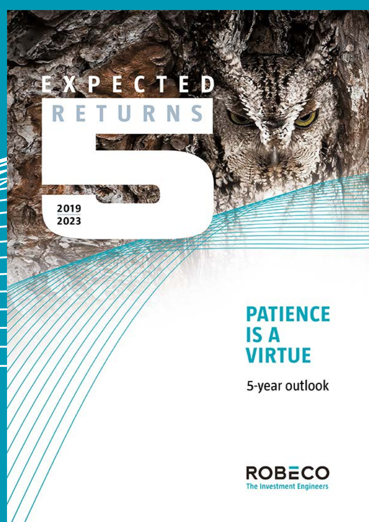
ROBECO
The Investment Engineers

LONG-TERM EXPECTED RETURNS

SEPTEMBER 2018



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1 Long-term expected returns

In this section we build on the methodology from previous editions to derive the expected long-term returns on a wide set of asset classes, in a similar fashion to Bekkers, Doeswijk and Lam (2009). We take an unconditional long-term view, which means that the current economic environment is not relevant. These long-term expected returns can be used as the equilibrium returns for asset-liability management (ALM) studies for long-term investors such as pension or endowment funds.

We realize that there is much uncertainty about our estimates. Nevertheless, we attempt to derive these estimates by using thorough empirical and theoretical research methods. We round expected returns to the nearest quarter, i.e. 0.25% precision, and volatilities to the nearest 1%. The estimates should reflect net returns for investors that want to gain exposure to each asset class. For liquid assets, transaction costs and management fees are low, and only play a marginal role when rounding expected returns to the nearest 0.25% precision. We also discuss those situations where costs actually play a larger role. The impact of investment fees is largest for alternative assets such as private equity and hedge funds that cannot be tracked at low cost.[1]

1. We also tried to address Environmental, Social, and Governance-related risk factors such as climate change, but given the limited research available we do not explicitly take this into account to determine the long-term asset returns. For an elaborate overview of the impact of climate change on asset-class returns, see Mercer (2011) and our special topic in the 2017-2021 edition of Expected Returns.

In addition to estimates for asset classes we provide estimates for factor premiums within credits, equities and commodities. Most factors we discuss have been documented extensively in academic literature. We do believe it is sensible for investors to consciously decide on their level of exposure to these factors. There are two reasons why we take a conservative approach on the excess returns for these factors. Firstly, Chordia, Subrahmanyam and Tong (2013) and more recently McLean and Pontiff (2016), argue that many popular equity return anomalies have experienced declining excess returns due to anomaly-based trading. Secondly, trading costs might reduce the real-life profitability of these return factors.

In line with the recommendations of the Dutch Association of Investment Professionals (VBA), the expected returns are geometric returns that are better suited to long investment horizons.[2] Since we also estimate the volatility risk of each asset class, interested readers can convert the geometric return to an arithmetic expected return if they wish to do so.[3] Our estimates are based on the worldwide market capitalization-weighted asset class. We also compare our estimate with the maximum allowed expected return according to the Dutch Pension Law and the volatility risk that is published by the Financial Services Authority in the Netherlands.[4, 5]

2. VBA (2010) Het toezicht op pensioenbeleggingen: Aanbevelingen van het VBA voor het FTK.
3. Assuming log-normally distributed returns the arithmetic average is the geometric average plus half of the variance of the returns; see Campbell, Lo, and MacKinlay (1997, p. 15).
4. Article 1 published in the Staatsblad van het Koninkrijk der Nederlanden on 24 July 2010 supplements the Besluit financieel toetsingskader with two additional articles, 23b and 23c.
5. The Financial Services Authority in the Netherlands is called the Autoriteit Financiële Markten (AFM). See also VBA risico standaarden beleggingen 2015.

1.1 Inflation, cash and bonds

We start by investigating the 2017 database compiled by Dimson, Marsh and Staunton. For each of the 21 countries in their database we calculate the compounded rate of inflation, the compounded real rates of return for cash, bonds and equities, and the excess returns over the 117-year period 1900-2016. Table 1.1 shows the results. We also calculate the average and a median over the 21 countries.

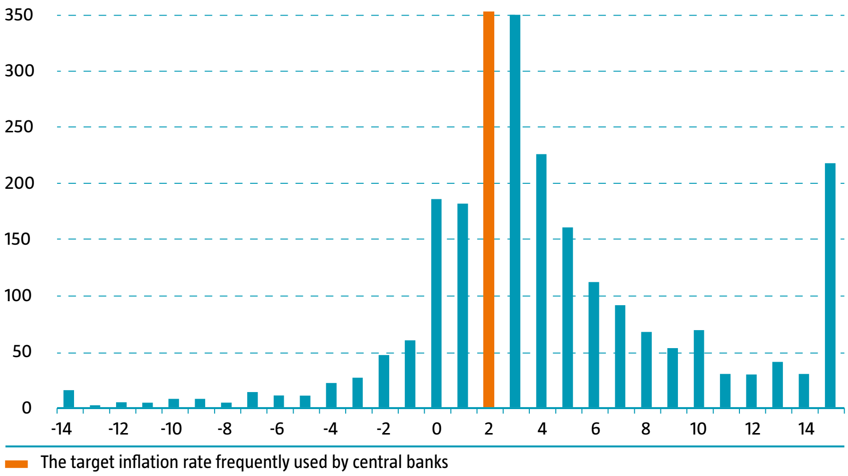
Inflation

In the long term, inflation around the globe has been significantly higher than we have seen over the past two decades. Germany is an outlier with its hyperinflation period in the early part of the sample period, resulting in an average inflation rate of 29.5% per year. The median compounded inflation rate equals 4.1%. Although central banks in developed markets target inflation at 2%, we doubt whether they will succeed in the long run, looking at historical records.[6] It would be lower than historically observed in any country.

6. Please note that inflation targeting usually takes place without exactly specifying what the central banks are targeting. So while central bankers might be interested in the number of years the inflation was close to 2%, a typical investor would also experience inflation spikes, resulting in an average inflation rate of 4%.

Another way of describing the history of inflation is to map all 2,457 inflation figures that we have for 21 countries over 117 years – see Figure 1.1. Using this method, as illustrated in the distribution frequency, it appears that inflation most often falls in the range of 2-3%, with 353 observations, and the median of these individual observations together comes in at 2.8%. Next, it clearly shows an asymmetric distribution: there are far more years in which inflation is above 2% than below 2%. A future distribution is likely to show the same asymmetry, as we have yet to meet a central bank that argues in favor of targeting a period of deflation after a period of overshooting the target inflation rate, as this would detract from its ability to achieve its target rate. This especially applies in an environment where the

Figure 1.1: Distribution frequency of 2,457 annual inflation data (1900-2016, 21 countries, in %)



Source: Dimson-Marsh-Staunton database (2017), Robeco

zero lower bound problem for central banks remains an issue. In their research, De Grauwe and Ji (2016) find that a low inflation target creates the risk of persistent recessions and low growth.

Our view is that when making long-term predictions about inflation, investors should consider both past and present inflation targets. We believe long-term inflation to be around 3% as a compounded average. That is right between the central banks' inflation target of 2% and the empirical reality of the 4.1% median compounded inflation over the period 1900 to 2017. It therefore seems to be a conservative estimate, being below the 4.1% median and the 6.2% average of the 21 individual compounded inflation rates. Note that the median is less sensitive to outliers (such as Germany) than the average of the data series. We do not make a distinction between the different inflation expectations of regions or countries, as it is hard to find strong arguments for this. Finally, we would like to point out that our long-term estimate is one for an average compounded inflation rate. As we envisage, this results from lengthy periods with inflation of around 2%, some periods with inflation spikes above 2% and the occasional deflationary episode.

1.1.1 Cash

For cash we suppose the real rate of return to be 0.5%, roughly in line with the historical median of 0.7%. Note that the average of -0.3% is heavily impacted by some cases of hyperinflation. There is a wide dispersion in real cash returns. No less than eight out of 21 countries in our sample experienced compounded negative real returns on cash over the 1900-2016 period.

