

The Road to Profitability is Paved with Volatility-Adjusted Carry

US Interest Rate Strategy

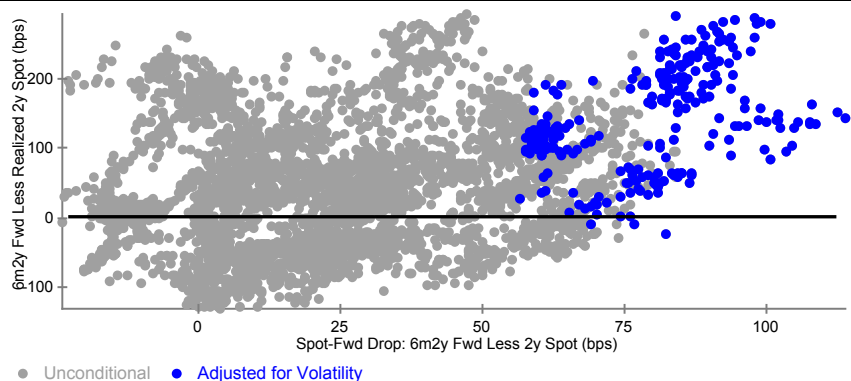
Research Analysts

George Oomman
 +1 212 325 7361
george.oomman@credit-suisse.com

Michael Chang
 +1 212 325 1962
michael.chang.2@credit-suisse.com

- When evaluating trades within a carry/rolldown framework, we strongly recommend that investors factor into their analysis market levels of volatility.
- Since investors earn the full carry/rolldown in a scenario that assumes an unchanged reference yield curve, investors are implicitly short volatility in positive carry/rolldown swap trades.
- Contrary to the widely held belief that positive carry drives profitability, we find no correlation between terminal P&L and carry at the initiation of the trade. However, we find that elevated levels of positive carry adjusted for market volatility are a consistent indicator of future profitability.
- Under current market conditions, carry and rolldown are most elevated at the front end of the yield curve.
- After accounting for levels of market volatility, we favor receiving outright in 6-month forward-starting 2-year swaps.
- Carry and rolldown are most elevated for the 5s30s and 2s10s steepeners across the spectrum of curve trades and are also at the high end of their historical range.
- After accounting for market levels of volatility, we favor establishing 1-year forward-starting steepeners in 5s30s. We also favor 1-year forward 2s10s steepeners but will wait for better entry levels
- These trades should be suitable for investors who believe that the Fed will fail to deliver on the implied hikes priced into the curve resulting in the forwards failing to get realized.

Exhibit 1: Terminal P&L to six-month horizon on receiving in a 6-month forward 2-year swap is correlated to carry/rolldown at the initiation of the trade after adjusting for volatility



Source: Credit Suisse Locus

The Road to Profitability Is Paved with Volatility-Adjusted Carry

When evaluating the attractiveness of any swaps trade (outright, curve, or fly), carry and roll are important factors to consider in the analysis. Carry and rolldown reflect the potential return on a swaps position assuming an unchanged scenario for a reference yield curve (for example, the par swap curve or the forward swap curve) over some given fixed horizon.

- Specifically, “carry” is the portion of the expected return that is attributed to the net income earned between the various payments that are received and paid out to the horizon date.
- “Roll-down” is the portion of the expected return that is attributed to the capital gains/losses on the swaps positions if the reference curve remains unchanged and the trade simply ages, resulting in an MTM at a lower swap yield.

