of investment. These results do not depend on the specific bootstrap method used, as they reflect a fundamental feature of the French and Italian markets: high volatility combined with relatively weak long-term growth, which longer investment horizons cannot fully overcome.

have important implications for investors. The high outperformance probabilities often reported for global equity indices reflect the disproportionate weight of the strongest-performing economies within those indices. Investors with concentrated exposure to French or Italian equities face very different long-term returns from those of globally diversified investors. The evidence presented by **anarkulova2022** warns against generalizing from the historical U.S. experience. The French and Italian bootstrap results suggest that this caution remains relevant even within developed economies. Consequently, the conventional advice that investors should simply “hold equities for the long run” appears considerably more defensible in some national markets than in others.

4.6 Robustness Check

To assess whether the main findings depend on the choice of block length, the stationary block bootstrap procedure is repeated for each country at the 30-year and 50-year horizons using average block lengths of 5, 10, and 15 years. These are the horizons for which the bootstrap results are reported in Section 4.5 and are the most relevant for genuinely long-term investors. The objective is to determine whether the estimated probability of equity outperformance changes under different assumptions about the persistence of returns.

The results in Table 12 indicate that the central conclusions are highly robust to the choice of block length. For most countries, varying the average block length between 5 and 15 years changes the estimated $P(\text{Eq} > \text{Bond})$ by less than three percentage points at both the 30-year and 50-year horizons. Moreover, country rankings remain entirely stable across all specifications. Australia, Denmark, Germany, and the United Kingdom consistently exhibit the highest probabilities of equity outperformance. The rankings remain unchanged across all alternative bootstrap specifications.

The countries displaying the greatest sensitivity to block length are France and Italy, which are also the countries with the weakest long-run equity advantage. For France at the 30-year horizon, the estimated P(Eq¿Bond) varies by about two to three percentage points across different block lengths, with Italy showing a similar level of variation. This result is informative in itself. When the equity premium is relatively small and returns are highly volatile, small changes in the resampling method can have a noticeable impact on the estimated advantage of equities over bonds. As a result, the evidence supporting a long-run equity advantage is less robust in France and Italy than in the other countries in the sample at every horizon considered.

At the 50-year horizon, a small pattern can be observed. In most countries, longer block lengths slightly increase the probability that equities outperform bonds. The increase is usually only one or two percentage points and does not affect the main conclusions. Similarly, the probability of losing money in real terms from equities tends to decrease slightly when longer block lengths are used.

Overall, the sensitivity analysis confirms that the main specification using an average block length of 10 years yields results that are highly stable. In fact, the main specification appears a bit conservative, since longer block lengths generally lead to slightly higher estimates of equity outperformance. The robustness of the results across block lengths therefore strengthens confidence in the central findings rather than weakening them.

4.7 What longer horizon adds

The country-level analysis contributes three insights that the 27-year index sample examined in Section 3 is structurally unable to provide.

First, it allows the question to be studied at horizons that are relevant for long-term investing. The bootstrap results at the 30-year and 50-year horizons reveal that the benefits of time diversification continue to increase well beyond the ten-year horizon accessible in the index data. At 30 years, the probability of a real equity loss falls below 10% in the majority of countries, dropping below 1% in Australia and Denmark. By 50 years, it ap-

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proaches zero in all markets except France and Italy. The median cumulative real equity return at the 50-year horizon exceeds 600% in most countries and surpasses 2,000% in Australia, Denmark, Germany, and Japan. These are the outcomes that are most relevant for pension fund trustees, endowment managers, and individuals saving for retirement. The analysis also highlights the importance of patience. The improvement between the 30-year and 50-year horizons is substantial in most countries, underscoring that long-term investing should be measured in decades rather than years.

Second, the country-level analysis provides an important validation of the index-level findings using a much larger and more heterogeneous sample. In the index analysis, the ten-year probability of equity outperformance was estimated at 77.9%–78.1% for global and developed-market indices. The country-level bootstrap produces probabilities ranging from 62.4% in Italy to 97.5% in Australia at the 30-year horizon, with the majority of countries concentrated between approximately 74% and 97%. The index-level estimate is among the highest values in the distribution, which is economically intuitive. Global indices are disproportionately weighted toward the largest and most successful economies, for instance, the United States, the United Kingdom, Japan, and several Northern European countries, which are also among the markets with the highest probabilities of long-run equity outperformance. As a result, investors in global indices are heavily exposed to these strong-performing markets. The country-level analysis helps show how much this composition influences the overall results.

Third, the country-level analysis identifies France and Italy as long-run exceptions where the equity premium exists but is weaker than elsewhere in the developed world. France has a 30-year equity loss probability of 38.0%, while Italy records 26.2%; both figures remain unusually high even at the 50-year horizon. These outcomes differ strongly with the near-zero loss probabilities observed in Australia, Denmark, and Germany over comparable horizons. Therefore, investors with concentrated exposure to French or Italian domestic equities face very different long-term outcomes from those reflected in global market indices. The results suggest that the common advice to “hold equities for the long run” cannot be applied uniformly across countries. While the principle remains broadly valid, its practical strength depends critically on the market in which investors are exposed.

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Conclusion

This paper examined whether stocks become less risky than bonds over long investment horizons. To answer this question, it used two datasets: monthly data from six regional stock and bond indices covering up to 27 years, and annual real return data from 15 developed countries spanning as much as 150 years from the Jordà-Schularick-Taylor Macrohistory Database.

Overall, the results provide support for the idea of time diversification. In all six regional markets, the probability that stocks outperform bonds increases as the investment horizon gets longer. For example, this probability rises from about 66% over one year to 78–80% over ten years in global and developed markets. The country-level analysis, that looks at horizons of 30 and 50 years, strengthens this finding. At a 30-year horizon, stocks outperform bonds more than 74% of the time in most countries, and reaching over 95% in Australia, the United Kingdom, and the United States. At 50 years, this probability is higher than 95% in several countries and remains above 80% everywhere except France and Italy. These findings are consistent with previous research showing that stocks tend to perform better than bonds over the long run.

However, the results also highlight important limitations. First, the risk of losing money does not disappear completely, even over long horizons. After ten years, the probability of a negative real stock return is still around 18% in developed markets and over 37% in emerging markets. While this risk falls below 10% in several countries at a 30-year horizon, it remains relatively high in France and Italy. Even after 50 years, investors in these countries still face a high probability of losing purchasing power. Bonds are not risk-free either: in many countries, the probability of a negative real bond return over 30 years remains above 20%, and exceeds 40% in some cases.

