# The Equity Premium and Low Interest Rates

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"I can calculate the motions of the heavenly bodies, but not the madness of people."

Isaac Newton (1720) on the South Sea Bubble.

## Introduction

In this lecture I can but scratch the surface of an enormous research agenda that since the mid-1980s has tried to explain why the return on equities are so high relative to that on safer assets. The answers close at home may be the best ones: 'equities seem to move up and down so much, they stop me from sleeping, so I want a big premium to allow me to worry less'. Indeed Isaac Newton's attitude to risk also seems about right. On April 20 1720 "he sold his shares in the South Sea Company at a 100 percent profit of £7000. Later an infection from the mania gripping the world that spring and summer caused him to buy a larger number of shares near the market top and he lost £20,000. In the irrational habit of so many who experience financial disaster, he put it out of his mind and never for the rest of his life could he bear to hear the name South Sea."[1] The answer seems clear. Or is it?

The accumulation of financial assets, or what we typically call saving, arises from an attempt to smooth the path of consumption over an individual's or household's lifetime. We expect the assets we accumulate to offer a rate of return sufficient to allow consumption growth to be stable in terms of the real price of goods and services. Given we do not have a crystal ball to reveal the future states of nature, we may want to hold a number of assets that offer variety of payoffs depending on the state of that future world. If we do a good job of covering those states with our portfolio, we may be able to consume in the future in the way that we would want.

What we want to try and do in this lecture is to understand better the payoffs from one class of assets, equities, and see if they are in some sense `too high' or `too low'. We will require a discount on equities if they do not hedge our consumption risk, that is if they provide high payoffs when we are well-off and low payoffs when we are poor. What we mean by a discount is that the current price will be below the actual expected return because of a risk premium that the holder of the asset demands. The conventional wisdom is that asset prices give a high rate of return precisely because they do not allow us to hedge our consumption risk and we as a society, rather like Newton's echo, do rather not like taking on risk.

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[1] Quoted in Kindleberger and Aliber (2011).

What we find is that equities simply do not give a stable excess return. This might result from all kinds of deep changes in the structure of society, the shocks faced and the set of policy responses. One way to think about this lack of constancy is suggested by Aesop. Equities are rather like a hare, they run quickly but are prone to sudden long lived stops. Bonds are more like a tortoise, in that whatever the state of nature they just keep plodding along. In any long race, analogous to the long run, the hare seems more likely to win if the stop probability is not too high and its duration is not too long. But for any short race, in which there is a high probability of a single long stop, the tortoise may just creep ahead.

In Section 2, we will look at the risk premium in the short and long run and give some clues as to the magnitude of the excess return on equities on long run UK data and try to think about risk as the number of bits of consumption we are willing to give up to eliminate uncertainty in consumption. In Section 3, we shall try to measure and estimate this risk. In Section 4, we shall look at the returns from a standard trading strategy that most of us make over our lives. Finally I conclude.


**The Equity Premium**

Let us start with a standard example. If we had $5 given to us in 1950, or placed in an account on our behalf by a friendly grandparent, and chose to invest and continuously roll-over the investment in either short term T-Bills or in equities, the differences by the end of 2014 are astounding. If our kindly grandparent had plumped for the T-Bill we would have $83, but had they taken a pot-shot with equities, the same process would yield some $610. In other words, the $5 in 1950 that would have bought you around 5lb of Porterhouse Steak in Maine in 1950, would buy you a one way ticket to Washington DC from New York this morning, if you invested in T-Bills, or a new iPhone if you had invested in equities.[2] The question is not so much whether you prefer the Train to Washington or the iPhone - but whether you need the offer of the iPhone to compensate you for the risk of equity investment.

