ICICI Bank Corporate Solutions

Market Watch

United States: Prospects of Treasury yield curve inversion

Samiran Chakraborty
+91-22-2653-7548
Tanvee Gupta
+91-22-2653-6276

Focus of financial markets is engrossed in the way Fed is visualizing the unfurling of growth-inflation scenario

The U.S. economy is growing at a robust pace in spite of unsteadiness caused by the Gulf of Mexico hurricanes and surge in oil prices. Headline inflation numbers have fallen off their earlier highs but the focus of financial markets has definitely been riveted to the way the Fed is visualizing the unfurling of this growth-inflation scenario. In the recent FOMC meeting on 13 Dec 2005, the Fed hiked rates by 25 bps to 4.25%, but for the first time in this rate hiking cycle it altered its policy stance by dropping the word "accommodative" from the operating part of the FOMC statement. The Fed seemed to hint that the Fed funds target is now close to its "neutral" goal and indicated 'measured policy firming' regarding its future monetary stance. The market is interpreting the developments as a precursor to an imminent Fed pause in the hiking cycle.

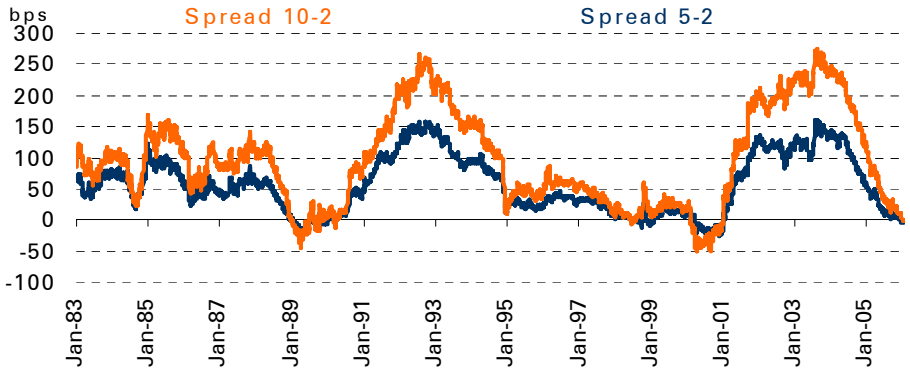
Long-term interest rates have trended lower even as Federal Reserve has raised the key interest rate

Intriguingly, long-term interest rate have trended lower even as Federal Reserve has raised its key interest rate by 325 bps since June 2004. As a result part of the yield curve has got inverted. Questions abound on how long this inversion can persist and whether it is a harbinger of slower growth and eventual recession in the economy. In our analysis we will try to explore some of these issues and try to present our outlook on interest rate spreads in US.

We start with a visual depiction of the spread movements in US, where we consider spreads over shorter horizon and longer horizon separately.

Short horizon spreads

Rapid compression of spreads seen lately



Source: Bloomberg, ICICI Bank Research

Some observations

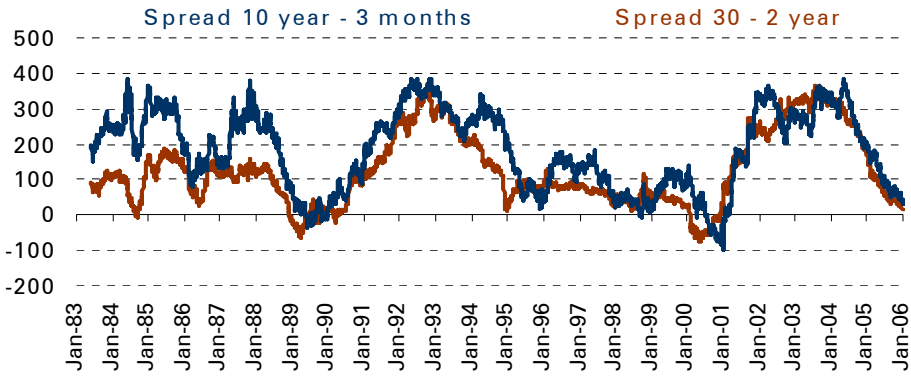
- Rapid compression of spreads happening across categories mainly after the Fed rate hike expectations started building in.
- Over a decade spreads have shown a lot of co-movement.
- Spread compressions in 1989, 1994 and 2000 were also synchronous with

the Fed's tightening moves except in 1989, when the compression in yields did not come through a fall in long term yields.