Second, the benefits of long-term investing vary significantly across countries. Countries such as the United States, Australia, the United Kingdom, Germany, Denmark, and several Nordic economies show a strong long-run advantage for stocks, with very low probabilities of loss. In contrast, France and Italy stand out as exceptions; In France, the probability that stocks outperform bonds after 50 years is only 73.9%, while in Italy it is 68.2%. These results suggest that factors such as economic growth, institutional stability, and major historical disruptions play an important role in determining long-term investment outcomes.

The country-level analysis also helps explain why global indices often show stronger results than individual countries. Global indices are heavily weighted toward the best-performing economies, that can make the long term advantage of stocks appear more reliable than it actually is in some domestic markets. Therefore, investors who rely only on global evidence may overestimate the strength of the equity premium in their own country.

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Also, the regional index results need to be interpreted carefully. The data for emerging markets and Asia-Pacific cover only relatively short periods and do not include many major historical crises. As a result, the risks in these regions may be underestimated. Future research could use longer datasets to determine whether the same patterns hold over extended horizons.

In conclusion, the results support a probabilistic view of the equity premium. Stocks are generally more likely than bonds to deliver higher returns over long investment horizons, especially in developed markets. However, this outcome is not guaranteed and varies considerably across countries. Long-term investors should remain patient while also maintaining international diversification rather than relying on the historical performance of a single market.

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A Appendix

This appendix reports the full descriptive and bootstrap materials underlying the results discussed in the main text.

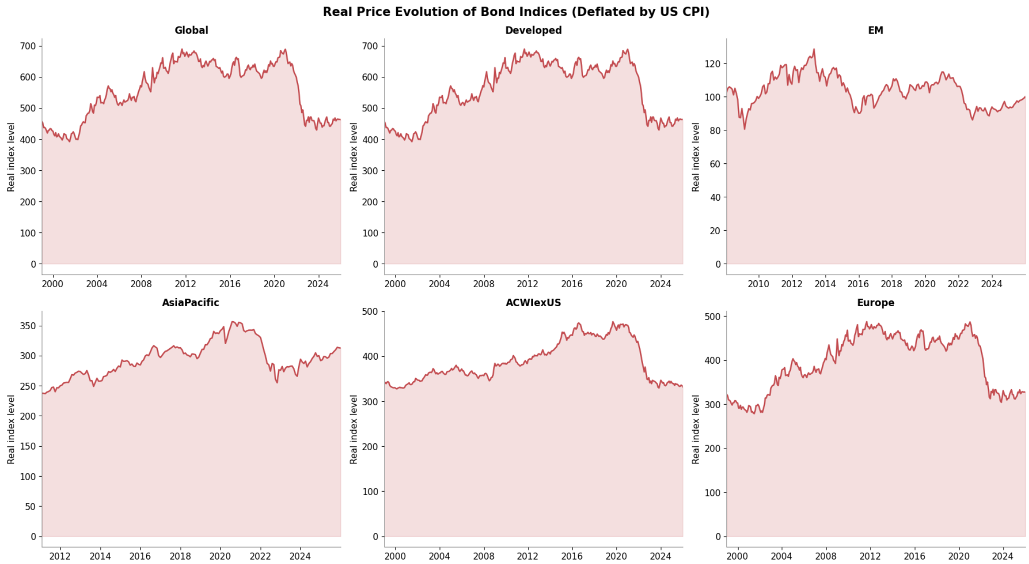

Figure 1: Real Government Bond Index Levels (Deflated by US CPI)

Note: Each series represents the evolution of the corresponding government bond index after deflation by the US Consumer Price Index (CPI). The figure illustrates the weak long-run real performance of government bonds across most regions and the sharp repricing observed after the 2022 inflation shock.

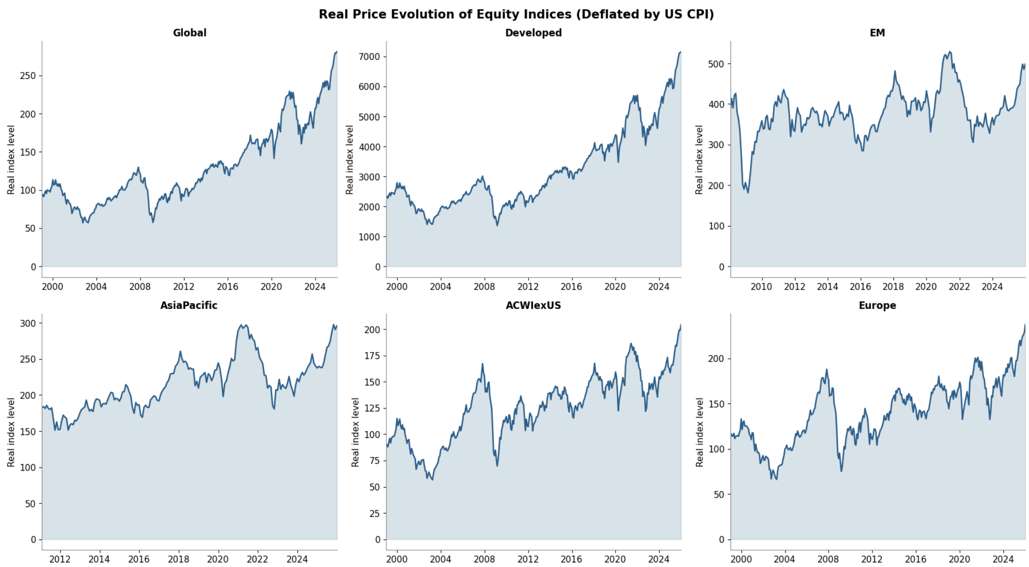

Figure 2: Evolution of Real Equity Index Levels

Note: Equity index levels are deflated by the US CPI in order to measure purchasing-power growth over time. The figure highlights the stronger long-run real appreciation of equities relative to bonds across most regions.

