New Zealand Long-Term Equity Returns and Their Determinants

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Abstract

We document several aspects of New Zealand's long-term equity returns over the 156 years from 1867 to 2022. Remaining invested in the market has been an effective strategy. Investors with a 5-year (20-year) horizon lost money just 10% (<1%) of the time in nominal terms. Equities outperformed bonds in periods of moderate and high inflation, although bonds generated superior returns in deflationary periods. Returns over 5- and 10-year horizons can be predicted with a three-component model based on the "Buffett indicator".

JEL Classification Codes: G11, G12
Keywords: Long-Term Returns; Equity Returns; Bond Returns

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Abstract

We document several aspects of New Zealand's long-term equity returns over the 156 years from 1867 to 2022. Remaining invested in the market has been an effective strategy. Investors with a 5-year (20-year) horizon lost money just 10% (<1%) of the time in nominal terms. Equities outperformed bonds in periods of moderate and high inflation, although bonds generated superior returns in deflationary periods. Returns over 5- and 10-year horizons can be predicted with a three-component model based on the "Buffett indicator".

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1. Introduction

Expected long-term equity returns are of interest to investors, regulators, and governments, and have an important impact on, among other things, asset allocation, and retirement decision-making. While it is impossible to forecast future returns with complete accuracy, past returns can be observed and used to make judgments about plausible future returns.

We contribute to the literature by (1) providing a comprehensive analysis of New Zealand equity returns over a long period; (2) providing insight into the returns earned by investors with different holding periods; (3) considering the impact of the inflationary environment on returns; and (4) documenting the extent to which returns can be predicted. We believe these four areas of focus are particularly relevant to investors. It is natural for individuals to wonder about the magnitude of past returns. We provide this information for the 156-year period between 1867 and 2022. Popular investment wisdom suggests that investors should focus on "time in the market not timing the market." However, investors are likely to be interested in knowing the link between different investment horizons and the chances of losing money. We address this issue. The impact of inflation on returns has emerged as a prominent issue for investors in recent times. We consider this from several perspectives. Finally, there is international evidence that stock returns can be predicted using several variables. We provide investors with information regarding the extent to which there is predictability in New Zealand equity returns.

While the primary focus is on generating results that are relevant to investors, we also provide a useful out-of-sample test of analysis that has focused on international markets, particularly the U.S. equity market. This is important as researchers such as van Binsbergen, Hua, and Wachter (2023) point out that U.S. equity returns have survivorship bias. This implies that they may not be indicative of returns in other markets.

We find that the arithmetic average annual return over this period is 9.9%, with dividend yield the largest component at 5.6%. Returns are larger, on average, after 1930, averaging 12.1% compared to 6.7% in the prior period. The well-documented large equity premium in the U.S. (e.g., Mehra and Prescott, 1985) combined with evidence that U.S. investors with long-term horizons have rarely lost money contributes to the popular wisdom that investors should invest for the long term. While the U.S. economy and stock market have exhibited standout performances over extended periods, Anarkulova, Cederburg, and O'Doherty (2022) show that investors' experience in the U.S. is not necessarily indicative of investors' experience in international markets. Rather, they show that a diversified investor in international markets with a 30-year investment horizon has a 12% chance of losing money relative to inflation.

We, therefore, consider the returns that investors with different holding periods would have earned historically in the New Zealand equity market.[1] While investors with a short-term horizon of one year or three years have a 30% and 17% chance of losing money in nominal returns, respectively, those with longer time horizons are less likely to lose money. We show that investors with 5-year horizons have a 10% chance of losing money in nominal terms and a 17% chance of losing money in real terms. Investors with 20-year horizons have a less than 1% chance of losing money.

There is renewed interest in the impact of inflation on stock returns. After a period of low inflation commencing in 1991, inflation rates in many countries, including New Zealand, rose above 5% in 2021 and remained high in 2022. Researchers such as Fama and Schwert (1977) note that unexpected inflation typically has an important impact on asset returns. In a comprehensive recent study, Neville, Draaisma, Funnell, Harvey, and van Hemert (2021) show

[1] Anarkulova, Cederburg, and O'Doherty (2022) include New Zealand returns in their sample and present aggregated results among 38 other developed countries. However, they do not report individual results for New Zealand.

that unexpected inflation harms both equities and bonds. We consider the impact of inflation on both equity and bond returns, as well as on a 60:40 portfolio. Annual inflation ranged from −16% to 18% with an average of 2.8% and a median of 2.1%. Our results indicate that equities outperform bonds in periods of moderate and high inflation. However, bonds generate superior returns to equities in deflationary periods.

There is considerable evidence that long-term returns are time-varying (e.g., Campbell and Shiller, 1998), with support for both rational (e.g., Campbell and Cochrane, 1999) and behavioral explanations (e.g., Shiller, 2016). Researchers have investigated the ability of several frameworks to forecast expected returns. These include dividend yield, the Gordon (1962) growth model, incorporating dividend yield and growth, valuation proxies, and the Gordon growth model combined with a valuation change variable. There is evidence supporting each of these frameworks in the U.S. and international markets. For instance, Golez and Koudijs (2018) show that dividend yields can be used to forecast 5-year returns, while Swinkels and Umlauft (2022) find that the Buffett indicator, which relates market capitalization to GDP, can be used to forecast 10-year returns. We therefore investigate if these approaches can be used to predict future returns in New Zealand. We find that the Gordon growth model including the Buffett indicator as a valuation proxy generates superior nominal and real return forecasts to those using the historical mean model. The Gordon growth model also performs well in forecasting nominal returns. Investors aiming for superior returns over these time intervals may benefit from adopting these approaches.

We are not the first to consider New Zealand returns over a long period. Lally and Marsden (2004) make an important contribution and their paper considers returns between 1931 and 2002. However, their focus is on estimating the tax-adjusted market risk premium. Frijns and Tourani-Rad (2016) document New Zealand equity market returns for 1899–2013 but their focus is on documenting returns, rather than exploring the extent to which they can be predicted and the implications for investors with different horizons. Finally, Dimson, Marsh, and Staunton (2023) include New Zealand in their analysis of real equity returns around the world since 1900. There are many similarities between New Zealand and Australia, so our work is also related to two comprehensive papers on the Australian equity market. Brailsford, Handley, and Maheswaran (2008) focus on data quality issues and document the equity risk premium in Australia for the 1958–2005 period. Brailsford, Handley, and Maheswaran (2012) present results for the equity risk premium over the 1883–2010 period and include an adjustment for dividend imputation credits in their analysis.

We also contribute to the literature detailing returns over long horizons in other equity markets and asset classes. Siegel (1992) documents U.S. equity and bond returns for the period 1802-1990. Zaremba, Kizys, and Raza (2020) present equity return data from 1830 to 2019 for 71 countries. Baltussen, Martens, and Penninga (2021) present global government bond factor premiums from 1800. Baltussen, Swinkels, van Vilet, and van Vilet (2023) document the impact of inflation on US and global stock, bond, bill, and factor returns over various periods dating back to 1875.

The rest of this paper is organized as follows. We describe the history of the New Zealand equity market in Section 2. Section 3 contains a description of our data sources. The method and results are in Section 4, and Section 5 concludes the paper.

2. New Zealand Equity Market

According to Larsen (2019), in 1860, the Joint Stock Companies Act marked the beginning of what were effectively limited liability companies that the public could invest in. Soon after, stockbrokers began to operate and, as Larsen (2019) states, “the earliest grouping of men who met specifically to deal in shares with the public occurred on 3 March 1866” and later that year they formed the Dunedin Brokers Association, which "can be regarded as the forerunner of the first Stock Exchange in New Zealand."

Frijns and Tourani-Rad (2016) note that the Share Brokers Act was passed in 1871, requiring stockbrokers to be licensed and providing rules around share broking practices. This led to the formal establishment of more broker associations in Dunedin, Auckland, Christchurch, Wellington, Taranaki, and Reefton. The New Zealand Stock Exchange Association was formed in 1915 and provided rules that covered the trading of securities in different exchanges. It was not until 1983 that the New Zealand Stock Exchange was formed through the amalgamation of the regional exchanges. In 1991, the regional trading floors were closed. In 2003, the New Zealand Stock Exchange changed its name to the New Zealand Exchange (NZX) and listed itself on the exchange.[2] At the end of 2020, the total value of stocks on the New Zealand Exchange was US$132.2 billion, which made New Zealand the 30th largest market.[3]

3. Data

We follow others (e.g., Anarkulova, Cederburg, and O'Doherty, 2022) and source long-term data from Global Financial Data (GFD). We obtain the New Zealand SE Gross All-Share Index (with GFD Extension) and New Zealand SE All-Share Capital Index (with GFD Extension) back to 1867. We calculate the dividend yield as the difference in returns between these two series. We require market capitalization data for the Buffett indicator calculation. Hence, we obtain the data series New Zealand SE Capitalization, Value Traded (USD) (with GFD Extension) and convert it to New Zealand dollars. We also use GFD as the source for several other metrics, including (1) GDP, using the New Zealand Nominal GDP (with GFD

[2] See https://www.nzx.com/about-nzx/organization-structure.
[3] See https://www.theglobaleconomy.com/rankings/stock_market_capitalization_dollars/.

Extension) series; (2) inflation, using the New Zealand Consumer Price Index Inflation Rate (with GFD Extension) series; (3) government bond yields using the New Zealand 10-year Government Bond Yield (with GFD Extension) series; (4) government bond total returns, using the GFD Indices New Zealand 10-year Bond Returns series; and (5) government T-bill returns, using the GFD Indices New Zealand Bills Total Return series. Each series is available from our starting year of 1867, except for the T-bill series, which starts in 1922.