1.1.2 Government bonds

We suppose the real return on bonds to be 1.25%, which is the sum of a 0.5% real return on cash and a 0.75% term premium on bonds. This real-return estimate is significantly below the historical median of 1.75% and the 1.82% for the GDP-weighted global bond index. Due to the strong recent performance of bonds, this figure has gradually moved higher in recent years, making a 1.25% real return estimate look very conservative compared to long-term history. Still, we refrain from a further upward adjustment of the real return as we believe that real returns in the near future will be negative, which will bring down the real return on the global bond index. Our total expected nominal return on bonds is 4.25%,

Table 1.1: Historical returns for several markets over the period 1900-2017

	Inflation	Real returns			Excess returns over cash	
		Cash	Bonds	Equities	Bonds	Equities
Australia	3.8%	0.7%	1.7%	6.8%	1.0%	6.0%
Austria	12.6%	-7.9%	-3.7%	0.8%	4.6%	9.5%
Belgium	5.0%	-0.3%	0.5%	2.7%	0.8%	3.0%
Canada	3.0%	1.5%	2.2%	5.7%	0.7%	4.2%
Denmark	3.7%	2.1%	3.3%	5.4%	1.2%	3.3%
Finland	7.0%	-0.5%	0.3%	5.4%	0.7%	5.9%
France	6.9%	-2.7%	0.3%	3.3%	3.1%	6.2%
Germany	29.5%	-2.3%	-1.3%	3.3%	1.0%	5.8%
Ireland	4.1%	0.7%	1.6%	4.4%	0.9%	3.6%
Italy	8.1%	-3.5%	-1.1%	2.0%	2.5%	5.7%
Japan	6.7%	-1.9%	-0.8%	4.2%	1.1%	6.1%
Netherlands	2.9%	0.6%	1.8%	5.0%	1.2%	4.5%
New Zealand	3.6%	1.7%	2.1%	6.2%	0.4%	4.4%
Norway	3.6%	1.1%	1.8%	4.3%	0.7%	3.2%
Portugal	7.3%	-1.1%	0.7%	3.5%	1.8%	4.6%
South Africa	5.0%	1.0%	1.8%	3.4%	0.9%	2.4%
Spain	5.6%	0.3%	1.8%	6.1%	1.6%	5.8%
Sweden	3.4%	1.8%	2.7%	4.5%	0.9%	2.6%
Switzerland	2.2%	0.8%	2.3%	5.5%	1.6%	4.7%
United Kingdom	3.7%	1.0%	1.8%	6.2%	0.8%	5.1%
United States	2.9%	0.8%	2.0%	5.2%	1.1%	4.3%
World	2.9%	0.8%	1.8%	5.1%	1.0%	4.2%
Average	6.2%	-0.3%	1.0%	4.5%	1.4%	4.8%
Median	4.1%	0.7%	1.8%	4.5%	1.0%	4.6%

Source: Dimson-Marsh-Staunton database (2017), Robeco

as our expected long-term inflation rate is 3%.[7] The estimate for the long-term return on bonds is 0.25% lower than our estimate of long-term economic growth. Looking deeper, it is also 0.25% lower than the global bond term premium of 1% observed from 1900-2016. This discount is validated by our observation that the median capture of real GDP growth by real bond returns over the past 114 years for 20 countries in the DMS database is only 91%, and the average compensation a mere 58%. This suggests bond investors are not fully compensated for economic growth risks in the long run.

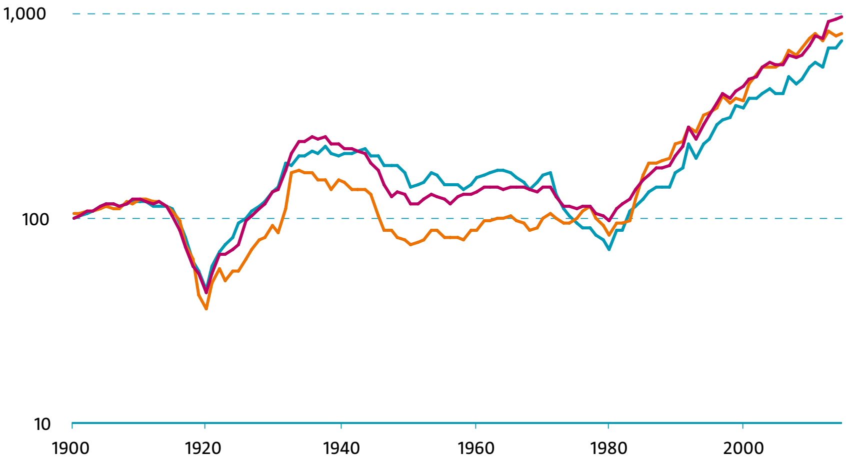
7. The European Commission has suggested an Ultimate Forward Rate of 4.2%, which is close to our long-term return estimate on high-quality government bonds of 4.25%. The arguments used by the European Commission are very different to ours. They expect a 2% inflation rate and a 2.2%(!) real interest rate in the long run.

We would like to point out that, unlike in the case of equities (which we will discuss later), the real returns generated on bonds have not risen gradually over time. As Figure 1.2 shows, real bond returns were roughly flat in the period 1900-1980. Since then the real annual compounded return has been in excess of 6% as a historical unprecedented bull market started. This dynamic historical pattern suggests that our real return estimate for bonds is more uncertain than it is for equities.

1.1.3 Credits

For high yield, investment grade credits and inflation-linked bonds, we use estimates for risk premiums versus government bonds as calculated by Bekkers, Doeswijk and Lam (2009). Below, we expand on the reasoning behind this. We discuss the categories in order of historical data availability. Table 1.2 shows historical excess returns for investment grade

Figure 1.2: Real return index for global bonds with different weighting methods



Source: Dimson-Marsh-Staunton database (2017), Robeco

credits, high yield and inflation-linked bonds. According to Elton, Gruber, Agrawal and Mann (2001), the credit spread comprises the following three components: specific default risk compensation, the tax premium and systematic default risk premium. Additionally, Bongaerts, De Jong and Driessen (2011) also find a liquidity premium in credit spreads. Houweling, Mentink and Vorst (2005) estimate the liquidity premium to be between 13 and 23 basis points.

We estimate the total risk premium of credits over government bonds at 0.75% as we think the findings of Altman (1998) and Giesecke, Longstaff, Schaefer and Strebulaev (2011) are far closer to the true credit premium than the historical excess return in the corporate bond indices calculated and published by Barclays Capital.[8] Over the period 1973 to 2013 the excess return for the Barclays Capital Aggregate Bond Index amounts to 0.4%. Over the period 1983 to 2013 the average excess return equals 0.9%, close to our long-term expected return. For this sub-period, we also have high yield data available which shows that the return difference between credits and high yield was 1.3% during this period.

We note that the Barclays Capital Aggregate Bond Index does not contain bonds with less than one year to maturity and investors are forced to sell bonds when they are rated below investment grade. Ng and Phelps (2011) find that relaxing these constraints leads to approximately a 0.4% additional return compared to constrained indices. This is a substantial increase and investors should be aware of this benchmark issue when investing in credit bonds.

Low volatility credits

In addition to the low-risk effect that is present in equity markets, recent research also indicates a similar phenomenon in credit bonds. This implies that credits with low distress risk and a short time to maturity achieve the same returns as the credit bond market as a whole. Illmanen, Byrne, Gunasekera and Minikin (2004) focus on short-dated credits. Moreover, several recent literature studies, like Houweling and Van Zundert (2015) and Frazzini and Pedersen (2014) show higher risk-adjusted returns for investors in low-risk credits than for the credit market as a whole.

8. We might be tempted to use Ibbotson's longer data series instead of those of Barclays. However, Hallerbach and Houweling (2011) argue that the Ibbotson's long-term credit series is an unreliable source from which to calculate excess returns, as most credits are of extremely high credit quality and the series is not appropriately duration-matched with the long-term government bond series.

1.1.4 High yield

High yield bonds require a higher default premium than corporate bonds due to the lower creditworthiness of the issuers and hence their higher risk profile. Altman (1998) also examines the return on US high yield bonds compared to US Treasuries over the period 1978-1997. The excess return of high yield over Treasuries during this 20-year period is 2.5%. We believe that this figure significantly overstates the risk premium of high yield. At the start of the sample period the high yield market was still immature with the associated liquidity problems and biases. Our sample period from 1983 to 2013 has a risk premium for high yield bonds of 1.7% over government bonds. We proceed with a 1.75% premium over government bonds, assigning more weight to our sample than Altman's older sample.

We believe that a buy-and-hold investor should easily be able to achieve the returns that we project. To illustrate this, the median spread on US investment grade corporate bonds has been 1.2% since 1983 (average 1.4%), and 5.1% for US high yield since 1987 (average 5.5%). After applying a typical default rate of 0.2% and recovery rate of 60% for investment grade, and 3-5% and 40% respectively for high yield, this should bring our estimated returns within reach. This results in a typical credit loss for investment grade of 0.1% and close to 3% for high yield.

We still want to discuss the possible negative impact of transaction costs on investors' ability to achieve our estimated returns for corporate bonds. We note the argument of Houweling (2011) that the returns for corporate bond indices are difficult to replicate as transaction costs for corporate bonds are higher than for government bonds which are more liquid and cheaper to trade. For government bonds he reports an underperformance of 16 basis points for the average Exchange Traded Fund in his study, while for investment grade bonds he reports an underperformance of 56 basis points, and for high yield funds the average underperformance amounts to as much as 384 basis points. Obviously, the liquidity or lack of it for these asset classes requires extra attention in terms of portfolio implementation. Passive index investing is likely to disappoint investors.