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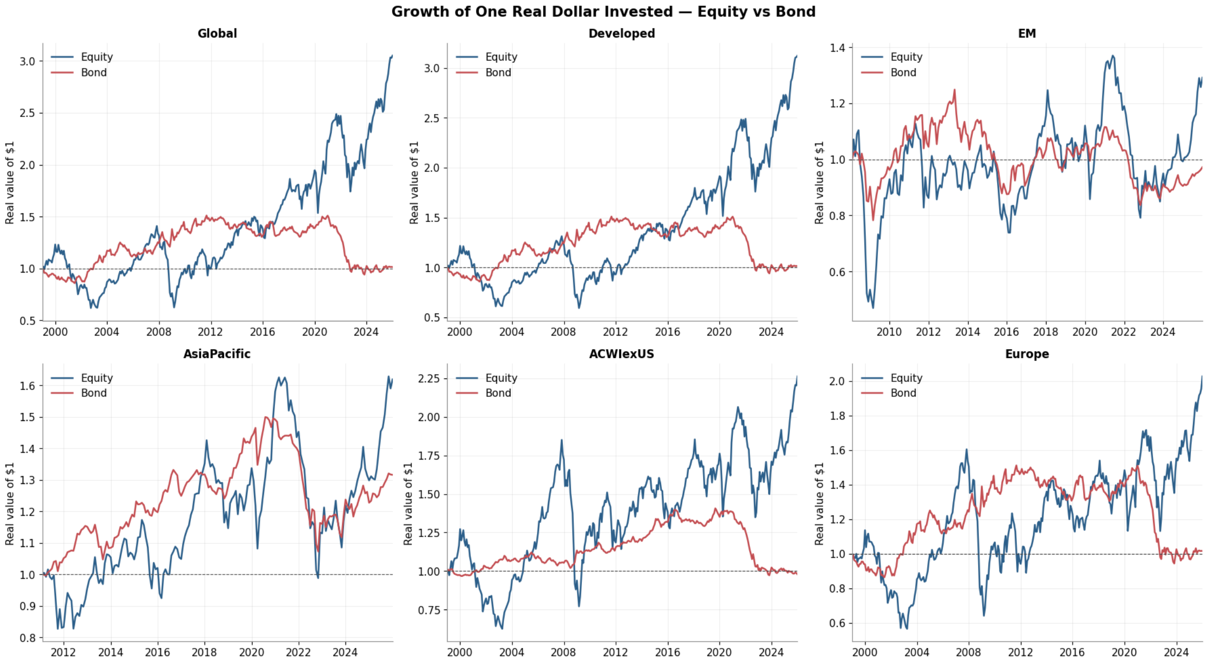

Figure 3: Growth of One Euro Invested in Equities and Bonds

Note: The figure compares the cumulative growth of one euro invested in equities and government bonds across regions over the available sample periods. Returns are expressed in real terms after inflation adjustment.

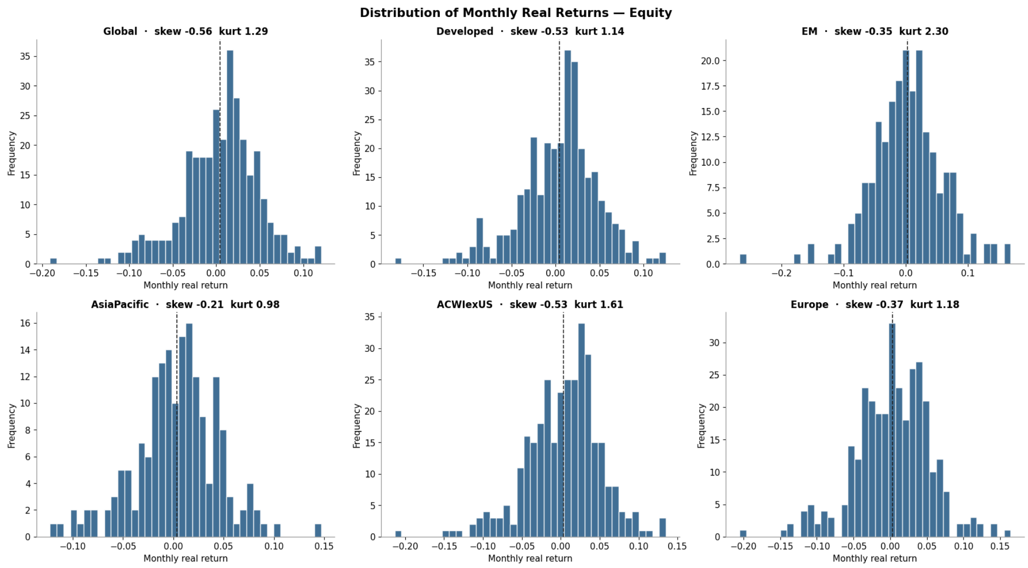

Figure 4: Distribution of Monthly Real Equity Returns

Note: The distributions highlight the non-normality of equity returns, including negative skewness and fat tails, particularly in emerging markets.

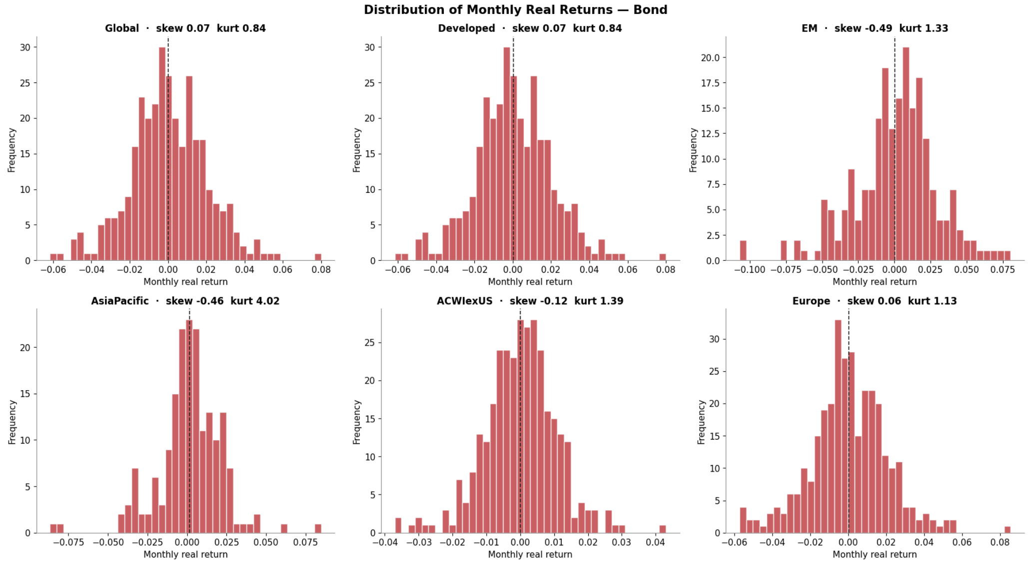

Figure 5: Distribution of Monthly Real Bond Returns

Note: Bond return distributions are generally less dispersed than equity distributions but still display periods of significant downside risk, especially after the 2022 inflation shock.

