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Dimson, Marsh, and Staunton: Triumph of the Optimists

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Chapter 4 International capital market history

In this chapter we provide an overview of capital market history over the 101 years from 1900 to 2000 for the sixteen countries covered by our study. We examine the performance of the main asset classes—equities, bonds, and bills—in both real and nominal terms, and draw comparisons across countries.

Sections 4.1 to 4.4 deal with the investment performance achieved by our sixteen countries, while sections 4.5 to 4.7 focus on the accompanying risks. Given the importance and dominance of the US capital markets, we begin in section 4.1 by examining the investment returns on US stocks, bonds, and bills. The US record may, however, paint a misleadingly rosy picture of twentieth century investment since the United States has been an especially successful economy. Section 4.2 therefore looks at the corresponding data for the United Kingdom, a nation that was in comparative decline over much of the century, but which, back in 1900, had the world's largest equity and bond markets. We find that UK returns were below those in the United States, but, perhaps surprisingly, by only a small margin. In section 4.3, we broaden our comparisons to embrace all sixteen countries, comparing nominal and real equity returns. Section 4.4 then compares equity returns around the world with the corresponding returns from bonds and bills.

Investment is as much about risk as return, so in sections 4.5 to 4.7 we turn our attention to risk. In section 4.5, we examine the distribution of annual real asset returns for the United States from 1900–2000, and document the risk of US equities, bonds, and bills. Our figures for equity risk are based exclusively on market indexes that represent highly diversified portfolios. Section 4.6 shows that individual stocks tend to be much riskier than this, and demonstrates the importance and power of diversification for equity investors. Finally, in section 4.7 we present risk comparisons both across asset classes and countries. We show that over the long haul, risk and return have gone hand-in-hand.

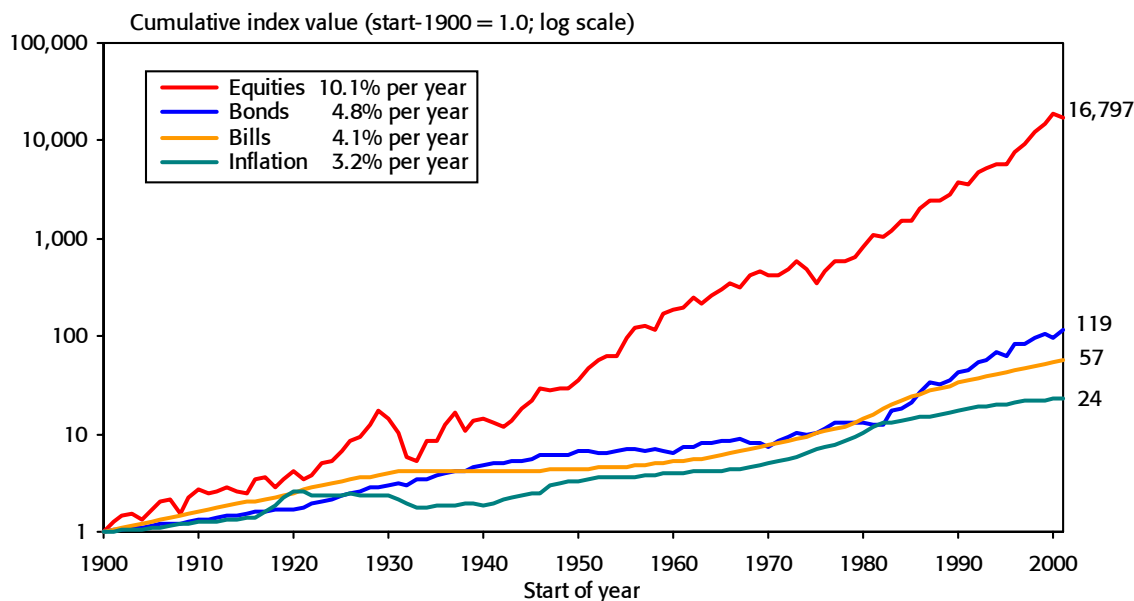
In the chapters that follow, we then examine each asset class in greater detail—bills and inflation in chapter 5, bonds in chapter 6, currencies and common-currency asset returns in chapter 7, international investment in chapter 8, stock returns in chapters 9–11, and the equity risk premium in chapters 12 and 13.

4.1 The US record

The United States is today's financial superpower. Its equity and bond markets are the largest and most important in the world, and its markets account for nearly half the world's total market capitalization. The US markets are also the best documented and most heavily researched, thanks to the early availability of comprehensive, high quality financial data. The most important contribution here was the founding in the early 1960s of the Center for Research in Security Prices (CRSP) at the University of Chicago's Graduate School of Business.

It seems natural, therefore, to begin our review of international capital market history by looking at the US record. Figure 4-1 shows the cumulative performance of US stocks, bonds,

Figure 4-1: Cumulative return on US asset classes in nominal terms, 1900–2000



bills, and consumer prices (i.e., inflation) over the 101-year period from 1900 to 2000. It shows the wealth that would have accumulated at each year-end from 1900 through to 2000 from an initial investment of \$1 in stocks, bonds, or bills at the end of 1899. It assumes that dividends and interest were reinvested, and that there were no taxes or transactions costs. Figure 4-1 also shows inflation, that is, the increase in consumer prices over time.

For stocks, the investment strategy represented in Figure 4-1 is one of buying and holding the US equity market. Today, this would be most cheaply accomplished by investing in an index tracker fund. Back in 1900, some 70 years before tracker funds were launched, it would have meant investing in all NYSE securities in proportion to their market capitalizations. From 1900–25, we use the capitalization weighted Cowles Index of all NYSE stocks (as modified by Wilson and Jones, 2002); from 1926–61, we employ the capitalization weighted CRSP Index of all NYSE stocks; from 1962–70, we use the extended CRSP Index, which over this period also incorporates Amex stocks; and from 1971 on, the underlying investment is in the comprehensive Wilshire 5000 Index, which, despite its name, now contains over 7,000 US stocks, including, of course, Nasdaq stocks (for further details, see chapter 33).

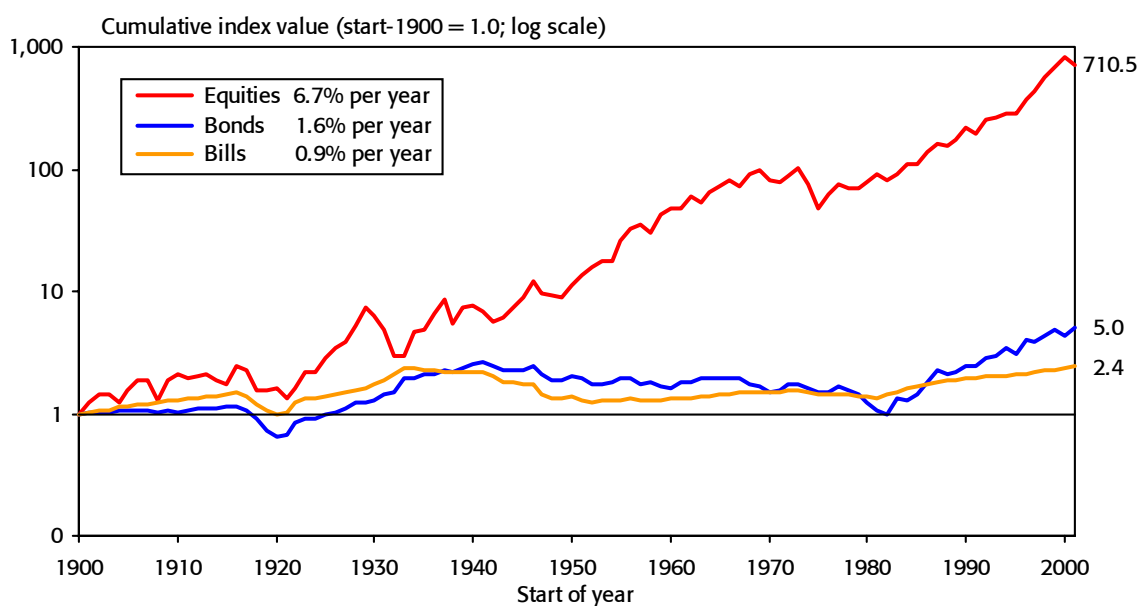
Figure 4-1 shows that US equities performed best, with an initial investment of \$1 growing to a nominal value of \$16,797 by the end of 2000. Long bonds and treasury bills gave lower returns, although they beat inflation. Their respective index levels at the end of 2000 are \$119 and \$57, with the inflation index ending at \$24. These terminal wealth levels correspond to annualized returns over the 101-year period of 10.1 percent on equities, 4.8 percent on bonds, and 4.1 percent on bills, while inflation ran at 3.2 percent per year (see the legend for Figure 4-1).

