Expert something sensible

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Expect something sensible:

Putting US returns in an international perspective

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SOM theme E: Financial intermediation

Abstract
This paper examines unconditional long-run expected returns for US equity and bond markets and contrast returns with those of four large economies. We confirm earlier studies on the US and find that, as a result of repricing, actual equity returns have exceeded what could reasonably be expected. As bonds returned less, the excess return was spectacular. With the exception of the UK, investors in other countries were less fortunate. Our results lend credibility to the argument that analysis using US historical data is overly comforting. Survivorship bias seems clearly an issue. Based on current valuations, expected returns on US equities are low and actual returns might well disappoint.

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1. INTRODUCTION

It is a well-documented stylised fact that investing in equity has provided investors with a return far above the risk free rate of return. In order to compensate for the embedded risks, investing in equities should provide investors with a premium: the equity risk premium (ERP). However, the excess return has been greater than what could be expected based on classical equilibrium theory. In a classic paper, Mehra and Prescott [1985] showed that for the US in the period 1889 – 1978 the difference has been in excess of 6% per year. Being incapable of associating the measured risk with the observed return, Mehra and Prescott dubbed the phenomenon the equity premium puzzle. Ever since, the issue caught the attention of academics as well as practitioners and spawned a whole new literature based on two classes of explanations for the existence of the ERP puzzle: theoretical and empirical. This paper is a contribution to the empirical side of research. [1]

Within this empirical side of research we are often confused as the term equity risk premium is used in both the ex post and ex ante approach, while Mehra [2003] clearly states that the two are different. One is the historical excess return of equity relative to bonds, and the other is the prospective risk premium for equities relative to bonds. Hence we adopt different labels and use excess return for the ex post estimates and equity risk premium for the ex ante measure. Within the area of ex post estimates of excess return Siegel [1992] extended the Mehra-Prescott sample. He found an average annualised excess return of 5.3% over the period 1802-1990. With most of the low excess return, interestingly enough, at the start of this time frame and the large excess return at the end. Brown, Goetzmann and Ross [1995] and Goetzmann and Jorion [1999] suggest the high returns in US equities to be an exception. Both studies hint at the issue of survivorship bias. By only using US data, one surely picks the economic winner of the

[1] For an excellent discussion of the theoretical literature we refer to Kocherlakota [1996] and Mehra and Prescott [2002].

last century. Blanchard [1993], Fase [1997] and Dimson, Marsh and Staunton [2001] show the robustness of the puzzle by studying a number of developed countries. This, however, still does not completely resolve the issue of survivorship bias as emerging markets are not included.

The above mentioned ex ante approach is the main focus of our study. It is of importance to know what people could reasonable have expected from equity. Cochrane [2001] questions whether people just after the Second World War, and throughout the period, knew that equity was going to return 5% over bonds, but shied away because they were afraid of the 14% volatility? Many attempts have been made to estimate the ERP using forward-looking information. Claus and Thomas [2001] and Gebhart, Lee and Swaminathan [2001] rely on valuation models to estimate expected returns and use forecasts by analysts to estimate future growth. Claus and Thomas [2001] find equity premia as low as 3%, but as analysts' expectations are only available over recent decades, their sample period is short (1985 – 1998). Arnott and Bernstein [2002] have a substantially longer sample period, 1802 – 2001. They use historical dividend growth and state that the current long-term ERP may well be near zero, perhaps even negative. Fama and French [2002] estimate the unconditional equity premium using dividend and earnings growth and note that the actual excess return was much more than investors could reasonably have expected. Our research interest in this paper is twofold. First, we use the Fama and French [2002] methodology to study unconditional long run expected returns for US equity markets. Second, as we find that this field of empirical finance has mostly focuses on US markets, we aim to extend the analysis to include France, Germany, Japan and the UK. Using the same methodology, we contrast the US data with expectations for other major markets. [2]

[2] Two points are worth a brief comment. First, it can be argued that the Gordon is a poor model to estimate expected equity returns. Alternative models are presented in Ilmanen [2003]. In all of the approaches assumptions are needed, which either might not make empirical sense, lack theoretical

Our data confirm previous results as we also find that excess returns in the US have surpassed what could reasonably be expected. However, in line with the survivorship bias arguments discussed above, it can be argued that it would be overly comforting just to study the US data. In comparison to the return distribution for other countries, the US data are very well behaved. It does not suffer from capital market closures, large (negative) outliers or substantial post-war inflation. The UK is the only other market where excess returns have been ahead of expectations. Even taking only the recent forty years as a base case for comparison, excess returns in other markets disappoint.

In the next section we present the methodology used to estimate expected equity and bond returns. The third section describes the data, with extra attention paid to the US data. We follow with our empirical results. A brief discussion of current outlook for equity and bond returns is in section 5. Section 6 concludes.

2. METHODOLOGY

Fama and French [2002] base their unconditional expected return for equity on the Gordon [1962] growth model. The Gordon estimate of the expected equity return is the average dividend yield during the estimation period, plus the average growth rate of dividends,

$$E\left(r^{e}\right) = A\left(\frac{D}{P}\right) + A\left(g_{d}\right) \tag{2.1}$$

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underpinnings or suffer from data availability. Arguably the best alternative is to adopt earnings yield as the best predictor of future equity returns. Unfortunately, such data is not available for a larger set of countries. Second, we estimate ERPs based on local markets as we argue it is justifiable that for a large part of our sample period global stock markets were not fully integrated (see Goetzmann, Li and Rouwenhorst [2001]). We note the anology to the current debate surrounding emerging markets (Bekaert and Harvey [2002]).

Given stationarity assumptions for all relevant stochastic processes (dividend yield, dividend growth rate and capital gains) and a long estimation period, the model produces unbiased estimates of the long-term expected equity return. Stationarity implies that if the sample period is long, the compound rate of dividend growth approaches the compound rate of capital gain. The logic underlying (2.1) applies to any variable that is cointegrated with equity prices. It must be stressed that the model abstracts from changes in yield; current yields are assumed to be fair.

As with equity, Ilmanen [1995] shows that current bond yields is a fair estimate of future bond returns. With the introduction of TIPS (Treasury Inflation-Protected Securities) in January 1997, we have a US government bond that pays a real return. [3] However, for longer sample periods only nominal bond yields are readily observable. Under the assumption that current yields are a fair estimate of future bond yield, we can calculate the unconditional long run expected real return on bonds by the average bond yield during the estimation period, minus the average actual annual rate of inflation (2.2).

$$E\left(r^{b}\right) = A\left(BY\right) - A\left(INFL\right) \qquad (2.2)$$

Now that we have an expected equity return based on a simple dividend growth model and an expected bond yield based on the current yield and inflation, we construct the ERP as the difference between the two (2.3). Upon construction we have a series that describes what investors could reasonably have expected for the excess return of equities over bonds.

$$ERP = E\left(r^{e}\right) - E\left(r^{b}\right) \qquad (2.3)$$

In the following sections, we will use equations (2.1), (2.2) and (2.3) for estimation. Before doing so we will give a description of the data.

[3] The acronym TIPS is still in use although the securities have been renamed Treasury Inflation-Indexed Securities.