Positive carry should be adjusted for market levels of volatility to determine whether investors are being adequately compensated for implicit short vol exposure

While carry and roll reflect only the potential return that investors earn for a very specific “unchanged” scenario for a reference yield curve and not the actual realized return in the presence of yield curve volatility, they are still useful measures in judging the attractiveness (positive carry and roll) or punitiveness (negative carry and roll) of various swaps trades. Since trades that carry positively and have positive rolldown are implicitly short volatility, we show later in this report, they should be compared relative to market levels of volatility in order to evaluate whether investors are being adequately compensated for selling volatility albeit implicitly. Trades based on the carry/rolldown framework are assumed to be static positions held to a fixed horizon (although they need not be due to forced unwinds and adverse MTM). In contrast, the trading of short-term dislocations in risk premia of market spreads needs to be managed more dynamically based on the strength of the dislocation from fair value and is beyond the scope of this report. However, it is worthwhile to note that in both frameworks, investors are implicitly selling the tails of some underlying distribution and are implicitly short volatility.

Below we review the carry and roll calculations for both spot and forward starting swaps, swap curves, and swap flies. Additionally, we recommend several preferred measures used to determine the optimal points in swaps space from a carry-and-roll perspective. Most of this analysis can be done on Locus, the Credit Suisse online analytics platform. (Please contact your Credit Suisse sales representative to gain access to Locus.)

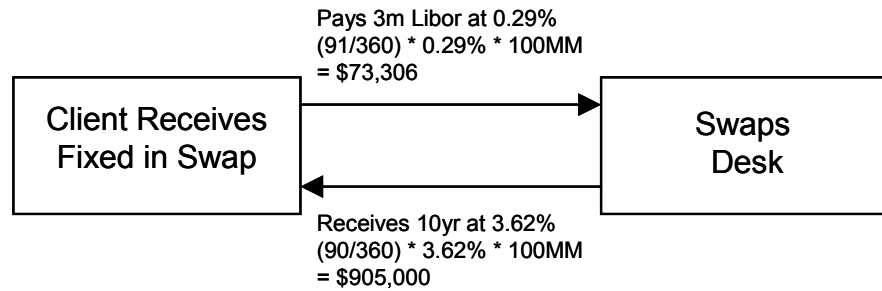
Spot-Starting Swaps

Income carry is the net interest payment earned on a spot swap

The expected total return on a spot-starting swap is comprised of the net fixed versus floating payments earned (income carry) and changes in the valuation of the swap when rates remain unchanged (rolldown). Because by definition the NPV of a swap is zero only when the forwards are realized, an unchanged rate scenario that fails to follow the forwards would always result in changes in the swap’s valuation.

For a simple example, when an investor receives a 10-year swap fixed at 3.62% and pays floating at 3-month LIBOR 0.29% on \$100MM notional, the net income carry for a three-month horizon is \$831,694. See Exhibit 2.

Exhibit 2: When the 10-year rate exceeds 3-month Libor, receiving fixed in swaps is a positive carry trade



Source: Credit Suisse Locus

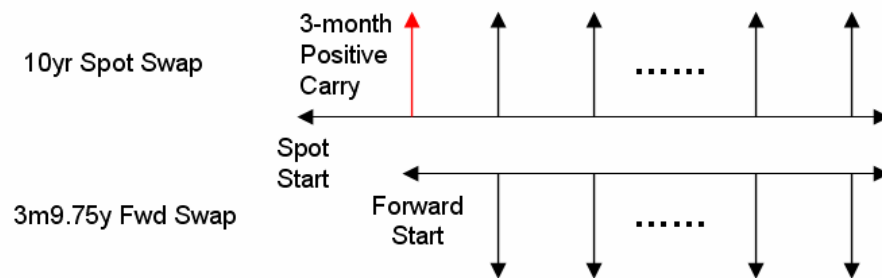
This positive carry earned for receiving fixed serves as a cushion for higher rate moves over the next three months. To determine how much rates can increase before the investor starts to lose money (mark-to-market loss exceeds the positive carry), we take the carry and divide it by the DV01 on the position (\$86,254) as of the 3-month forward date. Note that the forward DV01 is used rather than the spot DV01 because we are trying to calculate the breakeven three months from now. The breakeven rate change over a three-month horizon in this case is 9.6 bps (\$831,694/\$86,254). In the context of an investor receiving fixed on the 10-year swap, the positive carry earned over the next three months can offset up to 9.6 bps of a sell-off. Thus, the breakeven rate level is 3.72% (3.62% + 0.096%), which is also equal to the 3-month forward 9.75 year swap rate.