Over this period, consumer prices rose 24-fold, making comparisons in nominal terms hard to interpret. In Figure 4-2, we therefore show the corresponding real (i.e., inflation-adjusted) returns. Over the 101 years, an initial investment in equities of \$1 would, with dividends reinvested, have grown in purchasing power to 711 times as much as the initial investment. The equivalent multiples for bonds and bills are a growth in real terms to 5.0 and 2.4 times the initial investment, respectively. These terminal wealth figures correspond to annualized real returns of 6.7 percent on equities, 1.6 percent on bonds, and 0.9 percent on bills.

Figure 4-2 shows that US equities totally dominated bonds and bills. There were setbacks of course, most notably during the First World War; the Wall Street Crash of 1929 and its aftermath, including the Great Depression; and the OPEC oil shock of the 1970s. Each shock was severe at the time. At the depths of the Wall Street Crash, the Dow Jones Industrial Index had fallen by 89 percent. Many investors were ruined, especially those who had bought stocks with borrowed money. The crash lived on in the memories of investors—and indeed, those who subsequently chose to shun equities—for at least a generation. Yet in Figure 4-2, it features as little more than a short-term setback. The October 1987 crash, and the dramatic bursting of the technology bubble in 2000, hardly even register on this long-run graph. The setback in 2000, however, will look more severe when combined with the poor returns in 2001, including the sharp downturn in the wake of the tragic events of September 11.

We should be cautious about generalizing from the United States which, over the twentieth century, rapidly emerged as the world's foremost political, military, and economic power. For a more balanced view, we also need to look at investment returns in other countries.

Figure 4-2: Cumulative returns on US asset classes in real terms, 1900–2000



4.2 The UK record

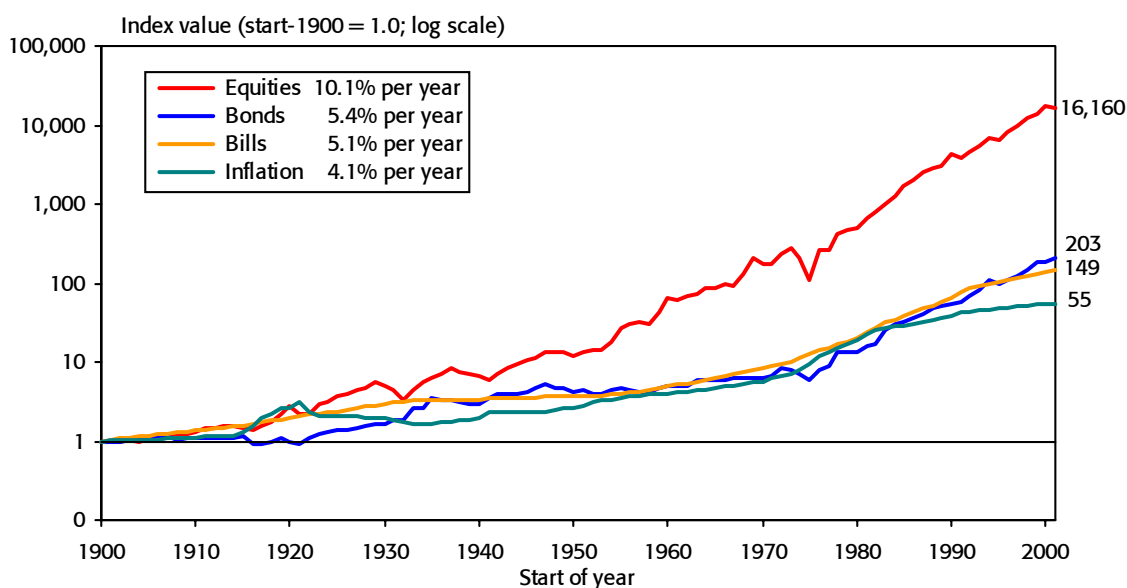
To help set the US record in perspective, the United Kingdom is an obvious comparator. UK markets are also well documented, and with the new data and indexes assembled for this book, we now have high quality data back to 1900 (see chapter 32). Furthermore, in 1900, London was the world's leading financial center. Its equity and bond markets were the world's largest, and its equity market capitalization exceeded that of the NYSE by 50 percent.

Yet for much of the twentieth century, the United Kingdom was in comparative decline. Despite “winning,” the United Kingdom was weakened financially by the world wars. Decolonization led to the dissolution of the British Empire. Yet the United Kingdom was slow to come to terms with its diminished role, and continued to overstretch itself, for example, in defense. It also suffered serious economic, labor, productivity, and investment problems, which were not fully addressed until the late 1970s. These were deeply rooted in its past as a mature industrialized nation, and the United Kingdom's early start in industrialization had become an unfortunate legacy. As Eatwell (1982) argued,

The weakness of the British economy ... is the cumulative product ... of the entire history of Britain since the end of the nineteenth century, when it first became evident that Britain was unable, or unwilling, to adapt to a competitive world in which her pre-eminence could no longer be taken for granted.

Unlike the United States, the British economy cannot therefore readily be classified as an obvious success story. Despite this, Figure 4-3, which shows the cumulative performance of UK stocks, bonds, bills, and inflation from 1900 to 2000, reveals that the UK investment