Table 1: Sample periods by index pair

Pair	**Start**	**End**	**Months**	**Years**
Global (ACWI)	1998-12	2025-12	325	27.1
Developed (World)	1998-12	2025-12	325	27.1
ACWI ex US	1998-12	2025-12	325	27.1
Europe	1998-12	2025-12	325	27.1
Emerging Markets	2008-01	2025-12	216	18.0
Asia Pacific	2011-01	2025-12	180	15.0

Table 2: Full-sample real returns by index pair

Region	**Eq Total**	**Eq Ann.**	**Bond Total**	**Bond Ann.**
Global	205%	4.2%	1.4%	0.05%
Developed	211%	4.3%	1.4%	0.05%
ACWI ex US	130%	3.1%	-2.2%	-0.1%
Europe	107%	2.7%	2.7%	0.1%
EM	28%	1.4%	-2.8%	-0.2%
Asia Pacific	63%	3.3%	32%	1.9%

Note: Cumulative (”Total”) and annualised (”Ann.”) real returns for equities and bonds over each pair’s full sample.

We acknowledge that we have used AI to help rewrite and improve the syntax of certain sections of this report.

Table 3: Descriptive statistics of monthly real returns

Region	Asset	N	Arith. ann.	Geom. ann.	Vol. ann.	Skew.	Kurt.	Min monthly	Max monthly
Global	Equity	324	5.5%	4.2%	15.4%	-0.56	1.29	-19.1%	12.1%
Global	Bond	324	0.3%	0.1%	7.0%	0.07	0.84	-6.2%	8.0%
Developed	Equity	324	5.5%	4.3%	15.2%	-0.53	1.14	-18.3%	12.5%
Developed	Bond	324	0.3%	0.1%	7.0%	0.07	0.84	-6.2%	8.0%
EM	Equity	215	3.6%	1.4%	20.2%	-0.35	2.30	-26.7%	16.9%
EM	Bond	215	0.4%	-0.2%	10.1%	-0.49	1.33	-10.7%	8.0%
Asia Pacific	Equity	179	4.3%	3.3%	14.3%	-0.21	0.98	-12.3%	14.7%
Asia Pacific	Bond	179	2.1%	1.9%	7.1%	-0.46	4.02	-8.7%	8.5%
ACWI ex US	Equity	324	4.5%	3.1%	16.5%	-0.53	1.61	-21.3%	13.5%
ACWI ex US	Bond	324	0.0%	-0.1%	3.7%	-0.12	1.39	-3.7%	4.3%
Europe	Equity	324	4.3%	2.7%	17.7%	-0.37	1.18	-20.6%	16.4%
Europe	Bond	324	0.3%	0.1%	7.1%	0.06	1.13	-5.7%	8.6%

Note: This table shows monthly real returns for each index pair, deflated by the US CPI. Means and volatility are annualised; skewness and kurtosis describe the monthly distribution. N is the number of monthly observations.

Table 4: Rolling 5 and 10-year real holding-period returns

Region	Horizon	Asset	N	Min	Max	Mean	Median
Global	5y	Equity	266	-29.7%	110.8%	27.5%	27.1%
Global	5y	Bond	266	-32.7%	37.5%	4.8%	6.7%
Global	10y	Equity	206	-39.7%	171.9%	57.2%	59.6%
Global	10y	Bond	206	-34.8%	69.8%	12.7%	11.3%
Developed	5y	Equity	266	-31.6%	114.0%	28.6%	31.0%
Developed	5y	Bond	266	-32.7%	37.5%	4.8%	6.7%
Developed	10y	Equity	206	-42.5%	188.7%	61.0%	59.2%
Developed	10y	Bond	206	-34.8%	69.8%	12.7%	11.3%
EM	5y	Equity	157	-32.8%	82.9%	9.7%	4.9%
EM	5y	Bond	157	-21.5%	22.9%	-2.2%	-8.8%
EM	10y	Equity	97	-17.1%	74.5%	20.0%	12.6%
EM	10y	Bond	97	-28.5%	26.7%	-5.0%	-4.3%
Asia Pacific	5y	Equity	121	-25.5%	59.5%	16.6%	14.2%
Asia Pacific	5y	Bond	121	-18.5%	24.0%	7.0%	12.7%
Asia Pacific	10y	Equity	61	2.2%	81.5%	35.3%	26.8%
Asia Pacific	10y	Bond	61	-7.1%	38.8%	13.8%	8.8%
ACWI ex US	5y	Equity	266	-32.5%	85.4%	21.0%	12.2%
ACWI ex US	5y	Bond	266	-29.1%	20.7%	2.2%	6.3%
ACWI ex US	10y	Equity	206	-24.5%	121.1%	32.9%	28.7%
ACWI ex US	10y	Bond	206	-27.2%	35.5%	10.0%	14.9%
Europe	5y	Equity	266	-41.7%	75.7%	20.0%	9.9%
Europe	5y	Bond	266	-32.7%	37.6%	4.8%	6.8%
Europe	10y	Equity	206	-34.4%	104.7%	28.9%	28.5%
Europe	10y	Bond	206	-34.7%	69.6%	12.6%	11.3%

Note: Real holding-period returns over 5 and 10-year horizons, computed from overlapping rolling windows. N is the number of windows; returns are cumulative (non-annualised).

Table 5: Frequency of equity outperformance over bonds, real returns

Region	1y N	1y freq.	5y N	5y freq.	10y N	10y freq.
Global	314	71.3%	266	66.2%	206	77.2%
Developed	314	71.0%	266	66.9%	206	77.2%
EM	205	59.5%	157	73.9%	97	99.0%
Asia Pacific	169	51.5%	121	69.4%	61	98.4%
ACWI ex US	314	61.8%	266	66.2%	206	71.4%
Europe	314	63.4%	266	63.2%	206	65.5%

Note: Frequencies are computed from overlapping rolling windows. The ten-year figures for EM and Asia Pacific are mechanically inflated by the limited number of independent ten-year windows.

