



The Yield Curve

WHAT IT IS AND WHY IT MATTERS

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The Yield Curve: What It Is and Why It Matters

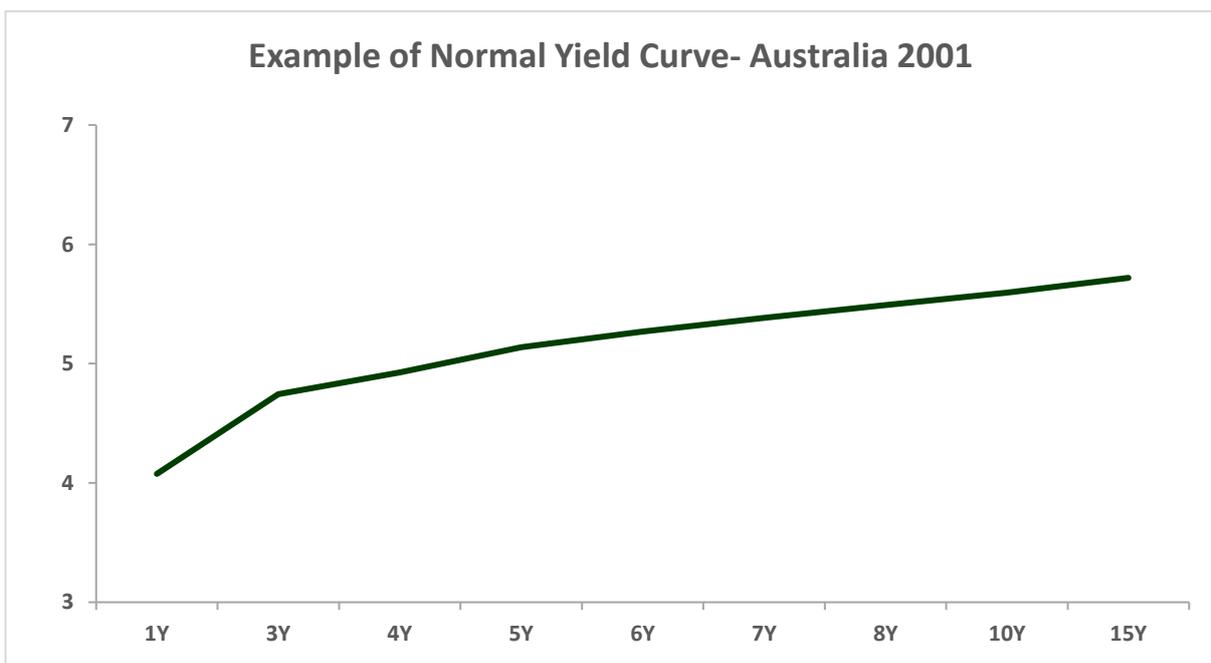
What is it?

The yield curve is a graph that plots the yields of similar-quality bonds against their maturities, ranging from shortest to longest. A yield refers to the percentage return on a given investment. Yield curves reflect the different return an investor will receive from investing in similar risk bonds over different maturity periods i.e. investing over different lengths of time. Yield curves enables investors at a quick glance to compare the yields offered by short-term, medium-term and long-term bonds. The yield curve can take four primary shapes; normal, steep, flat or inverted.

Normal Yield Curves

The normal yield curve depicts short-term bonds with a lower yield than long-term bonds of the same risk. This gives the yield curve an upward slope. This is the most common yield curve shape, and it is sometimes referred to as the 'positive yield curve'. This is the most logical yield curve as it reflects that investors receive higher returns the longer they invest, which is known as a term premium. This positive slope is most commonly associated with an expansionary phase in the business cycle when the economy is operating at full capacity. This is due to investors expecting inflation to rise in the future rather than fall and thus requires a higher yield to earn a similar real rate of return as short-term investments. The normal yield curve is often interpreted as an 'equilibrium', when the economy is at potential, and the market doesn't believe any central bank tightening/easing will occur. The positive slope of the yield curve is justified by a term premium, due to duration (interest rate) risk and liquidity premia. Think of the yield curve always tending towards a normal slope. As the long-term rates are determined by market forces, the long-term yields reflect the market expectations of future central bank rate changes to create a normal yield.

The relationship between future short-term interest rates and the yield curve is what is known as the expectations theory. This theory suggests that the forward rates in current long-term bonds are closely related to the bond market's expectation about future short-term interest rates. Essentially, this hypothesis states that long-term bond rates will move in line with the expected short-term interest rate. Therefore, in an expansion high interest rate expectations cause a positive yield curve. Figure one below represents the Australian yield curve in 2001 which was roughly normal.