3. DESCRIPTION OF THE DATA

Our sample periods are long; at least 75 years of monthly data are used in our study. The US data are all from Shiller [2000], who documents data from 1871, when the S&P 500 came into existence. Data on other markets are from Global Financial Data. Not all data series have similar sample periods; Table 1 gives the breakdown by variable. Also note that some data series have omissions because several capital markets were closed during the World Wars.

Table 1: International data series. This table gives the sample periods for which we have data available. The final row are the full sample dates.

	France	Germany	Japan	UK	US
Inflation	1901	1871	1900	1906	1871
Bond	1901	1924	1871	1871	1871
Equity	1901	1871	1914	1871	1871
Dividend	1901	1871	1926	1924	1871
Full sample	1901	1924	1926	1924	1871

The dramatic investment implications of the differential rates of return can be seen in Table 2, which compares the return on equity and bonds for the US. The table highlights three key observations:

1. It shows the wealth building potential of equity over bonds, the accumulation of an excess return of 4.79% a year. This number is slightly less than reported in the literature. Differences are due to differences in sample periods and use of bonds instead of risk-free rates with shorter maturities.
2. It shows the power of dividends. The difference between price and total return amounts to 4.89%. Accumulating income comprises over half the real total return on equity. These data put the lie to the conventional view that equities derive most of their return from capital appreciation, that income is far less relevant, if not irrelevant (see Arnott and Bernstein [2002]).
3. It shows the price of inflation. The real terminal wealth is notably less than the nominal terminal wealth. Inflation approximately erodes 2.1% purchasing power per annum in the full sample period.

Table 2: Terminal value of $1 invested. This table gives the terminal wealth from investment in equity and bonds for the sample period 1871 – 2000. The first rows display the real and nominal returns based on total return, which is including reinvested dividends. The final rows give the price return, excluding the dividends.

Investment Period	Equities		Bonds	
	Total Return			
	Real	Nominal	Real	Nominal
Jan 1871 – Dec 2000	9289.67	115471.78	24.43	341.03
Annual return	7.28%	9.38%	2.49%	4.59%
	Price Return			
	Real	Nominal		
Jan 1871 – Dec 2000	21.47	299.76		
Annual return	2.39%	4.49%		

The graphs in the appendix provide a graphical overview of the nominal and real total return indices for all equity and bond markets. It is clear that returns in other markets are far less exuberant and much more volatile. We can witness catastrophic losses in nominal terms and the detrimental effects on inflation. Post war inflation is clearly evident in some countries. Still, the period of Weimar inflation, which is not in our full sample period for Germany, is by far the most extreme. In the Appendix we also display real returns, volatilities and standard errors by decade. As the aim of investing is to provide for consumption in later stages of life, the remainder of this paper focuses on real total returns.

Sample statistics for the four variables needed to estimate the expected return on equity and bonds (dividend yields, dividend growth rates, nominal bond yields and inflation) are also in the Appendix. In addition we provide a graphical display of dividend yields. These data convey some interesting points. First, the monthly consumer price inflation and dividend growth data contain several outliers. Second, dividend yields at the end of the sample period are below their long-run averages for all countries. This corresponds with the well-known fact that equity markets have become more expensive as investors were willing to pay a higher price for a stream of dividends. Third, though beyond the scope on this paper, we would highlight that dividends in the US have not kept pace with economic growth and almost consistently fallen short of economic gains.

Ritter [2003] documents that this is also the case for other markets and provides several explanations. We do not report statistics, but note that (2.1) produces unbiased estimates of the long-term expected equity return. We can confirm that dividend yields, dividend growth rates and capital gains are stationary. Augmented Dickey Fuller statistics point towards no unit root. First order autocorrelations of dividend yields are high, but decay across longer lags. This is in line with previous evidence (e.g. Fama and French [1988]) that series are highly autocorrelated but slowly mean reverting processes. Johansen [1995] tests for cointegration demonstrate that dividend growth and capital gains are cointegrated.

The distributional characteristics of the dividend growth and inflation data make it hard to draw definitive conclusions based on the full sample and post war period for France, Germany and Japan. Distortions from the period around the First World War and Second World War are substantial. French equity markets were closed and the French economy suffered from tremendous bouts of inflation coming out of the wars. The average yearly inflation rate for the full sample is 8.5%, substantially higher than the average bond yield for the sample, indicating a negative expected return. The expected equity returns for Germany over the full period starting 1924 are simply too high to be credible. This is due to the fact that the dividend growth series in the Nazi era and the post-war period contains a lot of positive outliers skewing the average value. Substantial negative returns are observed in the Japanese bond market during the 1940s, where the actual real returns over the decade were –20% annualised. This is a function of a rise in nominal yields from 3.7% to 5.5% over the period 1946 – 1948 and substantial post war inflation. High dividend growth data in Japan for the post war period resemble the German data and are equally suspicious. Expected returns for full sample period and post war period are not reported. [4]

[4] As the outliers influence the results we have also calculated expected returns using median values instead of simple averages. These are left unreported, but are available at request. Though

4. EMPIRICAL RESULTS

Having demonstrated how the workhorse of asset pricing, the Gordon growth model, generates expected return for equities, we are now in a position to compare the expected return and the actual return. Table 3 gives the expected returns on equity and bond per country. As a consequence of the discussed data issues, we report returns for the 1961 – 2000 period for all countries, reflecting three considerations. First, times of financial distress, in which the collapse of a nation's economy, hyperinflation, war, or, revolution threatens the capital base and distorts the average returns. Objectively measuring the ERP in such conditions might be difficult. Second, the hyperinflation in some of the war torn countries did not subside until the early 1950s. During the 1950s, financial markets resumed normalcy, and financial data started to reflect free market movement rather than state control. Third, though Germany issued the first post-war bonds in 1948, it was only after the creation of the Bundesbank in 1957 that government bonds regained the safe-haven status. As the main focus of this paper is to contrast the returns in the US with those of other markets, we start with a detailed description of the US results. Results for other markets follow this discussion.

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median values provide a telling picture of the distributional characteristics, we doubt whether such an unconditional expected return generated is unbiased and hence should not be taken as the central estimate.

Table 3: Expected equity, bond returns and ERP in international context. In this table we compare expected and actual returns on equity and bonds for the five largest economies (France, Germany, Japan, UK and US). Following Fama and French [2002], the expected return is the sum of the average dividend yield and average annual growth rate for the period, assuming no change in yields. Expected real bond returns are constructed by subtracting actual annual inflation from nominal bond yields, assuming no change in yields. The difference between the two series, ERP and actual excess returns, are in the final columns.