Figure 4-3: Cumulative returns on UK asset classes in nominal terms, 1900–2000

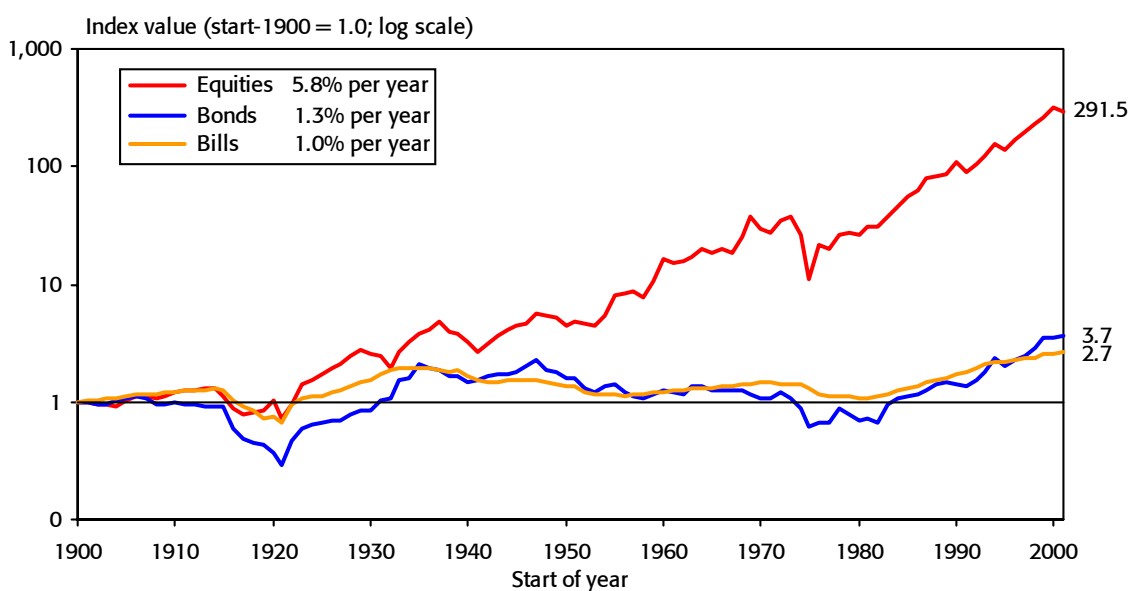


record was not greatly different from that of the United States. Equities performed best, with an initial investment of £1 growing to £16,160 in nominal terms by the end of December 2000. Long bonds and treasury bills gave lower returns, although they beat inflation. Their respective index levels at the end of 2000 are £203 and £149, with the inflation index ending at £55. The nominal returns of each asset category are recorded in the legend for Figure 4-3. UK equities, for example, gave an annualized nominal return of 10.1 percent, which to one decimal place is identical to the annualized nominal return for US equities. However, the United Kingdom's higher inflation rate of 4.1 percent per year compared with a US rate of 3.2 percent means that US equities outperformed in real terms.

Given that UK prices rose 55-fold over this period, it is more helpful to make comparisons in real terms. Figure 4-4 shows the real returns on UK equities, bonds, and bills. Over the 101 years, an initial investment of £1, with dividends reinvested, would have grown in purchasing power to 291 times as much as the initial investment. The corresponding multiples for bonds and bills are a growth in real terms to 3.7 and 2.7 times the initial investment, respectively. As the legend for Figure 4-4 shows, these terminal wealth figures correspond to annualized real returns of 5.8 percent on equities, 1.3 percent on bonds, and 1.0 percent on bills. These equity and bond returns lie below the equivalent US figures of 6.7 and 1.6 percent, but perhaps surprisingly, given the discussion above, by only a small margin.

Figure 4-4 shows that although the real return on UK equities was negative over the first twenty years of the twentieth century, the story thereafter was one of steady growth, broken by periodic setbacks. These occurred at the start of the two world wars and in the early

Figure 4-4: Cumulative returns on UK asset classes in real terms, 1900–2000



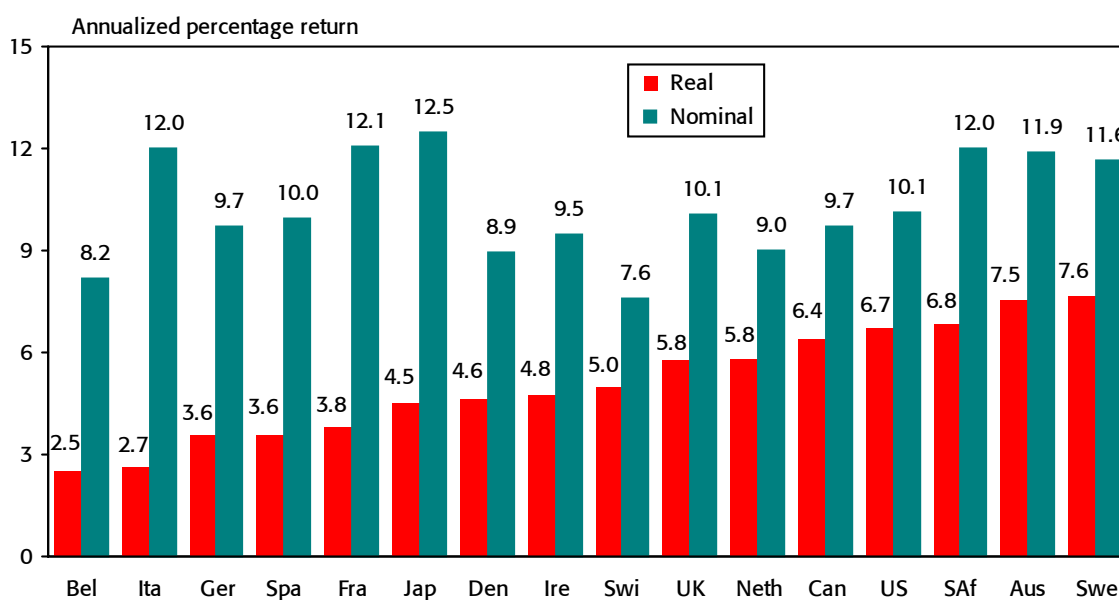
1930s, but unlike the United States, the largest decline in the United Kingdom was not during the 1930s, but instead in 1973–74, the period of the first OPEC oil squeeze following the 1973 October War in the Middle East. Oil prices jumped from around \$3 per barrel before the war to \$11.65. This drove the world economy into deep recession. In the United Kingdom, the impact was aggravated by poor economic management and monetary policy, which led to inflation spiralling, eventually peaking at 25 percent in 1975. It also coincided with serious labor unrest, political uncertainty, and a secondary banking crisis. Investors who kept faith with equities were eventually vindicated, however, and UK equities rose by 97 percent in real terms in 1975. Since the bottom of this savage UK bear market at the end of 1974, the dollar gains on UK equities have been greater than for any other country in our study.

4.3 Stock market returns around the world

In Figure 4-5 we show how US and UK equity market performance over the 101 years from 1900–2000 compares with the other fourteen countries in this study. This figure shows the annualized equity return for each of the sixteen countries in both nominal and real terms.

Clearly, to make comparisons across markets, it is more meaningful to focus on real (i.e., inflation adjusted) returns. The countries in Figure 4-5 have therefore been ranked by their annualized real returns, with the worst performers on the left and the best on the right. Figure 4-5 shows that the six worst performers in terms of real returns on the left-hand side experienced some of the highest nominal returns across all sixteen countries. (The nominal return for Germany excludes the hyperinflationary years 1922–23; without this adjustment, it

Figure 4-5: Nominal and real equity returns around the world, 1900–2000



would have been the highest for all countries.) High inflation rates may increase nominal returns but have on average been associated with lower real returns. Equities in the countries on the left-hand side of the chart were thus unable to avoid the negative impact of very high inflation rates.

When we focus on the more economically meaningful real return figures, there is at first sight a degree of similarity in the annualized (geometric mean) real returns of different countries, which can be seen in Figure 4-5. Despite great variation in their endowments, economic development, and wartime experiences, all sixteen countries achieved annualized real returns within three percentage points of the average of 5.1 percent.

Note, however, that because of the power of compound interest, small return deviations represent large differences in terminal wealth; the inter-country differences in annualized returns are therefore important. For example, an investment at start-1900 of one unit of local currency in the Belgian equity market (the worst performing country) would have grown, with dividends reinvested, to a terminal wealth of just 12.3 in real terms. The corresponding investment in Sweden, the best performing country, would have grown to a value of just under 1,700.

Thus, despite the fact that we have confined our study to data series that persist from 1900 to the current time, and therefore omit stock market fatalities, there is noticeable variation across countries in stock market performance. Some national markets have given strikingly good real equity returns, while others have turned in more modest results. It is the differences between each country's capital market experience that makes it worthwhile to compare the US and UK markets with others from around the world.

On the right-hand side of Figure 4-5, we show the countries that achieved the highest real returns over the period 1900–2000. The United States was fourth highest, and the United Kingdom's performance was above the (unweighted) international average. Thereafter, real returns decline as one shifts from the right-hand to the left-hand side of Figure 4-5. Over the 101 years as a whole, it was thus resource rich countries such as Sweden, Australia, South Africa, the United States, and Canada that achieved the best equity market performances. The Netherlands and the United Kingdom also gave good performance, while other countries fared less well. Generally speaking, the worst performing equity markets were associated with countries which either lost major wars, or were most ravaged by international or civil wars. These same countries also experienced periods of high or hyperinflation, typically associated with wars and their aftermath.