The Steepening Yield Curve

The steepening yield curve reflects that returns on long-term bonds are growing faster than return on short-term bonds, signalling economic optimism. This indicates the spread between short-term and long-term interest rates has widened. This yield curve reflects that the economy is expected to improve quickly in the future with short-term rates to rise sharply. This type of curve can be seen at the beginning of an economic expansion (or after the end of a recession). Here, economic stagnation will have depressed short-term interest rates controlled by the central bank; however, long-term rates begin to rise once the demand for capital is re-established by growing economic activity. Inflation is likely to rise in the future and therefore investors need a higher yield to earn the same rate of return. When a yield curve is steep, the market is pricing in central bank tightening. This means that the market believes the central bank will increase short-term rates, eventually creating a normal yield curve at higher short-term rates.

The ‘liquidity preference hypothesis’ states that investors always prefer the higher liquidity of short-term debt and therefore a positive yield curve will always prevail over time. In January 2003, the gap between yields on US two-year Treasury notes and 10-year notes widened to 2.92 percentage points, its highest ever. Currently, the 2-10-year spread is 0.5%, indicating the yield curve has flattened significantly since. This spread was due to positive long-term economic expectations and caused a steepening yield curve as shown in figure 2 below.

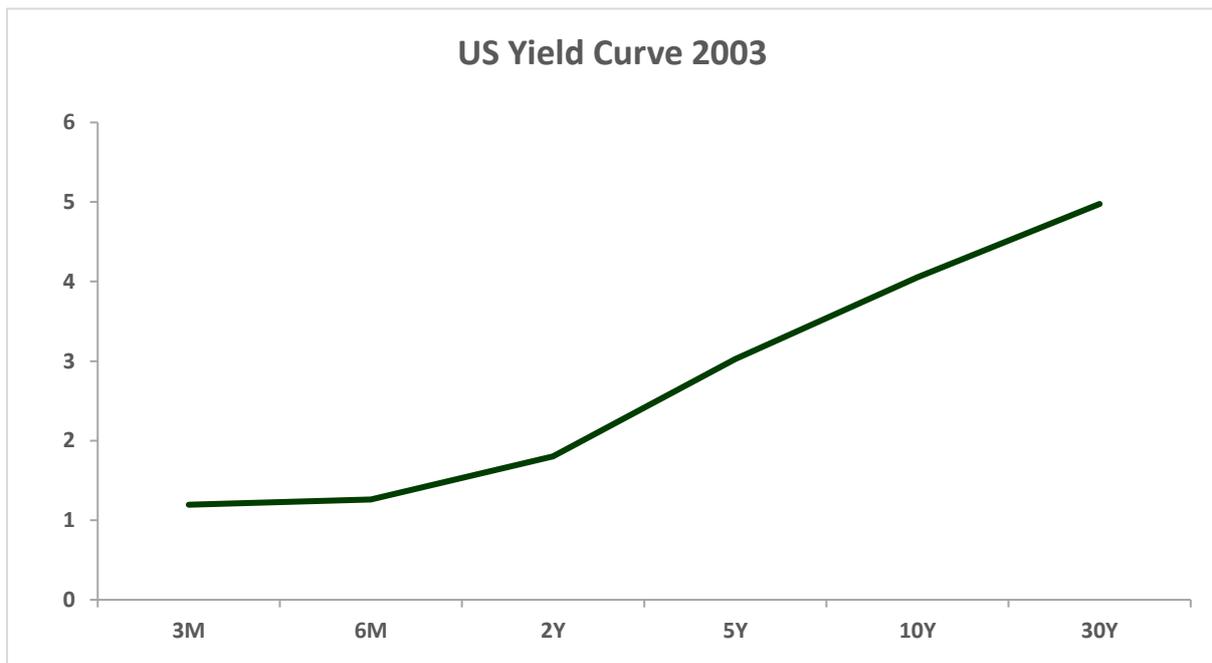


Figure 2: Steep Yield Curve USA 2003
Data Source: Bloomberg

The Flat Yield Curve

A flat yield curve is observed when all maturities have similar yields. A flat curve sends signals of uncertainty in the economy. This mixed signal is often a sign that the yield curve is in the process of changing from an inverted curve to normal or vice versa. It is rare for economies to have a flat yield curve for an extended period.

A flat yield curve is typically an indication investors and traders are worried about the macroeconomic outlook. One reason the yield curve may flatten is because market participants may be expecting inflation to decrease or the central bank to decrease the central bank rate in the near term. Australia displayed a flat yield curve in 2005 prior to the GFC as shown in figure 3.