Rather than using the GFD equity and bond series for the entire period, we use these until 1930 and then use Lally and Marsden's (2004) data from 1931 to 2002.[4] This ensures equivalence with the widely cited New Zealand study. They obtain equity return data for the Department of Statistics Capital Index from 1931–1969 and the Reserve Bank of New Zealand Capital Index from 1970–1978 (e.g., Lally and Marsden, 2002). This is converted to a gross index using the Department of Statistics dividend yield index. Lally and Marsden (2004) use the Datex gross share price index from 1979–1986 and the New Zealand Stock Exchange gross share price index from 1987–2002. A dividend imputation credits system was introduced in April 1988, and the stock exchange series includes these credits, so Lally and Marsden (2002, 2004) remove them. From 2003 onwards, we use the NZX50 gross index that already excludes imputation credits. We obtain this series from Bloomberg. The NZX 50 index is much more prominent than the NZX All series than the long-term GFD series is based on.

The long-term bond yield series in Lally and Marsden (2004) for 1931–2002 is obtained from the New Zealand Stock Exchange and Reserve Bank of New Zealand. For our study, from 2003 onwards, we source 10-year government bond rate data from the Reserve Bank of New Zealand. We calculate the average rate throughout each calendar year.[5]

[4] We are grateful to Martin Lally for providing these data.
[5] We summarize data proxies and sources in Appendix 1.

3. Method and Results

We report summary statistics for the 1867–2022 and 1931–2022 periods in Table 1.[6] The mean arithmetic return is 9.9% for the entire period and 12.1% for the more recent period.[7] The returns are positively skewed, with the median being 8.0% for the entire period and 11.8% for the 1931–2022 period. Dividends are an important component of total returns in New Zealand. The average dividend yield is 5.6% since 1867 and 5.0% since 1931. Using Robert Shiller's data,[8] we find that the average U.S. dividend yield is 4.4% for the 1872–2022 period and 3.8% for the 1931–2022 period. Inflation in New Zealand has averaged 2.8% for the entire period, increasing to an average of 4.7% since 1931. The average bond total return is 5.8% for the entire period and 6.5% since 1931. In unreported results, we find that interest rates have typically been higher in New Zealand than in the U.S. The 10-year government bond yield in New Zealand averaged 5.3% for the entire period, increasing to 6.1% since 1931. For comparison, the U.S. has seen average yields of 4.5% since 1872 and 4.8% since 1931.

The positive skewness in equity returns is reflected in the number of years with positive returns. For the entire series, 110 of the 156 years have generated positive equity returns, while 67 of the 92 years since 1931 have seen positive equity returns. The strongest performance was in 1983 with a 119.4% gain, while the equity market fell 48.6% in 1987.

[Insert Table 1 About Here]

We present the annual nominal and real stock returns in Figure 1A and 1B, respectively. The figure shows a preponderance of positive returns in both nominal and real terms. This is even more evident in Figure 2, which focuses on returns over 10-year holding periods. Average

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[6] In Appendix 2, we report summary statistics for additional subperiods.
[7] These returns are prior to transaction costs and assume that dividends are fully reinvested. Fried, Ma, and Wang (2021) point out that it is impossible for all investors to reinvest dividends.
[8] See http://www.econ.yale.edu/~shiller/data.htm.

nominal returns over 10-year periods (Figure 2A) are universally positive, except for in the 1880s when, during this deflationary period, real returns were less negative. However, the high inflation experienced in the late 1960s and early 1970s, as well as the mid-1980s, resulted in negative real returns for investors with a 10-year horizon during those periods (Figure 2B).

[Insert Figure 1A and 1B About Here]

[Insert Figure 2A and 2B About Here]

Our core analysis is based on the GFD New Zealand All-Share Index for the pre-1931 period, the Lally and Marsden (2004) data from 1931 to 2002, and the Bloomberg NZX50 index from 2003 to 2022. We replace GFD data in more recent periods so that our study is equivalent to previous research and based on a series that is most widely used in the industry. However, we also include summary statistics based entirely on the GFD New Zealand All-Share Index in Appendix 3. The results are broadly consistent, although the GFD series does have higher returns post-1931 period. For instance, the arithmetic mean return is 12.92% compared to 12.12%, and the median return is 12.25% compared to 11.82%. Given the GFD data includes all stocks, the results indicate that small stocks have outperformed large stocks on average over the 1931–2022 period.

In Table 2, we present the results of several tests to determine whether the mean, median, and variance of returns differ between subperiods. The results for nominal returns indicate a statistically significant difference between the mean return of 12.1% from 1931 onwards and the 6.7% mean before this period. The 1931-onwards median of 11.8% is also statistically different from the 5.3% median observed in the preceding period. The means and medians are also different from 1945 onwards compared to before this date. The differences in means and medians following the 1987 stock market crash and the 2008 Global Financial Crisis are not statistically different compared to their respective levels before these events. In contrast, there is no significant difference in the mean and median real returns between subperiods. After the Global Financial Crisis, the observed volatility of both nominal and real returns is materially below the volatility before the crisis.

[Insert Table 2 About Here]

In Table 3, we present results based on the bootstrap simulation design from Anarkulova, Cederburg, and O'Doherty (2022). We adopt a stationary block bootstrap approach, which draws blocks of returns from our return sample to form return series with 1-, 3-, 5-, 10-, 20-, and 30-year investment horizons. This method draws blocks of random length that follow a geometric distribution with a probability parameter of 1/*h*, where *h* represents the desired mean block length corresponding to our *h* horizon of interest (e.g., *h* = 20 years).

For each investment horizon, we simulate 10,000 annual return series. For a $1.00 investment at the beginning of an *h*-year time horizon, the cumulated wealth at the end of the investment horizon is calculated as per Eq. (1):

$$W_h = \prod_{t=1}^{h} (1 + r\_nom_t) \quad (1)$$

where h = 1, 3, 5, 10, 20, or 30, and r_nom_t denotes annual nominal simple returns drawn from our sample.

Our results indicate that, over the entire investment period, $1.00 invested for one year increases to, on average, $1.07. However, there is considerable variation around this outcome, with a 30% chance that an investor with a 1-year horizon will face losses. The risk of incurring losses decreases substantially for investors with longer investment horizons. For instance, a \$1.00 investment with 5-, 10-, 20-, and 30-year horizons increases to an average of \$1.42, \$2.02, \$4.04, and \$9.58, respectively, in nominal terms. Following Anarkulova, Cederburg, and O'Doherty (2022), we calculate the probability of losses as the proportion of the 10,000 simulations, for each investment horizon, in which investors experience a terminal wealth below \$1.00. An investor with a 5-year horizon has a 10% chance of incurring losses, while an investor with a 30-year horizon has just a 0.1% chance of incurring losses.[9]

We also consider the payoff to different investment horizons based on real returns. We first calculate these using the approximation of the Fisher Effect formula, as specified in Eq. (2):

$$r\_real_t = r\_nom_t - infl_t \tag{2}$$

where r_real_t and $infl_t$ are the real return and inflation in year t respectively.

We then apply Eq. (3):

$$W_h = \prod_{t=1}^{h} (1 + r\_real_t) \tag{3}$$

where h = 1, 3, 5, 10, 20, or 30, and r_real_t denotes annual real returns drawn from our sample.

[9] However, it should be noted that risk, as measured by the variance, increases with the holding period. Therefore, the optimal investment horizon depends on investor risk preferences.

The results in Table 3 Panel B indicate that inflation plays an important role for investors with longer time horizons. The average 5-, 10-, 20-, and 30-year real returns are $1.35, $1.81, $2.99, and $4.87, respectively. An investor with a 5-year horizon has a 17% chance of losing money in real terms. This declines to a 5% chance for investors with a 10-year horizon, and a less than 1% chance for those with a 20-year horizon.

Nominal returns were generally larger in the 1931–2022 subperiod. Investors with a 5-year horizon would have seen a $1.00 investment grow to an average of $1.78. However, due to more pronounced inflation during this time, the $1.00 investment would amount to an average of $1.41 in real terms. Investors with a 5-year horizon face a 7% chance of experiencing a loss in nominal terms, but the likelihood of a real-term loss increases to 27%.[10]

[Insert Table 3 About Here]

In Figure 3, we present annual inflation rates. The figure highlights that deflation was common prior to the 1930s but has been rare since then. Inflation was frequently above 10% in the 1970s and early 1980s. The Reserve Bank Act 1989, which aimed to reduce inflation to low single digits, was highly effective. The figure also shows that, for the first time in the past three decades, inflation has increased beyond 5%.

[Insert Figure 3 About Here]

The recent increase in inflation has resulted in increased interest on the impact of inflation on investment returns. Baultussen, Swinkels, van Vliet, and van Vliet (2023)

[10] We also calculate cumulative returns over 1-, 3-, 5-, 10-, 20-, and 30-year overlapping rolling windows, bootstrap cumulated returns 10,000 times for each of the six investment horizons, and then present comparable bootstrapped results in Appendix 4. We thank an anonymous referee for suggesting this analysis to us.

document the returns to equity and bonds across different inflationary periods in the U.S. We follow their approach for New Zealand. Our sample period and subperiods align closely with theirs. However, our data start in 1867, whereas theirs start in 1875, and our data finish in 2022, not 2021. We use the same post-World War One and post-World War Two periods, starting from 1926 and 1950, respectively. However, we start our most recent subperiod in 1990 to coincide with the new inflation legislation that came into force that year, rather than their start year of 1992.

Panel A of Table 4 indicates that the median inflation rate is 2.1% with an interquartile range spanning from 0.4% to 4.4%.[11] In Panel B, over the entire period, there have been 37 years of deflation, 40 years with inflation between 0% and 2%, 32 years with inflation between 2% and 4%, and 47 years with inflation above 4%. In the most recent period starting in 1990, there have not been any years with deflation, and only four of the 33 years have seen inflation rates above 4%.

Table 4 Panel C reports the returns on equities, bonds, cash, and a 60% equity and 40% bond portfolio across the full sample period and subperiods. In Panel D, equities outperform bonds by a substantial margin when inflation lies between 0% and 2%. The outperformance is reduced but remains evident when inflation is between 2% and 4% and when inflation is above 4%. However, bonds outperform equities during deflationary periods.