4.4 Equities compared with bonds and bills

Figure 4-6 portrays the long-term performance, in real terms, of the three asset categories—equities, bonds, and bills for the United States. Each bar in the diagram displays the average inflation-adjusted return from holding an asset category over the entire 101-year period, and over the most recent seventy five, fifty, and twenty five years. US Equities have outperformed government bonds and bills in all four periods considered.

Figure 4-6: Annualized US real returns over sub-periods to start of 2001

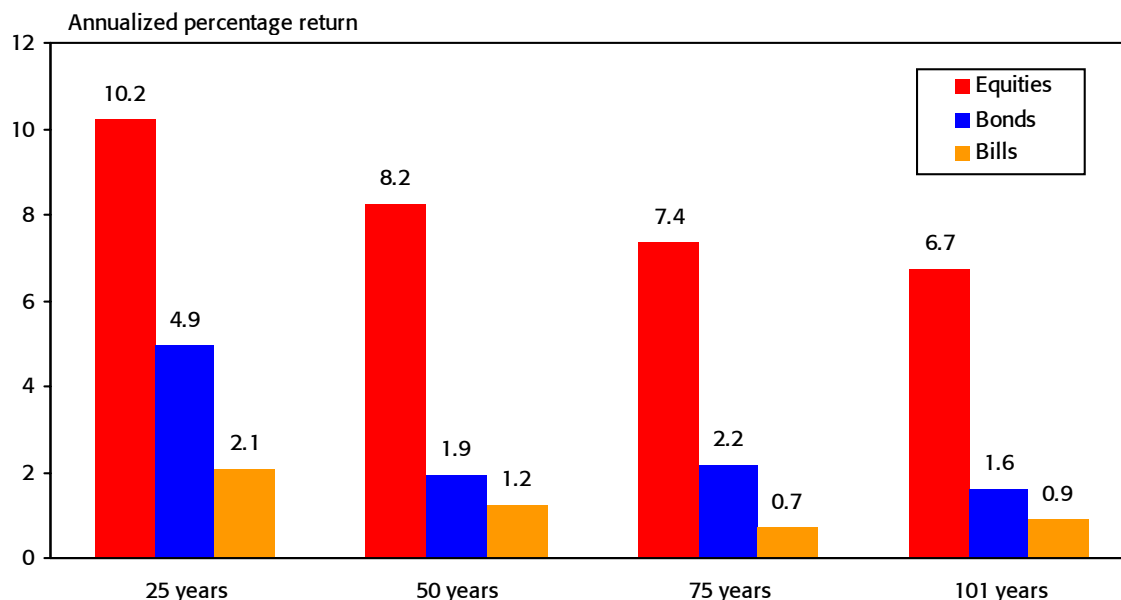


Table 4-1, which shows the real returns on equities, bonds, and bills in different countries, reveals that the US experience of equities outperforming bonds and bills has been mirrored in all sixteen countries. This table shows the annualized real returns over our full 101-year period from an investment in local currency. It is interesting to note that every country

Table 4-1: Annualized real returns on major asset categories around the world, 1900–2000

Country	Equities	Bonds	Bills
Australia	7.5	1.1	0.4
Belgium	2.5	-0.4	-0.3
Canada	6.4	1.8	1.7
Denmark	4.6	2.5	2.8
France	3.8	-1.0	-3.3
Germany*	3.6	-2.2	-0.6
Ireland	4.8	1.5	1.3
Italy	2.7	-2.2	-4.1
Japan	4.5	-1.6	-2.0
The Netherlands	5.8	1.1	0.7
South Africa	6.8	1.4	0.8
Spain	3.6	1.2	0.4
Sweden	7.6	2.4	2.0
Switzerland†	5.0	2.8	1.1
United Kingdom	5.8	1.3	1.0
United States	6.7	1.6	0.9

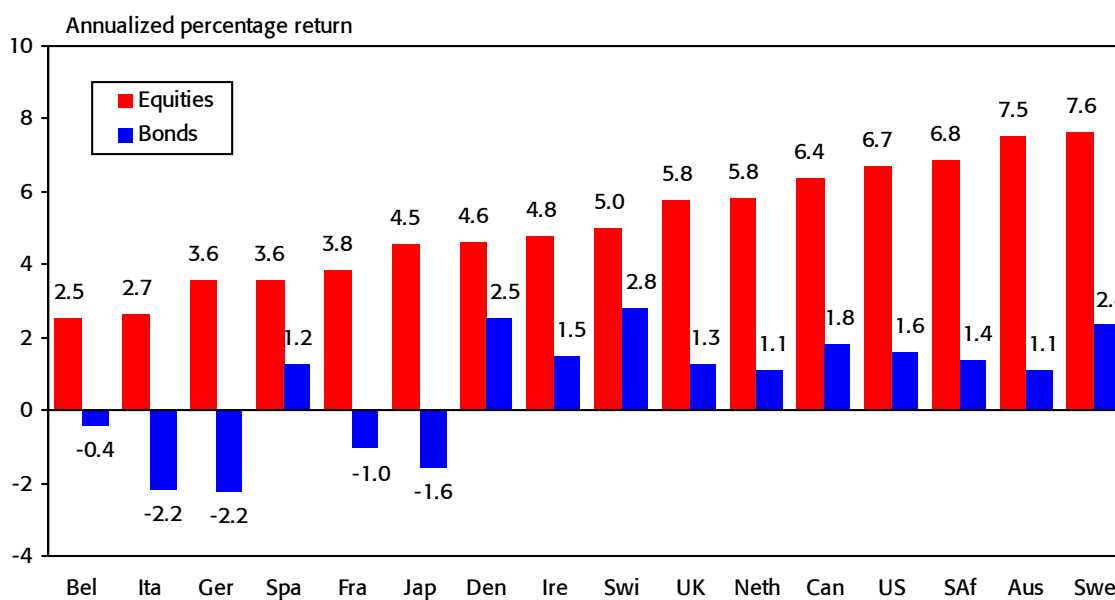
* Bond and bill figures for Germany exclude the years 1922–23; † Swiss equities from 1911.

achieved equity performance that was better than that of bonds. Over the 101 years as a whole, there were only two bond markets and just one bill market that provided a better return than our *worst* performing equity market.

As can be seen from Table 4-1, US and UK capital market history from 1900–2000 has been relatively benign for investors. Nevertheless, since few investors take a 101-year view on performance, we also need to look at risk, even in these two relatively successful markets. We turn to the question of investment risk in section 4.5. Interestingly, countries that experienced major dislocations still achieved equity market returns that were ahead of inflation. Bond and bill returns in these countries were often markedly negative, however, as these periods of economic turmoil had a more dramatic impact on fixed income than on equity investors.

Figure 4-7 shows the real equity and bond return data from Table 4-1 in bar chart form, in ascending order of equity market performance from left to right. In the bond markets, the five worst performing countries (shown by the blue bars with negative returns) were among those with the lowest equity returns (on the left-hand side of the chart). These are the countries that were hit hard by hyperinflation, which we discuss further in chapter 5. Interestingly, inflation appears to have had a negative impact on both stock and bond markets. This means that when we later consider the equity risk premium relative to bonds (see section 12.3), we may find the risk premium less affected by inflation than the underlying equity and bond returns.

Figure 4-7: Real returns on equities versus bonds internationally, 1900–2000



4.5 Investment risk and the distribution of annual returns

So far, we have compared returns across asset classes and countries without taking account of risk. Since investment is as much about risk as return, we now turn to the question of risk. By risk, most investors mean downside risk, that is, the prospect of loss, or of failing to meet some target return. The more variable is an asset's return, the riskier is the asset. In practice, therefore, investment risk is almost always measured by volatility, that is, the standard deviation of returns.