Indeed, the average annual return on short term bonds was 4.5% and on equities 9.1% and the standard deviation of short term bonds was 3.1% and for equities 16.8%. The difference in average returns measures the post-war market price of risk in the US and has been used a point of departure for many, many researchers that the facts seem to be treated as universal. A glance at the UK data suggests that they are not. Newton's £1 re-invested from 1717 to end-2014 gives a final amount of nearly £19,000 and yet equities would barely scrape over £3,000. A Waterloo-inspired punt of £5 would almost lead to equality of return at £21,000 and just over £16,000, respectively. A fiver invested at the time of Edward VII's accession would still favour bonds with £990 compared to £550. Indeed, it is only after World War II that returns reflect the standard view. A tenner on Churchill's return as Prime Minister in 1951 would give just over £500 from bonds and just under £850 from equities. Finally, if we had tucked away £50 on the re-issuance of the note in 1981, we would have £327 from bonds and just over £550 from equities. Spookily, the return from bonds is about this morning's price of a return train fare to Manchester from Euston and the return from equities is the price of a new Apple 6s iPhone.[3]

The high return on equities is a double edged sword, as it increases the cost of capital for firms and will tend to reduce the level of long run output. But if it is an equilibrium return that is required for risk bearing then it may not be such a problem. And, indeed, will help savers appropriately fund their retirement plans. On the other

hand, if the required premium on risky versus safe assets is excessive, then we might be introducing all kinds of distortions into firm's investment plans and households savings schedules. Let's see if we can understand which way we should think about this issue.

**Estimating Risk Aversion**

We now need to understand how to quantify risk and we start with some issues developed in the previous lecture. We first draw a mapping from any given level of consumption into a measure of its value to a household. We call this line a utility function and can see that any level of consumption translates into a unique level of welfare. Rather than a straight line, I have drawn this as an increasing function at a decreasing rate. This means that we get higher utility from a higher level of consumption but at a rate that falls for every extra unit of consumption.

Now consider the appearance of £40,000 of consumption units with certainty, perhaps the payoff from a government bond. We can map the level of utility and if we are sure about the pay-off we do not need to ask for a risk premium because if we are going to receive £40,000 no matter what state of nature occurs, there is no risk to quantify and to price. But now consider the possibility that we will get £25,000 half the time and £55,000 half the time: the former is a bad state of nature and the latter a good state of nature. The expected payoff - that is the mathematical average - is unchanged but now we face some risk because in any one period we cannot be sure what will be received. Let us assume that we cannot write some contract with an agent who gets £55,000 when we get £25,000 and gets £25,000 when we get £55,000, which would provide complete risk sharing. The average utility from this kind of pay-off can be found by adding the utility from each state of nature and dividing by two.

We can see immediately that because the utility function is neither linear nor convex: it is concave, the average utility of any two points is always below the utility level derived from the mean level of consumption. Of course, this result derives from our assumptions about the mapping between consumption and utility but it does tell us that in there somewhere is the statement that the household prefers a certain payoff to an uncertain payoff with the same expected return. Would you prefer £40,000 in your pocket or a coin toss for £25,000 or £55,000? The more concave the utility function the more you would prefer the certain payoff because the more risk averse you are.

The average utility gained from the two uncertain outcomes is the same as the household would receive from a lower payoff with certainty. And the difference between the certain level and expected level under uncertainty is the amount the household would be prepared to give up in order to eliminate the risk. Indeed we can also see that if we increase the parameter of risk aversion, the household will bid up its risk premium accordingly. We note that is the risk aversion parameter is 2, given the gamble I have suggested, we would rather get paid £36,250 rather than accept a fair gamble over £25,000 or £55,000, which on reflection may not seem terribly unreasonable. But once risk aversion parameters rise to 10 or 20, we would rather get paid a number as low as £28, 549 or £26, 672 than take the gamble, which does seem a little odd - even to a tenured academic.