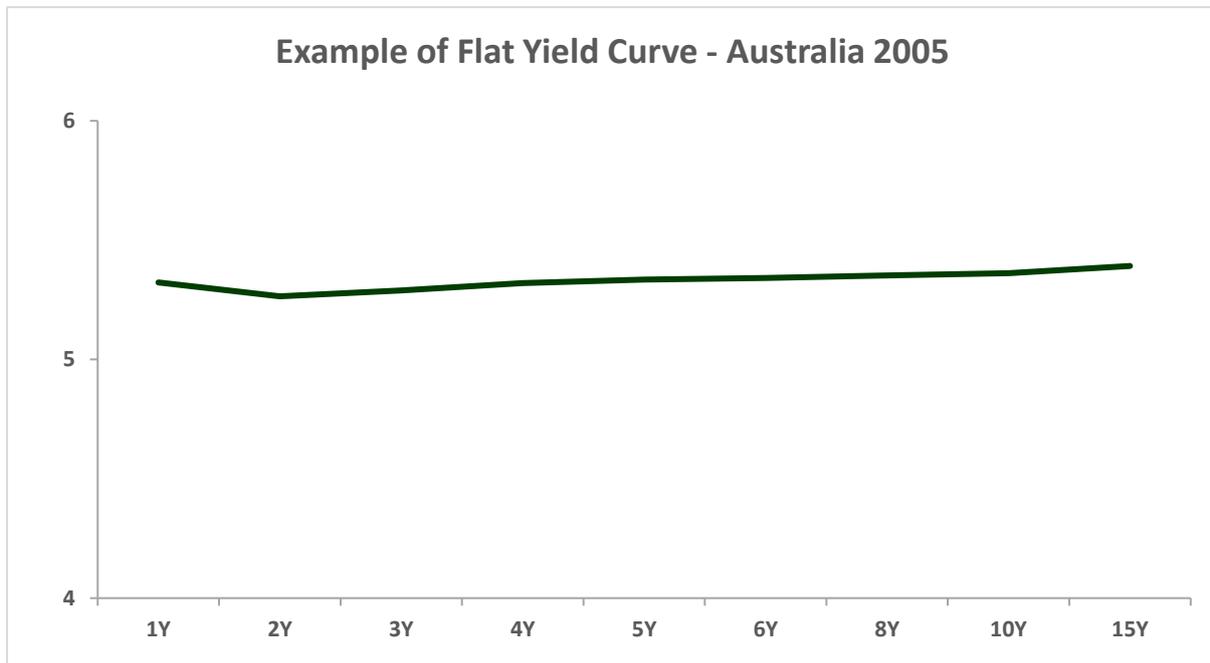


Figure 3: Flat Yield Curve Australia 2005
Data Source: Bloomberg

The Inverted Yield Curve

The inverted yield curve occurs when the term premiums of longer-term bonds fall below zero; that is, long-term bond yields are lower than that of short-term bonds. Therefore, unlike the normal curve, these are downwards sloping.

Given that the yield curve is a reflection of market expectations, an inverted curve is an indication that the long-term outlook is poor and is often a sign of impending recession. For example, the most recent inverted yield curve (recorded in the 2006/07 financial year) preceded the US recession of 2007 by only a few months.

Inverted curves are the result of either relative increases in short-term yields, or relative decreases in long-term yield rates, or both occurring at the same time. If investors expect the long-term yield rate to decrease, they will purchase long-term bonds before yields fall any further, which causes bond prices to rise, and ironically, yield rates to fall. Conversely, as demand decreases for short-term bonds, the price of the latter begins to decrease, and therefore short-term yield rates improve. However, this only has the effect of inverting the curve further.

An inverted yield curve occurs when the market is pricing in central bank easing. In other words, the market believes the central bank will lower short-term rates, creating a normal yield curve at lower short-term rates.

Finally, it is important to note that inverted curves are not always drastically inverted but tend to only have negative slopes for short periods of time. To illustrate this, see below an example of Australia's inverted yield curve from the year 2000.