Time period	Equity		Bond		ERP	
France	Expected	Actual	Expected	Actual	Expected	Actual
1961 – 2000	7.13%	6.54%	3.04%	2.93%	4.09%	3.61%
Germany						
1961 – 2000	6.11%	5.22%	3.95%	4.36%	2.16%	0.86%
Japan						
1961 – 2000	2.58%	3.96%	2.02%	3.94%	0.56%	0.02%
UK						
1924 – 2000	6.59%	6.81%	1.60%	1.28%	4.49%	5.50%
1946 – 2000	6.60%	7.17%	1.81%	1.06%	4.79%	6.11%
1961 – 2000	5.61%	6.74%	2.29%	3.09%	3.32%	3.65%
US						
1871 – 2000	5.96%	7.28%	2.35%	2.49%	3.61%	4.79%
1871 – 1945	6.26%	6.84%	2.72%	3.46%	3.57%	3.39%
1946 – 2000	5.55%	7.88%	1.87%	1.19%	3.67%	6.69%
1961 – 2000	4.25%	7.10%	2.85%	2.40%	1.40%	4.70%

Interestingly, the predictive power for US equity returns is reasonable for the pre-war period, but breaks down for the post-war period. In line with Fama and French [2002], our results confirm that the expected return has more than twice the precision as of the actual returns. The (unreported) standard errors are much smaller. The discrepancy between expected and actual equity return is at its greatest over the past two decades. Why has the actual equity return diverged so much from their theoretical expected value? The difference between the unconditional expected return (average dividend yield and average dividend growth) and actual return (average dividend yield and average annual capital gain) is the gap between the average dividend growth and average capital gain. Average dividend yield for 1946 – 2000 was 3.8% and dividend growth for the 1946-2000 period was 1.7%, generating 5.6% expected returns. The actual average return was 7.9%. The dividend yield falls from 3.7% in Jan 1946 to 1.2% in Dec 2000. The growth in equity prices was 3.7/1.2=3.1 times what it would have been if dividend yield had remained at the 1946 level. Roughly speaking, this adds about 2.1% per year to the compound return and explains the majority of the 2.3% unexpected return. Clearly the repricing of equity has resulted into some unexpected gains.

Expected and actual US bond returns for the full period match adequately; only 0.14% separates the two. It is interesting to note that in the period before the Second World War, expected returns were surpassed as bond returned more, whereas in post-war period investors expectations were not met and actual returns were 0.7% lower. As a cause of this divergence Arnott and Bernstein [2002] and Siegel [1998] point towards the decoupling of nominal from real bond yields. Until the last 40 years, there was virtually no trend in US inflation. However, in the post 1945 period, the rate of inflation hardly turned negative and consumer prices persistently trended higher. Expected inflation became a normal part of bond valuation, but bond investors misunderstood the effects of leaving the gold standard and the role of fiscal policy and subsequently underestimated inflation.

For the full sample period we find an ERP of 3.6% for the US and numbers for both sub periods are broadly similar. Again the predictability is better for the pre-war period. As equity returned more and bonds less than expected in the post war period, the actual excess returns surpassed expectations. Fama and French [2002] use the similar dividend growth model based on Gordon [1962] for the period 1872-1999 and find an ERP of 3.8% for period up to 1949 and 3.4% for period after 1949. Our numbers are comparable taking into account the slight differences in sample period, methodology and data.

For the UK we find that expected equity returns are higher than those in the US; a result of higher average dividend yield and higher average real dividend growth. Actual equity returns surpassed expectations for the full sample and for the post war period as dividend yields in the UK receded to lower levels. However, the magnitude of "surprise" is less than in the US. As bonds also returned less than expected, the excess returns in the UK were higher than the ERP.

Several interesting observations can be drawn from the data for the sample period 1961 – 2000, the period arguably free from the impact of outliers and financial shocks. First, in France and Germany, actual equity returns are lower than expected. This is in contrast to Japan, UK and US where the actual returns surpass expectations. The magnitude of "surprise" is by far the largest in the US. Actual returns on bonds are lower than expected in both France and the US, though the difference for France is small. The returns on Japanese bonds were substantially above what could reasonably be expected. As a consequence the excess return only surpasses the ERP in the UK and US.

5. LOOKING AHEAD

Where does this leave us for expected equity returns in the US? Ignoring future changes in valuation, the expected real equity return in the US is low. At time of writing dividend yields are only 1.6%. Lacking a reliable estimate for growth in future dividends we apply its post war average of 1.7%. Adding the two generates an expected return on equity of 3.3%. This is far shy of actual returns achieved in history. Expected real bond returns based on 10-year TIPS are approximately 2%, resulting in a meagre ERP of 1.3%. [5] Though Fama and French [2002] argue that share buy backs only change the timing of dividend, one could be tempted to raise the dividend yields by 0.5% to compensate for that effect. Arguably, one might argue for higher dividends in the future (e.g. as the profit share of GDP rise), say another 1% annually. However, even after these more generous assumptions the equity risk premium is only 2.8%. A worrying omen for investors is that the subsequent returns on equities might even disappoint as the models assume that the current yield is fair. Actual returns are likely to be worse if we take into account that

[5] We use TIPS as proxy for real bond yields, as they are readily available. The alternative of using nominal bond yields minus actual or expected CPI inflation would result in similar numbers.

valuations will mean revert and yields move up to their historic average. Even ignoring the valuation issue the real expected return on equity are low and offer only minor compensation over real bonds.

6. SUMMARY AND CONCLUSION

In this paper we used a dividend growth model to generate expected equity returns. We show that for the period 1871 – 2000, actual US equity returns were 1.3% above what could reasonably be expected. The majority of the difference arises in the post-war period. Similar models for bonds show that the expected return for US bonds match the actual returns for bonds. In the period before the war, expected returns were surpassed as bonds returned more, but in post war period investors expectations were not met and actual returns were 0.7% lower. Hence, it should come as no surprise that the excess return in the post war period was far higher than expected. Bond investors got less than expected, equity investors received more. A substantial part of the actual return is due to this revaluation of equity, not because of changes in the underlying fundamentals (dividends). One of the pitfalls of using historic excess returns is lacking this knowledge.

An international comparison of expected bond and equity returns between the five largest economies shows that in a cross-sectional comparison, the excess return in the US is remarkable. Expected and actual returns in France, Germany and Japan are all substantially impacted in the period surrounding the World Wars. The UK is the only other country where excess returns are above what could reasonably be expected. This suggests that the US data suffer from survivorship bias and provides an additional argument not to rely on historical excess returns when projecting expected returns.

Even based on generous assumptions, current lofty valuations do not bode well for investors. After a three-year bear market in equity, a reasonable investor should still not expect much return from US equities.

BIBLIOGRAPHY

Arnott, R. and P. Bernstein, 2002, "What risk premium is 'normal'?", *Financial Analysts Journal*, 58, 64-85.

Bekaert, G. and C. Harvey, 2002, "Research in emerging markets finance: Looking to the future", *Emerging Markets Review*, 3, 429-448.

Blanchard, O., 1993, "Movements in the equity premium", *Brookings Papers on Economic Activity*, 24, 75-118.

Brown, S., W. Goetzmann and S. Ross, 1995, "Survival", *Journal of Finance*, 50, 853-873.

Claus, J. and J. Thomas, 2001, "Equity premia as low as three percent? Evidence from analysts' earnings forecasts for domestic and international stock markets", *Journal of Finance*, 54, 1629-1666.

Cochrane, J., 2001, *Asset pricing*, Princeton University Press, Princeton, NJ.

Dimson, E., P. Marsh and M. Staunton, 2001, "101 Years of investment returns", *Millennium Book*, London Business School and ABN Amro.

Fama, E. and K. French, 1988, "Dividend yields and expected stock returns", *Journal of Financial Economics*, 22, 3-27.

Fama, E. and K. French, 2002, "The equity premium", *Journal of Finance*, 57, 637-659.

Fase, M., 1997, "The risk premium on stocks in the European Union", Dutch Central Bank *Research Memorandum.*

Gebhart, W., C. Lee and B. Swaminathan, 2001, "Toward an implied cost of capital", *Journal of Accounting Research*, 39, 135-176.