- In 1989, long term yields initially shot up following Greenspan's appointment as Fed Chairman because market did not expect him to be as hawkish as his predecessor Volcker. But when Greenspan embarked on an equally aggressive tightening, the long end crashed and the curve remained inverted for a significant amount of time.
- The last significant inversion of the yield curve happened in 2000.
- Spreads for different time horizons roughly follow a similar pattern although the absolute numbers can be somewhat different.

Long horizon spreads

Spreads for different time horizons roughly follow a similar pattern



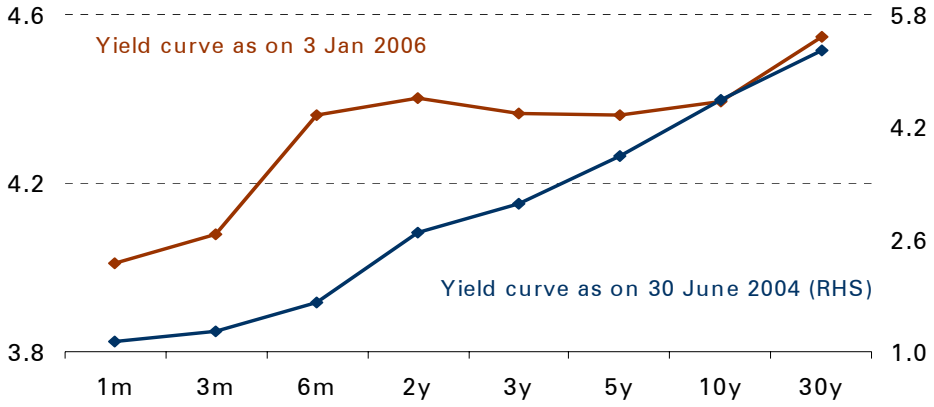
Source: Bloomberg, ICICI Bank Research

Why is the flattening happening? Some explanations

The yield curve flattens on account of simultaneous increase in short-term rates and stable to declining long-term yields. More specifically, when the market expects that the Fed is more concerned about its inflation fighting objective rather than its growth-promoting objective, long-term inflationary expectations come down along with the long end of the yield curve. Here, the presumption is that the long end yields are nothing but the sum total of short-term yields and inflationary expectations. Historically, in such a scenario yield curve inversion is a likely outcome.

Yield curve on the critical segment (5-2 year and 10-2 year) has shown signs of inversion

In this tightening cycle, while the yields on 10-year Treasuries have declined by 19 bps since the start of the cycle (June 2004), those on the 2-year bonds have increased by around 173 bps, thus indicating flattening of the curve. The yield curve on the critical segment (5-2 year and 10-2 year) has shown signs of inversion, with the spread touching -5 bps as on Jan 2, 2006 for 5-2 year segment.



Source: Reuters, ICICI Bank Research.

Greenspan's 'Conundrum' - In U.S., the more distant forward rates declined at the same time that short-term rates were rising

Ideally according to the preferred habitat theory, the interest rate on a long-term bond will equal the average of the short-term interest rates expected to prevail over the life of the bond, plus a term premium. However, in the case of U.S., the more distant forward rates declined at the same time that short-term rates were rising. Greenspan christened it as a "conundrum" but still some tentative explanations can be put in place.

Pension funds and insurance companies prefer fixed income assets because they are less volatile

1) Pension funds and insurance companies buying long-dated bonds

Increase in the retiring population in the developed world generates concern about under- funding of retirement plans. Pension funds are trying to address the issue by buying longer-term bonds. Pension reform proposals favoring mark-to-market valuations of assets over smoothed actuarial valuations will tilt allocation towards fixed income assets because they are less volatile.

2) Foreign Central Banks buying at the long end

Foreign Central Banks sitting on huge reserves are investing heavily into longer – term US treasuries. Their investments are now close to half of total marketable securities issued in 2005 and have been increasing significantly while the investment by private players within US has dropped sharply. It has to be borne in mind that the Central Bank investment data reported here does not take into account Treasuries purchased by foreign broker dealers on behalf of Central Bank clients.

Structure of holding in US Treasuries

Foreign Central Banks sitting on huge reserves are investing heavily into longer –term US treasuries

Year	Total Marketable Securities (USD bn)	Held by Fed	Held by state and local governments	Foreign & International holdings	o/w recorded holding of foreign central banks	Held privately in U.S.
2000	3038	17%	5%	34%	20%	44%
2001	3028	18%	6%	36%	20%	40%
2002	3246	19%	6%	39%	24%	36%
2003	3666	18%	6%	42%	25%	34%
2004	4017	18%	6%	47%	29%	29%
2005*	4064	18%	5%	50%	-	27%
* As of June 30 , 2005						

Source: Dept. of Treasury- U.S. and others, ICICI Bank Research

The situation becomes even clearer when we look at foreign purchase as a proportion of total new issuance of marketable treasuries.