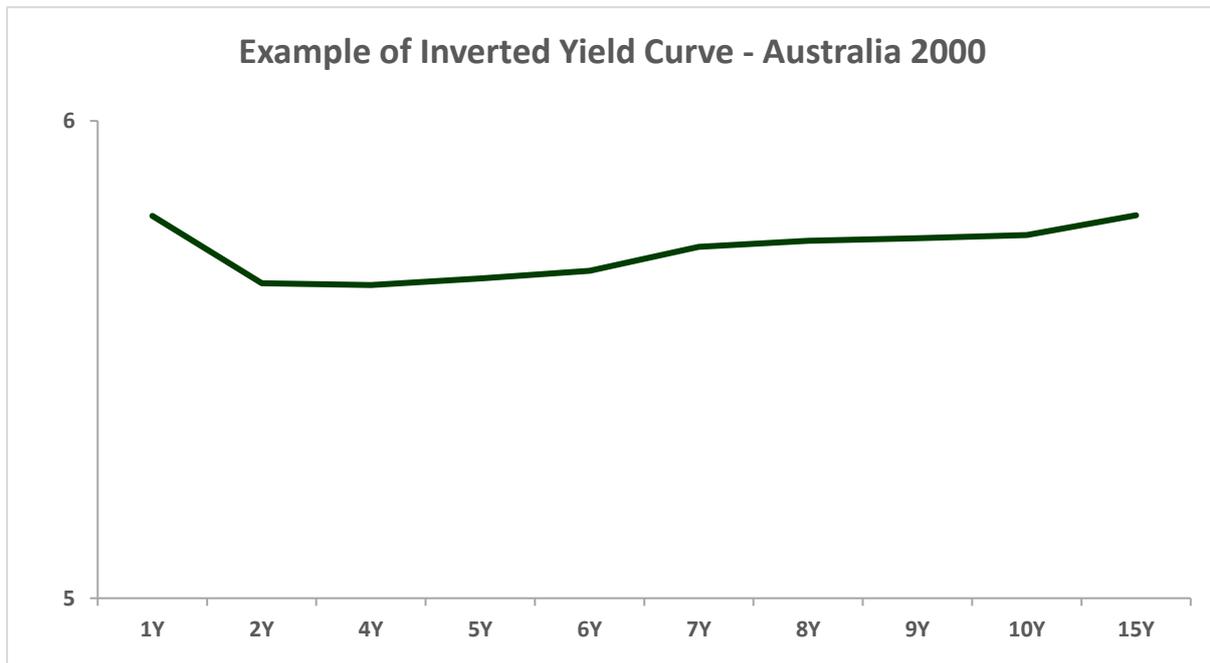


Figure 4: Inverted Yield Curve Australia 2000
Data Source: Bloomberg

Determinants of Yield Curve Slope

Along with investor outlook, the yield curve's slope is also affected by other factors. Key among those are a country's monetary policy and inflation.

Inflation and the Yield Curve

In essence, the yield curve is a predictor of future yields from government bonds, and therefore is shaped by expectations of the economy in the future. For example, a steep yield curve underlies expectations of an upturn in economic conditions and higher levels of future economic activity, which implies higher rates of inflation. Therefore, when purchasing long-term bonds today, investors demand higher yields to compensate the higher rates of inflation, resulting in higher future yields.

When economic growth is expected to remain constant, and as such inflation is not expected to increase, a flatter yield curve appears. Investors do not expect inflationary pressures for the future, and thus demand no compensation in yields, as a real return is more accessible.

It follows then that in the case of expected deflationary pressures, yields decrease, resulting in an inverted yield curve.

Monetary Policy and Yield Curves

Monetary policy is key in determining the slope of the yield curve, as it can influence short-term interest rates. Tightening monetary policy (increasing the cash rate) has the effect of raising short-term interest rates throughout the economy through arbitrage relationships in the money markets. These increases are reflected in returns on shorter term bills and bonds, and have the effect of flattening, or tightening the yield curve. Alternatively, decreases in the cash rate translate to lower yields on short-term bonds,

which has a stimulatory effect on the economy. In this case, we see an increase in the slope of the curve, reflecting the result of the stimulus in the future.

Long-term interest rates on the other hand, are largely unaffected by central banks, as they tend to follow the longer term fundamentals of the economy and financial markets. Therefore, changes in monetary policy have limited effects on the yields of longer term bonds, such as the 10, 20 and 30-year bonds for example.

Effects of Changes in the Yield Curve Slope

Changes in the slope of the yield curve can have follow-through impacts on an economy. These impacts generally begin in the financial sector, initially affecting financial institutions and the stock market.

The Yield Curve and Banks

Historically, steepening yield curves tend to increase the profitability of the banking sector. As previously discussed, a steepening yield curve reflects higher long-term interest rates relative to short-term rates. Banks tend to ‘borrow short and lend long’, so steeper yield curves raise banks’ net interest margins, and therefore the profit they make.