So what does the equity risk premium say about this parameter of risk aversion? Is the risk premium driven by the quantity of risk or the curvature of household utility function? Mehra and Prescott (1985) explain that the risk premium on a risky asset should be pretty well pinned down by the covariation of its returns with household consumption times the coefficient of relative risk aversion. In the postwar UK data the excess return on equities compared to short term bonds is of the order of 3.5% per year and the covariation of equity returns with

consumption growth is positive at 0.28% and this implies a large coefficient of risk aversion of over 12. In other words, the average UK household would rather accept around £27,000 than take a fair gamble over £25,000 or £55,000. If these estimates are accurate and stable, perhaps rather than a nation of shopkeepers we are one of book-keepers?[4]

Of course these results on risk aversion might not be completely convincing and the literature has suggested the following caveats.[5] The risk premium may not be stable or innate, as it might be an artefact of a particular time period or series of events. The returns on equities from historical series may suffer from survivorship bias, because we may not adequately account for firms that disappear or go bankrupt. The interest rates on short term government debt might be low because such instruments, akin to money, might offer liquidity.[6] To the extent that the price of debt is higher than it might otherwise be, bond rates are lower and the equity risk premium is amplified. We have considered a standard representation of the utility function but what it does not adequately capture our attitude to gains and losses? The estimated covariation between household consumption and equities might be not be captured well by a representative household assumption. For example, it might very well be that it is richer households are the ones holding equities and thus have face higher risk with respect to equity returns, which would explain the higher risk premia. Finally, what is equities occasionally suffer from a disaster, as Newton found to his cost, in which case equities might be required to give a large pay-out as a reward for bearing the risk of occasional disasters.

A final intriguing possibility is that the action of society's policymakers in seeking to hedge aggregate risk may impact on the equity return. Rather like the costs of business cycles analysis from the previous lecture,[7] aggregate consumption growth is just too smooth for households to seek large returns to hedge their consumption variance, unless, of course, they are extremely risk averse. Naturally, a policymaker with fiscal and monetary policy under their control may be able to do something about consumption variance. But they may also wish to dabble directly in equities. For example, if they are concerned that equity prices may fall and generate a recession, they may wish to make statements about the use of countercyclical monetary policy which supports those asset prices and reduces both their variance and the co-movement with the negative business cycle shocks. Indeed some have argued (see, for example, Miller et al., 2002) that monetary policy was set after the collapse of the dotcom bubble to stabilise equity prices and hence reduce their short-term risk. We might wish to interpret policy in the aftermath of the global financial crisis as a replay of the same set of responses writ large.

**A Trading Strategy**

I would now like to explore the implications of both a long run and short run investment strategy that mimics the possible life cycle of a representative household. We imagine that an individual starts saving at the age of 25 and for forty years saves £100 or $100 every year in 1965 constant prices i.e. so we increase or decrease the amount saved in line with the RPI (UK) or CPI (US). We do not increase the savings stream in real terms. The individual saves every year for 40 years in either bonds or equities e.g. 1965 to 2004 or 1966 to 2005, and re-invest the proceeds in the same asset every year. We run the exercise for the two postwar decades from 1951-1960 and from 1961-1970. We then compare the final pot with the nominal savings over the period and present

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[4]"To found a great empire for the sole purpose of raising up a people of customers, may at first sight, appear a project fit only for a nation of shopkeepers. It is, however, a project altogether unfit for a nation of shopkeepers, but extremely fit for a nation whose government is influenced by shopkeepers." Adam Smith, The Wealth of Nations, 1776.
[5]See Goetzmann and Ibbotson (2006) for an overview.
[6]See Chadha and Dimsdale (1999).
[7]See Lucas, 1985.

the overall relative payoff if you invested in short term bonds or in the equity index. Accordingly, we can evaluate the return from equities versus that from bonds or the profits from a long term `bet' when we have randomly accounted for the year of birth.