Goetzmann, W. and P. Jorion, 1999, "Global stock markets in the twentieth century", *Journal of Finance*, 54, 953-980.

Goetzmann, W., L. Li, G. Rouwenhorst, 2001, "Long-term global market correlations", NBER *Working Paper No. 8612*.

Gordon, M., 1962, *The investment, financing and valuation of the corporation*, Homewood, Ill.: Richard Irwin.

Ilmanen, A., 1995, “Time-varying expected returns in international bond markets”, *Journal of Finance*, 50, 481-506.

Ilmanen, A., 2003, “Expected returns on stocks and bonds”, *Journal of Portfolio Management*, 29, 7-27.

Kocherlakota, N., 1996, “The equity premium: It’s still a puzzle”, *Journal of Economic Literature* 23, 42-71.

Mehra, R., 2003, “The equity premium: Why is it a puzzle?”, *Financial Analysts Journal*, 59, 54-69.

Mehra, R. and E. Prescott, 1985, “The equity premium: A puzzle”, *Journal of Monetary Economics*, 15, 145-162.

Mehra, R. and E. Prescott, 2002, “The equity premium in retrospect”, in Constantinides, G., M. Harris and R. Stulz, eds., *Handbook of the Economics of Finances*, Amsterdam: North-Holland Elsevier, forthcoming.

Ritter, J., 2003, “Economic growth and equity returns”, University of Florida *Working Paper*.

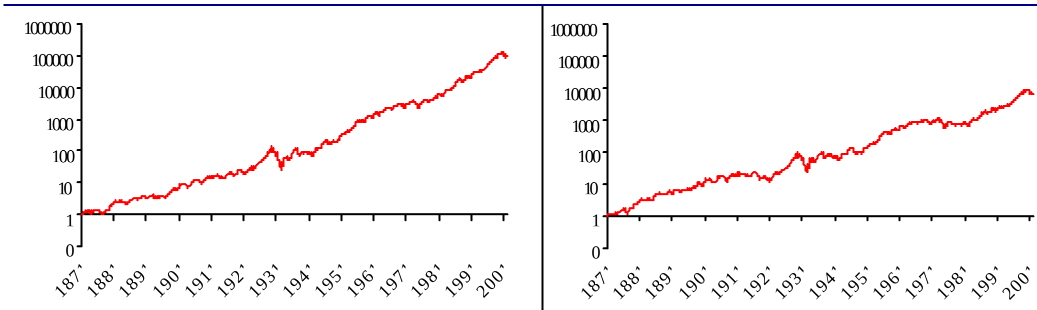
Shiller, R., 2000, *Irrational exuberance*, Princeton: Princeton University Press.

Siegel, J., 1992, “The equity premium: stocks and bond returns since 1802”, *Financial Analysts Journal*, 48, 28-38.

Siegel, J., 1998, *Stocks for the long run*, New York: McGraw-Hill.

APPENDIX

Figure A 1: Nominal and real total return index US equity market. This figure gives the total return index for the S&P500 for the US for the sample period 1871 – 2002. The axes are in logarithmic terms. The left hand graph gives nominal index, the right hand side the inflation adjusted real index. Both indices are indexed in 1871 and have similar scale.



Source: Shiller [2000] and updated by author.

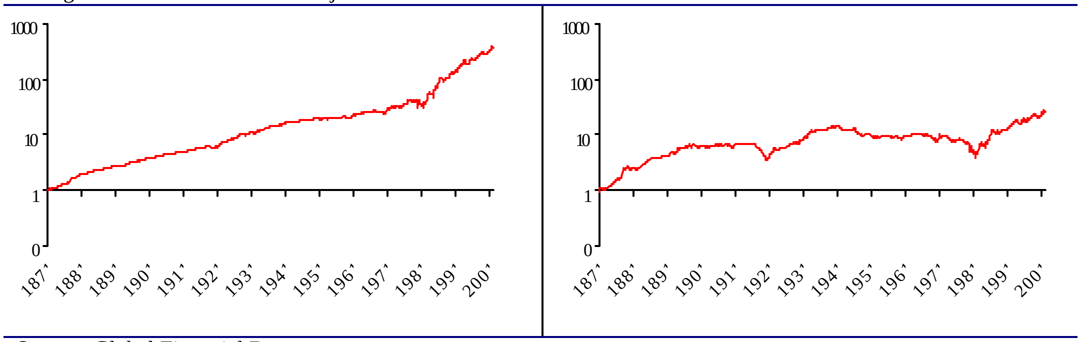
Table A 1:Real annualised equity returns US. This table shows the real annualised equity return, standard deviation and standard error by decade for US equity market data. Data are for the S&P500 for sample period 1871 – 2000.

Legend: m is the average annualised real total equity return, s is the standard deviation of annualised real total equity returns and $s/\sqrt{T}$ is the standard error of the average returns.

Time period	m	s	$s/\sqrt{T}$
1871 – 1880	12.24%	10.46%	3.31%
1881 – 1890	4.59%	10.10%	3.19%
1891 – 1900	9.05%	11.62%	3.67%
1901 – 1910	5.46%	12.97%	4.10%
1911 – 1920	-4.09%	11.72%	3.71%
1921 – 1930	16.54%	15.83%	5.01%
1931 – 1940	3.21%	29.93%	9.46%
1941 – 1950	6.51%	12.99%	4.11%
1951 – 1960	14.24%	9.78%	3.09%
1961 – 1970	5.03%	11.29%	3.57%
1971 – 1980	0.33%	13.22%	4.18%
1981 – 1990	9.04%	13.05%	4.13%
1991 – 2000	14.50%	10.16%	3.21%
1871 – 2000	7.28%	14.28%	1.25%
1871 – 1945	6.84%	15.80%	1.82%
1946 – 2000	7.80%	11.91%	1.61%
1961 – 2000	7.10%	12.04%	1.90%

Source: Shiller [2000] and updated by author.

Figure A 2: Nominal and real return index US bond market. This figure gives the index for an index of 10-year bonds in the US for the sample period 1871 – 2002. The axes are in logarithmic terms. The left hand graph gives nominal index, the right hand side the inflation adjusted real index. Both indices are indexed in 1871 and have similar scale.



Source: Global Financial Data.

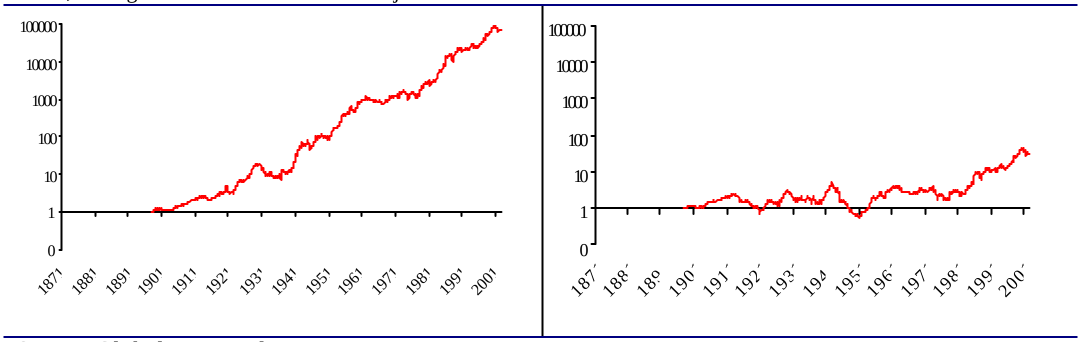
Table A 2: Real annualised bond returns US. This table shows the real annualised bond return, standard deviation and standard error by decade for US bond market data. Data are for a 10-year bond for sample period 1871 – 2000.