Table 1.2: Estimated excess returns for investment grade credits, high yield bonds and inflation-linked bonds

	Excess returns			
	over cash	over bonds	Volatility	Period
Investment grade credits				
Robeco (using Barclays data on US credits)	2.6%	0.4%	5.3%	1973-2013
Robeco (using Barclays data on US credits)	4.2%	0.9%	5.6%	1983-2013
Altman (1998)		0.8%	5.4%	1985-1997
Giesecke, Longstaff, Schaefer, Strebulaev (2011)		0.8%		1866-2008
Ng and Phelps (2011)		0.3%		
High yield bonds				
Robeco (using Barclays data on US high yield)	5.0%	1.7%	8.6%	1983-2013
Altman (1998)		2.5%	5.2%	1978-1997
Ng and Phelps (2011)		3.1%		
Inflation-linked bonds				
Robeco (using Barclays data on US IL bonds)	4.2%	-1.0%	5.8%	1998-2013
Hammond, Fairbanks, and Durham (1999)		-0.5%		
Grishchenko and Huang (2008)		-0.1%		2004-2006

Source: Robeco

1.1.5 Inflation-linked bonds

The return to maturity on (default-free) inflation-linked bonds comprises the real interest rate and the realized inflation rate. Intermediate returns depend on changes in expected real rates and realized inflation. This differs from the return on default-free nominal bonds which consists of a real interest rate, expected inflation and an inflation-risk premium. The cost of insurance for inflation shocks should be reflected in a discount in the risk premium for inflation-linked bonds relative to nominal bonds. Theoretically, the inflation risk premium should be positive as this is related to the positive skewness in the historical inflation numbers. In the period 1998-2013 the inflation risk premium in the US has been negative, as shown in Table 1.2, as inflation-linked bonds earned a 1.0% higher return than nominal bonds.[9] When the inflation-risk premium is positive, we expect inflation-linked bonds to underperform nominal bonds of the same maturity. Instead, nominal government bonds lagged inflation-linked government bonds. Grishchenko and Huang (2012) point to liquidity problems in the Treasury Inflation-Protected Securities (TIPS) market as the reason for the low inflation risk premium that they document. After adjusting for liquidity in TIPS they find an inflation risk premium of between -0.09% and 0.04% over the period 2000-2008, depending on the proxy used for expected inflation. They estimate the liquidity premium to be around 0.13%. A study by Garcia and Werner (2010) finds an inflation risk premium varying from 0.07% to 0.25% at longer horizons. Hammond, Fairbanks, and Durham (1999) estimate the risk premium at 0.5%.[10] On the basis of these findings we estimate the premium of nominal bonds over inflation-linked bonds to be 0.25%. This results in an ex-ante estimated total nominal return of 4% for inflation-linked government bonds relative to 4.25% for nominal government bonds.

9. This could be due to differences in duration between nominal and inflation-linked bonds, and their tax treatment, and the slightly higher credit risk in inflation-linked bonds due to the cash flow pattern that is further into the future.

10. For a sample of developed and emerging market inflation-linked bonds, Swinkels (2012) estimates returns on maturity matched nominal and government bonds to be virtually the same, indicating that the inflation risk premium in practice is small. This could be partially due to the lower liquidity of inflation-linked bonds compared to nominal government bonds.

1.1.6 Emerging market debt

Emerging market debt (EMD) is a fast-growing asset class with dynamic characteristics. The size of the emerging market corporate debt market has grown significantly in recent years as the BIS noted in its 85th annual report. Total issuance by non-financial and non-bank financial corporations amounted to USD 138 billion in 2014. As data availability is limited, it is impossible to take a firm view on risk and return for this asset class. Moreover, it is not a completely homogenous asset class.

In Table 1.3 we compare global government bonds, credits, high yield and EMD. Here, we have created two baskets of EMD. Both baskets have a monthly rebalanced three-quarter weight in sovereign bonds in local currencies and a one-quarter weight in EMD corporate debt issued in USD. The difference is whether or not one hedges the sovereign debt. Usually, investors maintain some level of currency exposure. Without currency exposure, EMD has on average returned 7.0% a year in (roughly) the past ten years, a 2.75% premium over (global developed market) government bonds. With currency exposure, the return was 11.2% and the premium 6.7% while the standard deviation for EMD was twice as high at 10.8% for unhedged portfolios than it was for those which were hedged (5.3%). Ex-ante, we position EMD between credits and high yield for two reasons. Firstly, both US corporate dollar-denominated debt and unhedged local currency sovereign debt have had standard deviations that are roughly in line with those of high yield. Secondly, the average credit ratings for Treasury (AA2/AA3), euro credits (A1/A2), sovereign emerging debt (BAA2) and global high yield (BA3/B1) indicate that from a credit rating perspective, EMD should also be placed between credits and high yield. So we estimate the EMD premium over government bonds to be 1.50%, which brings the nominal return to 5.75%. This is one notch below our return estimate for high yield bonds, as we believe the risk profile is closer to high yield bonds than to credits. Once again, we stress that this asset class is young and dynamic and so we feel less certain about this estimate than for asset classes that have a longer history and more data to back up our estimates.

Table 1.3: Return and risk for emerging debt and other fixed income asset classes (2003-2013; hedged USD unless noted otherwise)

	Return	Annualized st.dev.
Global government bonds	4.5%	3.0%
Investment grade credits	5.3%	4.1%
High yield	11.3%	10.3%
Emerging market debt (3/4 sovereign unhedged USD, 1/4 corporate)	11.2%	10.8%
Emerging market debt (3/4 sovereign hedged USD, 1/4 corporate)	7.0%	5.3%
Sovereign local emerging debt	6.4%	4.4%
Corporate debt emerging debt (USD issuance)	8.7%	10.2%
Sovereign local emerging debt (unhedged USD)	12.0%	11.8%

Source: Barclays, Robeco

As can be seen from Table 1.4, our results differ from those of the Dutch central bank (DNB). For their long-term government bond estimate they use the ultimate forward rate (UFR), which is currently close to 2.75%. For the other fixed income categories, we use a combination of this government bond return and an equity return of 6.75%. For example, 40% of the high yield return is derived from the government bond return and 60% from the equity return, resulting in 5.25%. Our volatility estimates are at the high end of the VBA/AFM range (e.g. 5% versus 3%-5% for government bonds).

Table 1.4: Long-term expected returns for fixed income asset classes

Long-term expected returns	Robeco		DNB*	VBA / AFM
	Return	Volatility	Max return	Volatility
Inflation	3%	-	-	-
Cash or money markets	3.5%	3%	-	0.5%-2%
High-quality government bonds	4.25%	5%	2.75%	3%-5%
Inflation-linked government bonds	4%	6%	-	-
Investment grade credit bonds	5%	6%	3.25%	3%-5%
Low volatility credits	5%	4%	-	-
Emerging government debt	5.75%	10%	-	7%-11%
High yield credit bonds	6%	12%	5.25%	9%-13%

* Eurozone bond estimate. Source: Robeco

1.2 Equities

We again begin by using the data compiled by Dimson, Marsh and Staunton. For 21 countries, over the period 1900 to 2016, the average and the median valuation adjusted excess returns of equities over cash were 4.6% respectively, while over bonds they were 3.2% and 3.0% (see Table 1.5). Dimson, Marsh and Staunton (2013) calculated a global risk premium of equities over cash with a new methodology using a broader dataset than before. They used a market capitalization world index instead of a GDP-weighted index and also took China and Russia into account. As a result, their calculation for the excess return of their global equities index over cash and bonds delivers 4.1% and 3.2% respectively.

In Chapter 2 we derive the ex-ante real global equity return from a theoretical point of view, which we estimate to be around 4%. Adding 3% inflation results in an estimate for the nominal total return of around 7%. This implies a risk premium of 3.5% versus cash. Relative to bonds the theoretical estimate for the equity risk premium would be 2.75%, taking our bond risk premium over cash of 0.75% into account. For reasons explained in more detail in Chapter 2, this is somewhat below the historical valuation-adjusted average and median figures of 3.2% and 3.0% respectively.