Figure 4-8 provides a visual representation of risk and volatility by displaying the annual real returns on US equities (plotted as bars) and on bonds (the area plot) from 1900–2000. The year-to-year performance of equities was clearly more volatile, and hence riskier, than that of bonds. Equity returns had a volatility (standard deviation) of a little over 20 percent. That is, in roughly one year out of six, equities tend to underperform expectations by 20 percent or more, and in roughly one year out of six, they tend to exceed expectations by 20 percent or more. Long bonds had a volatility of 10 percent. By comparison, the corresponding figure for short-term bills was less than 5 percent.

The real returns shown as a time series in Figure 4-8 can also be regrouped and presented as a histogram. Figure 4-9 shows the distribution of annual real returns on US equities over the period 1900–2000. The distribution is roughly bell-shaped, resembling a normal distribution, with an arithmetic mean (i.e., the average of the 101 one-year returns) of 8.7 percent. As noted above, the standard deviation, which measures the dispersion of the returns around

Figure 4-8: Time series of annual real returns on US equities and bonds, 1900–2000

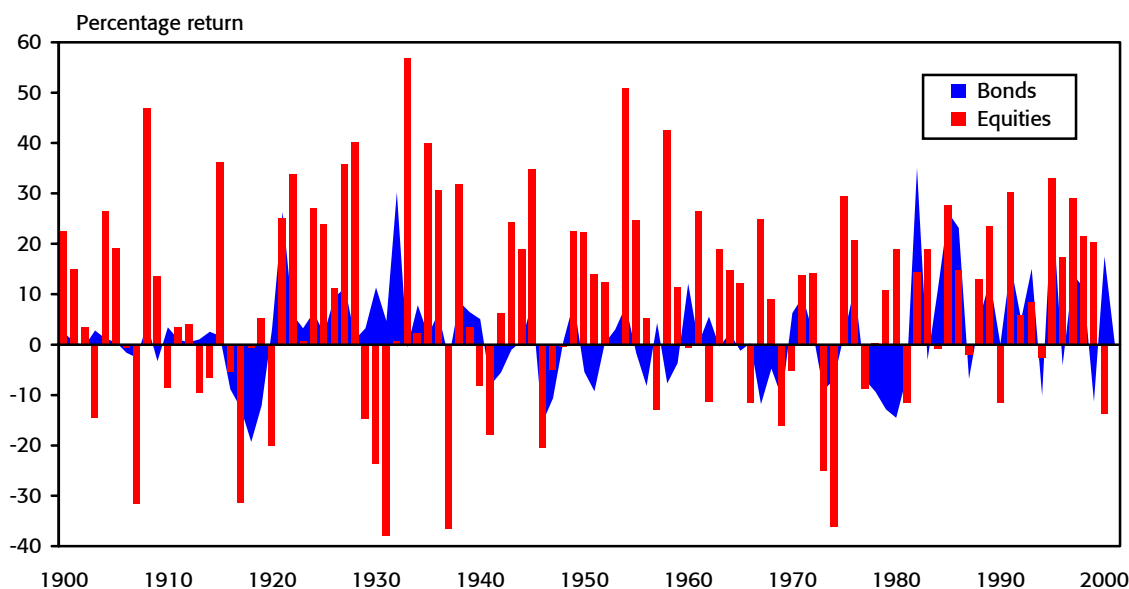
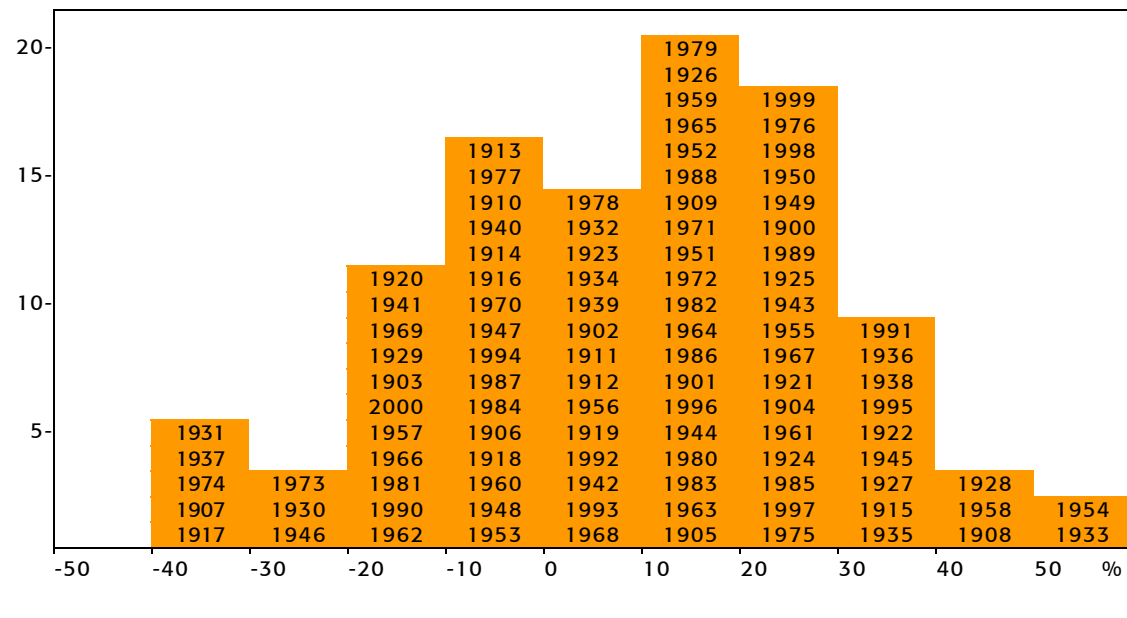


Figure 4-9: Histogram of annual US real equity returns, 1900–2000

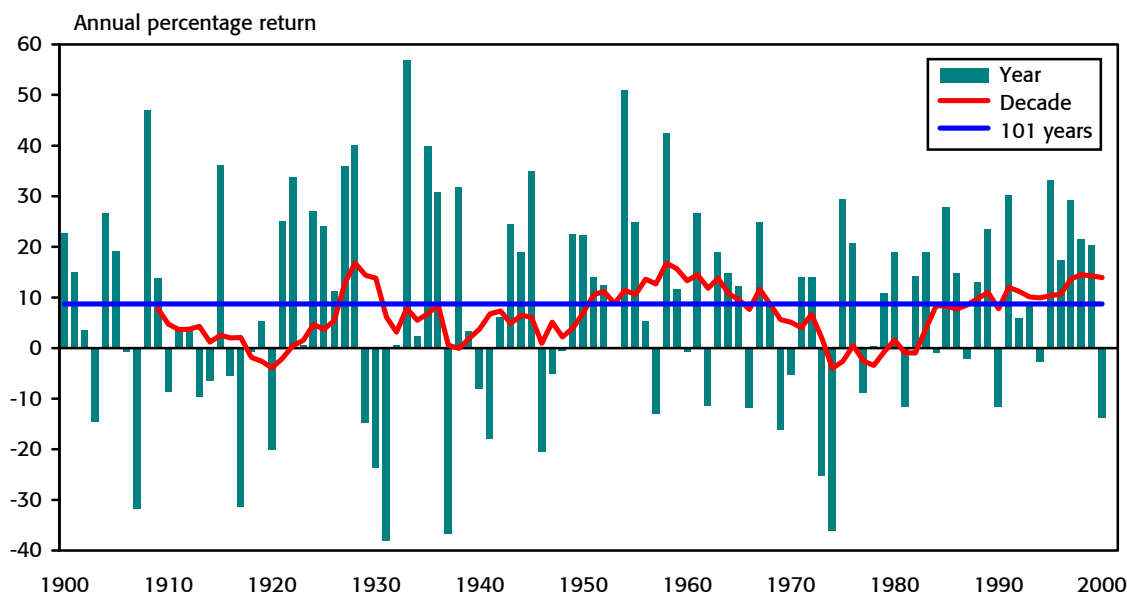


the mean, is 20.2 percent. US equities were clearly far from risk free, and in over a third of the years, real returns were negative. The leftmost column of Figure 4-9 shows that the worst year was 1931, with a real return of -38 percent, followed in sequence by 1937, 1974, 1907, and 1917. The best year was 1933, with a real return of 57 percent, closely followed by 1954, and then 1908 and so on. The distributions of returns for the other countries covered in this study are similar, but for most of them, the extremes are more marked. For example, the nominal equity return in Germany has been as high as 305 billion percent (in 1923) and as low as -87 percent (in 1948).