Legend: m is the average annualised real total bond return, s is the standard deviation of annualised real total bond returns and $s/\sqrt{T}$ is the standard error of the average returns.

Time period	m	s	$s/\sqrt{T}$
1871 – 1880	9.54%	9.06%	2.87%
1881 – 1890	5.50%	4.59%	1.45%
1891 – 1900	4.06%	6.56%	2.07%
1901 – 1910	0.59%	5.01%	1.59%
1911 – 1920	-5.30%	5.68%	1.80%
1921 – 1930	8.10%	3.66%	1.16%
1931 – 1940	5.62%	4.70%	1.49%
1941 – 1950	-3.99%	3.73%	1.18%
1951 – 1960	-0.28%	4.26%	1.35%
1961 – 1970	-0.56%	7.09%	2.24%
1971 – 1980	-5.26%	11.83%	3.74%
1981 – 1990	9.55%	16.14%	5.10%
1991 – 2000	6.53%	8.64%	2.73%
1871 – 2000	2.49%	7.94%	0.70%
1871 – 1945	3.46%	5.83%	0.67%
1946 – 2000	1.19%	10.13%	1.37%
1961 – 2000	2.40%	11.55%	1.83%

Source: Global Financial Data

Figure A 3: Nominal and real total return index French equity market. This figure gives the total return index for the SBF250 in France for the sample period 1871 – 2002. The axes are in logarithmic terms. The left hand graph gives nominal index, the right hand side the inflation adjusted real index. Both indices are indexed in 1898 and have similar scale.



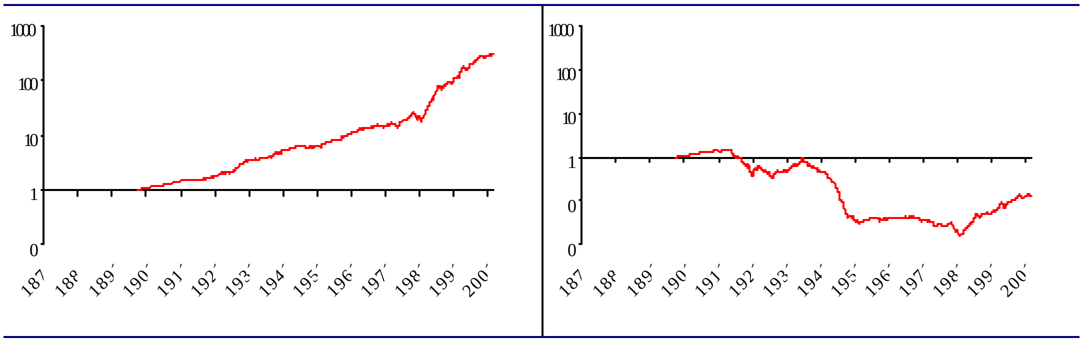
Source: Global Financial Data.

Table A 3: Real annualised equity returns France. This table shows the real annualised equity return, standard deviation and standard error by decade for French equity market data. Data are for the SBF250 for sample period 1901 – 2000. Legend: m is the average annualised real total equity return, s is the standard deviation of annualised real total equity returns and $s/\sqrt{T}$ is the standard error of the average returns.

Time period	m	s	$s/\sqrt{T}$
1901 – 1910	6.37%	6.39%	2.02%
1911 – 1920	-9.85%	16.80%	5.31%
1921 – 1930	9.88%	17.73%	5.61%
1931 – 1940	2.30%	23.29%	7.36%
1941 – 1950	-13.79%	24.47%	7.74%
1951 – 1960	19.58%	14.96%	4.73%
1961 – 1970	-0.62%	13.25%	4.19%
1971 – 1980	-0.36%	19.30%	6.10%
1981 – 1990	12.74%	22.15%	7.00%
1991 – 2000	15.38%	17.10%	5.41%
1901 – 2000	3.65%	18.41%	1.84%
1901 – 1945	0.54%	18.48%	2.75%
1946 – 2000	6.27%	18.33%	2.47%
1961 – 2000	6.54%	18.30%	2.89%

Source: Global Financial Data.

Figure A 4: Nominal and real total return index French bond market. This figure gives the index for an index of 10-year bonds in France for the sample period 1871 – 2002. The axes are in logarithmic terms. The left hand graph gives nominal index, the right hand side the inflation adjusted real index. Both indices are indexed in 1898. The scales are different.



Source: Global Financial Data.

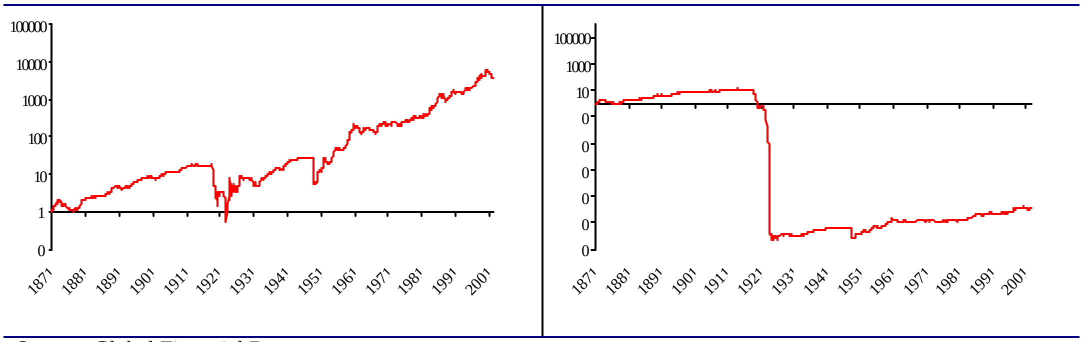
Table A 4: Real annualised bond returns France. This table shows the real annualised bond return, standard deviation and standard error by decade for French bond market data. Data are for a 10-year bond for sample period 1901 – 2000.

Legend: m is the average annualised real total bond return, s is the standard deviation of annualised real total bond returns and $s/\sqrt{T}$ is the standard error of the average returns.

Time period	m	s	$s/\sqrt{T}$
1901 – 1910	2.59%	1.07%	0.34%
1911 – 1920	-12.06%	14.19%	4.49%
1921 – 1930	2.29%	11.35%	3.59%
1931 – 1940	0.12%	9.20%	2.91%
1941 – 1950	-22.40%	13.06%	4.13%
1951 – 1960	0.49%	7.83%	2.48%
1961 – 1970	-0.99%	4.37%	1.38%
1971 – 1980	-5.61%	8.22%	2.60%
1981 – 1990	9.45%	12.30%	3.89%
1991 – 2000	9.74%	8.02%	2.54%
1871 – 2000	-2.10%	10.10%	1.01%
1901 – 1945	-4.12%	10.35%	1.54%
1946 – 2000	-0.42%	9.88%	1.33%
1961 – 2000	2.93%	8.88%	1.40%

Source: Global Financial Data

Figure A 5: Nominal and real total return index German equity market. This figure gives the total return index for the CDAX in Germany for the sample period 1914 – 2002. The axes are in logarithmic terms. The left hand graph gives nominal index, the right hand side the inflation adjusted real index. Both indices are indexed in 1871, but have different scales.