So, for example, if banks borrow funds from 30-day bills at 3% and are able to lend them out to the market at a longer term, let’s say, 1 year, they receive the long-term rate of 6%, and therefore have a higher profit margin.

As the yield curve flattens, this net interest margin (NIM) decreases, and as such profitability declines and credit growth slows, slowing economic growth.

It is important to note however, that while this correlation is considered conventional wisdom, there is not a perfect relationship between yield curves and bank profits. Evidence does show in some cases the relationship is quite literally the opposite of the correlation outlines above. Some reasons for this could be that banks do not always borrow short, instead preferring to spread liabilities over longer periods, as well as the availability of financial derivatives to hedge interest rate exposure, and other risk mitigation strategies being available.

The Yield Curve and the Stock Market

The stock market tends to be inversely related to movements in interest rates. There is considerable evidence to show that when bond yields rise the stock market index declines. For example, let us take the S&P 500 index and compare it to the spread of 3 Month Bills to 10-year US bonds, where we have highlighted recession years in grey. As you can see, through the economic cycle, when interest rates go up, and the yield curve inverts, a recession typically follows. This causes stock prices to go down, as costs of capital increase as well as tight money causing a contraction in the economy, resulting in a lower present value of cash flows produced by companies.

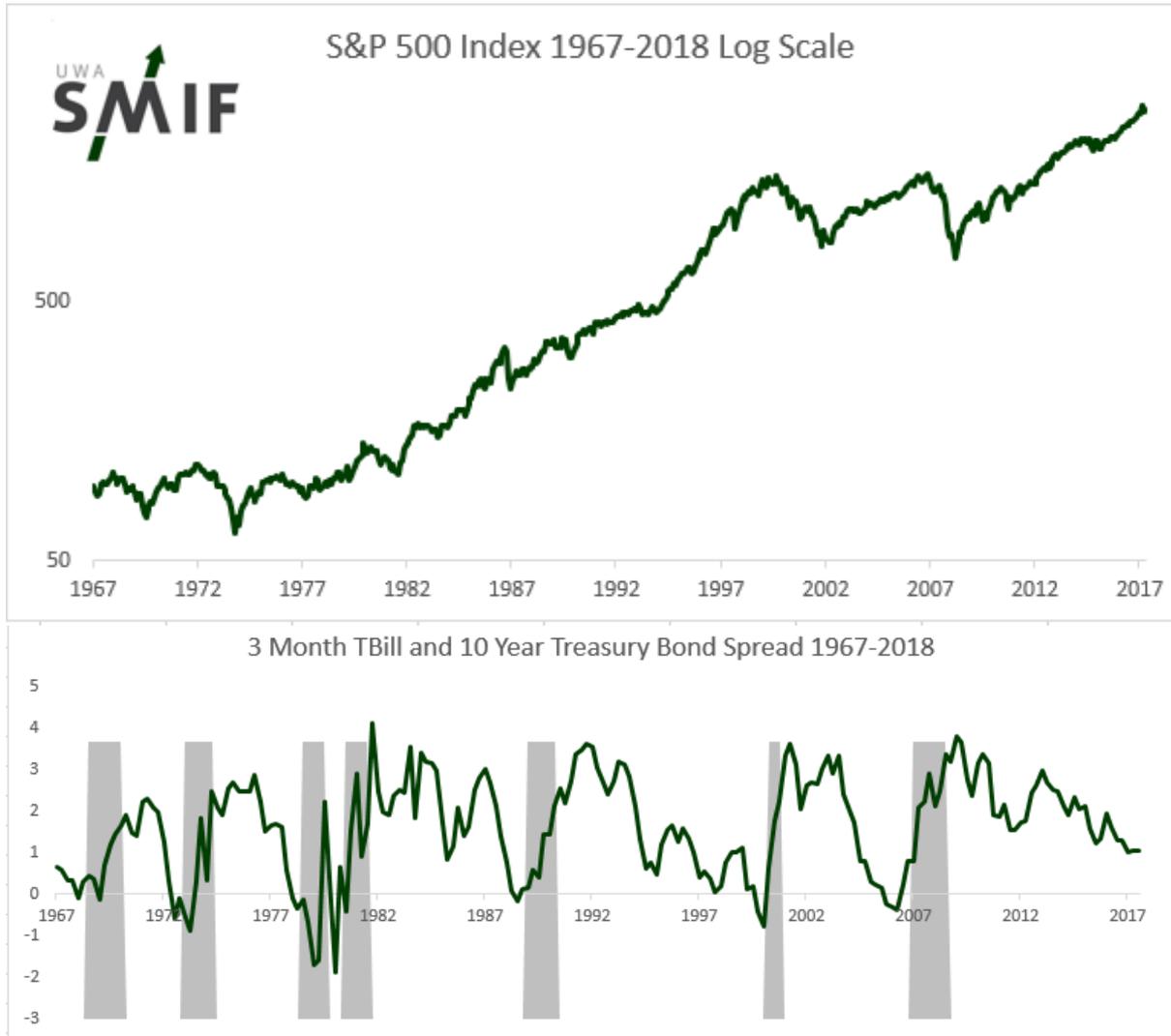


Figure 5: 3 Month T-Bill and 10 Year Treasury Bond Spread
Data Source: Bloomberg

Inverted Yield Curve	1966-1967	1969-1970	1973-1974	1979	1980-1981	1989	2000	2006-2007
S&P 500 Return Post Inverted Curve	-10.30%	-17.53%	-31.71%	-9.65%	-11.96%	-13.27%	-41.12%	-50.13%

Case Study: Yield Curves in the GFC

It is usually in hindsight that the predictive powers of the yield curve are most apparent. Below, we examine the changes in the slope of the US Treasury yield curves prior to, and throughout the 2007 recession we now know as the GFC.

In 2004 we observe a steep yield curve, reflective of strong growth and inflation expectations coming out of the 2000-2002 recession, thus the market pricing the central bank tightening. In 2005 we see an upward sloping, or *normal* yield curve, which shows a clear indication of a positive economic outlook for the future. However, if looked at more closely, a decrease in the gradient is apparent, meaning the Federal Reserve began to tighten, increasing short-term rates. This change is even more pronounced in 2006, where the curves flatten considerably, reflecting a poorer outlook and a possible indication of an economic downturn. Finally, in early 2007 we see a downward slope specifically across 6-Month to 2-year bond yields, reflecting the market's opinion that central bank tightening would cause a recession, causing short-term rates to fall. As you can see in 2008 and 2009, the market

was indeed correct, as the Federal Reserve lowered the Federal Fund Rate to almost 0%. This caused a normal yield curve, and in 2009 you can see the cycle beginning again with a steep yield curve.