Figure 4-10 repeats the time series pattern of annual equity returns shown in Figure 4-8, but also displays rolling ten-year annualized real returns as well as the 101-year arithmetic mean real return of 8.7 percent, which is shown by the horizontal line. The rolling ten-year returns are naturally smoother, and there have been relatively few periods when they have fallen below zero. A real return of zero, however, is not the appropriate benchmark since US investors have earned positive real returns from much lower risk investments in bills and bonds. The equity risk premium relative to bills and bonds forms the topic of chapter 12.

The standard deviation of real returns on US equities was 20.2 percent. If returns were normally distributed, we would expect that, one year in six, they would fall outside the range 8.7 ± 20.2 percent. Thus over 101 years, we would expect to find roughly sixteen years when returns fell below -11.5 percent and sixteen when they exceeded 28.9 percent. For the US market, the figures were eighteen years and sixteen years, consistent with a normal distribution. The United States was unusual, however, compared with other countries. Most had fewer than sixteen years falling in the left- and right-hand tails, but the tails contained

Figure 4-10: Annual and rolling ten-year US real equity returns, 1900–2000



more extreme outliers than would be expected with a normal distribution. For the United Kingdom, for example, there were twelve years when returns fell below the mean minus one standard deviation, and just ten when they exceeded the mean plus one standard deviation. If returns had truly been normally distributed, the United Kingdom's real return of -57 percent in 1974 would have been expected to occur just once in 1,400 years, while the +97 percent in 1975 should have been just a once in 30,000 years event.

These divergences arise from the well-documented fact that annual returns more closely follow a lognormal than a normal distribution, and even then are slightly “fat-tailed,” with extreme events more likely to occur. Volatilities also change over time, so that Figure 4-10 may reflect a mixture of distributions. The standard deviations in this book are computed from each year's percentage returns, and therefore ignore these considerations. For a more precise interpretation of risk attributes, see Levy and Gunthorpe (1993). For our purposes—emphasizing comparisons between assets and countries—greater precision is not needed.

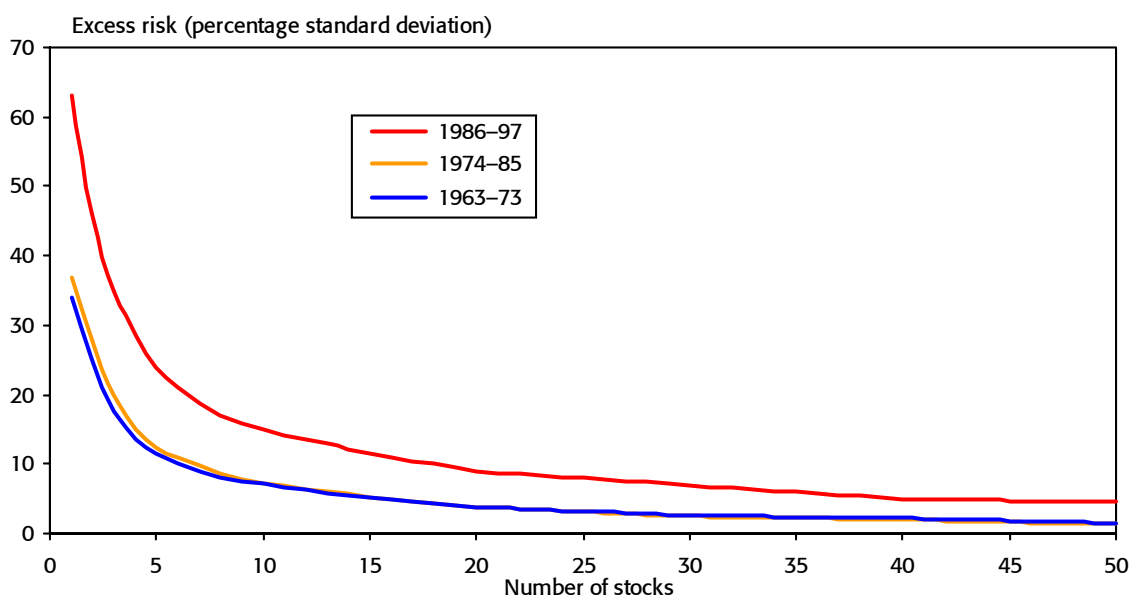
4.6 Risk, diversification, and market risk

The risk figure cited in the previous section, namely, a standard deviation of 20.2 percent, was for real returns on the overall US market. This would be the risk level experienced by an investor who purchased a US index fund, or who held a very well diversified portfolio of US stocks. Individual stocks will typically have standard deviations much higher than this. The lower risk for the overall market is attributable to the power of diversification.

Most finance textbooks have a diagram showing how rapidly diversification reduces the risk of an equity portfolio because the returns on different stocks are less than perfectly correlated. A typical example, taken from recent research by Campbell, Lettau, Malkiel, and Xu (2001), is given in Figure 4-11. This study covered all US stocks quoted on the main US exchanges from 1963–97. Figure 4-11 shows how quickly risk is reduced as the number of (randomly chosen) stocks rises from one to fifty, when equal amounts are invested in each. The vertical axis shows the “excess standard deviation,” which is the difference between the portfolio’s risk and the risk of investing in an equally weighted index of all stocks. “Excess standard deviation” thus measures diversifiable risk, which is zero for a fully diversified portfolio.

Diversifiable risk clearly falls off rapidly. Many textbooks state that most of the benefits are achieved with just twenty stocks. This is potentially misleading as a twenty-stock portfolio still has an appreciable level of diversifiable risk, and also because Campbell, Lettau, Malkiel, and Xu found that the number of stocks needed to achieve a given level of diversification has increased in recent years. Figure 4-11 shows that in their earlier periods, 1963–73 and 1974–85, a twenty-stock portfolio reduced annualized excess standard deviation to 4 percent, while during 1986–97, some fifty stocks were needed to achieve this. The key issue here, however, is neither the precise speed of diversification, nor how this has changed over time, but the sheer power of diversification in reducing risk. An investor with no stock selection skills should thus avoid exposure to diversifiable, and hence unrewarded, risk by holding as widely diversified a portfolio as possible. This effectively provides a stake in the overall market.