Source: Global Financial Data.

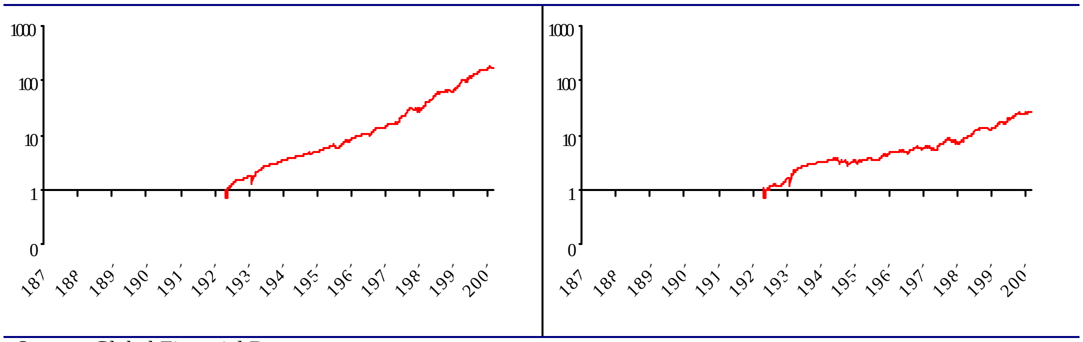
Table A 5: Real annualised equity returns Germany. This table shows the real annualised equity return, standard deviation and standard error by decade for German equity market data. Data are for the CDAX for sample period 1924 – 2000.

Legend: m is the average annualised real total equity return, s is the standard deviation of annualised real total equity returns and $s/\sqrt{T}$ is the standard error of the average returns.

Time period	m	s	$s/\sqrt{T}$
1924 – 1930	-5.27%	34.52%	13.05%
1931 – 1940	13.60%	12.82%	4.05%
1941 – 1950	-7.73%	30.16%	9.54%
1951 – 1960	27.89%	16.08%	5.08%
1961 – 1970	-2.44%	13.09%	4.14%
1971 – 1980	0.61%	13.63%	4.31%
1981 – 1990	12.37%	19.83%	6.27%
1991 – 2000	11.15%	17.04%	5.39%
1924 – 2000	6.14%	29.74%	2.61%
1924 – 1945	-25.10%	35.25%	4.07%
1946 – 2000	6.70%	20.13%	2.71%
1961 – 2000	5.22%	16.19%	2.56%

Source: Global Financial Data.

Figure A 6: Nominal and real total return index German bond market. This figure gives the index for an index of 10-year bonds in Germany for the sample period 1871 – 2002. The axes are in logarithmic terms. The left hand graph gives nominal index, the right hand side the inflation adjusted real index. Both indices are indexed in 1924 and have similar scales.



Source: Global Financial Data.

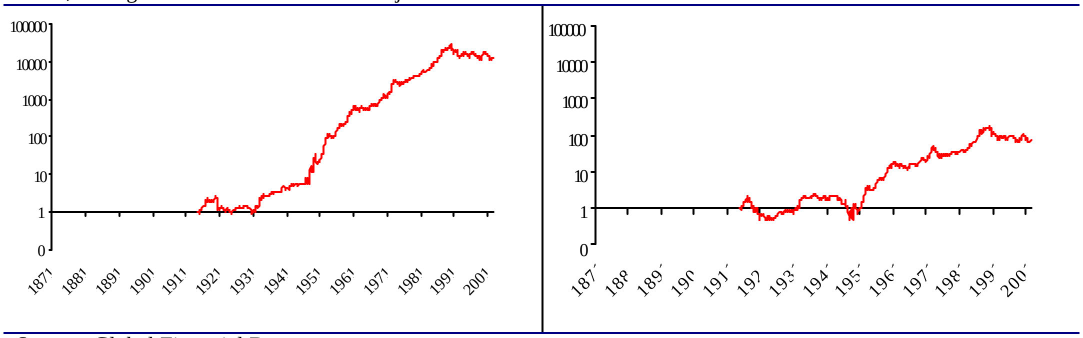
Table A 6: Real annualised bond returns Germany. This table shows the real annualised bond return, standard deviation and standard error by decade for German bond market data. Data are for a 10-year bond for sample period 1924 – 2000.

Legend: m is the average annualised real total bond return, s is the standard deviation of annualised real total bond returns and $s/\sqrt{T}$ is the standard error of the average returns.

Time period	m	s	$s/\sqrt{T}$
1924 – 1930	5.71%	13.04%	4.93%
1931 – 1940	7.65%	11.03%	3.49%
1941 – 1950	0.73%	5.84%	1.85%
1951 – 1960	2.62%	4.75%	1.50%
1961 – 1970	2.60%	3.68%	1.16%
1971 – 1980	2.50%	6.80%	2.15%
1981 – 1990	5.24%	6.93%	2.19%
1991 – 2000	7.18%	5.65%	1.79%
1924 – 2000	4.27%	7.53%	0.86%
1924 – 1945	6.05%	10.56%	2.25%
1946 – 2000	3.57%	5.90%	0.80%
1961 – 2000	4.36%	5.92%	0.94%

Source: Global Financial Data.

Figure A 7: Nominal and real total return index Japanese equity market. This figure gives the total return index for the TPX in Japan for the sample period 1871 – 2002. The axes are in logarithmic terms. The left hand graph gives nominal index, the right hand side the inflation adjusted real index. Both indices are indexed in 1914 and have similar scale.



Source: Global Financial Data.

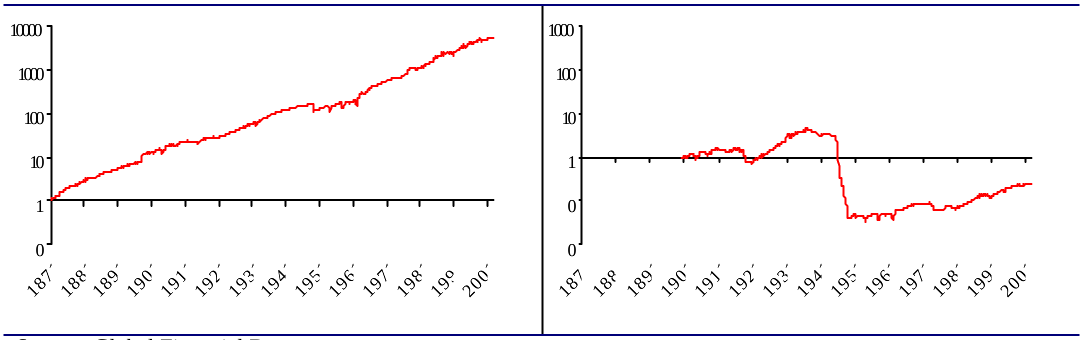
Table A 7: Real annualised equity returns Japan. This table shows the real annualised equity return, standard deviation and standard error by decade for German equity market data. Data are for the Topix for sample period 1926 – 2000.

Legend: m is the average annualised real total equity return, s is the standard deviation of annualised real total equity returns and $s/\sqrt{T}$ is the standard error of the average returns.