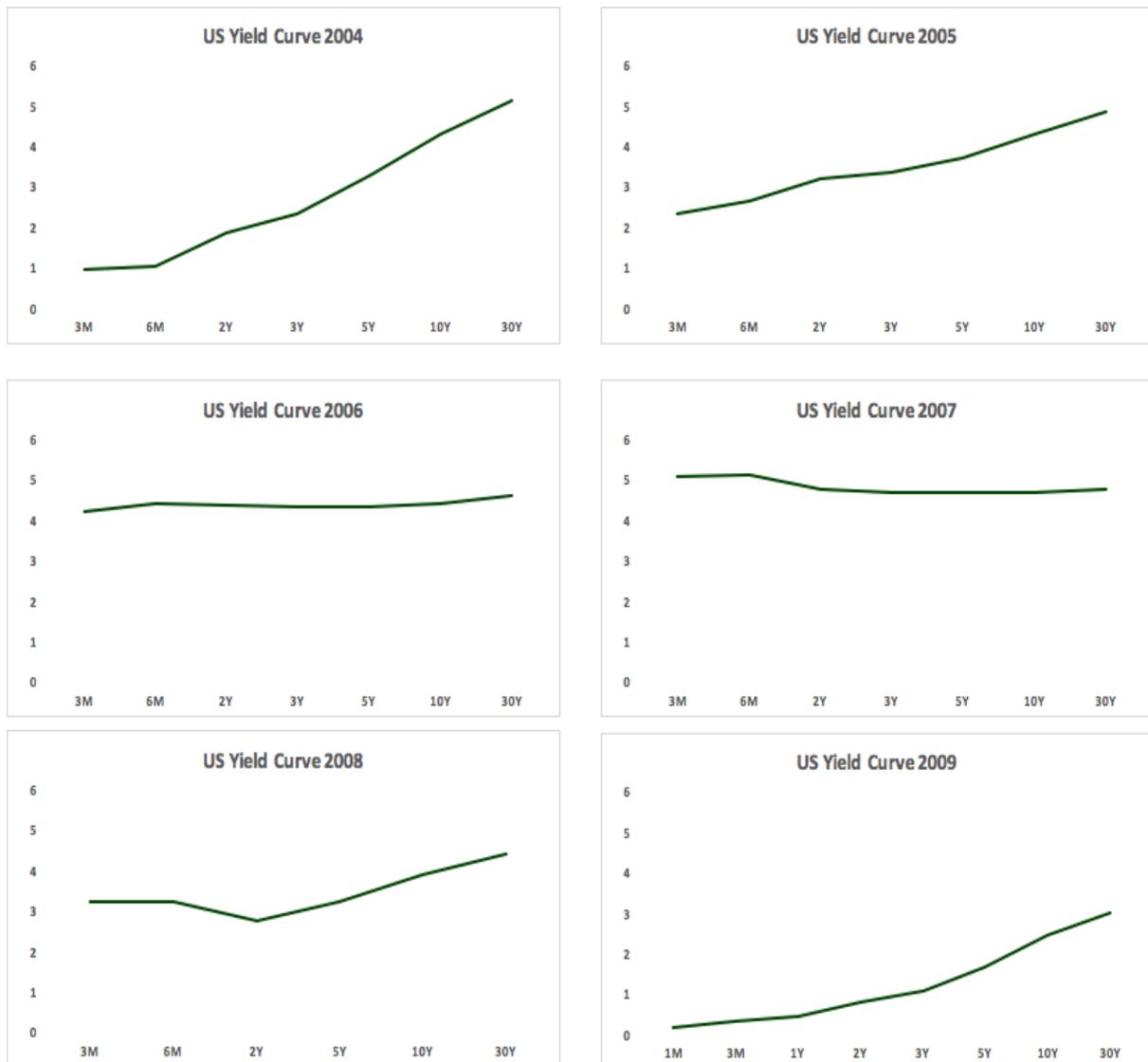


Figure 6: Yield Curve Over the Business Cycle, USA 2004-2009
Data Source: Bloomberg

During that particular period (late 2007 to 2009), the USA saw a banking sector collapse. This led to a major worldwide recession; a testament to the predictive powers of the yield curve. However, it is important to appreciate that the yield curve is a function of market expectations and is therefore an inexact science for fortune-telling exercises in all circumstances.

In 2008, a distinctly inverted curve was indicative of poor economic conditions from the GFC, but from 2009, the outlook for the US improves drastically, as observed through the positive slope of long- and short-term bond yields that year.

Final Summary

The yield curve is in essence a summary of short- and long-term bond yields, which reflects market expectations about the future economic outlook. Normal (upward sloping) curves reflect positive expectations about the future, while inverted (downward sloping) ones indicate the opposite. Naturally, flat yield curves fall somewhere in the middle.

Two key factors influencing the slope of the yield curve are monetary policy and inflation, as they affect the yield rates of short-term and long-term bonds respectively. Monetary policy controlled by the central bank controls the short end of the yield curve, as through arbitrage short-term debt follows the central bank rate. While inflation is affected by rates of economic growth relative to productive capacity and the market's expectations of inflation. Thus, expectations of future central bank policy, drives the long end of the yield curve through demand and supply forces.

To close, we have included below on the next page a few yield curves recorded at the present day. From these it is possible to gauge the economic outlook for six different countries, and perhaps gain an understanding of where we can see them going in the next few years.