Table 6: Robustness of real-return bootstrap estimates to block length

Region	Horizon	$P(E > B)$			$P(E < 0)$		
		12m	24m	36m	12m	24m	36m
Global	1y	64.8%	65.5%	65.6%	32.7%	32.2%	32.2%
Global	5y	70.5%	71.2%	71.3%	27.2%	26.1%	25.8%
Global	10y	76.2%	77.9%	79.3%	20.9%	18.5%	16.1%
Developed	1y	65.2%	66.0%	66.5%	32.2%	31.6%	31.3%
Developed	5y	70.9%	71.5%	71.4%	26.8%	26.3%	26.5%
Developed	10y	77.0%	78.1%	79.1%	20.1%	17.9%	16.5%
EM	1y	55.8%	55.7%	56.2%	43.0%	43.0%	42.9%
EM	5y	57.8%	58.1%	58.4%	41.9%	41.4%	40.5%
EM	10y	59.9%	62.0%	63.8%	39.7%	37.2%	35.0%
Asia Pacific	1y	55.6%	56.7%	56.5%	37.0%	35.8%	36.1%
Asia Pacific	5y	59.3%	59.7%	60.8%	27.3%	24.2%	22.6%
Asia Pacific	10y	62.2%	64.3%	65.2%	20.5%	15.8%	13.2%
ACWI ex US	1y	61.3%	61.8%	62.0%	38.4%	37.8%	37.7%
ACWI ex US	5y	65.9%	66.1%	66.2%	33.7%	32.8%	32.3%
ACWI ex US	10y	70.8%	72.8%	74.4%	28.7%	25.8%	23.7%
Europe	1y	58.8%	59.1%	59.4%	40.4%	40.3%	40.0%
Europe	5y	62.7%	62.8%	63.1%	35.2%	34.9%	34.1%
Europe	10y	66.7%	68.2%	68.6%	31.2%	28.5%	26.8%

Note: Bootstrap estimates of the probability that equities outperform bonds, P(E>B), and the probability of a negative real equity return, P(E<0), under average block lengths of 12, 24 and 36 months, for each region and horizon.

We acknowledge that we have used AI to help rewrite and improve the syntax of certain sections of this report.

Table 7: Sample periods by country (JST Database)

Country	**Start**	**End**	**Years**
Australia	1900	2020	121
Belgium	1871	2020	144
Denmark	1873	2020	147
Finland	1896	2020	125
France	1871	2020	150
Germany	1871	2020	142
Italy	1871	2020	150
Japan	1886	2020	132
Netherlands	1900	2020	121
Norway	1881	2020	140
Spain	1900	2020	117
Sweden	1871	2020	150
Switzerland	1900	2020	120
UK	1871	2020	150
USA	1872	2020	149

Note: This table lists the data window available for each of the fifteen developed countries in the country-level analysis. Start and end years correspond to the first and last year for which both equity and bond total return series are simultaneously available in the Jordà–Schularick–Taylor (JST) Macrohistory Database, Release 6, Years = number of annual observations used after data cleaning.

We acknowledge that we have used AI to help rewrite and improve the syntax of certain sections of this report.

Figure 6: Growth of 1$ invested in Equity vs Bonds

Notes: Each panel shows the cumulative real wealth accumulated by a buy-and-hold investor who invested one dollar in equities (blue) and one dollar in government bonds (orange) at the beginning of the country's sample period and held the investment until 2020. Returns are deflated using each country's consumer price index (CPI) and computed according to the Fisher equation:

$$r_{\text{real}} = \frac{1 + r_{\text{nominal}}}{1 + \pi} - 1.$$

The vertical axis is displayed on a logarithmic scale. JST = Jordà–Schularick–Taylor; CPI = Consumer Price Index.

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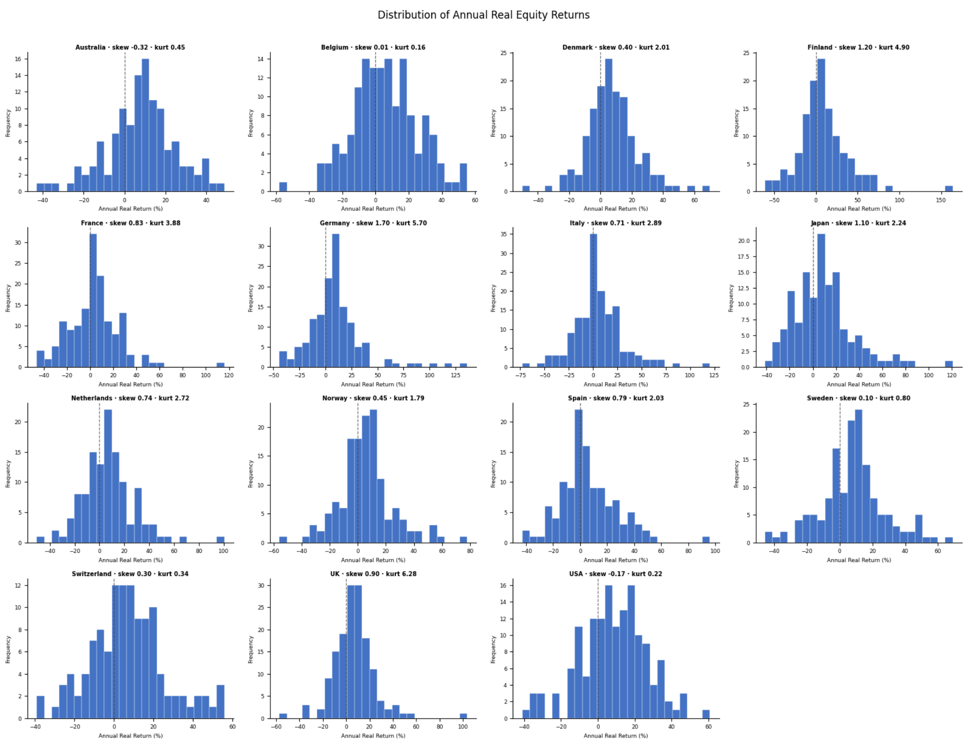

Figure 7: Distribution of Annual Real Equity returns

Notes: Each panel shows a histogram of annual real equity returns for one country. The horizontal axis reports annual inflation-adjusted returns (in percent), while the vertical axis reports the number of observations within each return interval. Returns are calculated in real terms using country-specific consumer price indices (CPI). JST = Jordà–Schularick–Taylor; CPI = Consumer Price Index.