Time period	m	s	$s/\sqrt{T}$
1926 – 1930	5.12%	13.07%	4.13%
1931 – 1940	7.54%	15.43%	4.88%
1941 – 1950	-6.32%	41.34%	13.07%
1951 – 1960	33.79%	21.68%	6.86%
1961 – 1970	1.39%	16.75%	5.30%
1971 – 1980	5.68%	15.15%	4.79%
1981 – 1990	12.11%	19.44%	6.15%
1991 – 2000	-2.78%	19.68%	6.22%
1926 – 2000	6.61%	22.14%	2.65%
1926 – 1945	3.78%	13.48%	3.01%
1946 – 2000	7.66%	24.52%	3.31%
1961 – 2000	3.96%	17.87%	2.83%

Source: Global Financial Data.

Figure A 8: Nominal and real total return index Japanese bond market. This figure gives the index for an index of 10-year bonds in Japan for the sample period 1871 – 2002. The axes are in logarithmic terms. The left hand graph gives nominal index and is indexed in 1871. The right hand side gives the inflation adjusted real index, which is indexed in 1900. The scales are different.



Source: Global Financial Data.

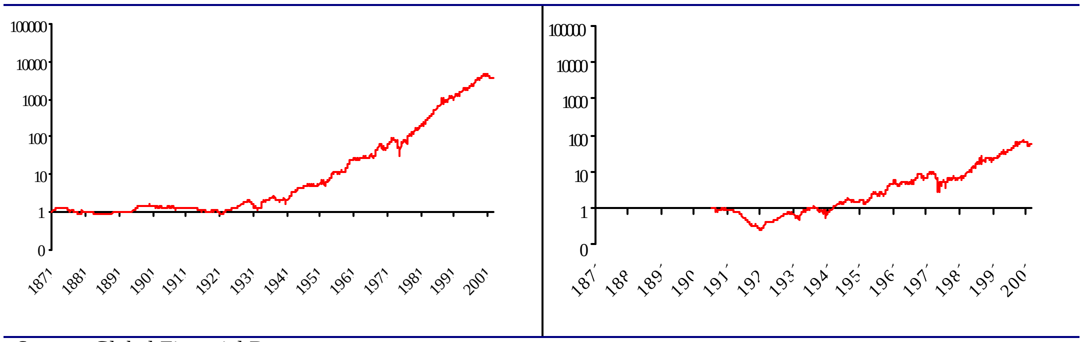
Table A 8: Real annualised bond returns Japan. This table shows the real annualised bond return, standard deviation and standard error by decade for German bond market data. Data are for a 10-year bond for sample period 1926 – 2000.

Legend: m is the average annualised real total bond return, s is the standard deviation of annualised real total bond returns and $s/\sqrt{T}$ is the standard error of the average returns.

Time period	m	s	$s/\sqrt{T}$
1926 – 1930	16.21%	6.39%	2.86%
1931 – 1940	1.13%	9.24%	2.92%
1941 – 1950	-34.42%	25.99%	8.22%
1951 – 1960	0.86%	15.14%	4.79%
1961 – 1970	4.92%	9.65%	3.05%
1971 – 1980	-1.81%	7.69%	2.43%
1981 – 1990	6.19%	9.63%	3.04%
1991 – 2000	6.69%	6.99%	2.21%
1926 – 2000	-2.27%	13.80%	1.59%
1926 – 1945	-0.73%	13.46%	3.01%
1946 – 2000	-2.83%	13.93%	1.88%
1961 – 2000	3.94%	8.60%	1.36%

Source: Global Financial Data

Figure A 9: Nominal and real total return index UK equity market. This figure gives the total return index for the FTSE in the UK for the sample period 1871 – 2002. The axes are in logarithmic terms. The left hand graph gives nominal index and is indexed in 1871. The right hand side the inflation adjusted real index, indexed in 1906. Both indices have similar scale.



Source: Global Financial Data.

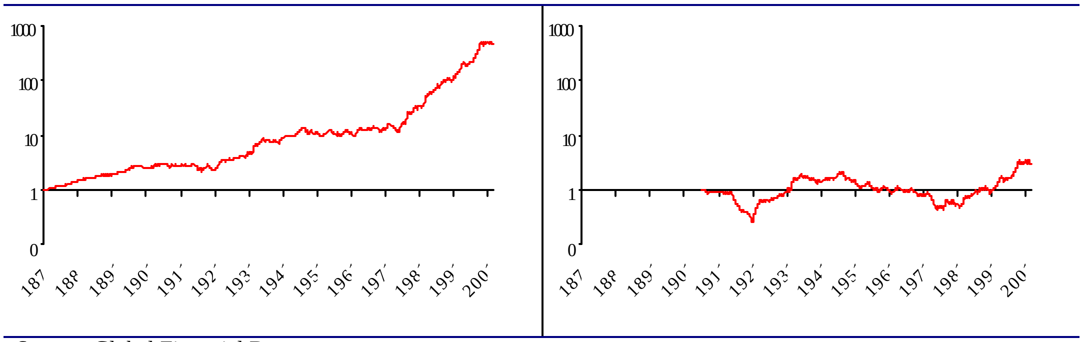
Table A 9: Real annualised equity returns UK. This table shows the real annualised equity return, standard deviation and standard error by decade for UK equity market data. Data are for the FTSE for sample period 1906 – 2000.

Legend: m is the average annualised real total equity return, s is the standard deviation of annualised real total equity returns and $s/\sqrt{T}$ is the standard error of the average returns.

Time period	m	s	$s/\sqrt{T}$
1906 – 1910	-2.06%	6.80%	3.04%
1911 – 1920	-12.51%	8.38%	2.65%
1921 – 1930	10.61%	8.93%	2.83%
1931 – 1940	0.44%	17.34%	5.48%
1941 – 1950	8.99%	10.95%	3.46%
1951 – 1960	11.45%	14.37%	4.54%
1961 – 1970	3.55%	14.18%	4.49%
1971 – 1980	0.14%	28.29%	8.95%
1981 – 1990	11.70%	19.38%	6.13%
1991 – 2000	12.06%	14.23%	4.50%
1906 – 2000	6.79%	17.73%	2.12%
1906 – 1945	5.39%	15.17%	3.92%
1946 – 2000	7.17%	18.38%	2.48%
1961 – 2000	6.74%	19.85%	3.14%

Source: Global Financial Data.

Figure A 10: Nominal and real total return index UK bond market. This figure gives the index for an index of 10-year bonds in the UK for the sample period 1871 – 2002. The axes are in logarithmic terms. The left hand graph gives nominal index and is indexed in 1871. The right hand side gives the inflation adjusted real index, which is indexed in 1906. The scales are similar.



Source: Global Financial Data.