[Insert Table 4 About Here]

The observed variation in equity returns based on inflation raises the question of whether equity market returns can be effectively timed. There are evidence that long-term (5-year to 20-year) returns are predictable in markets outside of New Zealand. Early work pointing

[11] In Table 1, we show that inflation ranged between −16.0% and 18.2%.

this out includes Fama and French (1988) and Campbell and Shiller (1998). Two possible explanations are posited for return predictability. Some suggest that it is caused by variation in investor risk aversion over time (e.g., Campbell and Cochrane, 1999), while others propose a behavioral explanation, often attributing it to investor psychological biases (e.g., Shiller, 2016).

We investigate whether any models can be used to predict 5- and 10-year returns in New Zealand. In selecting models to test, we start by considering the approaches that have been used internationally and then narrow these down based on data availability. The literature has generally used four possible frameworks when testing for return predictability, with each framework able to be applied with different proxies. First, expected returns can be forecasted based on dividend yield (D_1 / P_0) (e.g. Fama and French, 1988), which we refer to as "yield alone." Second, expected returns can be forecasted using the Gordon growth model ($D_1 / P_0 + g$) or "yield and growth." Third, a "valuation alone" (ΔV) approach can be used using a valuation proxy (e.g., Swinkels and Umlauft, 2022). Finally, the "yield and growth" and "valuation alone" approaches can be combined to form what they refer to as the "three components" approach (see also Bogle, 1991a, b).[12]

Consistent with international studies, we access dividend yield data which allows us to test "yield alone" and "yield and growth" approaches. However, data limitations prevent us from considering a wide range of valuation proxies. We follow Swinkels and Umlauft (2022) and use the Buffett indicator, which is the market value of the equity market divided by gross domestic product. Warren Buffett once suggested that when this ratio is high, future expected returns tend to be low, and vice versa. However, we are not able to calculate other valuation proxies used in the literature. For instance, we do not have access to long-term market earnings data which prevents us from using the CAPE ratio as in Campbell and Shiller (1998).

[12] The interested reader should refer to Ma, Marshall, Nguyen, and Visaltanachoti (2023) for a summary of the literature.

Care needs to be taken when implementing tests of long-term return predictability, as using overlapping observations from a sample can result in biased estimates. We, therefore, follow Boudoukh, Israel, and Richardson (2022) and use an out-of-sample (OOS) analysis. We start with the "yield alone" framework using a standard predictive regression model with T years of data:

$$r\_log\_nom_{t:t+h} = \alpha + \beta x_t + \varepsilon_{t:t+h} \text{ for } t = 1, \ldots, T-h \tag{4}$$

where $r\_log\_nom_{t:t+h} = (1/h)(r\_log\_nom_{t+1} + \ldots + r\_log\_nom_{t+h})$ with h = 5 or 10 years, $r\_log\_nom_t$ is the New Zealand equity log return for year t, and x_t is either dividend yield or cyclically adjusted dividend yield (*CADY*), which is calculated as the average dividends over the past 10 years scaled by the current market index level (e.g., Straehl and Ibbotson, 2017).

We then generate the h-period ahead OOS forecasts, which involves estimating α and β in Eq. (4) using data up to time t. We then use the value of the predictor variable x_t at the end of the in-sample period and insert regression estimates back to Eq. (4) to compute the forecasting value, denoted as $r\_\widehat{log\_norm}_{t:t+h}$. We compute a time series of OOS forecasts by adding one more observation each time in Eq. (4) and using expanding windows (e.g., Gao and Nardari, 2018). The "yield and growth" approach differs slightly in that we calculate the expected return by adding the current yield and historical average growth rate. The "valuation alone" approach is similar to the "yield alone" approach except that we use a proxy for ΔV. Here, we use the Buffett indicator. For the "three components" approach, we calculate the predicted ΔV using a regression like Eq. (4) and then add this predicted ΔV to the yield and growth estimates.[13]

[13] Refer to Ma, Marshall, Nguyen, and Visaltanachoti (2023) for a detailed discussion on the four possible frameworks to use when testing for return predictability.

We use two metrics to gauge the accuracy of the forecasts: mean absolute error (MAE) and the OOS-R^2. With $T-h$ forecasted and actual returns from a predictive model, the MAE represents the average absolute difference between the forecasted and actual returns, as specified in Eq. (5).

$$MAE = \frac{\sum_{t=1}^{T-h} |r_{t:t+h} - \hat{r}_{t:t+h}|}{T-h} \quad (5)$$

where $\hat{r}_{r:t+h}$ is the forecast return and $r_{t:t+h}$ is the actual return. If the analysis is based on nominal (real) returns both the forecast and actual refer to nominal (real) returns.

The OOS-R^2 is calculated as per Goyal and Welch (2008):

$$R^2_{OOS} = 1 - \frac{MSE_A}{MSE_N} \quad (6)$$

where MSE_A is the mean squared forecast error of each prediction model, and MSE_N is the mean squared forecast error of the historical mean model. We apply Clark and West's (2007) statistics to test whether the MSE_A is lower than the MSE_N which is equivalent to H_0: $R^2_{OOS} \leq 0$ versus H_1: $R^2_{OOS} > 0$.

$$\hat{f}_{t:t+h} = (r_{t:t+h} - \hat{r}^{his}_{t:t+h})^2 - \left[(r_{t:t+h} - \hat{r}^{pred}_{t:t+h})^2 - (\hat{r}^{his}_{t:t+h} - \hat{r}^{pred}_{t:t+h})^2\right] \quad (7)$$

where the sample average of $\hat{f}_{t:t+h}$ is the difference between the MSEs of the historical mean and the predictive model adjusting for the bias when the predicted value is calculated based on an estimated parameter that is zero under the null; $r_{t:t+h}$ is the actual future return; $\hat{r}^{his}_{t:t+h}$ is the predicted return based on the historical average return up to time t; $\hat{r}^{pred}_{t:t+h}$ is the predicted return based on a predictive model using information up to time t. We regress $\hat{f}_{t:t+h}$ on a constant and compute the Clark and West statistics based on the one-sided t-statistics of the constant. We use Newey-West standard errors to adjust for the autocorrelated forecast errors. Rejecting the null hypothesis would suggest that the MSE of the predictive model is lower than the MSE of the historical average or the predictive model R^2_{OOS} is positive and statistically significant.

We present results for the entire sample period and the 1931–2022 subperiod in Tables 5 and 6. Along with MAE and OOS-R^2, we also report the MAE difference between each predictive model and the historical mean model. A negative MAE difference indicates that the predictive model has a lower MAE than the historical mean model over the period during which the forecasts are calculated using the predictive model.[14] In Appendix 3, we also report the results for the 1973–2022 subperiod. The results in Tables 5 and 6 indicate that the three-component model exhibits the strongest performance for both nominal and real returns. For example, in Table 6 Panel B, the OOS-R^2 results indicate that the three-component models result in an improvement of approximately 30% for 10-year nominal return forecasts. The Gordon model based on CADY performs well for both 5-year and 10-year nominal return forecasts. By comparing the results across the entire sample period and the subperiods, it is evident that the forecasting models have generally become more effective over time.[15]

[Insert Table 5 About Here]

[Insert Table 6 About Here]

[14] As noted in Clark and West (2007), the sign of the OOS-R^2 and its corresponding CW statistic are not necessarily the same. This is due to the adjustment Clark and West (2007) make to the CW statistic to account for estimation errors in the predictive model. See Section 2, page 294 of Clark and West (2007).

[15] In addition, we use the most recent 5-year and 10-year realized returns as predictors for 5-year and 10-year returns, respectively. These have no predictive power for future 5-year and 10-year nominal returns, but some predictive power for real returns. We thank an anonymous referee for suggesting this analysis to us.

4. Conclusions

We examine New Zealand equity returns over the 156-year period from 1867 to 2022 to achieve several objectives. First, we document the average returns earned by investors over this period. Second, we consider the returns earned by investors with different time horizons. Third, we investigate the impact of different inflationary regimes on returns. Fourth, we examine whether investors can employ market timing techniques to predict returns.

Our findings indicate that investors with horizons of ten years face only an 6% chance of incurring losses in nominal terms and a 5% chance in real terms. The probability of incurring losses approaches zero as horizons extend to 20 years. Equities tend to outperform bonds in periods of moderate to high inflation. However, bonds generate superior returns in deflationary periods. Market timing strategies using the three-component model based on the Buffett indicator, which gauges the market value as a proportion of GDP, produce superior 5- and 10-year forecasts compared to those that are estimated based on historical average returns.

References

Anarkulova, Aizhan, Cederburg, Scott, and O'Doherty, Michael S. (2022). Stocks for the long run? Evidence from a broad sample of developed markets. *Journal of Financial Economics*, 143(1), 409–433.

Baltussen, Guido, Martens, Martin, and Penninga, Olaf (2021). Factor investing in sovereign bond markets: Deep sample evidence. *Journal of Portfolio Management*, 48(2), 209–225.

Baltussen, Guido, Swinkels, Laurens, van Vliet, Bart, and van Vilet, Pim (2023). Investing in deflation, inflation, and stagflation regimes. *Financial Analyst Journal*, 79(3), 5–32.

Bogle, John C. (1991a). Investing in the 1990s. *Journal of Portfolio Management*, 17(3), 5–14.

Bogle, John C. (1991b). Investing in the 1990s: Occam's razor revisited. *Journal of Portfolio Management*, 18(1), 88–91.

Boudoukh, Jacob, Israel, Ronen, and Richardson, Matthew (2022). Biases in long-horizon predictive regressions. *Journal of Financial Economics*, 145(3), 937–969.