The forward rate is the break-even rate at which investors are indifferent between receiving on a spot or forward basis

If the forward rate equaled the spot rate, investors can simply receive fixed on the spot-starting swap and pay fixed on the 3-month forward-starting swap with the same final maturity to earn positive carry risk-free. Thus, forward rates are just spot rates adjusted by the breakevens so that investors are indifferent between receiving in a spot-starting 10-year swap or in a 3-month forward-starting 9.75 year swap.

Put differently, the carry on a spot-starting swap can also be calculated by subtracting the spot-starting swap rate from the forward-starting swap rate with the same final maturity. The positive carry in rate terms (9.6 bps) can be calculated from the difference between the 3-month forward 9.75 year swap (3.72%) and 10-year spot (3.62%) and can be converted to dollar carry by multiplying by the DV01 of the forward-starting swap. (See Exhibit 3).

Exhibit 3: Receiving fixed in a 10-year swap will carry positively over three months and will age into a 9.75 year swap. Using arbitrage principles, today's 3-month forward 9.75-year swap rate must equal the spot-starting 10-year swap rate plus the three months of positive carry



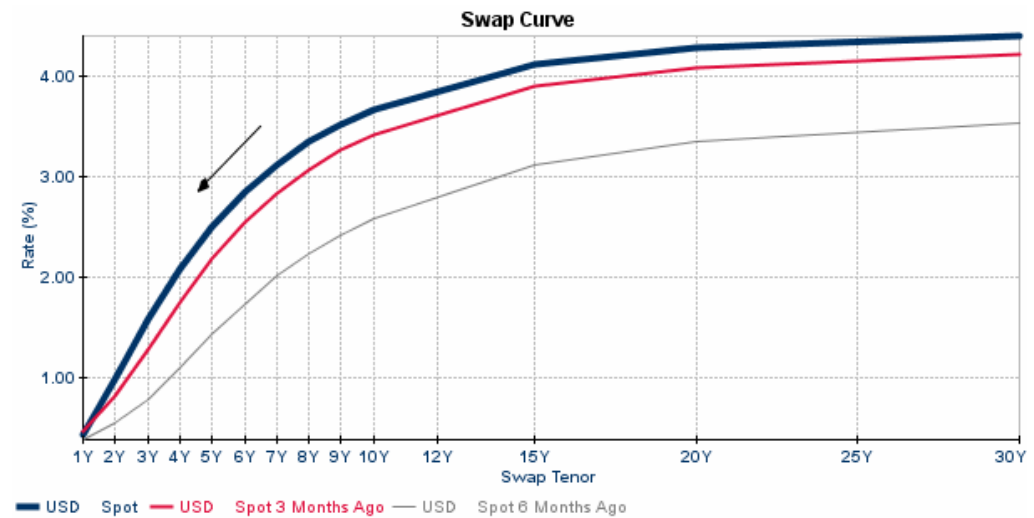
$$3m9.75yr \text{ Fwd Swap} = 10yr \text{ Spot Swap} + 3\text{-month Carry}$$

Source: Credit Suisse Locus

Rolldown on a spot-starting swap is the capital gains/losses if the par swap curve is unchanged to the horizon date

The rolldown on a spot-starting swap is the capital gains/losses the investor would achieve if the par swap curve remains unchanged to the horizon date. In the example above, the 10-year spot-starting swap at 3.62% would become a 9.75-year swap at 3.62% in three months. But because at 3.59%, the market rate for a 9.75-year swap would be assumed unchanged, the mark-to-market on the 10-year swap, which has aged by three months would change and in this case favorably (3.0 bps). The change in mark-to-market is referred to as “rolldown” because visually the aged swap is simply rolling down the rate curve. Together, the three-month carry and roll for receiving fixed in 10-year swap is 12.6 bps. (To create Exhibit 4 on Locus, please go to Rates->US Swap & Volatility Analytics and click on the Swap Curves and Roll Page under Swap RV Tools.)

