Summary

At Convex Capital, we continuously monitor movements in US yield spreads along with other macroeconomic indicators. After the end of the recession in June 2009, the spread (difference) between the 10-year and 3-month yields reached about 3.8% in December 2010 but since then the trend has been downward. However, during this time the US economy has recovered. Even at the end of the fourth quarter in 2013, when expectations for growth were high (and we had a couple of quarters of good GDP growth), the spread was about 3.00%. Since then the spread has continuously dropped, hitting 2.18% in Dec 2014 even after GDP growth in the second and third quarters of 2014 was greater than 4%.

The recent decline in yield spread has raised concerns about potential headwinds that can hinder the growth momentum starting to take form in the US. However, the current economic conditions in the US indicate that the economy is in a recovery phase. We note that while an inverted yield curve\(^1\)\(^,\)\(^2\) can predict a potential near-term recession, a flattening of the yield curve cannot predict a slowdown in economic growth with certainty.

In this white paper, we explain the relationship between the yield curve and its ability to predict near term recessions in the United States and other countries. We conclude that:

1. While an inversion in the yield curve has predictive power in the US, significant declines in the long term yield (10 years or more) can result in false alarms of a recession when we only consider the slope of the yield curve.

   • Therefore, complementing the yield curve analysis with an analysis of movements in the effective Federal Funds Rate (FFR) provides added valuable information about the potential of a recession.

   • In fact, when we consider the current level of the FFR along with the slope of the yield curve, it confirms our expectations of the US economy—that it will continue to experience a robust recovery in the near term.

2. The predictive power of the yield curve and short term policy rates to warn against near-term recessions is weaker for other countries.

   • Consequently, further empirical analysis needs to be conducted to assess the effectiveness of yield curve analysis in non-US countries (especially emerging markets), in addition to observing macroeconomic trends, to predict recessions.

---

\(^1\) The curve shows the relationship between the interest rate (yield) and the time to maturity.

\(^2\) When the yield curve is inverted (downward sloping)—It indicates that interest rate (cost of borrowing) is higher for bonds with a shorter time to maturity in comparison to an equivalent bond with a longer time till maturity. If the yield curve is inverted, a spread (or difference) between a 10 year and a 3 month US Treasury bond is negative.
Introduction

The yield curve plots the relationship between bond yields and maturities for fixed-income assets with similar credit quality profiles (PIMCO, 2006). Since the 1980’s, economists note that an inversion of the slope of the yield curve serves as a prescient warning signal for a recession in the near future (usually within the next 4 to 5 quarters). Consequently, the yield curve’s use as a leading economic indicator has grown over time by the Federal Reserve Bank, the Conference Board and other financial institutions.

How can changes in the slope of the yield curve predict a potential economic recession? In a growing economy the yield from investing in a fixed-income asset with a shorter term till maturity is lower than the yield derived from investing in a comparable fixed-income asset with a longer term till maturity. This results in a steep, positively sloping, yield curve. Economists provide three hypotheses that affect the slope of the yield curve.

- First, investors generally expect interest rates to rise in the future and therefore, the slope of the yield curve reflects investor expectations³.
- Second, investors require a premium as compensation for tying up expendable income in fixed-assets over a long term period⁴.
- Third and related to the second, the investor requires a greater premium for investing in longer term fixed-income assets in order to insure against future price uncertainty.

Thus when the slope of the yield curve flattens, it may indicate that:

- Investors expect lower rates in the future due to expansionary intervention from the central bank;
- Investors demand higher yields to invest in fixed-income assets with a shorter time till maturity since they expect more investment risk, weaker credit demand, and price uncertainty from deflationary pressures in the near term.

Does the Yield Curve Provide Complete Information Necessary to Predict a Recession? The US Case

All twelve US recessions since 1955 were preceded (approximately 12 to 18 months earlier) by an inversion in the yield curve (Estrella, 2010). Economists continue to investigate potential mechanisms that help bolster the hypothesis surrounding the slope of yield curve’s ability to predict recessionary trends. For instance, Adrian, Estrella, & Shin (2010) find that whenever tighter monetary policy leads to a yield spread below a threshold of 93 basis points, financial intermediaries reduce lending and the consequent reduction of credit supply in the real economy is followed by an increase in unemployment.