Brailsford, Tim, Handley, John C., and Maheswaran, Krishnan (2008). Re-examination of the historical equity risk premium in Australia. *Accounting & Finance*, *48*(1), 73-97;

Brailsford, Tim, Handley, John C., and Maheswaran, Krishnan (2012). The historical equity risk premium in Australia: post-GFC and 128 years of data. *Accounting & Finance*, *52*(1), 237-247.

Campbell, John Y., and Shiller, Robert J. (1998). Valuation ratios and the long-run stock market outlook. *Journal of Portfolio Management*, 24(2), 11–26.

Campbell, John Y., and Cochrane, John H. (1999). By force of habit: A consumption-based explanation of aggregate stock market behavior. *Journal of Political Economy*, 107(2), 205–251.

Clark, Todd E., and West, Kenneth D. (2007). Approximately normal tests for equal predictive accuracy in nested models. *Journal of Econometrics*, 138(1), 291–311.

Dimson, Elroy, Marsh, Paul, and Staunton, Mike (2023). Credit Suisse global investment returns yearbook 2023 summary edition.

Fama, Eugene F., and French, Kenneth R. (1988). Dividend yields and expected stock returns. *Journal of Financial Economics*, 22(1), 3-25.

Fama, Eugene F., and Schwert, G. W. (1977). Asset returns and inflation. *Journal of Financial Economics*, 5(2), 115–146.

Fried, Jess, Ma, Paul, and Wang, Charles (2021). Stock investors' returns are exaggerated. SSRN working paper: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3964177

Frijns, Bart, and Tourani-Rad, Alireza (2016). The long-run performance of New Zealand stock markets: 1899–2013. *Pacific Accounting Review*, 28(1), 59–70.

Gao, Xin, and Nardari, Federico (2018). Do commodities add economic value in asset allocation? New evidence from time-varying moments. *Journal of Financial and Quantitative Analysis*, 53(1), 365–393.

Golez, Benjamin, and Koudijs, Peter (2018). Four centuries of return predictability. *Journal of Financial Economics*, 127(2), 248–263.

Gordon, Myron J. (1962). The savings, investment, and valuation of a corporation. *Review of Economics and Statistics*, 44(1), 37–51.

Goyal, Amit, and Welch, Ivo (2008). A comprehensive look at the empirical performance of equity premium prediction. *Review of Financial Studies*, 21(4), 1455–1508.

Lally, Martin (2019). Estimation of the TAMRP. Available at: https://comcom.govt.nz/__data/assets/pdf_file/0024/318462/Dr-Martin-Lally-Estimation-of-TAMRP-report-10-April-2023.pdf

Lally, Martin, and Marsden, Alastair (2002). Historical market risk premiums in New Zealand: 1931–2000. Working paper, 1–46.

Lally, Martin, and Marsden, Alastair (2004). Tax-adjusted market risk premiums in New Zealand: 1931–2002. *Pacific-Basin Finance Journal*, 12, 291–310.

Larsen, Michael (2019). *Stories from the marketplace: Celebrating 150 years of New Zealand Stock Exchange*. Mary Egan Publishing.

Ma, Rui, Marshall, Ben R., Nguyen, Nhut H., and Visaltanachoti, Nuttawat (2023). Estimating long-term expected returns. SSRN working paper. Available at: https://ssrn.com/abstract=4493448

Mehra, Rajnish, and Prescott, Edward C. (1985). The equity premium: A puzzle. *Journal of Monetary Economics*, 15(2), 145–161.

Neville, Henry, Draaisma, Teun, Funnell, Ben, Harvey, Campbell R., and van Hemert, Otto (2021). The best strategies for inflationary times. *Journal of Portfolio Management*, 47(8), 8–37.

Shiller, Robert J. (2016). Irrational exuberance. Available at: https://press.princeton.edu/books/paperback/9780691173122/irrational-exuberance

Siegel, Jeremy (1992). The equity premium: Stock and bond returns since 1802. *Financial Analysts Journal*, 48(1), 28–38.

Straehl, Philip U., and Ibbotson, Roger G. (2017). The long-run drivers of stock returns: Total payouts and the real economy. *Financial Analysts Journal*, 73(3), 32–52.

Swinkels, Laurens, and Umlauft, Thomas S. (2022). The Buffett indicator: International evidence. SSRN working paper. Available at: https://ssrn.com/abstract=4071039

van Binsbergen, Jules H., Hua, Sophia, and Wachter, Jessica A. (2023). Is the United States a Lucky Survivor: A Hierarchical Bayesian Approach. SSRN working paper. Available at: https://ssrn.com/abstract=3689958

Zaremba, Adam, Kizys, Renatas, and Raza, Muhammad W. (2020). The long-run reversal in the long run: Insights from two centuries of international equity returns. *Journal of Empirical Finance*, 55, 177–199.

Table 1
Summary Statistics

	Nominal Total Return	Nominal Capital Gain	Nominal Dividend Yield	Inflation	Nominal Bond Total Return	Nominal Cash Total Return
Panel A: 1867–2022						
Arithmetic Mean	0.0988	0.0391	0.0563	0.0281	0.0578	-
Median	0.0795	0.0179	0.0505	0.0208	0.0542	-
Geometric Mean	0.0838	0.0248	0.0560	0.0266	0.0550	-
Std Dev	0.1908	0.1809	0.0262	0.0546	0.0882	-
No. Years Pos Return	110	88	156	124	129	-
No. Years Neg Return	46	68	0	32	27	-
Highest Annual Returns	1.1942	1.0291	0.3167	0.1820	0.4488	-
Highest Year	1983	1983	1894	1986	1932	-
Lowest Annual Returns	−0.4855	−0.5034	0.0246	−0.1599	−0.1956	-
Lowest Year	1987	1987	2021	1879	1984	-
Skewness	1.7924	1.7636	6.4802	0.2865	0.6747	-
Kurtosis	9.7515	9.3034	62.4159	1.6527	3.1443	-
Jarque–Bera Stat	379.82	339.12	24038.41	13.93	11.97	-
Jarque–Bera p-Value	0.0000	0.0000	0.0000	0.0009	0.0025	-
Panel B: 1931–2022						
Arithmetic Mean	0.1212	0.0650	0.0504	0.0466	0.0650	0.0621
Median	0.1182	0.0676	0.0473	0.0304	0.0601	0.0610
Geometric Mean	0.1006	0.0455	0.0503	0.0454	0.0585	0.0526
Std Dev	0.2252	0.2128	0.0142	0.0506	0.1044	0.0510
No. Years Pos Return	67	57	92	88	77	92
No. Years Neg Return	25	35	0	4	15	0
Highest Annual Returns	1.1942	1.0291	0.0896	0.1820	0.4488	0.2499
Highest Year	1983	1983	1979	1986	1932	1985
Lowest Annual Returns	−0.4855	−0.5034	0.0246	−0.0916	−0.1956	0.0031
Lowest Year	1987	1987	2021	1932	1984	2021
Skewness	1.6427	1.5694	1.0391	0.7783	0.5144	1.4192
Kurtosis	7.5269	7.1276	0.8861	1.0897	1.9102	1.8553
Jarque–Bera Stat	119.93	103.07	33.69	23.28	8.61	35.91
Jarque–Bera p-Value	0.0000	0.0000	0.0000	0.0000	0.0135	0.0000

This table presents summary statistics for the entire sample period in Panel A and for the 1931–2022 subperiod in Panel B.

Table 2
1867-2022 Total Returns Distribution Differences

	Nominal Returns					Real Returns				
Panel A: Mean Comparison										
	Pre	Post	Diff	t-Stat	p-Value	Pre	Post	Diff	t-Stat	p-Value
Pre- and Post-1931:	0.0667	0.1212	0.0545	1.95	0.0530	0.0653	0.0746	0.0093	0.33	0.7400
Pre- and Post-1945:	0.0705	0.1272	0.0567	1.87	0.0637	0.0671	0.0745	0.0074	0.24	0.8091
Pre- and Post-1988:	0.0994	0.0968	−0.0026	−0.08	0.9381	0.0705	0.0716	0.0011	0.03	0.9756
Pre- and Post-2009:	0.0973	0.1142	0.0169	0.48	0.6359	0.0688	0.0909	0.0221	0.57	0.5729
Panel B: Median Comparison										
	Pre	Post	Diff	z-Stat	p-Value	Pre	Post	Diff	z-Stat	p-Value
Pre- and Post-1931:	0.0526	0.1182	0.0656	−1.66	0.0964	0.0578	0.0825	0.0247	−0.1531	0.8783
Pre- and Post-1945:	0.0526	0.1349	0.0823	−1.80	0.0726	0.0609	0.1016	0.0407	−0.1825	0.8552
Pre- and Post-1988:	0.0753	0.1358	0.0605	0.81	0.4171	0.0627	0.1207	0.0580	0.8539	0.3932
Pre- and Post-2009:	0.0772	0.1375	0.0603	0.83	0.4043	0.0666	0.1299	0.0633	0.9766	0.3288
Panel C: Variance Comparison										
	Pre	Post	Diff	F-Stat	p-Value	Pre	Post	Diff	F-Stat	p-Value
Pre- and Post-1931:	0.0145	0.0507	0.0362	0.29	1.0000	0.0139	0.0513	0.0374	0.2710	1.0000
Pre- and Post-1945:	0.0139	0.0577	0.0438	0.24	1.0000	0.0138	0.0583	0.0445	0.2362	1.0000
Pre- and Post-1988:	0.0386	0.0297	−0.0089	1.30	0.1892	0.0370	0.0327	−0.0042	1.1287	0.3510
Pre- and Post-2009:	0.4043	0.0134	−0.3909	2.89	0.0169	0.0377	0.0172	−0.0206	2.1992	0.0544

In this table, we test whether the mean, median, and variance of annual nominal and real returns differ across subperiods. For mean and median comparisons, we employ a two-sample test with unequal variance and a Wilcoxon rank sum test, respectively. For variance comparison, we use an F-test.