Foreign purchase of new Treasury issuance

Foreign holdings of U.S. treasury securities have been growing rapidly in recent years

Year	Net Increase in Marketable Securities (USD bn)	Net purchase by Foreign & International sources (USD bn)	As %of net new issuance	Average maturity of new Treasury issuance
2002	218	163	75%	2.1
2003	421	275	65%	2.3
2004	351	367	104%	2.9
2005	47	124	265%	-

Source: Dept. of Treasury - U.S. and others, ICICI Bank Research

Here the above table clearly elucidates the fact that foreign holdings of U.S. treasury securities have been growing rapidly in recent years. One reason for this might be that Investing in U.S. Treasury securities is less risky for these central banks than putting their money in corporate stocks and bonds. Moreover, with sluggish growth seen in European and British economies, investors hope to get a better return on U.S. bonds than they can in their home countries.

The following table presents the possible impact of Central Bank financing on long end treasuries. There are concerns that a windfall of foreign money has pushed the yield on Treasuries (at the long end) lower than it would be otherwise. Although the estimates vary a lot, there is considerable agreement that the impact effect is significant.

Estimates of impact of central bank financing at the long end

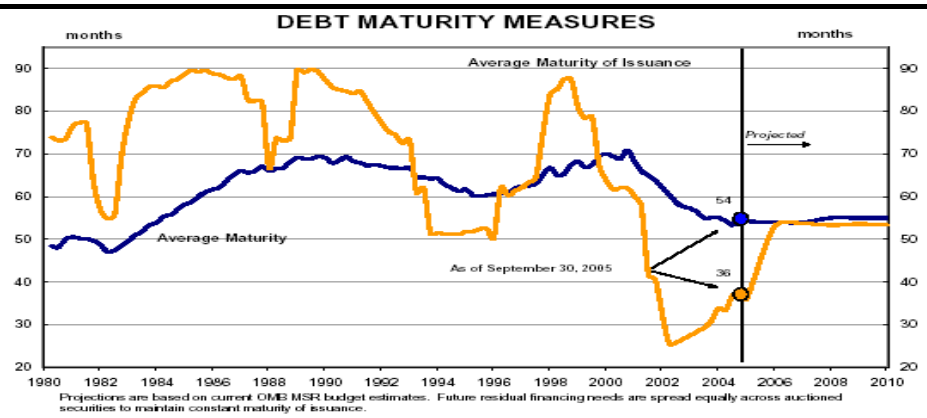
Surge in foreign money flowing into U.S. has pushed the yields at the long end lower than it would be otherwise

Report	bps
Goldman Sachs	40
Sack (2004)	40
Truman(2005)	75
Federal Reserve (2004)	50-100
PIMCO	100
Morgan Stanley	100-150
Francis E. Warnock	150

3) Supply of Treasuries not coming in the long end

Some analysts have argued that lack of supply of securities in the long end has pushed up prices and compressed yields. The following diagrams try to illustrate the point.

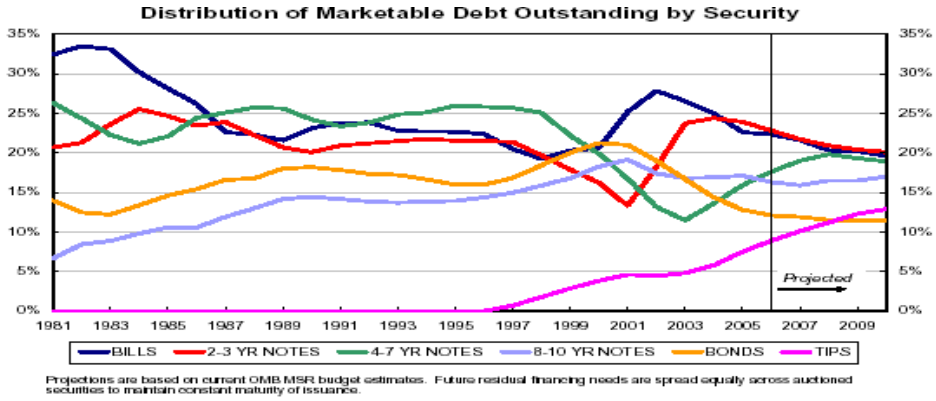
Average maturity of issuance has risen on account of re-introduction of the 30- year bond by U.S. Treasury office



Source: U.S. Dept. of the Treasury, ICICI Bank Research

From the diagram it is clear that the average maturity of new issuances took a huge dip after 1998. It has increased somewhat in the last couple of years and remains largely stable over the forecast period. However, average maturity of issuance has risen to 54 months from earlier lower levels largely due to re-introduction of the 30-year bond by the U.S. Treasury office.