Does the equity strategy, exploiting the equity premium, dominate the bond strategy? For the US, basically yes: particularly, those born during the Great Depression (which does sound rather odd!). But there is considerable variation in the returns depending on birth year and so part of the higher average return is exactly a compensation for this uncertainty. In the UK, the pattern is very similar but the excess return is not as high, which suggests that equity investors did not get such a good deal in terms of compensation or that UK investors are less risk averse. But if they were not risk averse they did seem to be willing to diversify into housing.[8]

Finally, we can note that when we collapse the horizon to ten years, the persistent dominance of equities disappears. And this implies that the equity premium does not offer a reliable short term premium for savers. We have, in effect, replayed a version of Aesop's fable about the tortoise and hare. In which bonds play the role of the tortoise - with slow, reliable progress year on year, or rather step by step. And in which equities play the role of the hare, offering rapid returns but also the strong possibility of `sudden stops' or naps. If we imagine such a race, then without stops the hare would win every time. But clearly as soon as we fine tune the game, to even things up, as the probability and duration of stops increases we could in principle make this a fair game i.e. one in which we cannot be sure which animal will win. Indeed, we notice that in the ten-year short version of the race, we cannot really know who will win and so might prefer to back the less risky tortoise.

## Concluding Remarks

The day-to-day variance in equities worries savers. These changes are widely reported and frequently make the front pages of the newspapers or the main item in the evening news. Often the dramatic effect of the story is enhanced with the tolling of the bell that signals the end of a day's trading at the New York. For those of us with memories of second form English lessons, we know well from John Donne the significance of the tolling bell. And so equities do seem to induce a particular kind of fear. This fear should rationally lead us to demand a premium or token reward to sooth our frayed nerves.

The supposed equity premium thus results from the extent of our risk aversion (which is a deep social preference) and from the variance, volatility, of returns and in particularly how they interact with the act of consumption. If equity prices are high when consumption is low, we will gladly hold those equities without the need for a high return and will bid up those prices so that the premium return disappears. Remember that the return from an asset is inversely related to its price. On the other hand, if equity prices are low when consumption is low, for example, in a recession when we value highly one extra unit of consumption, if at that moment the equity price is low, then it does not help us offset the business cycle shock. It is therefore risky and we will not wish to hold it at a high price and will demand a high return in equilibrium. Any finding that says equities always offer a high return is therefore similar to a statement that says we do not really think that equities help us smooth consumption, so we only want to buy them at a large discount.

As is well known, and has been widely explored, the US postwar data seems to suggest a `free lunch' i.e. a high equity return relative to the risk premium we might plausibly expect. This means, and we have illustrated with some very simple examples, that we seem to be able to make high returns from investing over the long run in

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[8]See Aron et al. 2010.

equities. As a side point, if we thought as a firm rather than a saver, we might not think that expensive to sell equity was a good thing as it might in principle skew investment decisions and hold back longer run growth because the elasticity of output with respect to the costs of capital is negative. But even for the US, once we move into the most recent decade that encompasses two equity crashes, the excess returns seem to be dwindling. One possible explanation the follows this reasoning is that equities have become less risky!

The excess returns found in UK data are less clear. Over the very long run with changes in the very modes of production, the scale of wars and postwar needs to rebuild shattered economies, the excess return does not seem at all stable. But in the post-war period, there is also less evidence of a dominant equity return. As a side question here, we might wonder whether these low returns have held back household savings? Or led to distortions in the asset allocation strategy? What we can see though is that there is considerable random variation in returns depending on which year you happened to be born and started saving. This random variation is what you accept when you invest in equities and why a risk averse individual would accept a certainty equivalent payoff at a discount, which might not be that far away from the bond return. And certainly, to the extent that any individual may wish to liquidate their portfolio before term, for example, after ten years, it is not at all clear that equities offer a superior return. There is therefore some small support for the hypothesis evidence that in the UK we have diversified into housing assets, which offer some liquidity through mortgage equity withdrawal and perhaps feed our primal requirement for tangible assets. The problem is that this national obsession has developed into something of a problem.

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