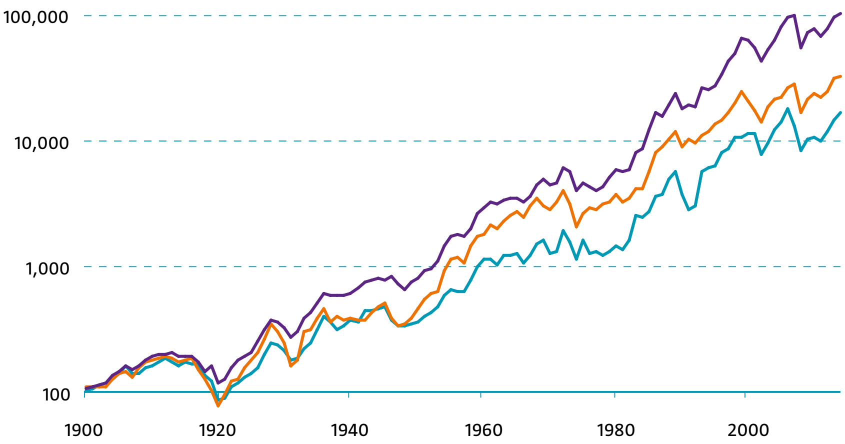
Table 1.5: Historical returns for several markets over the period 1900-2017

	Excess return equities over			Valuation adjusted excess return equities over		
	Inflation	Cash	Bonds	Inflation	Cash	Bonds
Australia	6.8%	6.0%	5.0%	6.4%	5.7%	4.7%
Austria	0.8%	9.5%	4.7%	0.6%	9.2%	4.4%
Belgium	2.7%	3.0%	2.2%	2.5%	2.8%	2.0%
Canada	5.7%	4.2%	3.4%	5.3%	3.7%	3.0%
Denmark	5.4%	3.3%	2.1%	4.3%	2.2%	1.0%
Finland	5.4%	5.9%	5.2%	5.6%	6.1%	5.3%
France	3.3%	6.2%	3.0%	3.2%	6.1%	2.9%
Germany	3.3%	5.8%	4.7%	2.9%	5.4%	4.3%
Ireland	4.4%	3.6%	2.7%	4.1%	3.4%	2.5%
Italy	2.0%	5.7%	3.1%	2.0%	5.7%	3.1%
Japan	4.2%	6.1%	5.0%	3.3%	5.2%	4.1%
Netherlands	5.0%	4.5%	3.2%	4.6%	4.1%	2.8%
New Zealand	6.2%	4.4%	4.0%	7.0%	5.3%	4.8%
Norway	4.3%	3.2%	2.4%	4.1%	3.0%	2.3%
Portugal	3.5%	4.6%	2.7%	3.5%	4.6%	2.7%
South Africa	3.4%	2.4%	1.6%	3.2%	2.2%	1.3%
Spain	6.1%	5.8%	4.2%	6.6%	6.3%	4.7%
Sweden	4.5%	2.6%	1.7%	4.4%	2.5%	1.6%
Switzerland	5.5%	4.7%	3.1%	5.4%	4.6%	3.0%
United Kingdom	6.2%	5.1%	4.3%	6.1%	5.0%	4.2%
United States	5.2%	4.3%	3.2%	4.7%	3.9%	2.7%
World	5.1%	4.2%	3.2%	4.6%	3.8%	2.8%
Average	4.5%	4.8%	3.4%	4.3%	4.6%	3.2%
Median	4.5%	4.6%	3.2%	4.3%	4.6%	3.0%

Source: Dimson-Marsh-Staunton database (2017), Robeco

We would still like to stress that the real return on equities has been realized gradually in the past. Annual volatility for stocks is obviously higher than for bonds, but over a 117-year horizon there has been a consistently upward sloping real return, as illustrated in Figure 1.3.

Figure 1.3: Real return index for global equities with different weighting methods



Source: Dimson-Marsh-Staunton database (2017), Robeco

We make a distinction between the equity risk premiums for developed and emerging markets, mainly because most of the investment management industry is organized in this way. We have outlined the differences in economic growth between developed and emerging markets in our special 'Emerging markets: The grain that will grow?' in the 2017-2021 edition of Expected Returns. Several researchers have argued that equity risk premiums can be higher for countries that are less integrated into global financial markets; for examples, see Errunza and Losq (1985) and Bekaert and Harvey (1995). Also, developed markets tend to have better governance, which should result in a higher risk premium for emerging markets. Furthermore, Erb, Harvey, and Viskanta (1996) and Damodaran (2009) argue that country credit spreads are related to the magnitude of the equity risk premium in that particular country. Since most emerging markets have become more integrated into the global financial markets and country credit spreads have decreased substantially, the estimated excess returns of emerging markets relative to developed markets have also decreased in recent years.[11] Hence, we assume that developed equity markets return 7% and emerging equity markets return 7.5% per annum. For long-term expected returns, we do not separately discuss regional equity premiums. Our approach focuses on well-documented return premiums within global equity markets on small-cap, value, momentum, and low volatility stocks.

Table 1.6 contains the excess returns relative to the risk-free rate for the US stock market between 1963 and 2009. See Blitz (2012) for more details on how these portfolios are formed. The return premium on small-capitalization stocks is partially reduced by the higher risk, measured by their Capital Asset Pricing Model (CAPM) beta and volatility. The 1.8% higher return that small-cap stocks have relative to the market capitalization-weighted index is reduced to 1.1% when the higher beta is taken into account. The excess returns for value and momentum are substantially higher, leading to a CAPM alpha of 4.6% per annum. Note that these estimates do not yet include transactions costs. This might be a larger problem for the momentum strategy as this requires trading each stock approximately once a year (assuming one-year momentum) while the holding period for

11. See Salomons and Grootveld (2003) for a discussion of the emerging markets equity premium relative to that of developed markets.

value strategies is typically three to five years. The excess return of 5.9% for low volatility stocks, which corresponds with a 3.0% CAPM alpha, comes with a lower volatility than the market capitalization-weighted index.

These strategies do not by definition earn excess returns each year, as they also have sustained periods of negative excess returns. For example, in the period leading up to the internet bubble, valuation strategies severely underperformed the market capitalization-weighted index. Moreover, executing these strategies is not as simple as following a market capitalization-weighted index – several types of choices have to be made on rebalancing frequency (see, e.g., Blitz, Van der Grient and Van Vliet 2010) and the exact definition of the strategy parameters (see, e.g., Blitz and Swinkels 2008). Hence, it is difficult to define a uniform value premium. Here, we take the academically most established definitions from Fama and French (1992) for value and size, from Carhart (1997) for momentum, and from Blitz and Van Vliet (2007) for low volatility stocks.

Table 1.6: Historical data on excess returns for the US equity markets 1963-2009

	Excess return	CAPM alpha	Volatility
Cap-weighted index	3.9%	-	15.6%
Small-cap stocks	5.7%	1.1%	20.0%
Value stocks	8.3%	4.6%	17.4%
Momentum stocks	8.8%	4.6%	18.5%
Low volatility stocks	5.9%	3.0%	13.3%

Source: Blitz (2012), Robeco

The historical evidence on the US is overwhelming and many authors have empirically detected the same return factors in other countries; see, e.g., Rouwenhorst (1998, 1999) and Van der Hart, Slagter and Van Dijk (2003), Van der Hart, De Zwart and Van Dijk (2005), and De Groot, Pang and Swinkels (2012). For example, Chen, Petkova and Zhang (2008) estimate a value premium relative to the market of approximately 3% per annum for the US over the period 1945 to 2005. Kim (2012) shows that over the period 1990 to 2010 the value effect is significantly present in the majority of the 36 countries they investigate, and stronger in the post-1995 period than in the pre-1995 period that Fama and French (1998) analyze. Nevertheless, we take a conservative approach for the excess returns on these return factors. The reason for this is that trading costs might reduce their real-life profitability. Moreover, more institutions have incorporated these return factors into their investment process, potentially leading to a decrease in their excess returns and increased volatility in the future.

In Table 1.7 we estimate that value and momentum stocks will have an excess return of 1% per annum. We assume that both value and momentum have somewhat higher volatilities than developed equity markets. The empirical evidence for excess returns on small- capitalization stocks is less convincing, leading us to estimate an excess return of 0.25% and risk of 22% for this group of stocks. For low volatility stocks, we assume that they have the same expected returns as the market average, but at a substantially reduced risk of 13% instead of 18%. Although a debate about the increased valuation of low volatility stocks has been heating up, we think the subsequent return impact of higher valuations is limited. As Marmer (2015) suggested, the low volatility strategy is in a sense self-correcting with regard to valuation; overvalued stocks exhibit higher volatility and will be removed from the strategy.

Table 1.7: Long-term expected returns for equity asset classes

Long-term expected returns	Robeco		DNB	VBA / AFM
Asset class	**Return**	**Volatility**	**Max return**	**Volatility**
Developed markets	7%	18%	7%	12%-17%
Value stocks	8%	20%	7%	-
Small-cap stocks	7.25%	22%	7%	-
Momentum stocks	8%	22%	7%	-
Low volatility stocks	7%	13%	7%	-
Emerging markets	7.5%	25%	7%	18%-23%

Source: Robeco

Although we believe that the factor premiums are present in all markets (see for instance Asness 2013), do not separately include them for emerging and frontier equity markets in the table. There is some evidence that the factor premiums are somewhat higher in less developed markets, but trading frictions make it more expensive to exploit them. Hence, our estimation is that the relative factor returns for developed markets apply for emerging and frontier markets. For example, as value stocks have a 1%-point higher return than the market as a whole (8% versus 7%), the expected return for value stocks in emerging markets is 8.5%. This is the same 1%-point higher than the 7.5%.