A similar idea is reflected when we plot the amount outstanding of different maturities against each other. 4-7 Year notes and TIPS are increasing as share of debt outstanding while 2 – 3 year notes and T-bills outstanding have been projected to continue on a downward trend. Long duration bonds have also shown significant declines along with almost unchanged supply in the 8-10 year segment. Lack of supply in the longer end has pushed up prices and kept the yields down.



Source: U.S. Dept. of the Treasury, ICICI Bank Research

Lower maturity of debt increases the need to rollover debt frequently. A reduced appetite of Central bank's for rollover is an important risk factor, which might push up yields dramatically.

4) Credibility of the Fed reducing the inflation premium on the long end

There are concerns that decline in long term yields reflects expectation of lower inflation

There are concerns that a decline in long term yields can be attributed to expectations of lower inflation and a reduced risk premium resulting from less inflation volatility. In simple terms, this reflects the ability and willingness of the Fed to fight inflation tooth and nail. Market participants are unwilling to take a view on rising inflation levels and expect long term nominal yields to be stable.

5) Globalization and reduced inflation premia worldwide

Integration of global markets has contributed to lower inflation

In a recent speech Greenspan has argued that globalization of trade and financial flows, especially after the breakup of Russia and the emergence of China and India as major players, has led to the tapping of low-cost productive sources and capacity expansion. Also, investment costs have reduced because of enhanced cross-border flows. This integration of global markets has definitely contributed to lower inflation in quite a few countries.

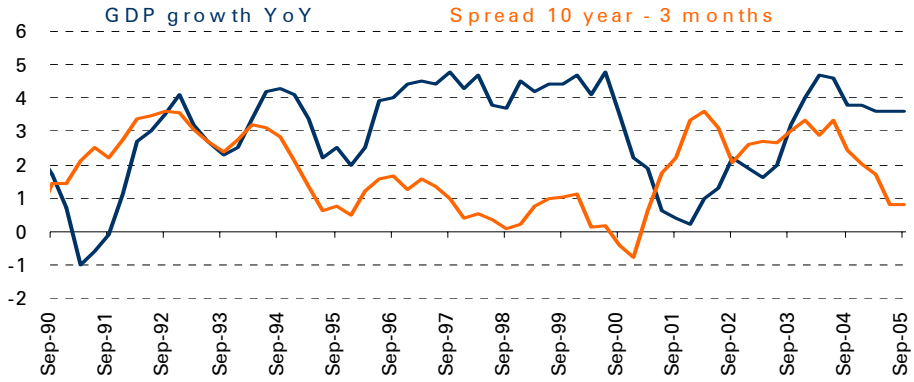
With oil prices softening after witnessing significant volatility on account of Gulf hurricanes in past few months, the inflation outlook now seems fairly benign.

6) Lower spreads signaling periods of economic weakness in the near future

Greenspan has acknowledged this as a possibility. Spreads are being talked as the crystal ball to gaze at. Let us analyze in detail whether that can be a significant feature.

Yield spreads and economic performance

The yield spread four quarters ahead is an important forecaster of current economic growth



Source: Bloomberg, ICICI Bank Research

As can be seen from the figure above, the yield spread a year earlier is an important forecaster of economic growth. This is so because short-term interest rates are most sensitive to monetary stance of the Fed. Thus any rise in Fed rate would most likely push up the short term rates, thus have a negative impact on output and employment in the economy.

Historical evidence of recession and yield curve inversion

The gap between the short-term and long-term interest rates has been thought of as a good predictor of future economic performance. Negative yield curve spreads often tend to signify recession. The following table evidently indicates that all the US recessions after 1964 have been preceded by yield curve inversion or significant flattening.