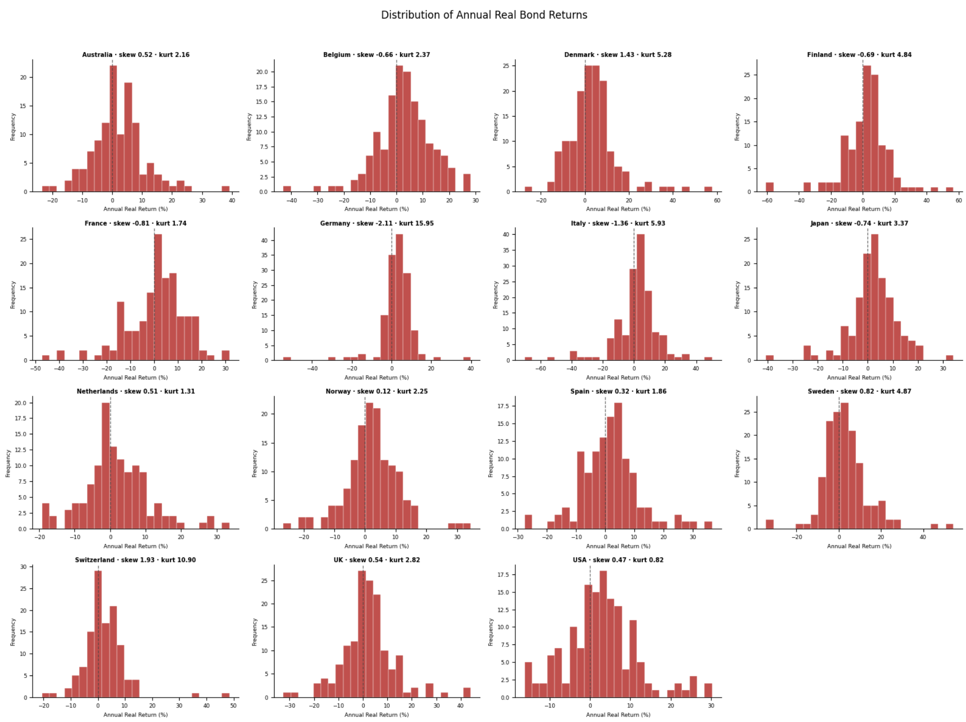

Figure 8: Distribution of Annual Real Bond returns

Notes: Constructed identically to Figure 7 but for annual real government bond returns. Skew = skewness; Kurt = excess kurtosis; CPI = Consumer Price Index; JST = Jordà–Schularick–Taylor.

We acknowledge that we have used AI to help rewrite and improve the syntax of certain sections of this report.

Table 8: Descriptive statistics of annual real returns by country

Country	Asset	Arith. Mean	Geom. Mean	Volatility	Skewness	Min	Max
Australia	Eq	7.82%	6.46%	16.61%	-0.32	-43.0%	62.0%
Australia	Bond	2.17%	1.78%	9.02%	0.52	-20.0%	38.0%
Belgium	Eq	6.00%	4.06%	19.80%	0.01	-44.0%	100.0%
Belgium	Bond	3.00%	2.42%	10.55%	-0.66	-28.0%	40.0%
France	Eq	3.40%	1.13%	21.91%	0.83	-37.0%	80.0%
France	Bond	0.92%	0.05%	12.66%	-0.81	-31.0%	42.0%
Germany	Eq	9.59%	6.74%	26.82%	1.70	-56.0%	155.0%
Germany	Bond	2.68%	2.24%	8.66%	-2.11	-37.0%	22.0%
Italy	Eq	5.70%	2.44%	25.89%	0.71	-48.0%	120.0%
Italy	Bond	1.82%	0.49%	14.53%	-1.36	-39.0%	45.0%
Japan	Eq	9.52%	6.71%	25.98%	1.10	-54.0%	121.0%
Japan	Bond	2.27%	1.78%	9.65%	-0.74	-23.0%	30.0%
USA	Eq	7.14%$^{(*)}$	6.82%	17.8%	-0.48	-38.0%	57.0%
USA	Bond	2.43%	1.78%	9.65%	-0.74	-23.0%	30.0%

Note: This table summarises the statistical properties of annual real returns for each country's equity and bond markets, from JST data. Eq = equity; Bond = government bond; Arith. = arithmetic; Geom. = geometric; JST = Jordà–Schularick–Taylor;

Table 9: Full-sample real returns by country

Country	Start	End	Eq Total	Eq Ann.	Bond Total	Bond Ann.	Years
Australia	1900	2020	194795%	6.46%	747%	1.78%	121
Belgium	1871	2020	30830%	4.06%	3018%	2.42%	144
Denmark	1873	2020	872855%	6.37%	8259%	3.06%	147
Finland	1896	2020	43198%	4.98%	96%	0.54%	125
France	1871	2020	440%	1.13%	7%	0.05%	150
Germany	1871	2020	1049189%	6.74%	2215%	2.24%	142
Italy	1871	2020	3638%	2.44%	108%	0.49%	150
Japan	1886	2020	530663%	6.71%	930%	1.78%	132
Netherlands	1900	2020	40957%	5.10%	496%	1.49%	121
Norway	1881	2020	22563%	3.95%	1119%	1.80%	140
Spain	1900	2020	8665%	3.90%	219%	1.00%	117
Sweden	1871	2020	991226%	6.33%	5102%	2.67%	150
Switzerland	1900	2020	38812%	5.10%	1041%	2.05%	120
UK	1871	2020	236455%	5.32%	1251%	1.75%	150
USA	1872	2020	1864542%	6.82%	3466%	2.43%	149

Note: This table translates each country's full return history into the language most relevant for long-term investors: total cumulative wealth and its annualised equivalent, both in real (inflation-adjusted) terms. Eq = equity; Bond = government bond; Ann. = annualised; JST = Jordà–Schularick–Taylor; CPI = Consumer Price Index.