Figure 4-11: Risk reduction gains from diversification: domestic US equities, 1963–97



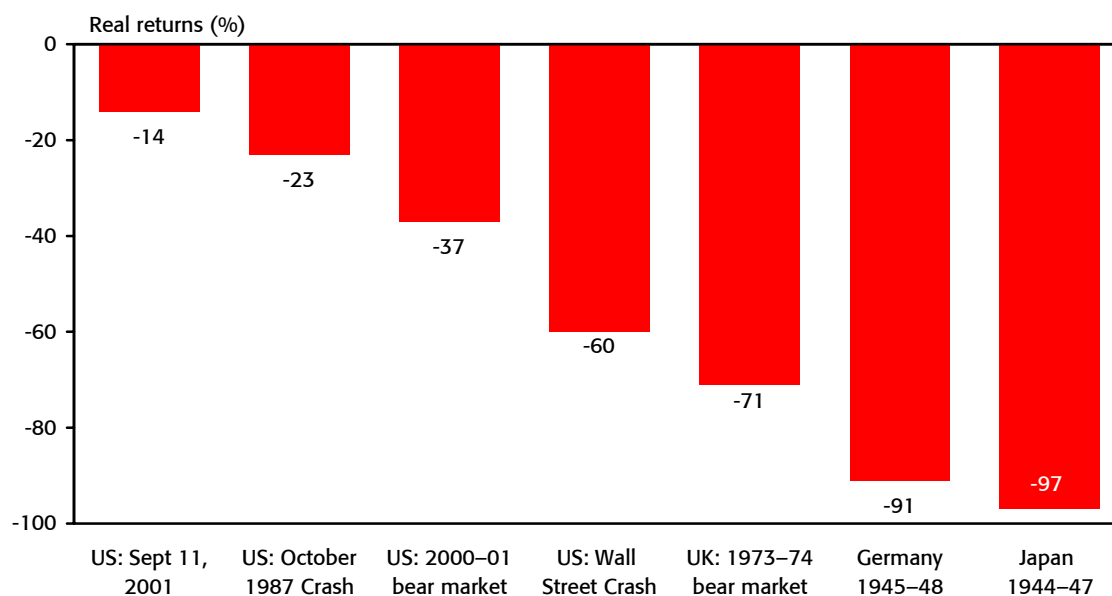
Source: Campbell, Lettau, Malkiel, and Xu (2001)

Even a stake in the market, however, still involves considerable risk. Figure 4-12 provides a dramatic reminder of the risks of equity investment. The leftmost bar shows the aftershock of the terrorist attacks on New York and Washington on September 11, 2001. After a four day market closure, the Dow Jones Index fell 14 percent over the next week. The second bar depicts Black Monday, October 19, 1987. US investors lost 23 percent in one day, and the impact reverberated around the globe, with even-larger losses in many other markets. The October 1987 crash is remembered, however, for its massive one-day loss rather than its lasting effects. The third bar in the chart reminds us how far US equities fell during 2000–01 from their 24 March 2000 high. Over the next eighteen months until end-September 2001—the date this book went to press—the real return on the Wilshire 5000 Index was -37 percent.

The fourth bar of Figure 4-12 shows that, in the Wall Street Crash from 1929–31, US equities fell 60 percent in real terms. The effects were long lasting (see section 4.1), and US stocks did not regain their pre-Crash level in real terms until 1955. While the Wall Street Crash lives on in legend, the fifth bar shows that UK stocks fell even more—a staggering 71 percent in real terms—in the 1973–74 bear market. But the final bars of Figure 4-12 show that even this pales into insignificance compared with the losses on equities at the end of the Second World War in Germany (-91 percent from 1945–48), and Japan (-97 percent from 1944–47).

Even for investors with well diversified portfolios, individual equity markets are clearly risky. But investors are not limited to their domestic markets. Just as they can reduce risk domestically by diversifying across stocks, they can further reduce risk by diversifying internationally. Later, in chapter 8, we explore the benefits of international diversification.

Figure 4-12: Selected periods of large losses on equities around the world



4.7 Risk comparisons across asset classes and countries

For the United States, we have seen that for the major asset classes—equities, bonds, and bills—risk and return went hand in hand. Equities performed best, giving a compound annualized (i.e., geometric mean) real return of 6.7 percent, and an average annual (i.e., arithmetic mean) real return of 8.7 percent between 1900–2000. Figure 4-13 shows that this was much larger than the corresponding real returns on bonds and bills. It also shows, however, that equities were far more risky. Bonds, which were less risky than equities but more volatile than treasury bills, gave an intermediate return between that of equities and bills.

Table 4-2 shows that the US pattern of asset risk rankings was repeated in all sixteen countries, with equities proving riskier than bonds, and bonds being riskier than bills. As observed earlier, there are marked differences between the risks and rewards across different markets. We noted four countries with a hyperinflationary history. These are the countries with the highest volatilities for all asset classes. Note that the larger the standard deviation of returns, the greater is the difference between the arithmetic mean of one-year returns as in Table 4-2, and the long-run annualized (geometric mean) returns shown earlier in Table 4-1.

Table 4-3 focuses more closely on equities, and shows how the historical volatility of real returns on US equities has compared with other countries. The US's standard deviation of 20.2 percent places it at the lower end of the risk spectrum, ranking fifth lowest after Canada at 16.8 percent, Australia at 17.7 percent, the United Kingdom at 20.0 percent, and Denmark

Figure 4-13: Risk and return on the major asset classes in the United States, 1900–2000

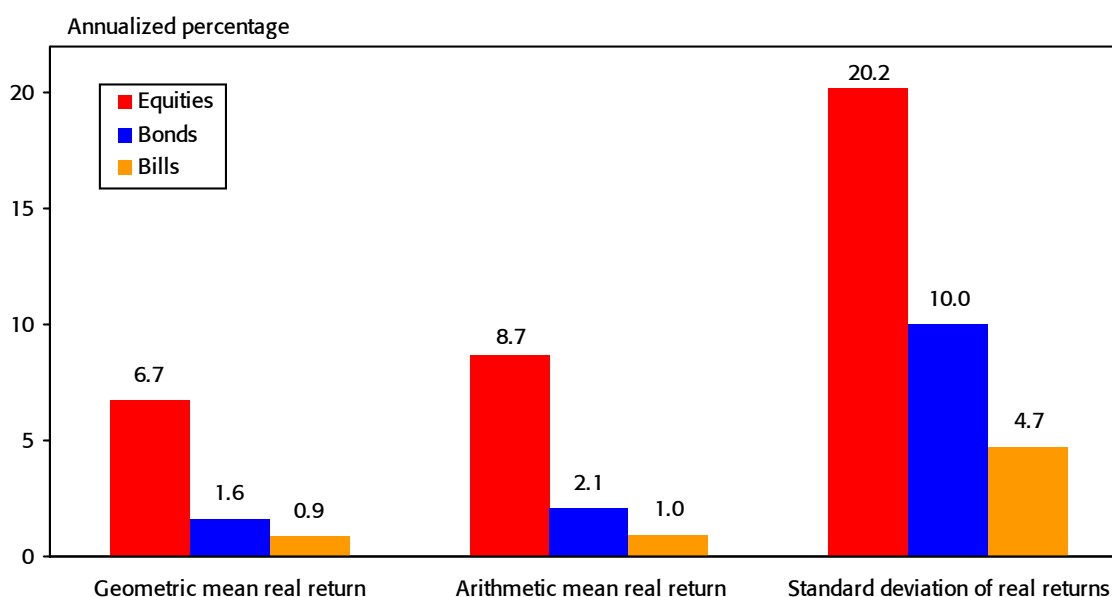


Table 4-2: Means and standard deviations of real returns on asset classes around the world

Country	Equities (%)			Bonds (%)			Bills (%)		
	Arithmetic mean	Standard error	Standard deviation	Arithmetic mean	Standard error	Standard deviation	Arithmetic mean	Standard error	Standard deviation
Australia	9.0	1.8	17.7	1.9	1.3	13.0	0.6	0.6	5.6
Belgium	4.8	2.3	22.8	0.3	1.2	12.1	0.0	0.8	8.2
Canada	7.7	1.7	16.8	2.4	1.1	10.6	1.8	0.5	5.1
Denmark	6.2	2.0	20.1	3.3	1.2	12.5	3.0	0.6	6.4
France	6.3	2.3	23.1	0.1	1.4	14.4	-2.6	1.1	11.4
Germany*	8.8	3.2	32.3	0.3	1.6	15.9	0.1	1.1	10.6
Ireland	7.0	2.2	22.2	2.4	1.3	13.3	1.4	0.6	6.0
Italy	6.8	2.9	29.4	-0.8	1.4	14.4	-2.9	1.2	12.0
Japan	9.3	3.0	30.3	1.3	2.1	20.9	-0.3	1.4	14.5
The Netherlands	7.7	2.1	21.0	1.5	0.9	9.4	0.8	0.5	5.2
South Africa	9.1	2.3	22.8	1.9	1.1	10.6	1.0	0.6	6.4
Spain	5.8	2.2	22.0	1.9	1.2	12.0	0.6	0.6	6.1
Sweden	9.9	2.3	22.8	3.1	1.3	12.7	2.2	0.7	6.8
Switzerland†	6.9	2.1	20.4	3.1	0.8	8.0	1.2	0.6	6.2
United Kingdom	7.6	2.0	20.0	2.3	1.4	14.5	1.2	0.7	6.6
United States	8.7	2.0	20.2	2.1	1.0	10.0	1.0	0.5	4.7