Recession	Inversion of yield curve	Lead time
	1966:Q3 - 1966:Q4	
1969:Q4 - 1970:Q4	1968:Q2, 1968:Q4, 1969:Q4	6 qtrs
1973:Q4 - 1975:Q1	1973:Q2 - 1974:Q1, 1974:Q4	2 qtrs
1980:Q1 - 1980:Q3	1978:Q4 - 1980:Q1	5 qtrs
1981:Q3 - 1982:Q4	1980:Q3 - 1980:Q4, 1981:Q2, 1982:Q1	4 qtrs
1990:Q3 - 1991:Q1	1989:Q2	5 qtrs
2001:Q1 - 2002:Q1	2000:Q3 - 2000:Q4	2 qtrs

All the U.S. recessions after 1964 have been preceded by yield curve inversion or significant flattening

The periods of recession are taken from NBER definitions, which are more general than the two-quarter declining real GDP definition used commonly. Periods of an inverted yield curve are defined as time periods when there is a negative difference between the 5-year zero coupon yield and the 3-month T-bill yield. The 5-2 spread however does not provide such a perfect correlation. The lead-time differs widely from 2 quarters to 6 quarters. It is observed that after the onset of recession yield curve can either remain inverted (1973:Q4 – 1975:Q1) or revert back to normal shape (2001:Q1 – 2002:Q1).

Econometric studies have also demonstrated the predictive power of the term spread over any other variable in the two or more quarters horizon (Estrella and Mishkin 1996, Stock and Watson 2001, Ang, Piazessi and Wei, 2004). Yield curves are better predictors of economic growth than equity market, leading indicators and even professional forecasters. (Haubrich and Dombrosky) But in some cases short rates provide better forecasts if dynamic inter linkages between GDP and yields are taken into account.

Recession probabilities given the yield curve spread

Specifically, Estrella and Mishkin estimated recession probabilities based on the interest rate spread between the 10-year Treasury note and the three-month Treasury bill.

With the current spread the probability of a recession happening within a year is in the vicinity of 15-20 %

Recession Probablity	5	10	15	20	25	30	40	50	60	70	80	90
Spread	1.21	0.76	0.46	0.22	0.02	-0.17	-0.50	-0.82	-1.13	-1.46	-1.85	-2.40

(Source: Estrella and Mishkin)

According to them, the smaller the interest rate spread between the long and short-term interest rates, the greater the probability of recession four quarters ahead. In sum, the probability of recession rises moderately as the yield curve flattens and increases dramatically as it inverts. With the current spread of around 31 bps, the probability of a recession happening within a year is in the vicinity of 15-20 %, which is not alarming. The spreads will have to narrow to 17 bps to raise the probability to 30%.

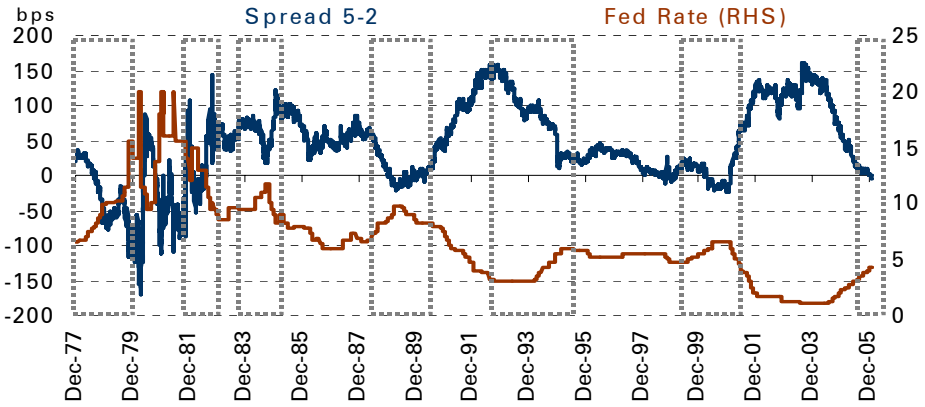
Relationship between yield curve inversion and recession might not be so straightforward this time around

We believe that the relationship between yield curve inversion and a recession might not be so straightforward this time around. Traditional way of looking at yield curve inversion stress on the inflationary expectations channel to raise the spectre of recession but if the reason behind an inversion can be traced to a pure demand-supply mismatch, then the association with recession might not hold.

Fed rates and yield curve inversion

The plot of spread between 5-2 year yields on U.S. Treasuries and fed fund rate signifies that as Fed reaches close to the peak of its tightening cycle, the spread turns negative.