Table 1.7 shows that our geometric returns are about 1%-point higher than those allowed by DNB for most factor strategies and emerging markets.

1.3 Alternatives

Here, we discuss the return perspectives for private equity, real estate, commodities and hedge funds. Since these asset classes are illiquid or by definition involve the use of derivatives, we classify these as alternatives. This implies that investors in these asset classes should usually have additional measures in place to manage the risks involved.

1.3.1 Private equity

A large number of studies have tried recently to compare the returns of private equity with those of listed equities. Kaplan and Schoar (2005) do not find an outperformance for private equity, with a public market equivalent (PME) of 0.96 for all funds. Phalippou and Gottschalg (2009) draw a comparable conclusion on a larger sample. However, Stucke (2011), using a different methodology, finds a net outperformance for the same data set as Phalippou and Gottschalg (2009). Harris, Jenkinson and Kaplan (2012) perform a meta-study using databases from Burgiss, Venture Economics (VE), Preqin and Cambridge Associates (CA). They show that for all datasets, except VE, the median buy-out fund has returned a PME of between 1.2 and 1.27. For venture capital their findings show outperformance for the 1990s and an underperformance in the 1980s and the 2000s. Robinson and Sensoy (2011) findings also demonstrate outperformance over the S&P 500 for buy-out funds over the period 1984-2010. For venture capital they document a similar performance to the S&P 500 using data from one large limited partner. These recent studies suggest that private equity may well perform better than listed equities. This would be in line with the overview of different PE studies that Diller and Wulff (2011) have provided.

In a comment on Stucke (2011), Robinson and Sensoy (2011), Harris, Jenkinson and Kaplan (2012), and Phalippou (2012) indicate that the results from their studies are largely derived from the outperformance of small- and midcap stocks relative to large caps. Moreover, most PME calculations do not take leverage, which is common in private equity, into account.

Driessen, Lin and Phalippou (2012) estimate the beta of buy-outs at 1.5. Kaplan and Schoar (2005), Higson and Stucke (2012) and Sensoy, Wang and Weisbach (2013) also note a heterogeneous pattern in the performance of private equity funds. This implies that results are strongly dependent on manager selection. Finally, Robinson and Sensoy (2011) show more capital calls than distributions during crises. Higson and Stucke (2012) also find this cyclical pattern. Diller and Kaserer (2009) find private equity returns to be positively correlated to economic growth, so negative returns come in periods when they are least desired.

Although Table 1.8 shows an outperformance for private equity over stocks in the period 1998-2013, we do not have enough evidence from existing literature that private equity returns (net of fees) exceed public equity returns. There is no consensus in the academic literature. Most studies point to private equity outperformance, but the issue of what is left after proper risk adjustment remains a question. Also, all the studies mentioned above are subject to selection and reporting biases. Hence, we assume the risk premium of private equity as a group to match that of listed equities.

Table 1.8: Estimated excess returns for private equity, real estate and hedge funds

	Excess returns			
	over cash	over equities	Volatility	Period
Private equity				
Robeco (LPX America)	4.7%	2.1%	29.8%	1998-2013
Driessen, Lin, Phalippou (2012)		-4.9%		1980-2003
Higson and Stucke (2012)		4.5%		1980-2000
Wilshire (2013)		3.0%		prospective
Real estate				
Robeco (NAREIT US)	4.2%	0.0%	17.9%	1972-2013
Fugazza, Guidolin and Nicodano (2006)	4.7%	-1.0%		1986-2005
Wilshire (2013)	0.0%	-2.5%		prospective
Hedge funds				
Robeco (HFRI FOF Composite)	3.9%	-1.6%		1990-2013
Robeco (HFRI FOF Composite)	5.7%	-1.9%		1990-2001
Robeco (HFRI FOF Composite)	1.8%	-1.2%		2002-2013

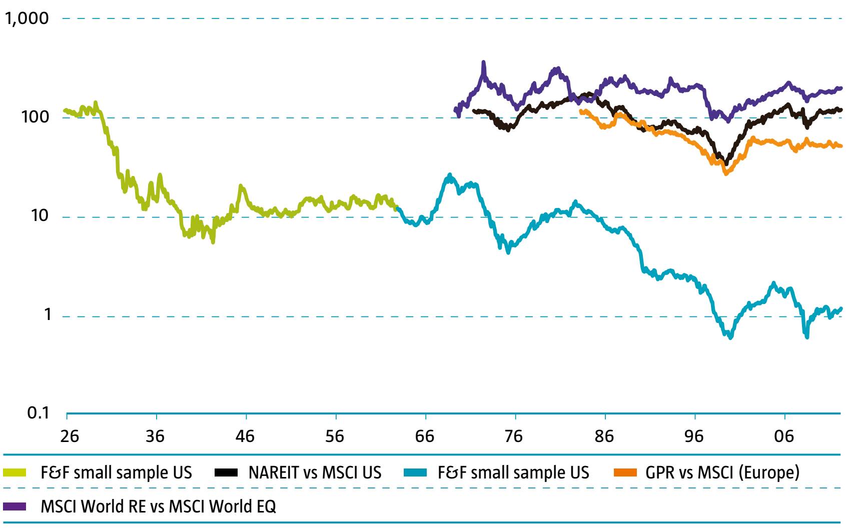
Source: Robeco

1.3.2 Real estate

In principle, we view direct and indirect real estate as one particular source of risk and return. This corresponds to Idzorek, Barad and Meier (2006), who state: "Although all investors may not yet agree that direct commercial real estate investments and indirect commercial real estate investments (REITs) provide the same risk-reward exposure to commercial real estate, a growing body of research indicates that investment returns from the two markets are either the same or nearly so." Of all alternative asset classes, real estate is the one that has probably received most attention from academics in the past. A literature review by Norman, Sirmans and Benjamin (1995) tries to summarize all the findings. Overall, they find no consensus for risk and return characteristics for real estate. However, more than half of the consulted literature in their paper reported a lower return for real estate compared to equities. Fugazza, Guidolin and Nicodano (2006) also show lower excess returns for real estate than for stocks. Their estimate of -1.0% per year can be seen in Table 1.8.

As Figure 1.4 illustrates, the relative performance of real estate versus equities differs according to the data source and region. There is a lack of long-term data with the same country allocation for real estate and equities. Even with the same country weightings, results can differ substantially. US data from the Fama and French data library paint a different picture than the NAREIT data relative to the MSCI US equity market.

Figure 1.4: Relative performance of real estate/REITs versus equities



Source: Fama and French, Thomson Financial Datastream, Robeco

We proceed with an estimated excess return for indirect real estate that is 1% lower than our estimate for stocks. Due to the lower leverage in direct real estate compared to indirect real estate, we estimate expected returns to be another 1% lower for that asset class.

1.3.3 Commodities

An unleveraged investment in commodities is a fully collateralized position which has three drivers of returns: the risk-free rate, the spot return and the roll yield. Erb and Harvey (2006) point out that the roll return has been a very important driver of commodity returns, but it is unclear what the size of roll returns will be in the future.[12] In their extensive study they find that the average individual compound excess return of commodity futures was zero. They argue that individual commodities are not homogeneous and that their high volatility and low mutual correlations result in high diversification benefits. The diversification benefit comes from periodically rebalancing the portfolio and is reflected in the high historical performance of the GSCI Index compared to the return from individual commodities.

12. The upward (contango) or downward (backwardation) sloping term structure of futures prices creates a negative or positive roll return. It arises when an almost expiring future is rolled over to a future with a longer maturity.

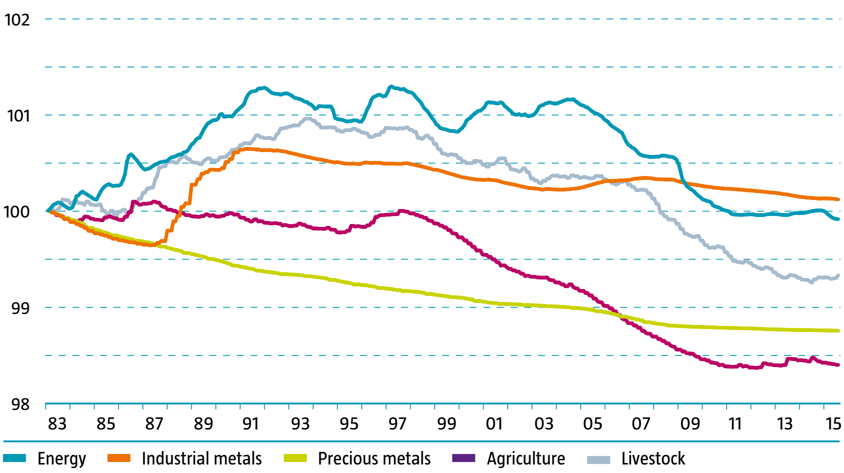
Gorton and Rouwenhorst (2006) create an equally-weighted monthly rebalanced portfolio of commodity futures that had returns like stocks over the period 1959-2004. Erb and Harvey (2006) raise questions over the representativeness of both the equally-weighted portfolio and the GSCI index. On the one hand, they show that an equally-weighted stock index would by far outperform a market cap-weighted index. On the other hand, the GSCI index composition has changed dramatically over time and allocates heavy weights to energy commodities. They suggest that a simple extrapolation of historical commodity index returns might not be a good estimate for future returns.