* Bond and bill statistics for Germany exclude the years 1922–23. † Swiss equities are from 1911

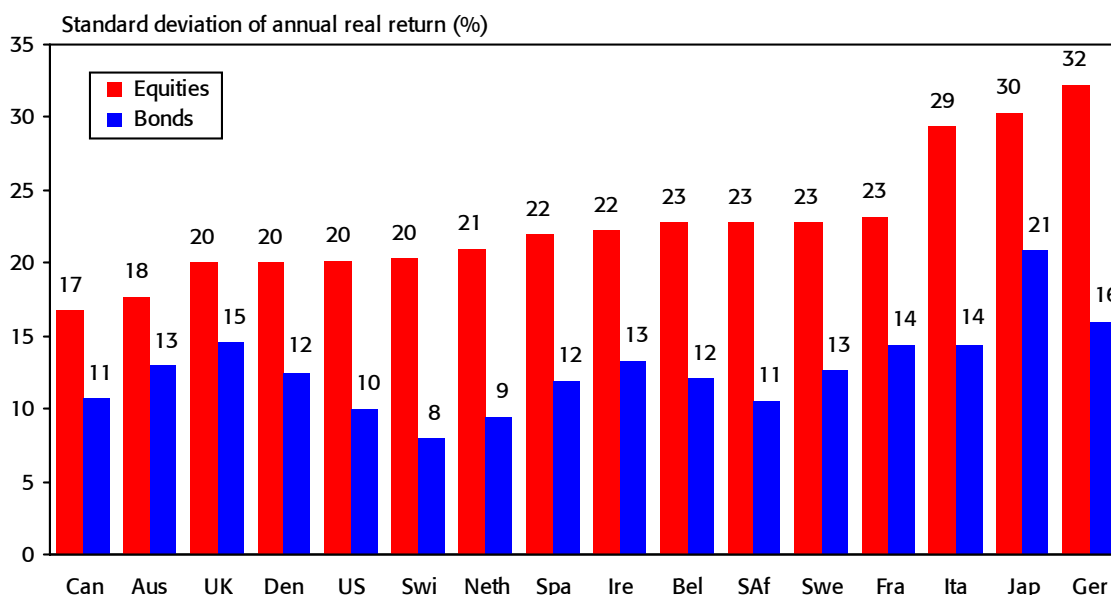
at 20.1 percent. The highest volatility markets were Germany, Japan, Italy, and France, which were the countries most seriously affected by the depredations of war and inflation. Table 4-3 also shows that, as one would expect, the countries with the highest standard deviations experienced the greatest range of returns, that is, the lowest minima and the highest maxima. Inevitably, these were also the countries where the annualized rate of return over the 101 years (the geometric mean) differed most from the average annual return (the arithmetic

Table 4-3: Real (inflation-adjusted) equity returns around the world, 1900–2000

Country	Geometric mean %	Arithmetic mean %	Standard error %	Standard deviation %	Minimum return %	Minimum year	Maximum return %	Maximum year
Australia	7.5	9.0	1.8	17.7	-34.2	1974	53.5	1983
Belgium	2.5	4.8	2.3	22.8	-40.9	1947	100.5	1940
Canada	6.4	7.7	1.7	16.8	-32.0	1974	55.2	1933
Denmark	4.6	6.2	2.0	20.1	-28.4	1974	106.1	1983
France	3.8	6.3	2.3	23.1	-37.5	1947	66.1	1954
Germany	3.6	8.8	3.2	32.3	-89.6	1948	155.9	1949
Ireland	4.8	7.0	2.2	22.2	-54.3	1974	69.9	1977
Italy	2.7	6.8	2.9	29.4	-72.9	1945	120.7	1946
Japan	4.5	9.3	3.0	30.3	-84.0	1946	119.6	1952
The Netherlands	5.8	7.7	2.1	21.0	-34.9	1941	101.6	1940
South Africa	6.8	9.1	2.3	22.8	-52.2	1920	102.9	1933
Spain	3.6	5.8	2.2	22.0	-43.3	1977	98.9	1986
Sweden	7.6	9.9	2.3	22.8	-43.0	1918	89.5	1905
Switzerland †	5.0	6.9	2.1	20.4	-37.8	1974	56.2	1985
United Kingdom	5.8	7.6	2.0	20.0	-57.1	1974	96.7	1975
United States	6.7	8.7	2.0	20.2	-38.0	1931	56.8	1933

† Swiss equities are from 1911

Figure 4-14: Standard deviations of real equity and bond returns around the world, 1900–2000



mean). We return to these differences between arithmetic and geometric means in chapter 13. Finally, Figure 4-14 highlights (in red) the comparative historical volatilities of equity markets, with countries ranked from lowest volatility on the left, to highest on the right, with accompanying bond market volatilities (in blue).

4.8 Summary

This chapter has provided an overview of the international evidence on the investment performance of the major asset classes—stocks, bonds and bills—over the 101 years from 1900–2000. The results we have presented provide a foretaste of our more detailed discussion of interest rates, inflation, and bill returns in chapter 5, bond performance in chapter 6, currencies in chapter 7, international investment in chapter 8, stock returns in chapters 9–11, and the equity risk premium in chapters 12 and 13.

This chapter has overviewed risk as well as return. We find a clear ranking of asset risks in all sixteen countries. Stocks are the most volatile investment, followed by bonds and then bills, with the latter most closely approximating a risk free asset. For the United States, which ranked toward the lower end of the country risk spectrum, we find that the standard deviation of real returns on stocks was 20.2 percent, compared with 10.0 percent for bonds and 4.7 percent for bills. This equity risk figure is for the overall US market, and it is far lower than the risk of individual stocks, thanks to the power of diversification. Even for well-diversified portfolios, however, we have seen that the high volatility of equities means that there can be, and indeed have been, periods of large losses.

We have also seen that, over the long run, the risk of investing in stocks has been rewarded. US equities provided a real (inflation adjusted) return of 6.7 percent versus 1.6 percent on bonds and 0.9 percent on bills. We have cautioned against generalizing too readily from the US experience since the US economy has been such an obvious growth and success story over the twentieth century. But while we find that US stocks have performed well, the United States has not been the best performing equity market, nor are its returns especially out of line with the world averages. The real return on equities was positive in all sixteen countries, typically at a level of 4–6 percent compounded over the period 1900–2000.

Bonds performed much worse than equities. In the majority of countries, however, they gave a positive real return, although several markets recorded negative real returns for bonds and bills. The five countries with the worst performing bond markets were also among those with the lowest equity returns. Mostly, this poor performance dates back to the first half of the twentieth century, and these were the countries that either lost major wars, or were most ravaged by war and civil strife. These same countries also experienced periods of high or hyperinflation, typically associated with wars and their aftermath. In spite of this, over the 101 years as a whole, there were only two bond markets and just one bill market that provided a better real return than the *worst* performing equity market.

In summary, we have found that, over the long haul, stocks—the riskiest asset class—have beaten bonds in every single country. At the same time, bonds, which are intermediate in risk between equities and bills, have beaten bills almost everywhere, the main exception being Germany. Our findings thus provide strong support for one of the lasting laws of finance—the law of risk and return.