Table 3
Return Bootstrap Simulation for Different Holding Periods

Panel A: 1867–2022 Nominal Returns

Horizon	Mean	SD	1%	5%	10%	25%	50%	75%	90%	95%	99%	$P(W_m<1)$
1 year	1.0702	0.1127	0.7887	0.9087	0.9381	0.9937	1.0575	1.1544	1.2141	1.2713	1.3569	0.3006
3 years	1.2327	0.2359	0.7701	0.8791	0.9381	1.0630	1.2220	1.3715	1.5572	1.6504	1.8609	0.1695
5 years	1.4188	0.3478	0.7128	0.8804	0.9924	1.1772	1.4109	1.6528	1.8499	1.9871	2.3252	0.1028
10 years	2.0227	0.6404	0.6528	0.9657	1.1534	1.6106	1.9880	2.4338	2.8466	3.1097	3.5651	0.0588
20 years	4.0381	1.7049	1.0773	1.3317	1.7366	2.8998	3.9204	5.1930	6.2719	6.9488	8.3599	0.0069
30 years	9.5789	10.2188	1.7510	2.6363	3.1756	4.9999	7.9895	11.0171	14.5890	17.1623	52.0821	0.0013

Panel B: 1867–2022 Real Returns

Horizon	Mean	SD	1%	5%	10%	25%	50%	75%	90%	95%	99%	$P(W_m<1)$
1 year	1.0629	0.1167	0.7240	0.8660	0.9095	0.9908	1.0591	1.1406	1.1998	1.2312	1.3912	0.2857
3 years	1.1984	0.2370	0.7629	0.8384	0.9121	1.0050	1.1807	1.3524	1.5147	1.6371	1.7540	0.2468
5 years	1.3525	0.3383	0.7576	0.8605	0.9327	1.1059	1.3117	1.5860	1.8048	1.9278	2.2402	0.1697
10 years	1.8117	0.5889	0.8036	0.9928	1.1202	1.3852	1.7323	2.1523	2.6340	2.9414	3.3266	0.0518
20 years	2.9886	1.1897	1.1519	1.4436	1.6691	2.1758	2.7775	3.5158	4.4194	5.1632	7.1333	0.0042
30 years	4.8704	2.0637	1.5543	2.1446	2.5825	3.5367	4.5410	5.8704	7.3333	8.4140	11.2248	0.0000

Panel C: 1931–2022 Nominal Returns

Horizon	Mean	SD	1%	5%	10%	25%	50%	75%	90%	95%	99%	$P(W_m<1)$
1 year	1.1211	0.2170	0.6408	0.8838	0.9311	0.9956	1.1245	1.2107	1.3067	1.4817	2.0136	0.2742
3 years	1.4142	0.4986	0.5667	0.8079	0.9495	1.1151	1.3367	1.5713	1.9477	2.4658	3.4018	0.1474
5 years	1.7795	0.9547	0.5676	0.9259	1.0393	1.2714	1.6089	1.9428	2.5216	3.4545	5.8384	0.0742
10 years	3.0948	2.6550	0.9157	1.3720	1.6100	1.9187	2.3860	3.1444	4.6827	8.2424	14.6529	0.0144
20 years	8.6519	8.7055	2.2088	3.2182	3.7211	4.6692	5.8723	8.9514	18.0189	22.4237	44.7805	0.0002
30 years	23.7463	27.1829	4.8993	7.2828	8.8460	10.6920	14.7772	29.5559	49.5219	61.5535	116.8645	0.0000

Panel D: 1931–2022 Real Returns

Horizon	Mean	SD	1%	5%	10%	25%	50%	75%	90%	95%	99%	$P(W_m<1)$
1 year	1.0762	0.2266	0.4181	0.7659	0.8602	0.9456	1.0898	1.1679	1.2408	1.4177	2.1591	0.3347
3 years	1.2344	0.4307	0.4198	0.6777	0.7719	0.9318	1.1836	1.4467	1.6947	1.9525	2.9496	0.3195
5 years	1.4069	0.6501	0.3597	0.6094	0.7581	0.9770	1.2913	1.6620	2.0560	2.4636	4.0108	0.2715
10 years	1.9029	1.1745	0.4525	0.6805	0.8679	1.2187	1.6677	2.2458	3.0576	3.6269	6.4119	0.1431
20 years	3.1951	2.0854	0.6913	1.1056	1.3880	1.9386	2.8476	3.7913	5.2500	6.4301	10.8837	0.0328
30 years	5.3571	3.8358	1.0917	1.6685	2.1291	3.0442	4.4944	6.8663	9.2434	11.2839	17.4219	0.0081

This table presents results based on the bootstrap simulation design from Anarkulova, Cederburg, and O'Doherty (2022). In Panels A and B, we use the entire sample period and present the distribution of nominal and real buy-and-hold payoffs from a $1.00 investment across 1-, 3-, 5-, 10-, 20-, and 30-year investment horizons. For each of these investment horizons, we simulate 10,000 annual return series. The final column indicates the proportion of simulated series that finish below $1.00 at the end of the investment horizon. In Panels C and D, we focus on the more recent 1931–2022 subperiod and re-run our simulation results.

Table 4
Inflation Analysis

Panel A: Inflation Distribution

	Percentiles								
	0.05	0.10	0.25	0.33	0.50	0.67	0.75	0.90	0.95
Inflation	−5.3%	−3.0%	0.4%	0.9%	2.1%	3.6%	4.8%	9.8%	15.3%

Panel B: Inflation Episodes

Inflation Bucket	1990–2022	1950–2022	1926–2022	1867–2022
Inflation ≤ 0%	0	0	10	37
0% < Inflation ≤ 2%	19	23	28	40
2% < Inflation ≤ 4%	10	18	21	32
Inflation > 4%	4	32	38	47
All	33	73	97	156

Panel C: Asset Class Returns by Period

	1990–2022	1950–2022	1926–2022	1867–2022
Equities	0.0992***	0.1309***	0.1155***	0.0988***
	(3.64)	(4.85)	(5.39)	(6.11)
Bonds	0.0785***	0.0673***	0.0644***	0.0578***
	(4.41)	(4.96)	(5.81)	(7.25)
Cash	0.0502***	0.0708***	0.0625***	-
	(7.20)	(7.00)	(7.52)	-
60/40	0.0909***	0.1055***	0.0951***	0.0824***
	(4.87)	(5.83)	(6.50)	(7.51)

Panel D: Asset Class Returns by Inflation Regime

	Inflation Bucket			
	Inflation ≤ 0%	0% < Inflation ≤ 2%	2% < Inflation ≤ 4%	Inflation > 4%
Nominal Returns:				
Equities	0.0525	0.1372	0.1003	0.1016
Bonds	0.0613	0.0661	0.0559	0.0493
Cash	0.0526	0.0432	0.0617	0.0800
60/40	0.0560	0.1088	0.0825	0.0807
Real Returns:				
Equities	0.0860	0.1247	0.0715	0.0125
Bonds	0.0947	0.0535	0.0270	−0.0399
Cash	0.0759	0.0302	0.0326	−0.0112
60/40	0.0895	0.0962	0.0537	−0.0085

Panel A presents the distribution of inflation rates. Panel B presents the number of years that fall within each inflation bucket, both for the full sample period and for the subperiods. Panel C reports returns on equities, bonds, cash, and a 60% equity and 40% bond portfolio across the full sample period and subperiods. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively, with standard errors computed using the Newey–West procedure. Panel D details nominal and real returns on asset classes by inflation regime.

Table 5
5-Year Forecasts

	Nominal Returns				Real Returns			
	MAE	MAE Diff	OOS-R^2	CW Stat	MAE	MAE Diff	OOS-R^2	CW Stat
Panel A: Full Sample 1886−2022								
Historical Mean	0.0544	0.0000	0.0000		0.0575	0.0000	0.0000	
Panel A1: Yield Alone, YLD_i								
YLD_{Div}	0.0594	0.0050	−0.2567	(0.39)	0.0605	0.0030	−0.1803*	(1.42)
YLD_{CADY}	0.0612	0.0078	−0.1594	(−1.50)	0.0573	0.0008	0.0049**	(1.70)
Panel A2: Gordon, $GOR_{i,j} = YLD_i + g_j$								
$GOR_{Div,Div} = YLD_{Div} + g_{Div}$	0.0554	0.0010	-0.0441**	(2.02)	0.0717	0.0142	−0.6271	(0.31)
$GOR_{CADY,CADY} = YLD_{CADY} + g_{CADY}$	0.0506	−0.0038	0.1090***	(2.44)	0.0635	0.0059	−0.2527	(0.55)
Panel A3: Valuation Alone, ΔV_k								
ΔV_{BUF}	0.0561	0.0017	−0.1222*	(1.29)	0.0607	0.0032	−0.1767	(0.66)
Panel A4: Three Components, $GOR_{Div,Div} + \Delta V_k$								
$GOR_{Div,Div} + \Delta V_{BUF}$	0.0550	−0.0011	0.0916*	(1.30)	0.0618	0.0024	−0.0717	(0.26)
$GOR_{CADY,CADY} + \Delta V_{BUF}$	0.0554	−0.0007	0.0067*	(1.46)	0.0601	0.0007	−0.0682	(1.28)
Panel B: Subperiod Analysis 1931−2022								
Historical Mean	0.0609	0.0000	0.0000		0.0674	0.0000	0.0000	
Panel B1: Yield Alone, YLD_i								
YLD_{Div}	0.0614	0.0005	0.0004	(0.22)	0.0666	−0.0008	0.0332*	(1.35)
YLD_{CADY}	0.0639	0.0031	−0.0586	(−1.23)	0.0646	−0.0028	0.0738**	(1.76)
Panel B2: Gordon, $GOR_{i,j} = YLD_i + g_j$								
$GOR_{Div,Div} = YLD_{Div} + g_{Div}$	0.0536	−0.0073	0.1930**	(2.01)	0.0774	0.0100	−0.4376	(0.34)
$GOR_{CADY,CADY} = YLD_{CADY} + g_{CADY}$	0.0516	−0.0092	0.1941***	(2.58)	0.0704	0.0030	−0.1994	(0.63)
Panel B3: Valuation Alone, ΔV_k								
ΔV_{BUF}	0.0607	−0.0001	−0.0762	(1.10)	0.0708	0.0033	−0.1562	(−0.36)
Panel B4: Three Components, $GOR_{Div,Div} + \Delta V_k$								
$GOR_{Div,Div} + \Delta V_{BUF}$	0.0561	−0.0047	0.1616**	(1.68)	0.0667	−0.0007	−0.0054	(0.86)
$GOR_{CADY,CADY} + \Delta V_{BUF}$	0.0565	−0.0044	0.0946**	(1.97)	0.0652	−0.0022	0.0154**	(1.84)

In this table, we present the 5-year nominal and real return forecast results over the full sample period and the 1931–2022 subperiod using four frameworks (e.g., Ma, Marshall, Nguyen, and Visaltanachoti, 2023). MAE is the mean absolute error, measuring the average magnitude between predicted and actual returns.