Table 10: Frequency of real equity outperformance over bonds, by country

Country	1yr	5yr	10yr	20yr	30yr	50yr
Australia	68.6%	78.6%	87.5%	95.1%	95.7%	100.0%
Belgium	56.2%	57.1%	71.1%	76.8%	92.2%	97.9%
Denmark	63.9%	74.1%	85.5%	90.6%	95.8%	100.0%
Finland	55.2%	63.6%	78.4%	93.4%	100.0%	100.0%
France	52.0%	56.2%	61.7%	67.9%	76.0%	85.1%
Germany	64.1%	71.7%	79.7%	92.7%	99.1%	100.0%
Italy	52.7%	52.7%	54.6%	60.3%	67.8%	81.2%
Japan	60.6%	67.2%	74.8%	74.3%	83.5%	100.0%
Netherlands	60.3%	70.9%	70.5%	84.3%	81.5%	100.0%
Norway	57.9%	61.0%	71.0%	84.3%	95.5%	97.8%
Spain	56.4%	64.6%	76.9%	93.9%	95.5%	100.0%
Sweden	62.0%	74.0%	77.3%	80.2%	76.9%	87.1%
Switzerland	67.5%	73.3%	75.7%	84.2%	94.5%	100.0%
UK	67.3%	75.3%	82.3%	89.3%	100.0%	100.0%
USA	61.7%	71.7%	88.6%	97.7%	100.0%	100.0%

Note: For each country and investment horizon (1, 5, 10, 20, 30, and 50 years), the table reports the fraction of all overlapping rolling windows in which equities delivered a higher cumulative real return than bonds. yr = year horizon; JST = Jordà–Schularick–Taylor; CPI = Consumer Price Index.

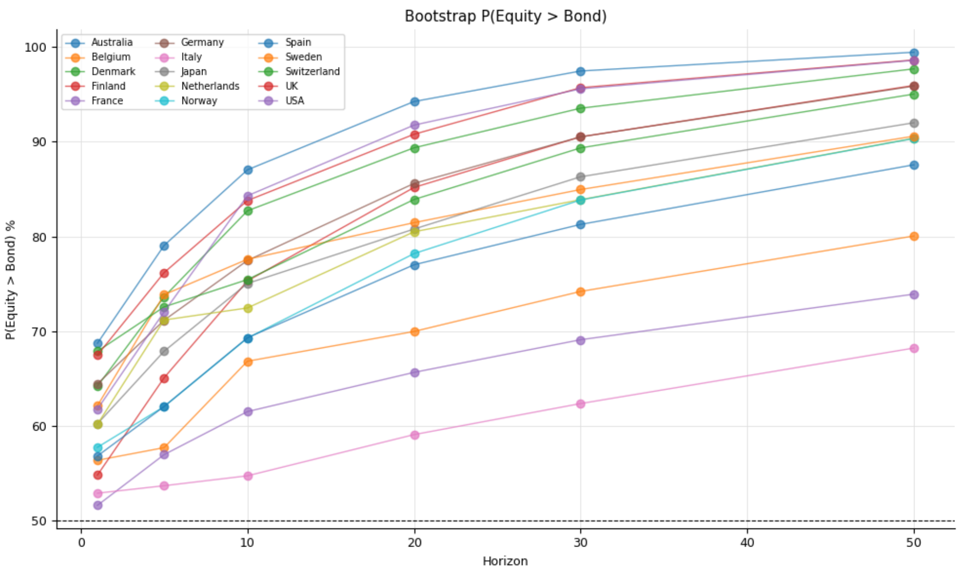

Figure 9: Boostrap P(Equity > Bond)

Note: This figure plots the probability that equities outperform bonds in real terms as a function of the investment horizon (x-axis, 1–50 years) for each of the fifteen JST countries, estimated via a stationary block bootstrap with 50,000 simulated paths per country and horizon. P(Equity ¿ Bond) = probability that cumulative real equity return exceeds cumulative real bond return; JST = Jordà–Schularick–Taylor; CPI = Consumer Price Index.

We acknowledge that we have used AI to help rewrite and improve the syntax of certain sections of this report.

Table 11: Stationary Block Bootstrap Results by Country and Horizon

Country	Horizon	P(Eq Loss)	P(Bond Loss)	P(Eq > Bond)	Eq Median	Eq p5	Eq p95
Australia	30yr	0.5%	23.8%	97.5%	571.8%	113.8%	1739.5%
Australia	50yr	0.0%	16.6%	99.4%	2256.6%	472.6%	8389.0%
Belgium	30yr	7.7%	17.3%	74.2%	232.2%	-17.1%	1241.9%
Belgium	50yr	3.1%	11.8%	80.0%	638.5%	26.2%	4200.0%
Denmark	30yr	0.1%	9.3%	93.5%	522.5%	120.3%	1871.9%
Denmark	50yr	0.0%	4.1%	97.7%	2055.3%	435.2%	9545.7%
Finland	30yr	13.5%	40.7%	90.5%	338.7%	-54.9%	3791.1%
Finland	50yr	7.8%	41.4%	95.9%	1037.2%	-33.3%	18170.3%
France	30yr	38.0%	43.6%	69.1%	62.3%	-89.7%	1004.3%
France	50yr	36.3%	45.2%	73.9%	103.4%	-93.6%	2845.5%
Germany	30yr	6.3%	19.4%	90.5%	519.9%	-11.1%	9595.2%
Germany	50yr	2.1%	19.5%	95.9%	2126.6%	79.2%	58757.0%
Italy	30yr	26.2%	39.6%	62.4%	117.0%	-73.7%	1203.0%
Italy	50yr	20.7%	40.5%	68.2%	251.7%	-73.7%	3404.3%
Japan	30yr	3.0%	22.9%	86.3%	598.1%	25.7%	3982.8%
Japan	50yr	0.7%	18.0%	92.0%	2432.0%	188.7%	23902.3%
Netherlands	30yr	6.1%	28.0%	83.9%	332.2%	-8.3%	2248.2%
Netherlands	50yr	1.8%	21.8%	90.4%	1078.8%	67.0%	9741.8%
Norway	30yr	10.6%	25.5%	83.8%	228.0%	-29.8%	1279.2%
Norway	50yr	5.0%	18.7%	90.3%	600.1%	-0.7%	4476.5%
Spain	30yr	13.5%	37.1%	81.3%	219.8%	-51.2%	1873.7%
Spain	50yr	8.5%	34.6%	87.6%	588.0%	-35.7%	6233.7%
Sweden	30yr	5.5%	16.0%	85.0%	607.8%	-5.0%	2727.8%
Sweden	50yr	1.8%	9.3%	90.6%	2349.0%	118.2%	15397.4%
Switzerland	30yr	3.4%	8.6%	89.3%	347.0%	17.0%	1524.8%
Switzerland	50yr	0.8%	4.3%	95.0%	1105.0%	124.6%	5919.3%
UK	30yr	2.4%	26.9%	95.7%	386.9%	35.6%	1459.4%
UK	50yr	0.5%	20.7%	98.6%	1274.6%	179.1%	5921.3%
USA	30yr	0.6%	13.1%	95.6%	642.0%	106.8%	2357.9%
USA	50yr	0.0%	6.8%	98.6%	2637.5%	465.6%	12366.6%