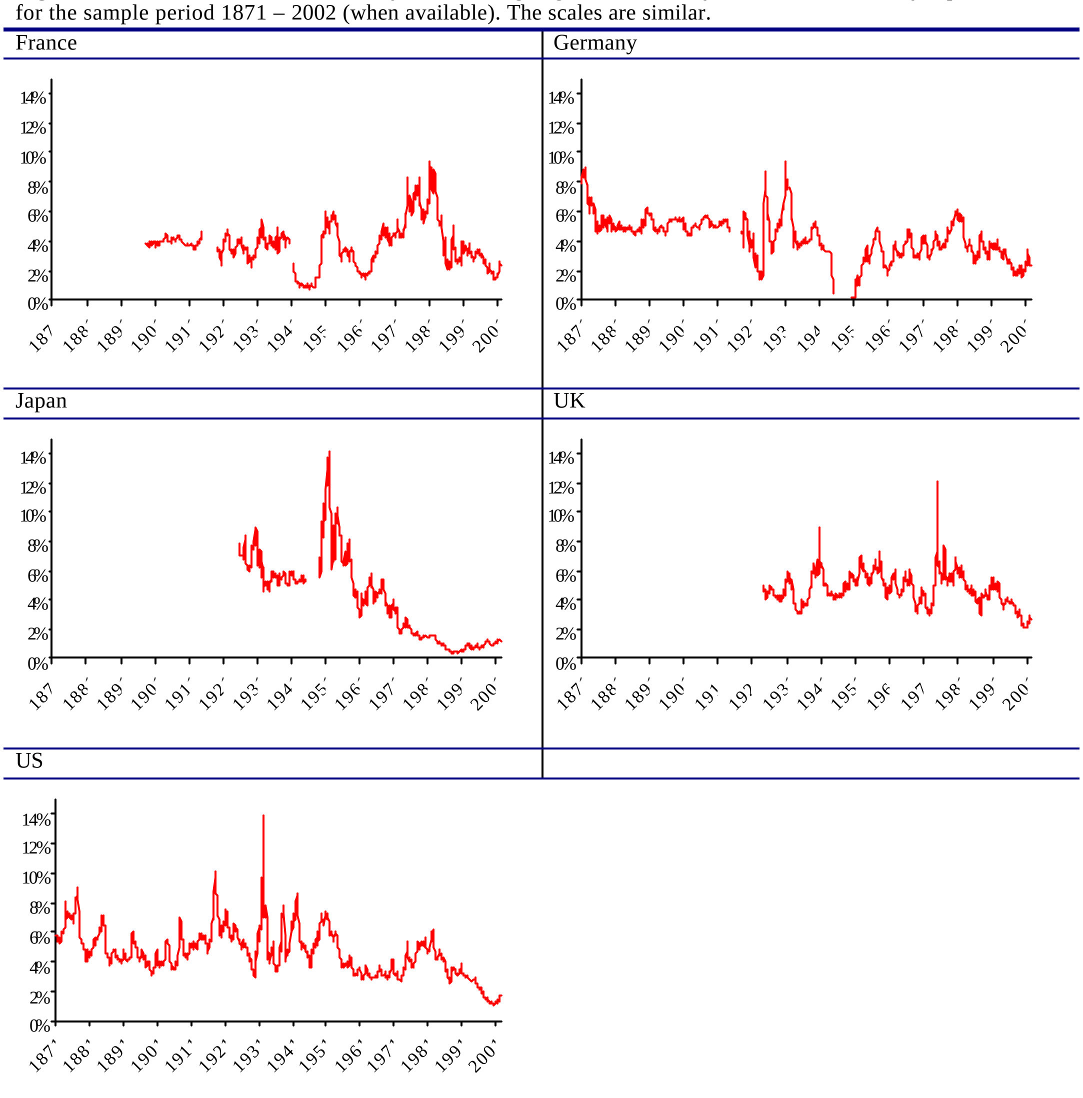
Table A 10: Real annualised bond returns UK. This table shows the real annualised bond return, standard deviation and standard error by decade for UK bond market data. Data are for a 10-year bond for sample period 1901 – 2000.

Legend: m is the average annualised real total bond return, s is the standard deviation of annualised real total bond returns and $s/\sqrt{T}$ is the standard error of the average returns.

Time period	m	s	$s/\sqrt{T}$
1906 – 1910	-1.03%	5.88%	2.63%
1911 – 1920	-11.32%	8.43%	2.66%
1921 – 1930	13.50%	10.67%	3.37%
1931 – 1940	3.87%	12.46%	3.94%
1941 – 1950	0.57%	7.26%	2.30%
1951 – 1960	-3.97%	7.94%	2.51%
1961 – 1970	-2.67%	8.24%	2.61%
1971 – 1980	-2.99%	12.46%	3.94%
1981 – 1990	5.62%	11.65%	3.68%
1991 – 2000	13.25%	11.61%	3.67%
1906 – 2000	1.28%	10.29%	1.06%
1906 – 1945	1.59%	9.94%	1.57%
1946 – 2000	1.06%	10.54%	1.42%
1961 – 2000	3.09%	11.23%	1.78%

Source: Global Financial Data

Figure A 11: International dividend yields. This figure gives the dividend yields for France, Germany, Japan and the UK for the sample period 1871 – 2002 (when available). The scales are similar.



Source: Global Financial Data and Shiller [2000].

Table A 11: Sample statistics. This table presents the sample statistics for dividend yield (D/P), consumer price inflation (CPI), dividend growth rates (g_d) and nominal bond yield (BY). Consumer price inflation and dividend growth rates are changes in month-on-month terms. Full sample periods are reported in parenthesis. We report number of monthly observation s, mean values, standard deviation, skewness, kurtosis, median, minimum and maximum values.

	D/P	CPI	g_d	BY
France (1901 – 2000)	1135	1200	1133	1200
Mean	3.72%	0.67%	0.14%	5.96%
St. Dev.	1.55%	2.33%	5.02%	2.96%
Skewness	0.59	4.05	3.04	1.52
Kurtosis	0.90	34.20	41.65	2.10
Median	3.71%	0.28%	0.00%	5.17%
Min	0.69%	-8.86%	-26.67%	2.88%
Max	9.42%	26.78%	71.38%	17.32%
Germany (1924 – 2000)	851	923	848	923
Mean	3.66%	0.20%	1.23%	6.20%
St. Dev.	1.35%	0.78%	15.39%	1.98%
Skewness	0.59	0.73	15.29	-0.59
Kurtosis	1.84	14.19	306.75	2.14
Median	3.59%	0.18%	0.20%	6.16%
Min	0.10%	-4.77%	-68.53%	0.00%
Max	9.37%	6.59%	338.87%	13.12%
Japan (1926 – 2000)	849	900	848	877
Mean	3.98%	0.79%	0.15%	6.04%
St. Dev.	2.83%	4.18%	4.83%	2.43%
Skewness	0.60	14.56	0.27	0.36
Kurtosis	-0.10	288.30	5.48	0.04
Median	3.97%	0.27%	-0.16%	5.59%
Min	0.33%	-5.41%	-30.36%	0.77%
Max	14.12%	93.64%	23.89%	14.82%
UK (1924 – 2000)	924	924	923	924
Mean	4.78%	0.36%	0.15%	6.60%
St. Dev.	1.13%	1.26%	4.10%	3.33%
Skewness	0.79	0.32	0.00	0.78
Kurtosis	3.63	1.51	7.57	-0.38
Median	4.69%	0.24%	0.17%	5.36%
Min	2.06%	-3.51%	-27.10%	2.53%
Max	12.04%	8.27%	29.06%	17.10%
US (1871 – 2000)	1560	1559	1559	1560
Mean	4.68%	0.18%	0.11%	4.60%
St. Dev.	1.54%	1.10%	1.49%	2.42%
Skewness	0.66	0.00	-0.38	1.65
Kurtosis	1.78	5.93	4.20	2.80
Median	4.54%	0.12%	0.12%	3.62%
Min	1.09%	-6.58%	-8.93%	1.55%
Max	13.84%	7.04%	8.01%	15.64%