MAE Diff denotes the difference in MAEs between each prediction model and the historical mean model. OOS-R2 is the out-of-sample R-squared for each prediction model. We also employ the Clark and West (2007) method to test the null hypothesis, H0: OOS-R2 $\leqslant$ 0, against the alternative, H1: OOS-R2 > 0. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

Table 6
10-Year Forecasts

	Nominal Returns				Real Returns			
	MAE	MAE Diff	OOS-R^2	CW Stat	MAE	MAE Diff	OOS-R^2	CW Stat
Panel A: Full Sample 1886−2022								
Historical Mean	0.0319	0.0000	0.0000		0.0297	0.0000	0.0000	
Panel A1: Yield Alone, YLD_i								
YLD_{Div}	0.0390	0.0070	−0.6020	(-1.88)	0.0323	0.0026	−0.6247	(0.18)
YLD_{CADY}	0.0474	0.0152	−0.4990	(-2.20)	0.0333	0.0039	−0.0739***	(3.05)
Panel A2: Gordon, $GOR_{i,j} = YLD_i + g_j$								
$GOR_{Div,Div} = YLD_{Div} + g_{Div}$	0.0385	0.0066	−0.2252***	(2.63)	0.0603	0.0306	−2.5428	(−0.06)
$GOR_{CADY,CADY} = YLD_{CADY} + g_{CADY}$	0.0318	−0.0001	0.2087***	(3.00)	0.0491	0.0195	−1.1050	(0.33)
Panel A3: Valuation Alone, ΔV_k								
ΔV_{BUF}	0.0408	0.0088	−0.3039	(0.78)	0.0358	0.0061	−0.3276**	(2.01)
Panel A4: Three Components, $GOR_{Div,Div} + \Delta V_k$								
$GOR_{Div,Div} + \Delta V_{BUF}$	0.0314	−0.0008	0.2810**	(2.07)	0.0319	0.0011	−0.0500	(1.09)
$GOR_{CADY,CADY} + \Delta V_{BUF}$	0.0334	0.0012	0.1795**	(1.91)	0.0285	-0.0023	0.1813***	(3.23)
Panel B: Subperiod Analysis 1931−2022								
Historical Mean	0.0363	0.0000	0.0000		0.0355	0.0000	0.0000	
Panel B1: Yield Alone, YLD_i								
YLD_{Div}	0.0385	0.0022	−0.0407	(−2.13)	0.0334	−0.0021	0.1049***	(3.05)
YLD_{CADY}	0.0456	0.0093	−0.2182	(−4.05)	0.0326	−0.0028	0.1624***	(3.08)
Panel B2: Gordon, $GOR_{i,j} = YLD_i + g_j$								
$GOR_{Div,Div} = YLD_{Div} + g_{Div}$	0.0347	−0.0016	0.3382***	(2.58)	0.0657	0.0302	−1.7806	(0.12)
$GOR_{CADY,CADY} = YLD_{CADY} + g_{CADY}$	0.0314	−0.0049	0.3645***	(2.89)	0.0537	0.0182	−0.9129	(0.47)
Panel B3: Valuation Alone, ΔV_k								
ΔV_{BUF}	0.0378	0.0015	−0.0037**	(1.75)	0.0383	0.0028	−0.1975**	(1.68)
Panel B4: Three Components, $GOR_{Div,Div} + \Delta V_k$								
$GOR_{Div,Div} + \Delta V_{BUF}$	0.0346	−0.0017	0.3051**	(2.19)	0.0351	−0.0004	0.0020*	(1.32)
$GOR_{CADY,CADY} + \Delta V_{BUF}$	0.0340	−0.0023	0.2835**	(2.30)	0.0308	−0.0047	0.2248***	(3.05)

In this table, we present the 10-year nominal and real return forecast results over the full sample period and the 1931–2022 subperiod using four frameworks (e.g., Ma, Marshall, Nguyen, and Visaltanachoti, 2023). MAE is the mean absolute error, measuring the average magnitude between predicted and actual returns.

MAE Diff denotes the difference in MAEs between each prediction model and the historical mean model. OOS-R2 is the out-of-sample R-squared for each prediction model. We also employ the Clark and West (2007) method to test the null hypothesis, H0: OOS-R2 $\leqslant$ 0, against the alternative, H1: OOS-R2 > 0. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

Appendix 1
Data Sources

	Data Sources		
	1867−1930	1931−2002	2003−2022
Nominal total return	GFD	Lally and Marsden (2004)	Bloomberg, Lally (2019)
Nominal capital gain	GFD	Lally and Marsden (2004)	Bloomberg, Lally (2019)
Nominal dividend yield	GFD	Lally and Marsden (2004)	Bloomberg, Lally (2019)
Nominal bond yield	GFD	Lally and Marsden (2004)	Reserve Bank of New Zealand
	1922−1984		1985−2022
Nominal cash total return	GFD		Reserve Bank of New Zealand
	1867−2022		
Nominal bond total return	GFD		
Inflation	GFD		
Market capitalization	GFD		
Nominal GDP	GFD		
NZDUSD exchange rate	GFD		

This table summarizes our data proxies and sources.

Appendix 2
Subperiod Summary Statistics

	Nominal Total Return	Nominal Capital Gain	Nominal Dividend Yield	Inflation	Nominal Bond Total Return	Nominal Cash Total Return
Panel A: 1946–2022						
Arithmetic Mean	0.1270	0.0696	0.0508	0.0535	0.0654	0.0680
Median	0.1341	0.0753	0.0473	0.0318	0.0608	0.0667
Geometric Mean	0.1034	0.0473	0.0507	0.0524	0.0583	0.0610
Std Dev	0.2418	0.2282	0.0150	0.0489	0.0998	0.0533
No. Years Pos Return	55	49	77	77	64	77
No. Years Neg Return	22	28	0	0	13	0
Highest Annual Returns	1.1942	1.0291	0.0896	0.1820	0.3391	0.2499
Highest Year	1983	1983	1979	1986	1991	1985
Lowest Annual Returns	−0.4855	−0.5034	0.0246	0.0008	−0.1956	0.0031
Lowest Year	1987	1987	2021	2015	1984	2021
Skewness	1.5164	1.4603	0.9815	1.1896	0.1320	1.2306
Kurtosis	6.3916	6.0977	0.6289	0.2770	0.5997	1.2315
Jarque–Bera Stat	66.42	58.15	30.40	41.95	18.71	29.47
Jarque–Bera p-Value	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000
Panel B: 1988–2022						
Arithmetic Mean	0.0968	0.0396	0.0486	0.0252	0.0851	0.0555
Median	0.1358	0.0847	0.0477	0.0189	0.0800	0.0549
Geometric Mean	0.0822	0.0257	0.0485	0.0250	0.0826	0.0576
Std Dev	0.1722	0.1638	0.0131	0.0178	0.1059	0.0371
No. Years Pos Return	25	22	35	35	29	35
No. Years Neg Return	10	13	0	0	6	0
Highest Annual Returns	0.5171	0.4374	0.0861	0.0723	0.3391	0.1524
Highest Year	1993	1993	2004	1989	1991	1988
Lowest Annual Returns	−0.3592	−0.4007	0.0246	0.0008	−0.1449	0.0031
Lowest Year	1990	1990	2021	2015	2022	2021
Skewness	−0.5651	−0.5953	0.8008	1.2120	−0.0967	0.8402
Kurtosis	1.4554	1.5455	1.7366	1.2301	0.0752	0.4576
Jarque–Bera Stat	5.34	5.15	6.07	13.14	12.53	13.54
Jarque–Bera p-Value	0.0692	0.0761	0.0481	0.0014	0.0019	0.0011

This table presents summary statistics for the 1946–2022 and 1988–2922 subperiods in Panels A and B, respectively.