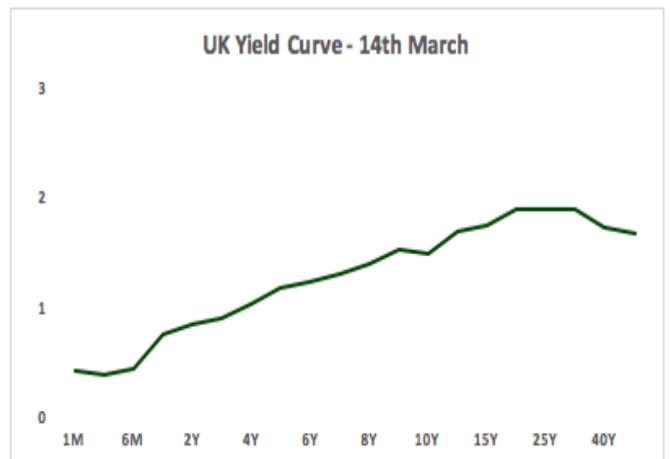
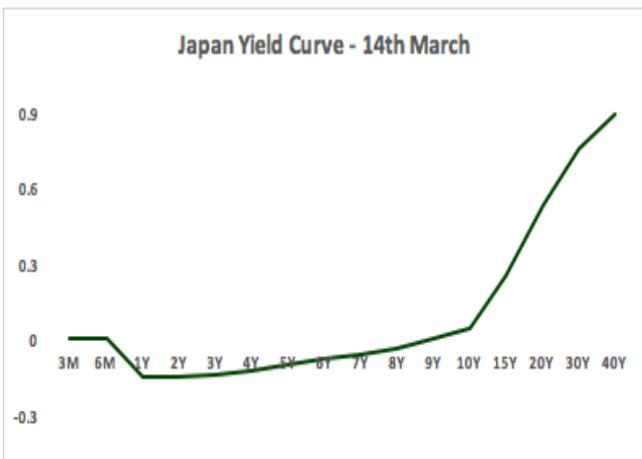
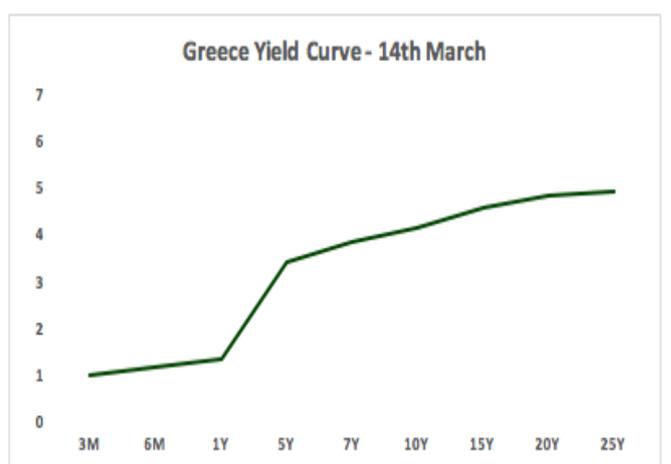
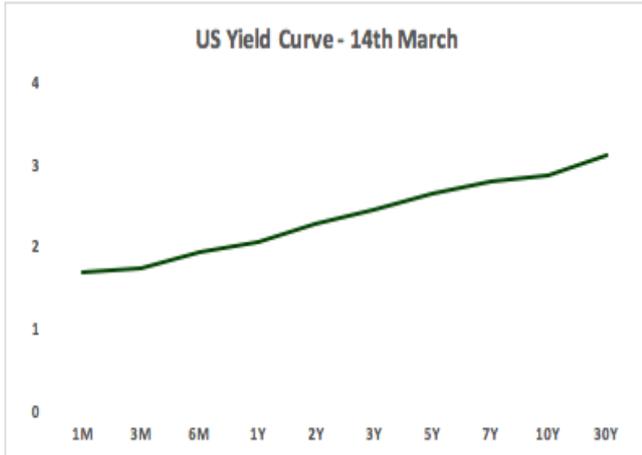
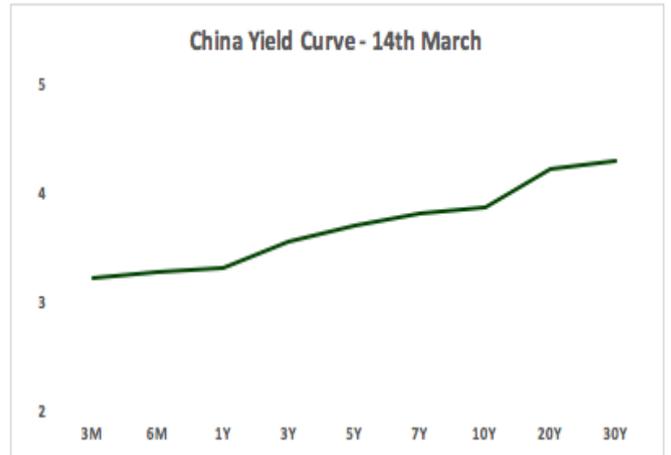
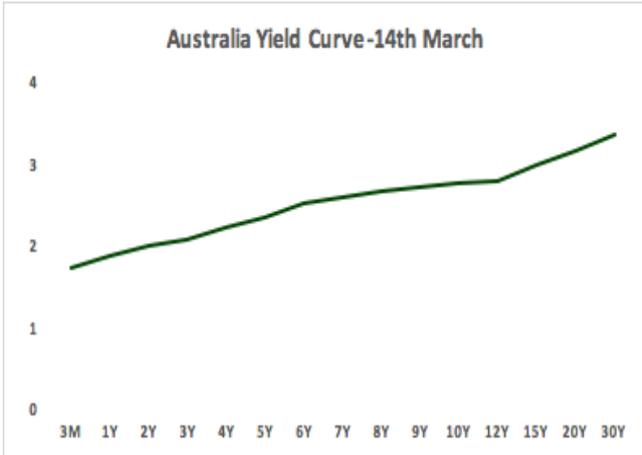


Figure 7: Current Yield Curves of Major Economies
Data Source: Bloomberg