However, other researchers point out that the expectations hypothesis does not fully explain yield curve behaviors (Rosenberg & Maurer, 2008). For instance, controlling for the level of the FFR⁵ predicted lower odds of recession in subsequent quarters when the yield curve started to significantly flatten in 1995 (Wright, 2007). It is important to note that Wright is referring to the

³ Pure expectations hypothesis
⁴ Liquidity preference theory
⁵ The federal funds rate (FFR) is the interest rate banks charge each other for overnight loans of reserve balances. A higher federal funds rate makes it more expensive to borrow whereas a lower federal funds rate makes it less expensive to borrow. The Federal Reserve Bank’s reserve requirement limits affect the federal funds rate. When the Fed tightens monetary policy and sells securities to banks, it reduces reserve requirements, putting an upward pressure on federal funds rate. That typically causes market rates to rise, which slows economic activity. The opposite happens in recessions when the Fed eases monetary policy to lower federal funds rate.
“effective” FFR, which is the rate observed in the market and not the target FFR (the short term inter-bank lending rate the Fed aims to achieve through monetary policy). Wright (2007) notes that previous researchers have failed to explain why a rise in short term interest rates carries a predictive content that is analogous to a fall in average expected future nominal interest rates in the next ten years. Economists theorize that long term interest rates are comprised of three unobservable components:

1. The expected inflation over the term of the security,
2. The expected path of short-term real interest rates, and
3. The term-premium.

Since the financial crisis of 2008, all three components have declined in the US.

However, recent trends in the economy suggest that the rate of decline associated with the first two components is likely to come to a halt. To start off, the downward trend in expected inflation has stabilized since 2012 now that the US economy is showing strong signs of a resurgence (Bernanke, 2013). In addition, the Chairman of the Federal Reserve has repeatedly informed the investment community that short-term rates will remain low in the foreseeable future as the employment numbers improve and the economy strengthens.

On the other hand, recent events in the global economy suggest that the third component, the term premium, continues to decline at a more rapid pace. The term premium is the extra return expected by an investor from holding long-term bonds relative to holding a sequence of short term bonds (Bernanke, 2013). In return, the investors need to be compensated for the exposure to interest rate risk—capital gains and losses created by interest changes. The decline in the term premium since the financial crisis in 2008 can be attributed to two changes in the nature of interest rate risk:

1. The declining volatility of Treasury yields, and
2. The increasing value of bonds as a hedge against risks from holding other assets (correlation between bond prices and stock prices has become increasingly negative over time).

As financial stresses in the Eurozone and the slowdown in emerging market economies continue, US treasuries are increasingly viewed as a safe haven. Consequently, domestic and international economic developments post US financial crisis (2008) have pushed treasury yields down further, along with the term premium (Bernanke, 2013).

Unlike the yield curve, trends in the FFR do not incorporate the effects of a term premium (Wright, 2007). Therefore, while the slope of the yield curve can act as a harbinger of recession, it needs to be complemented with trends in the FFR.

In Exhibit 1A, we consider the period between December 1999 and January 2015, which contains two recessions. We plot the US yield spread (10 year – 3 month yield) along with the FFR. Recessionary periods are shaded.

We see that the yield curve inverted (yield spread below zero) mid-way through 2000, about 9 months prior to the recession that started in March 2001. At the same time the FFR had reached the heights of a tightening cycle by the Fed. The Fed started to reduce the target FFR in January 2001 as the economy slowed. They continued to do so over the next two years, with the FFR hitting a low of 1% in 2003. Subsequently, as the economy improved, the Fed raised its target
The Yield Curve’s Ability to Predict a Recession in the US and Abroad - February 2015

Exhibit 1A

FRR, reaching a new high of 5.25% in June, 2006. Then the yield curve once again inverted, warning about an impending recession.

The Fed started to drop its target FFR in late 2007, while trying to increase liquidity as a response to the financial crisis. The FFR has remained close to 0%-0.25% since the financial crisis even though the economy continues to recover. While the Fed’s unprecedented expansionary monetary policy has helped stabilize the FFR close to 0%, we do not expect to see a sudden and significant jump in the FFR in the near future. For example, recent (January 2015) notes from the FOMC indicate that the FFR will most likely remain at this level in the near future given labor market conditions, inflation expectations and international developments. Moreover, banks currently have adequate leverage. Economic conditions and inflation figures also do not indicate a sign of bubble analogous to the housing bubble in 2008.

We provide graphs plotting the spread between the 10-year and 3-month treasury yields and the effective FFR before and after all US recessionary periods since 1968 in Appendix A. All previous recessions show similar symptoms — a rising effective FFR combined with an inverted yield curve (yield spread falls below zero) a few quarters ahead of a NBER defined recession.