Appendix 3
GFD Summary Statistics

	Nominal Total Return	Nominal Capital Gain	Nominal Dividend Yield	Inflation	Nominal Bond TR	Nominal Cash TR
Panel A: 1867−2022						
Arithmetic Mean	0.1036	0.0418	0.0617	0.0281	0.0578	-
Median	0.0857	0.0165	0.0593	0.0208	0.0550	-
Geometric Mean	0.0878	0.0263	0.0614	0.0266	0.0542	-
Std Dev	0.1977	0.1921	0.0291	0.0546	0.0882	-
No. Years Non Neg	113	89	156	124	129	-
No. Years Neg	43	67	0	32	27	-
Highest Annual Returns	1.3122	1.2217	0.3167	0.1820	0.4488	-
Highest Year	1983	1983	1894	1986	1932	-
Lowest Annual Returns	-0.4855	-0.5034	0.0179	-0.1599	-0.1956	-
Lowest Year	1987	1987	1987	1879	1984	-
Skewness	2.0565	2.1938	5.3919	0.2865	0.6747	-
Kurtosis	11.6601	12.1800	42.5583	1.6527	3.1443	-
Jarque-Bera	597.45	672.91	10927.49	13.93	11.97	-
JB p-Value	0.0000	0.0000	0.0000	0.0009	0.0025	-
Panel B: 1931−2022						
Arithmetic Mean	0.1292	0.0696	0.0596	0.0466	0.0650	0.0621
Median	0.1225	0.0602	0.0571	0.0304	0.0585	0.0526
Geometric Mean	0.1075	0.0481	0.0594	0.0454	0.0601	0.0610
Std Dev	0.2343	0.2284	0.0234	0.0506	0.1044	0.0510
No. Years Non Neg	70	58	92	88	77	92
No. Years Neg	22	34	0	4	15	0
Highest Annual Returns	1.3122	1.2217	0.2200	0.1820	0.4488	0.2499
Highest Year	1983	1983	1931	1986	1932	1985
Lowest Annual Returns	-0.4855	-0.5034	0.0179	-0.0916	-0.1956	0.0031
Lowest Year	1987	1987	1987	1932	1984	2021
Skewness	1.8652	1.9431	3.5281	0.7783	0.5144	1.4192
Kurtosis	8.8699	9.0337	23.4127	1.0897	1.9102	1.8553
Jarque-Bera	185.42	197.45	1788.13	23.28	8.61	35.91
JB p-Value	0.0000	0.0000	0.0000	0.0000	0.0135	0.0000

This table presents summary statistics based entirely on the GFD New Zealand All-Share Index.

Appendix 4
Return Simulation for Overlapping Windows

Panel A: 1867−2022 Nominal Returns

Horizon	Mean	SD	1%	5%	10%	25%	50%	75%	90%	95%	99%	P(W<1)
1 year	1.0981	0.1885	0.6408	0.8838	0.9248	0.9937	1.0792	1.1803	1.2639	1.3490	2.0136	0.2943
3 years	1.3305	0.4311	0.7058	0.8188	0.9329	1.0715	1.2651	1.4758	1.6905	2.0359	3.4018	0.1696
5 years	1.6341	0.8117	0.6998	0.8823	1.0131	1.2380	1.4920	1.7977	2.1016	2.5037	5.4037	0.0819
10 years	2.5651	2.0177	0.6528	1.0005	1.4150	1.8001	2.2071	2.6765	3.2508	4.0165	11.1195	0.0477
20 years	6.4582	6.0323	1.1093	1.4860	1.8839	3.5040	4.7281	6.3712	14.8741	20.0497	24.2213	0.0000
30 years	16.9502	17.4011	2.5676	3.1198	3.2907	6.9302	10.3891	19.5569	42.1510	52.2715	62.2714	0.0000

Panel B: 1867−2022 Real Returns

Horizon	Mean	SD	1%	5%	10%	25%	50%	75%	90%	95%	99%	P(W<1)
1 year	1.0705	0.1862	0.5929	0.8081	0.8844	0.9694	1.0726	1.1618	1.2280	1.3853	1.8317	0.3194
3 years	1.2224	0.3499	0.5819	0.7348	0.8328	0.9723	1.2062	1.4338	1.6220	1.6926	2.5362	0.3128
5 years	1.3950	0.5048	0.4456	0.7576	0.8934	1.1059	1.3357	1.6748	1.9287	2.0608	3.2471	0.2187
10 years	1.8137	0.7483	0.5838	0.8433	1.0261	1.3482	1.6748	2.1350	2.8000	3.0748	3.5143	0.0791
20 years	2.8624	0.9922	1.1056	1.4134	1.5655	2.1763	2.7764	3.3824	4.1693	5.0232	5.5442	0.0000
30 years	4.7278	2.0702	1.6685	2.0010	2.5353	3.3548	4.3107	5.7945	7.3078	7.8107	11.5756	0.0000

Panel C: 1931−2022 Nominal Returns

Horizon	Mean	SD	1%	5%	10%	25%	50%	75%	90%	95%	99%	P(W<1)
1 year	1.1212	0.2212	0.5145	0.8803	0.9311	0.9965	1.1245	1.2107	1.3067	1.4817	2.0136	0.2602
3 years	1.4147	0.4989	0.7058	0.8188	0.9890	1.1149	1.3367	1.5589	1.7062	2.5543	3.7068	0.1288
5 years	1.7996	0.9686	0.4745	0.9818	1.0541	1.2940	1.6320	1.9112	2.3921	3.8400	6.8747	0.0571
10 years	3.1129	2.6296	1.0788	1.7822	1.8171	1.9774	2.3377	2.9989	4.0095	8.5537	20.0298	0.0000
20 years	8.8773	6.8655	2.8874	3.7553	4.0580	4.9136	5.8827	10.0397	19.1507	22.4237	44.7805	0.0000
30 years	27.6705	19.6471	4.8993	9.7104	10.5758	11.8697	21.6108	38.5078	52.2715	58.5962	116.8645	0.0000

Panel D: 1931−2022 Real Returns

Horizon	Mean	SD	1%	5%	10%	25%	50%	75%	90%	95%	99%	P(W<1)
1 year	1.0769	0.2301	0.4181	0.7659	0.8602	0.9417	1.0898	1.1679	1.2857	1.4177	2.1591	0.3381
3 years	1.2338	0.4149	0.5819	0.6959	0.7465	0.9287	1.2236	1.4691	1.6531	1.9349	2.9895	0.3445
5 years	1.3895	0.6031	0.3156	0.5971	0.7576	0.9677	1.2641	1.6431	2.0130	2.3028	4.1939	0.2939
10 years	1.7863	0.8668	0.5302	0.7490	0.8984	1.2281	1.6194	2.1350	2.7977	3.2963	6.4119	0.1087
20 years	2.7594	1.0865	1.0554	1.2290	1.4762	1.8881	2.6425	3.3510	4.2005	5.2437	5.5442	0.0000
30 years	4.6532	2.6264	1.4063	1.7405	2.1294	2.8217	4.0568	5.6846	7.6799	10.6509	14.7615	0.0000

We calculate cumulative returns over 1-, 3-, 5-, 10-, 20-, and 30-year overlapping rolling windows, and bootstrap cumulated returns 10,000 times for each of the six investment horizons. This table presents bootstrapped results for this alternative bootstrapping approach.

Appendix 5
Return Forecasts 1973−2022

	5-Year Forecasts				10-Year Forecasts			
	MAE	MAE Diff	OOS-R^2	CW Stat	MAE	MAE Diff	OOS-R^2	CW Stat
Panel A: Nominal Returns								
Historical Mean	0.0859	0.0000	0.0000		0.0502	0.0000	0.0000	
Panel A1: Yield Alone, YLD_i								
YLD_{Div}	0.0863	0.0004	0.0049	(0.36)	0.0506	0.0004	−0.0128	(−0.53)
YLD_{CADY}	0.0858	−0.0002	−0.0148	(−0.51)	0.0509	0.0007	−0.0480	(−1.77)
Panel A2: Gordon, $GOR_{i,j} = YLD_i + g_j$								
$GOR_{Div,Div} = YLD_{Div} + g_{Div}$	0.0749	−0.0110	0.2107**	(1.71)	0.0503	0.0001	0.3437**	(2.04)
$GOR_{CADY,CADY} = YLD_{CADY} + g_{CADY}$	0.0726	−0.0134	0.1995**	(2.28)	0.0450	−0.0052	0.3503**	(2.31)
Panel A3: Valuation Alone, ΔV_k								
ΔV_{BUF}	0.0798	−0.0061	0.0995***	(2.62)	0.0472	−0.0030	0.1216***	(2.58)
Panel A4: Three Components, $GOR_{Div,Div} + \Delta V_k$								
$GOR_{Div,Div} + \Delta V_{BUF}$	0.0759	−0.0100	0.2184**	(1.76)	0.0429	−0.0073	0.3915**	(2.06)
$GOR_{CADY,CADY} + \Delta V_{BUF}$	0.0727	−0.0132	0.1933***	(2.63)	0.0433	−0.0069	0.3371***	(2.46)
Panel B: Real Returns								
Historical Mean	0.0827	0.0000	0.0000		0.0358	0.0000	0.0000	
Panel B1: Yield Alone, YLD_i								
YLD_{Div}	0.0827	0.0000	0.0218	(0.71)	0.0350	−0.0008	0.0850*	(1.51)
YLD_{CADY}	0.0784	−0.0043	0.0661	(1.13)	0.0332	−0.0026	0.1088*	(1.53)
Panel B2: Gordon, $GOR_{i,j} = YLD_i + g_j$								
$GOR_{Div,Div} = YLD_{Div} + g_{Div}$	0.0859	0.0032	−0.2992	(0.84)	0.0652	0.0294	−1.6994*	(1.53)
$GOR_{CADY,CADY} = YLD_{CADY} + g_{CADY}$	0.0788	−0.0039	−0.0698	(1.25)	0.0503	0.0145	−0.5899**	(1.95)
Panel B3: Valuation Alone, ΔV_k								
ΔV_{BUF}	0.0816	−0.0011	0.0086	(0.72)	0.0336	−0.0022	0.1373**	(2.33)
Panel B4: Three Components, $GOR_{Div,Div} + \Delta V_k$								
$GOR_{Div,Div} + \Delta V_{BUF}$	0.0820	−0.0007	0.0109	(0.67)	0.0343	−0.0016	0.1256*	(1.63)
$GOR_{CADY,CADY} + \Delta V_{BUF}$	0.0757	−0.0070	0.0785**	(2.11)	0.0278	−0.0080	0.4282***	(2.94)