We observe that the return from systematically rolling over energy-related futures has historically added substantially to the total return of commodity investing in energy and livestock until the early 1990s (see Figure 1.5). However, over roughly the past ten years, roll returns on all commodity categories have tended to be negative. Due to the increased interest of institutions in commodity investors, the future roll return is unlikely to again become positive. Lummer and Siegel (1993) and Kaplan and Lummer (1998) argue that the long-term expected return of commodities equals the return on Treasury bills. Many theories for commodity risk premiums exist, but most of those are not easily measurable.[13]

13. See Erb and Harvey (2006) for a literature overview of commodity market theories.

Since we have not found enough evidence for a large risk premium on commodities, we use a commodity risk premium that lies between those of cash and government bonds, i.e. a risk premium of 0.5% relative to cash.

Figure 1.5: Roll returns for commodities (EUR, 1983=100)



Source: Thomson Financial Datastream, Robeco

Recent research suggests there are factor premiums in commodity markets similar to those that exist in credit and equity markets. We focus on well-documented return premiums within the commodity market. The momentum and carry factor have been documented by Erb and Harvey (2006), Gorton and Rouwenhorst (2006), Miffre and Rallis (2007) and Shen, Szakmary and Sharma (2007). The low volatility factor is in the spirit of findings by Miffre, Fuertes and Pérez (2012) and Frazzini and Pedersen (2010). Blitz and De Groot (2013) also find that the case for factor premium investing carries over to the commodity market. More specifically, they find that a commodity portfolio which simply invests equal amounts in the various factor premiums achieves a significantly higher risk-adjusted performance than a traditional commodity market portfolio, with much smaller drawdowns.

Table 1.9 shows the excess returns relative to the risk-free rate for the S&P GSCI commodity market index and the long-only momentum, carry and low-risk commodity factor portfolios over the period January 1979 to June 2012 and over the most recent ten years of this sample. See Blitz and De Groot (2013) for more information on the construction of these portfolios. Over this time period, but also over the past ten years, commodity investments were considerably more volatile than equities and earned lower returns than bonds, resulting in a relatively low risk-return ratio. However, the risk-adjusted performance of the commodity factor premiums is more attractive. The excess returns of the momentum and carry factors are substantially higher, providing up to almost 8% additional return relative to the market over the whole sample period and up to more than 13% higher returns over the past ten years of the sample. The volatilities of the momentum and carry premiums have been in line with the market. The return of the low-risk factor is only somewhat higher than the commodity market premium; however, the volatility is significantly lower than the market volatility. All returns are in US dollars and do not include the impact of transaction costs, although these are relatively low for commodity futures (see e.g. Locke and Venkatesh (1997)).

Table 1.9: Historical data on excess returns for the long-only commodity factor premiums 1979-2012

	1979-2012		2002-2012	
Asset class	Excess return	Volatility	Excess return	Volatility
Commodity market	1.16%	19.50%	1.61%	25.13%
Momentum	8.90%	23.17%	13.56%	23.91%
Carry	7.89%	19.80%	15.09%	21.12%
Low risk	3.75%	12.38%	6.67%	12.23%

Source: Blitz and De Groot (2013)

Although historical risk-adjusted returns have been significant, we use conservative estimates of the excess returns of these commodity factor premiums, as each of the strategies can also experience periods of negative excess returns. We also took the premiums of similar factors for equities into account, as these have existed for longer than the 'newer' factor premiums for commodities. We focus on generic factors in this study, while in practice less naïve approaches can be used to construct the factors, such as by using more advanced portfolio construction techniques and aiming for optimal rolling returns by investing further down the curve. Table 1.10 illustrates the estimated excess returns and volatilities. We assume that returns of the momentum and carry premium are 1.5% higher than the commodity market premium, with similar volatilities as the commodity market factor. As the reported factor premiums for commodities are larger than those for equities, we have put excess returns for these commodity factor premiums relative to the commodity market 0.5% higher (at 1.5%) than the equity factor premiums relative to the equity market (1%). For low volatility commodities, we assume similar expected returns to the market, but with a substantially reduced risk of 15% instead of 25% for the commodity market. Table 1.10 summarizes our estimates for the commodity market and the commodity factor premiums.

Table 1.10: Long-term expected returns for long-only commodity factor premiums

Asset class	Return	Volatility
Commodity market	4.0%	25%
Momentum	5. 5%	25%
Carry	5.5%	25%
Low risk	4.0%	15%

Source: Robeco

1.3.4 Hedge funds

Table 1.8 shows historical excess returns for hedge funds of funds. We use the HFRI Fund of Funds Composite Index which is net of all fees, equally weighted and includes over 600 funds. Furthermore, it is broadly diversified across different hedge fund styles. At first sight, hedge funds might show a reasonable performance with a net of fees excess return over cash of 3.9%. Since 2002, this has dropped to below 2%, though biases and the favorable equal weighting affect this figure. The academic literature contains extensive information on biases in hedge fund indices, as shown in Table 1.11. However, estimates for the market portfolio of hedge funds are scarce. Funds of hedge funds are often considered to be a good proxy for the market portfolio, since they have fewer biases than typical hedge funds. However, their returns are affected by the double counting of management fees. Fung and Hsieh (2000) estimate the portfolio management costs for a typical hedge fund of fund portfolio to be between 1.3% and 2.9%. There is no cheaper way to obtain exposure to this asset class.[14]

14. There are cheaper and more liquid so-called hedge fund replication strategies available for investors. We do not include these in our analysis, as they are usually dynamic strategies using derivatives on traditional asset classes.

Table 1.11: Biases in hedge fund databases

	Robeco	Magnitude	Period
Fung and Hsieh (2000)	Backfill	0.7%	1994-1998
Fung and Hsieh (2000)	Survivorship	1.4%	1994-1998
Posthuma and Van der Sluis (2003)	Backfill	2.3%	1996-2002
Amin and Kat (2005)	Survivorship	0.6%	1994-2001

Source: Robeco

Taking this all together, we believe the estimate of Bekkers, Doeswijk and Lam (2009) to be reasonable with an excess return over cash of 1.25%. Note that this is a combination of possible manager skill and also the systematic exposures that hedge funds seem to have. When we compare our expected returns in Table 1.12 to those of DNB and VBA/AFM, we see that the differences are relatively small. We tend to be more conservative. For example, for commodities we estimate 4% return, where DNB allows a max return estimate of 5%.

Table 1.12: Long-term expected returns on alternative asset classes

Long-term expected returns	Robeco		DNB	VBA / AFM
	Return	Volatility	Max return	Volatility
Private equity	7%	25%	7.5%	-
Commodities	4%	25%	5%	20%-25%
Indirect real estate	6%	20%	7%	16%-21%
Direct real estate	5%	10%	6%	-
Hedge funds	4.75%	10%	7.5%	7%-12%

Source: Robeco

2

Economic growth and financial markets in a steady state

Long-term economic growth stems from increasing labor productivity and changes in the potential labor force, emanating from cyclical swings in the unemployment rate. Labor productivity and labor force growth also play an important role in the earnings growth rate and thus in financial returns for investors. So we will start by discussing labor productivity and labor force growth rates and then move on to economic and earnings growth. We will conclude with the theoretical implications this will have for equity and bond returns in the long-term steady state.

2.1 Labor productivity

Labor productivity in a mature economy grows between 1.5% and 2% per year. Productivity gains can be determined by looking at the real growth in per capita gross domestic product (GDP). In the long run, this matches the increase in labor productivity, if we assume that the per capita hours worked remain constant. Apart from periods of significant unrest, the speed of productivity growth has been remarkably gradual. According to data from macroeconomist Angus Maddison covering a wider set of 20 Western countries, growth in per capita GDP averaged 1.9% in the period 1870 to 2008. Developing economies can temporarily show higher labor productivity growth rates. For example, Japan experienced an average increase of 3.8% between the end of World War II and 1980. However, as an economy matures, it is harder to realize productivity gains. For example, in the period 1980 to 2015, Japan's labor productivity increased by 1.5%, which is close to the gains of 1.6% seen in the US over this same period. Some developing countries have shown even stronger growth rates. China has enjoyed an annual productivity gain of 6.6% since 1980 and India 4.5%. In contrast, Brazil has lagged with a modest gain of just 0.8%. Barro and Ursúa (2008) estimate an average historical growth rate for developing economies of 2.8% over the period 1960-2006, 0.4% above the growth rate for mature economies over that same period. Please note that these numbers are average per capita real GDP growth rates, and that there can be significant differences between different countries.