In Exhibit 1B (next page), we plot prior episodes when the spread between 10-year and the 3-month yields declined significantly and hovered close to 0%, but did not precede a recession. We also plot the effective FFR along with the yield spread. In all periods, including the current one, we see that the FFR did not increase while the yield spread was declining. This is in contrast to our graphs in Appendix A - cases where declines in the yield spread, accompanied by an increasing FFR, was followed by recessions.
Therefore, we arrive at the conclusion that both movements in the yield spread and the FFR are necessary when predicting a potential near-term recession.

In Exhibit 2, we investigate the “term premium” theory by plotting the 10-year yield, 3-month yield, and the spread between the two from January 2001 till January 2015. Prior to the 2008 recession, the fall in yield spreads was primarily due to rising 3-month yields. In contrast, we see that short term yields have not changed significantly since QE 1 in November 2008. Instead, long term yields have declined significantly. The downward trends in the long term yield, a consequence of the declining term premium phenomenon, seems to be associated with flattening of the yield curve in US bond markets.
Assessing the Shape of the Yield Curve in Other Countries

Next, we consider whether the yield curve provides adequate information about recessions in other countries. While the yield curve is heavily monitored by economists and financial experts in the United States, it is not utilized as widely in the international context. But, Estrella & Mishkin (1997) and Estrella, Rodriguez, and Schich (2003) empirically tested the predictive power of the yield curve in non-US OECD countries using post-1970 data. They concluded that the yield curve’s predictive power holds for other economies such as the UK, Germany, and Japan.

A more recent investigation by Chinn & Kuchko (2010) highlights that while the yield curve has predictive power in some Western-European economies, the analysis suffers a loss of predictive power in non-European economies. Even in the European scenario, the bond market has experienced unprecedented changes since the creation of the Eurozone, resulting in significant changes in the relationship between interest rates and output (Wright, 2007).

Chinn & Kuchko (2010), follow Wright’s (2007) recommendation by adding a short-term interest rate (the central bank’s target rate) to the yield spread for a predictive model. They find that it improves the overall model’s goodness of fit when predicting recessions in the United States and Germany. In contrast, the yield spread becomes statistically insignificant in predicting a recession when a short-term inter bank lending rate is added to the model in Canada, Sweden and the UK. In Japan though, using only the yield spread as an independent variable in a predictive model leads to statistically insignificant results. While analyzing short-term interest rates in addition to the yield spread leads to statistically significant effects for both independent variables, the direction of results does not provide any meaningful interpretation of the impact of short-term rates on the likelihood of a recession.

Exhibit 3

In Exhibit 3, we present the yield spreads in Germany along with the MRO rate (the policy target rate of the European Central Bank). Recessionary periods (as defined by the OECD) are shaded.
We observe that the yield spread between the 3 month Bund yield and the 10 year Bund yield dipped down to 2% before October 2010 and then rose to 3% prior to the recession in January 2011. Moreover, we do not observe a significant increase in the MRO rate before the 2011 recession. Clearly we do not observe a significant inversion in the yield curve, or an increase in the short term policy rate, that we noticed in the US prior to the 2008 recession.

Conclusion

In sum, the US appears to be an outlier where the yield curve and the short term interest rate (FFR) can provide ample predictive information about future recessions. We emphasize on the combined analysis of the yield curve and the FFR when assessing the likelihood of a potential near-term recession. In fact, movements in the yield spread that may lead to an inverted yield curve can often provide conflicting information about the likelihood of a recession when we do not account for the FFR, as observed in the current US economic scenario. In our analysis, we do not find confirming evidence for the yield curve, by itself, to predict economic growth with certainty.

When it comes to non-US economies, the predictive power of the yield curve and short-term policy rates to warn against near-term recessions is weaker than in the US. Further empirical analysis needs to be conducted to assess the added benefits of yield curve analysis in addition to the information provided by traditional macro-economic variables. This is especially true in emerging economies, where bond markets tend to be under-developed.

We also do not recommend comparing the slope of yield curves between the US and other countries. Conducting a comparative analysis of yield curves and short term interest rates across countries does not capture structural and often indiscernible differences between economies.

References


Appendix A

Looking at trends in the yield spread (10-year – 3-month US Treasury Yield) and monthly Federal Funds Rate Before and After Previous US Recessions since 1968 (NBER recessions are shaded out in gray)