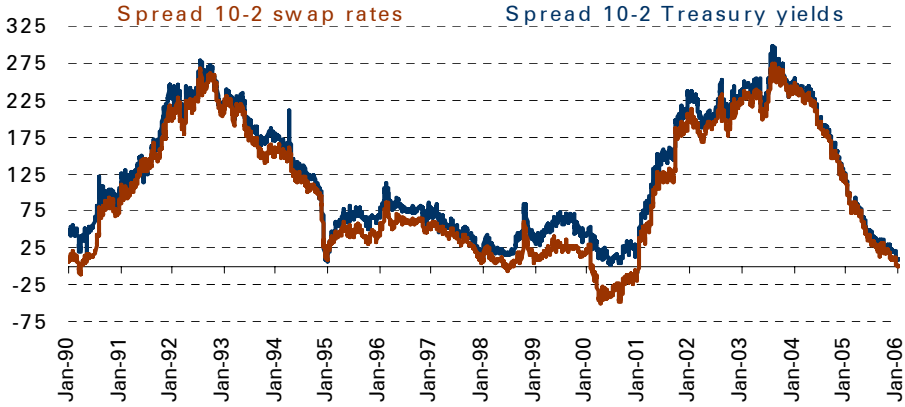
As Fed reaches close to the peak of its tightening cycle, the 5-2 year spread turns negative



Source: Bloomberg, ICICI Bank Research

Treasury yields and swap rates spread – moving in tandem

Treasury yields moving closely with Swap rates



Spreads between Swap rates and Spreads between Treasury yields have historically shown a lot of co-movement. The factors responsible for a Treasury yield curve inversion as identified above, can qualify as explanatory variables for swap spread movement as well. The only distinguishing factor seems to be the fact that the swap spreads have exhibited extreme stickiness at close to zero levels. So, even if the Treasury yields start getting inverted, inversion of swap spreads might take some time to come.

There is a high likelihood that the yield curve will remain inverted till end- March

Potential economic outlook

We are of the opinion that the federal funds rate would peak at 4.75%. To get there the Federal Reserve would raise rates a quarter point in January and then finally in March under the chairmanship of Ben Bernanke. There is a high likelihood that the yield curve will remain inverted till end- March. However downside risks to our view stems from 2 factors. One is the FOMC minutes releasing on Jan 3, 2005, which possibly will provide clues to Fed watchers about the expected move of the FOMC in

the next meeting. Secondly, it is probable that in the Jan end meeting, the Fed might indicate that it is not nearing the end of its long tightening cycle – this would extend the inversion of the yield curve further.

Moreover, with U.S. Treasury resuming issuance of its 30-year bond in February 2006, its impact on yields is fairly uncertain. It might be possible that the greater supply at long end of the curve would depress prices and nudge yields higher. This might help to overcome yield curve inversion to some extent.

Gyrations in the yield curve should not be perceived as a sign of economic slowdown

Here it is apt to mention that the relative stability in long-term rates in the U.S. seen recently has spurred housing market loans and underpinned consumption. As long as this chain of events does not get disrupted, the risk to the growth outlook is limited. This gives some sort of relief to market participants. Since the current economic outlook in United States continues to be upbeat and inflationary expectations remain well anchored, we are of the opinion that recent gyrations in the yield curve should not be perceived as a sign of a future recession in the economy or economic slowdown. However, as the yield curve steepen slowly with a subsequent pause in Fed's tightening cycle, we perceive the risks of U.S. economic slowdown emanating from breakdown of the above channel.

ICICI Bank
ICICI Bank Towers
Bandra Kurla Complex
Mumbai- 400 051

Phone: (+91-22) 2653-1414

Treasury Research Group

Economics Research

Samiran Chakraborty	Chief Economist	(+91-22) 2653-7548	samiran.chakraborty@icicibank.com
Tanvee Gupta	Fixed Income Economist	(+91-22) 2653-6276	tanvee.gupta@icicibank.com
Priyanka Pahwa	Fixed Income Economist	(+91-22) 2653-8942	priyanka.pahwa@icicibank.com
Sonal Varma	Currency Economist	(+91-22) 2653-6276	sonal.varma@icicibank.com
Manpreet Gill	Currency Economist	(+91-22) 2653-8922	manpreet.gill@icicibank.com

Derivatives Research

Bhaskar Gurnani	Fixed Income	(+91-22) 2653-8940	bhaskar.gurnani@icicibank.com
Vibhor Mittal	Forex	(+91-22) 2653-7549	vibhor.mittal@icicibank.com
Sivakumar Upadrasta	Fixed Income	(+91-22) 26537206	sivakumar.upadrasta@icicibank.com

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