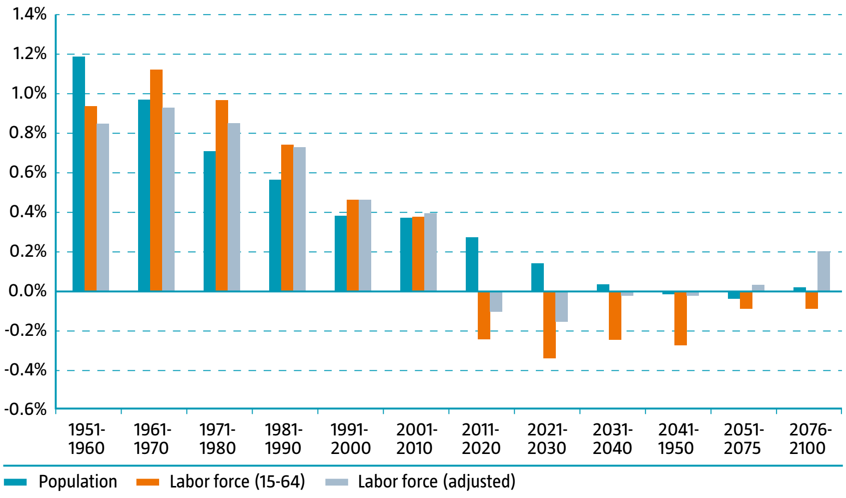
If history is a good proxy for what happens in the future, a 1.75% gain for mature economies seems to be a good starting point. Some commentators such as Robert Gordon argue that the past two centuries of economic growth could actually just be 'one big wave' of dramatic change rather than a new era of uninterrupted progress, and that the world is returning to a regime in which growth is mostly of the extensive sort. The idea that technology-led growth must either continue unabated or steadily decline, rather than ebbing and flowing, is at odds with history. Nevertheless, the last two centuries have been a 'special' period in terms of population growth. And although it is difficult to make a link between population growth and productivity, academic literature indicates a positive relationship which seems logical to us. As we argue in the next paragraph, population growth will not track the strong historical growth rates seen in the past and so we reduce the historical estimate to 1.5% for our steady-state calculations.

2.2 Size of the labor force

The growth of the labor force has been an important stimulus for economic growth. Projections from the United Nations show that population growth will gradually fall from 1.2% per year in 2015 to 0.2% per year in 2100. The graph below gives a breakdown of the actual and projected population and labor-force growth in developed regions up to 2100.

In most analyses, the labor force is defined as the population aged between 15 and 64 years old. If we apply this definition, we see labor force growth projections for developed regions entering negative territory. However, we do not believe this definition is realistic. As people are expected to live longer, we can expect the retirement age to increase. For example, the life expectancy for a 65-year old living in 2015 is 19 years. For a 70-year old living in 2075 this figure is 20 years. Assuming the retirement period stays the same, it is unlikely that you will be able to retire at 65 in 2075. We assume that the retirement age will increase by 2/3 of the increase in life expectancy. Adjusting for this higher retirement age and for the number of youngsters remaining in education longer, we arrive at an adjusted labor force projection. This projection is remarkably close to 0% (see Figure 2.1).

Figure 2.1: Average population growth in developed regions



Source: United Nations, Robeco

The global labor-force growth projections will remain in positive territory. We calculate the average yearly increase to be 0.5% between 2020-2100. Much of the growth will take place in frontier markets. This global number will likely overstate the effect of population growth on financial markets as we believe we should give more weight to developed regions. For this reason, we use 0.25% as an estimate for labor-force growth in our further analysis.

2.3 Economic growth, earnings growth and dividend growth

Based on a productivity growth of 1.5% and a labor force growth of 0.25%, we end up with a steady-state growth rate of 1.75% for the world economy. The question is, how much of this growth will be translated into shareholder returns in the steady-state scenario. Much depends on the assumptions we make on the level of dilution that occurs at the various stages of transition between economic growth, earnings growth and actual returns.

The first form of dilution takes place at the earnings level and occurs right across the whole economy. Earnings are diluted in the form of taxes, reducing the potential growth for shareholders. Looking at the economy as a whole, you can present this as a transfer from the profit to the non-profit part of the economy. As we are looking at the returns in a steady-state environment, it seems logical to assume that the net earnings growth will be equal to the growth of the underlying economy. If this does not prove to be the case, it means either that earnings are becoming a dominant factor for the economy as a whole (if net earnings growth is consistently above economic growth), or that they have diminished to nothing. The notion that net earnings growth should equal economic growth is the central assumption taken in the literature.

The more relevant question here is: how much of the economy's earnings growth is linked to listed companies, as these form the basis for shareholders' returns. It stands to reason that the earnings growth available to shareholders in listed companies will be lower than that for non-listed companies. One reason is that listed companies are skewed towards the older, less dynamic parts of the economy. The rapid start-up growth seen in new industries mostly takes place outside the listed arena. More importantly, however, established listed companies issue new shares on a regular basis (either to finance acquisitions, or as part of payments schemes), which dilutes existing shareholders' claim to the earnings growth. This is the second stage of dilution.

So how is it possible that earnings growth for the economy as a whole is structurally higher than it is for listed companies? Doesn't this imply that listed companies are gradually being marginalized? This would be true if the split between listed and not-listed companies remained static, but of course this is not the case: successful companies normally eventually opt for a listing. Having missed out on the first high-growth phase, equity investors will only be able to tap into this new growth potential by rebalancing their portfolios.

One final point to address relates to the earnings and growth measures we should compare. As we are interested to see how much GDP growth will ultimately feed through to the equity investor, the logical measure for earnings would be earnings (or dividends) per share, as this takes new share issuance into account and adjusts for the changing composition of the general stock market. For the growth measure, real GDP seems to be a better option than per capita GDP: equity investors are not interested in what the direct source of growth is, but in the level of that growth. Most people seem to compare per capita GDP with earnings per share. But this seems to imply a link between 'capita' and 'share' which we find difficult to see. So we stick to a comparison between real GDP growth and earnings (or dividends) per share.

So how big is this dilution effect? Literature on this subject is relatively scarce, but the most relevant study was carried out by Bernstein and Arnott (2003). They find the dilution factor to be as high as 80% for the period 1900-2000, based on data on dividend growth versus real growth. To be more specific: equity investors only get 20% of the underlying earnings growth seen in the economy. We do not think that this is a realistic conclusion. For one, dividend payout ratios are far from static. Fundamental shifts in these and reforms in terms of tax treatment can lead to structural changes in the absolute and relative distribution to investors. A decline in the payout ratio (as seen in the US) will result in lower dividend growth, which is not related to dilution. Looking at data from the Shiller database, for example, the dividend payout ratio for US stocks had steadily declined from around 80% in the late 19th century to less than 40% at the start of the current century. Clearly this has an impact on the dividend growth calculations. In recent years, a preference for increased payouts to shareholders seems to indicate a reversal in this trend. We also have difficulty reproducing the numbers given for the US. According to the Shiller database, real dividends per share have risen by 1.3% annually, not the 0.6% Bernstein and Arnott present in their paper. Although this 1.3% is still way below the real GDP growth of 3.3%, if we were to adjust for the structural decline in the payout ratio, we would arrive at dividend growth of around 2.5%. Unfortunately, we have not been able to analyze other countries using another dataset from a different source to compare the outcome with the results of the Bernstein and Arnott study.

We have carried out an equity dilution analysis for the period 1871 to 2015 with earnings and dividend data from Robert Shiller's website and economic growth data from MeasuringWorth. Table 2.1 shows the compounded growth rates. Based on the US data, we find a dilution factor of 50% compared to GDP growth. This is in line with research carried out by Brightman (2012), who states that "Half of the growth in total corporate earnings flows to new investors through the formation of new companies and new share issuance by existing companies". This means that we expect earnings for equity investors to rise between 0.75% to 1% in the steady state.