Note: This table reports five statistics derived from 50,000 independently simulated 30-year and 50-year investment scenarios per country, generated by the stationary block bootstrap (average block length: 10 years). P(Eq Loss) = probability of a negative cumulative real equity return; P(Bond Loss) = probability of a negative cumulative real bond return; P(Eq ¿ Bond) = probability that cumulative real equity return exceeds that of bonds; Eq Median = median cumulative real equity return across all simulations; Eq p5 and Eq p95 = 5th and 95th percentile outcomes, representing a one-in-twenty adverse scenario and a one-in-twenty favourable scenario respectively. JST = Jordà–Schularick–Taylor; CPI = Consumer Price Index; Bootstrap = stationary block bootstrap.

We acknowledge that we have used AI to help rewrite and improve the syntax of certain sections of this report.

Table 12: Robustness of $P(\text{Eq} > \text{Bond})$ to Alternative Bootstrap Block Lengths

Country	Horizon	BL = 5yr	BL = 10yr	BL = 15yr
Australia	30yr	96.9%	97.4%	97.7%
Australia	50yr	99.3%	99.4%	99.6%
Belgium	30yr	71.3%	74.3%	75.5%
Belgium	50yr	76.1%	80.1%	81.9%
Denmark	30yr	91.6%	93.7%	94.4%
Denmark	50yr	96.4%	97.8%	98.3%
Finland	30yr	86.4%	90.3%	93.0%
Finland	50yr	92.0%	95.9%	97.5%
France	30yr	66.2%	69.1%	70.8%
France	50yr	70.5%	74.5%	77.0%
Germany	30yr	87.9%	90.1%	92.2%
Germany	50yr	93.5%	95.6%	97.1%
Italy	30yr	65.0%	61.7%	60.3%
Italy	50yr	70.4%	68.3%	66.3%
Japan	30yr	86.7%	86.1%	85.7%
Japan	50yr	92.3%	91.9%	92.3%
Netherlands	30yr	83.3%	84.1%	84.6%
Netherlands	50yr	89.0%	90.0%	91.6%
Norway	30yr	79.3%	83.9%	86.6%
Norway	50yr	85.5%	90.5%	92.9%
Spain	30yr	81.0%	81.2%	80.9%
Spain	50yr	87.6%	87.5%	87.5%
Sweden	30yr	85.5%	85.3%	84.6%
Sweden	50yr	90.8%	90.9%	90.2%
Switzerland	30yr	87.7%	89.5%	90.8%
Switzerland	50yr	93.0%	95.0%	96.3%
UK	30yr	94.5%	95.5%	96.4%
UK	50yr	98.0%	98.6%	99.0%
USA	30yr	93.4%	95.2%	96.8%
USA	50yr	97.5%	98.6%	99.2%

Note: This sensitivity table re-estimates the probability of equity outperformance (P(Eq ¿ Bond)) at the 30-year and 50-year horizons using three alternative average block lengths: 5, 10, and 15 years, to confirm that the baseline results in Table 10 do not depend on this design choice. P(Eq ¿ Bond) = probability that cumulative real equity return exceeds cumulative real bond return; BL = average block length; JST = Jordà–Schularick–Taylor.

We acknowledge that we have used AI to help rewrite and improve the syntax of certain sections of this report.

References

[1] Anarkulova, A., Cederburg, S. (2022). *Stocks for the Long Run? Evidence from a Broad Sample of Developed Markets*. Working paper.

[2] Bessembinder, H. (2018). "Do Stocks Outperform Treasury Bills?" *Journal of Financial Economics*, 129(3), 440–457.

[3] Bodie, Z. (1995). "On the Risk of Stocks in the Long Run." *Financial Analysts Journal*, 51(3), 18–22.

[4] Campbell, J. Y., Viceira, L. M. (2002). *Strategic Asset Allocation: Portfolio Choice for Long-Term Investors*. Oxford University Press, Oxford.

[5] Dimson, E., Marsh, P., Staunton, M. (2002). *Triumph of the Optimists: 101 Years of Global Investment Returns*. Princeton University Press, Princeton.

[6] Lettau, M., Wachter, J. A. (2007). "Why Is Long Horizon Equity Less Risky? A Duration-Based Explanation of the Value Premium." *Journal of Finance*, 62(1), 55–92.

[7] Pastor, L., Stambaugh, R. F. (2012). "Are Stocks Really Less Volatile in the Long Run?" *Journal of Finance*, 67(2), 431–478.

[8] Siegel, J. J. (1994). *Stocks for the Long Run*. Irwin Professional Publishing, Chicago.

[9] Siegel, J. J. (2014). *Stocks for the Long Run* (5th ed.). McGraw-Hill, New York.

[10] London Stock Exchange Group (LSEG). (2026). *Refinitiv LSEG Workspace Database*. Source of monthly total return data for MSCI equity indices and FTSE government bond indices used in this study. Accessed January 2026.

[11] Jordà, Ò., Schularick, M., and Taylor, A. M. (2017). "Macrofinancial History and the New Business Cycle Facts." *NBER Macroeconomics Annual*, 31, 213–263.

[12] Jordà, Ò., Schularick, M., and Taylor, A. M. (2022). *JST Macrohistory Database, Release 6*. Dataset.

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