In this table, we present the 5-year and 10-year nominal and real return forecast results over the 1973–2022 subperiod using four frameworks (e.g., Ma, Marshall, Nguyen, and Visaltanachoti, 2023). MAE is the mean absolute error, measuring the average magnitude between predicted and actual returns. MAE Diff denotes the difference in MAEs between each prediction model and the historical mean model. OOS-R^2 is the out-of-sample R-squared for each prediction model. We also employ the Clark and West (2007) method to test the null hypothesis, H0: OOS-R2 $\leq$ 0, against the alternative, H1: OOS-R2 > 0. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

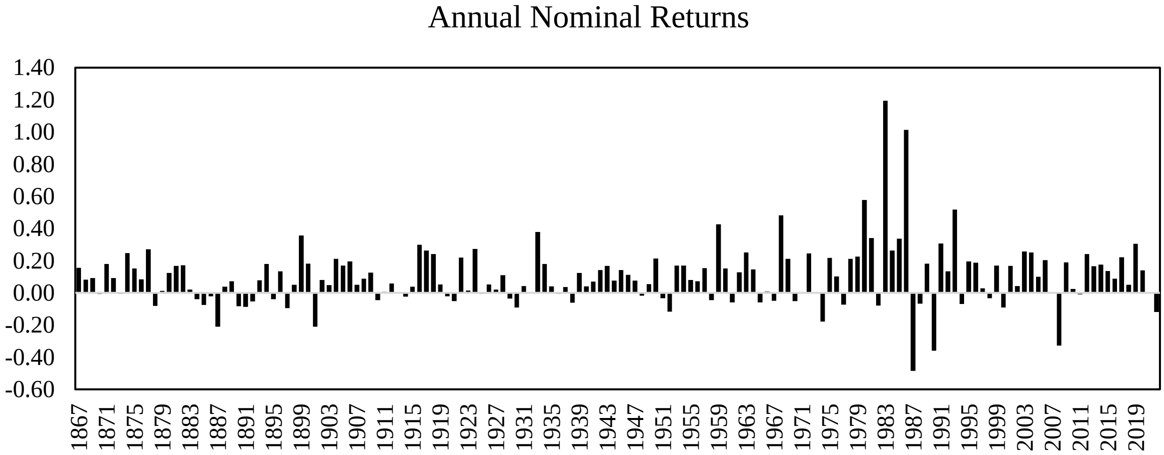

Figure 1A: Annual Nominal Returns. This figure presents annual returns in nominal terms over the entire sample period.

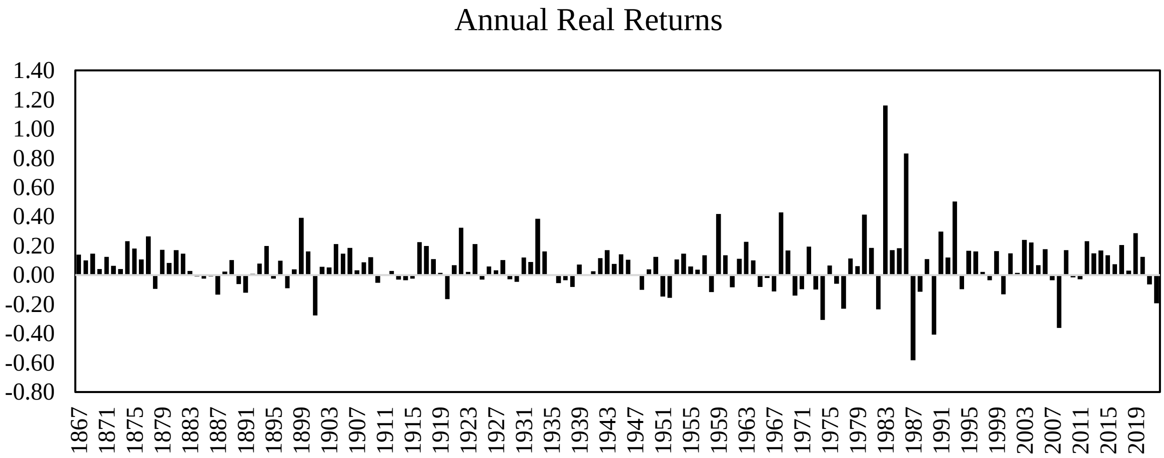

Figure 1B: Annual Real Returns. This figure presents annual returns in real terms over the entire sample period.

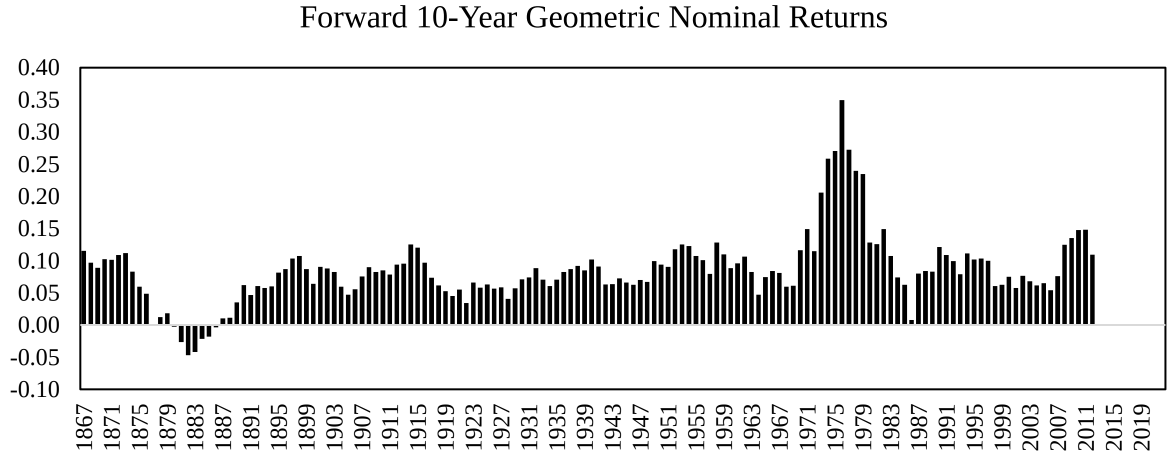

Figure 2A: Forward 10-Year Geometric Nominal Returns. In this figure, we present geometric returns in nominal terms for 10-year intervals rolling forward one year at a time.

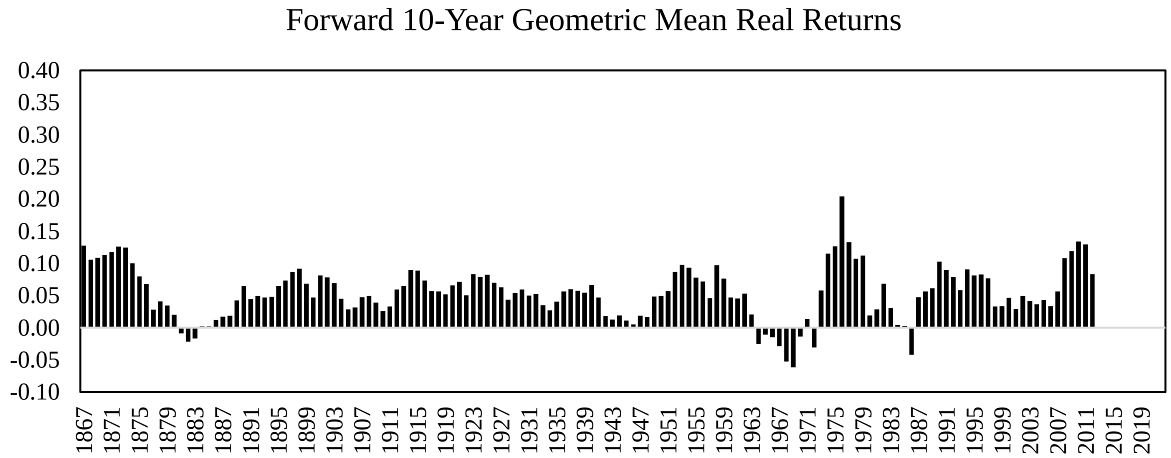

Figure 2B: Forward 10-Year Geometric Real Returns. In this figure, we present geometric returns in real terms for 10-year intervals rolling forward one year at a time.

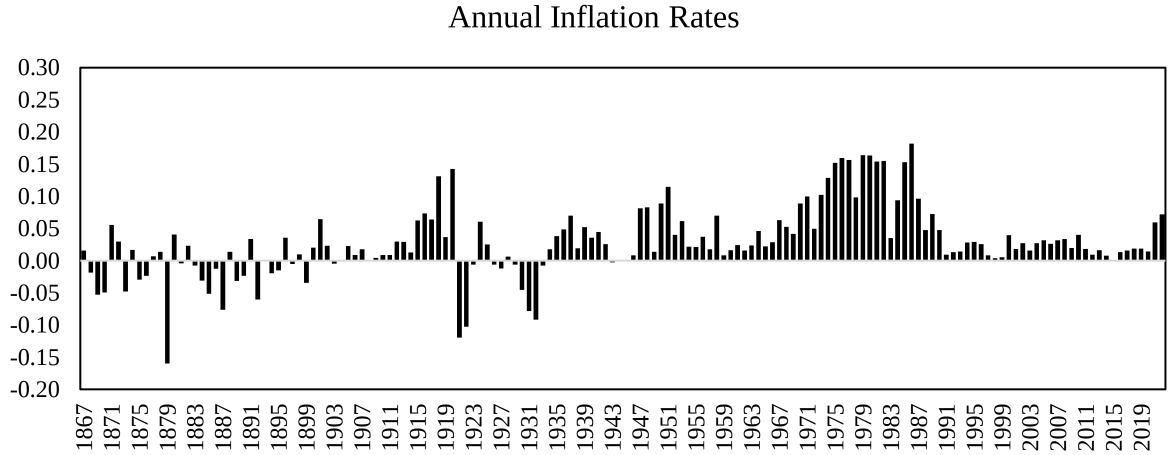

Figure 3: Annual Inflation. This figure presents annual inflation rates over the entire sample period.