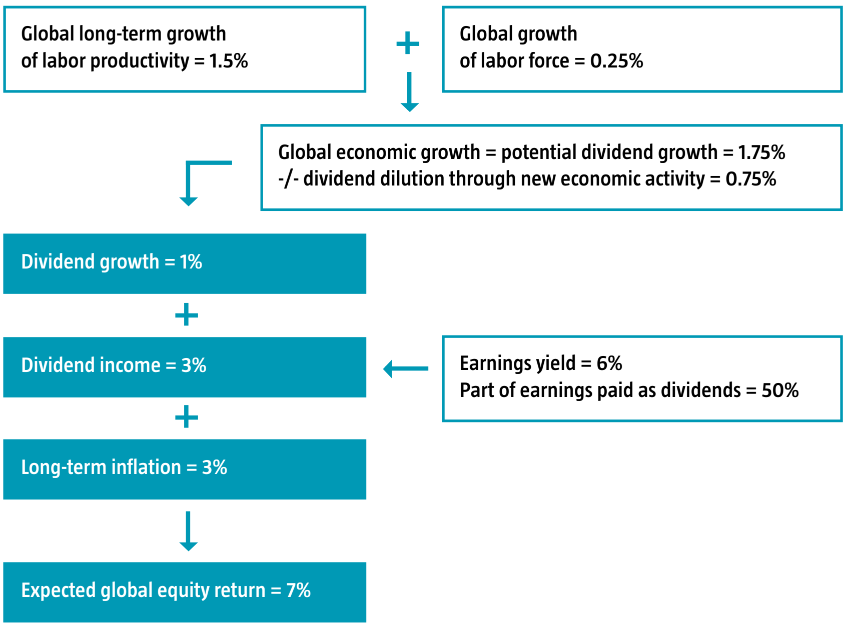
Table 2.1: Dilution of earnings per share (EPS) and dividends per share (DPS) in the United States

		Real			Dilution	
Period	Source	GDP	EPS	DPS	EPS	DPS
1900-2000	Robeco	3.3%	1.6%	1.3%	-52%	-60%
1871-2015	Robeco	3.4%	1.7%	1.5%	-50%	-55%
1900-2000	Bernstein and Arnott (2003)	3.3%	-	0.6%	-	-80%

Source: MeasuringWorth, Shiller, Robeco

Figure 2.2 presents a schematic overview of the theoretical building blocks for global equity returns. The components are derived from the growth model developed by Gordon (1959), in which the expected equity returns are split between dividend income and capital appreciation. As we assume no valuation changes in this steady-state equilibrium (meaning no structural P/E increases or decreases), the capital appreciation should be equal to the real diluted earnings growth we calculated at the end of the previous paragraph (P. growth = E. growth).

Figure 2.2: Schematic overview of the theoretical building blocks for global equity returns



Source: Robeco

This brings us to the second element of real returns: what is the equilibrium dividend yield we can expect in the steady state? As it turns out, this is a key question, as numerous reports underscore the importance of dividends in determining total return. Looking at Shiller's data, for example, the average (median) dividend yield for the US market over the period 1871 to 2015 was 4.4% (4.3%), comprising roughly two thirds of the real total return of 6.8% over that period. Although this sounds high, when compared with other areas of the world, the US is actually at the lower end of the scale. Dimson, Marsh and Staunton (2006) present a table with dividend yields for sixteen countries for the period 1900-2005. This shows that the geometrical mean for the whole sample was 4.5%, compared to a total real excess return over cash of 5.0%. This figure is to a certain extent misleading as it is an average, where a country like Belgium has the same weight as one like the US. Still, there is no denying that dividend yields have played an important if not dominant role in determining the overall level of returns.

So, what is the steady-state dividend yield? The way to assess this is to look at the payout ratio (D/E; the percentage of earnings that is being paid out in the form of dividends) and the earnings yield (E/P; the reversal of the P/E ratio). If you multiply these two yields you get the dividend yield (D/P). Looking at the Shiller database, the average payout rate has been 61%, while the median reached 58%. It is clear that these numbers have been inflated by the very high payout ratios in the first half of the period: if we look at the period after World War II, the average and median are 51%. This appears to be more in line with other periods, with average and median dividend payout ratios of 47% for the MSCI World since 1970. The average earnings yield for the US since 1871 is 7.4% and the median is 6.8%. Again, these numbers have been positively impacted by the first half of the sample: looking at the postwar period, the average (7.0%) and median (6.0%) earnings yields are much more in line with the longer-term averages we see for the world as a whole: since 1970 these figures for the MSCI World have been 6.5% and 5.9% respectively. Based on these observations we end up with an equilibrium dividend yield of 3 to 3.5%. If we combine this with the earlier 'neutrally priced' dividend yields, we feel that a dividend yield of 3% is a prudent longer-term assumption.

It is easy now to derive the real return on equities. We add the dividend yield of 3% and the dividend growth rate of 0.75 to 1% to arrive at a real return of close to 4% for global equities.

2.4 Economic growth and interest rates

The nominal interest rate can best be seen as the sum of the real interest rate and the expected rate of inflation (Fisher, 1930). Academic literature provides a link between economic growth and real interest rates (Ramsey, 1928). Cornell (2012) describes a model that gives the expected risk-free interest rate as a function of time preference, per capita consumption growth, aggregate risk aversion, and the volatility of per capita consumption growth. Generally, higher economic growth is expected to lead to higher interest rates and vice versa. For example, assuming that higher economic growth leads to higher future income and hence higher future consumption, a higher interest rate will be required to delay household consumption. If not, households will consume more today by borrowing against expected future growth. To expand this example slightly, if expected growth is uncertain or households are risk averse, one would expect them to be more cautious about increasing consumption today, which would lead to lower rates.

Rachel and Smith of the Bank of England (2015) provide a number of arguments for today's low interest rate environment. Most of these arguments can be incorporated into Cornell's model. For example, demographic changes have shifted weight from starters to employees closer to retirement in most developed countries. This has three effects. First, consumption growth is expected to decline as these employees have already experienced their biggest real income increases in an earlier phase of their career; second, there will be more need for consumption smoothing as retirement comes closer (i.e. time preference changes) and finally risk aversion is expected to rise as people get older. All these factors lead to lower interest rates. It should be noted that interest rates can rise again when the number of elderly increases and the uncertainty about future consumption growth diminishes as income (i.e. pension) becomes more certain.

For our steady-state estimate for nominal interest rates we need to look beyond today's market to establish what the expected rate will be in a world in equilibrium. Following Cornell's model, we first look at the historical compensation investors have demanded from real GDP growth (assuming this translates into consumption growth). We calculate the historical compensation to be 90% of real per capita GDP growth for developed markets. This implies that the expected real GDP per capita growth of 1.5% leads to a real return on bonds close to 1.35%. We believe this estimate to be a good indication for future compensation with one exception. The compensation is calculated using a dataset which is not in line with forward-looking demographics (see for example United Nations (2015)). Rachel and Smith (2015) calculated that changing demographics would have a severe impact on real rates, causing them to fall significantly. In looking to the future, we believe this correction to be too high as the number of elderly will increase substantially leading to higher interest rates. Depending on longevity and retirement age trends, the earlier correction could reverse. However, we do not believe there will be a complete reversal and so we incorporate a small correction to the historical estimates leading to a real return of 1.25% (i.e. 80% capture of real per capita GDP). This lower figure is also consistent with our belief that there is a relatively lower risk associated with investing in government bonds, than in investing in the growth of the real economy. Hence, there is a safety discount for investing in government bonds.

A real return of 4% for equities and 1.25% for government bonds, means that we expect a steady-state excess return of 2.75%, which is at odds with the historically observed excess return of 3.4% (see Table 1.5). It should be kept in mind though that this historical excess return figure is at least partly due to the fact that equities became more expensive during the period in question. From a steady-state perspective, we do not expect this price increase to be repeated and it might in fact be reversed. This will lead to a lower excess return on equities in our steady-state scenario.

2.5 Inflation

Most economic theories take a real (i.e. inflation-adjusted) perspective on economic growth. Money is often seen as a unit which reflects the prices of goods, but which carries no information in itself. There appears to be a growing consensus among central banks that 2.0% is an optimal level of consumer price inflation and that this target is not symmetrical. Deflation is generally considered to be a more serious threat that has to be prevented at all costs. This suggests a bias towards maintaining a somewhat loose monetary policy in a bid to err on the side of caution as illustrated by current circumstances. Representatives of the International Monetary Fund have even advocated an inflation target of 4.0%. All in all, we expect policymakers in a steady-state environment to actually have a preference for a higher level of inflation than the stated target of below but close to 2.0%. We should also take into account the fact that an inflation overshoot in one year, will almost certainly not be compensated by attempting an undershoot in later years, as this would increase deflationary risks. Finally, policy preferences have clearly shifted towards growth enhancement, even at the cost of somewhat higher inflation (as has been the experience in emerging markets). All in all, in our opinion, an inflation estimate in line with the empirically observed 3.0% is not a bad one.

For references, see our 5-year Expected Returns 2019-2023 publication.

Important Information

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