Exhibit 4: Rolldown has increased sharply at the front end of the yield curve on the back of recent steepening

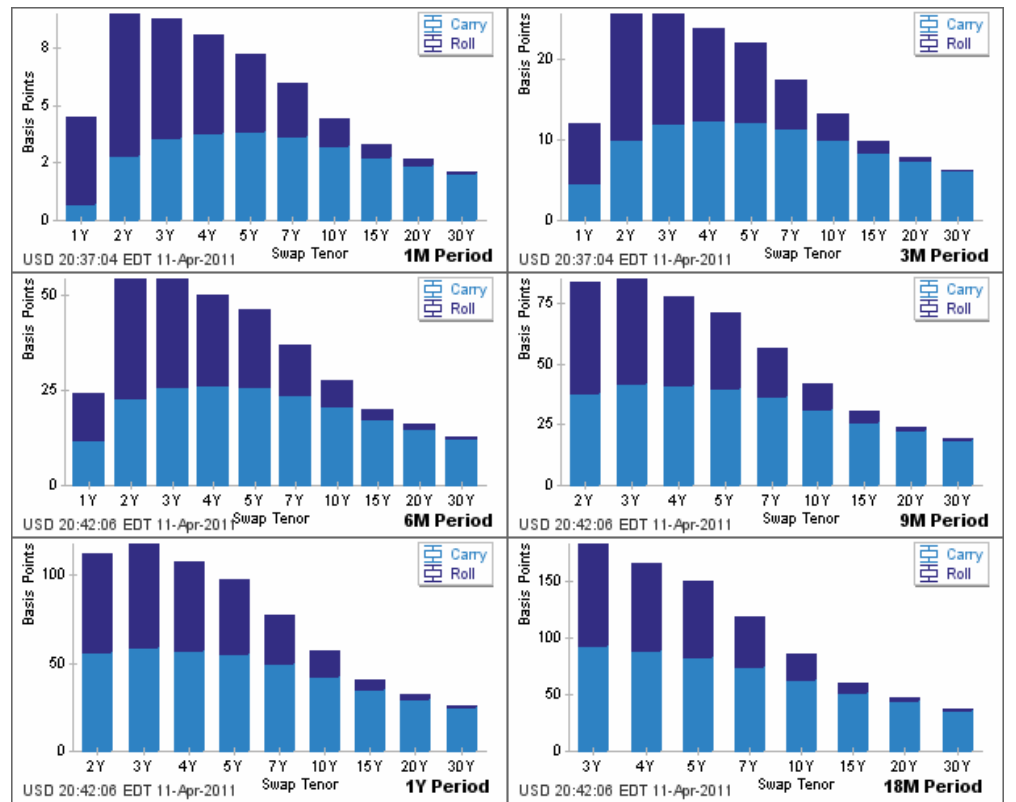


Source: Credit Suisse Locus

Zero volatility return assuming the par swap curve remains unchanged is the just the sum of carry and rolldown

Exhibit 5 highlights carry and rolldown over different time horizons for various spot-starting swaps from a receiving fixed perspective. (These can be generated by going to the Rates->US Swap and Volatility Analytics tools on Locus and then clicking on the Carry and Roll page under Swap RV Tools.) Note that receiving front-end rates (other than very short rates such as one-year swaps) offers the most attractive carry and rolldown. Rolldown makes up a big part of the zero volatility returns for front-end swaps, but it is insignificant for 30-year swaps. This speaks directly to the steepness in the front end of the curve, which is pricing for aggressive Fed tightening beyond 2011. The attractive rolldowns on two- and three-year swaps represent the potential returns that investors can earn for receiving fixed if front-end par rates remain unchanged in a zero-volatility environment.

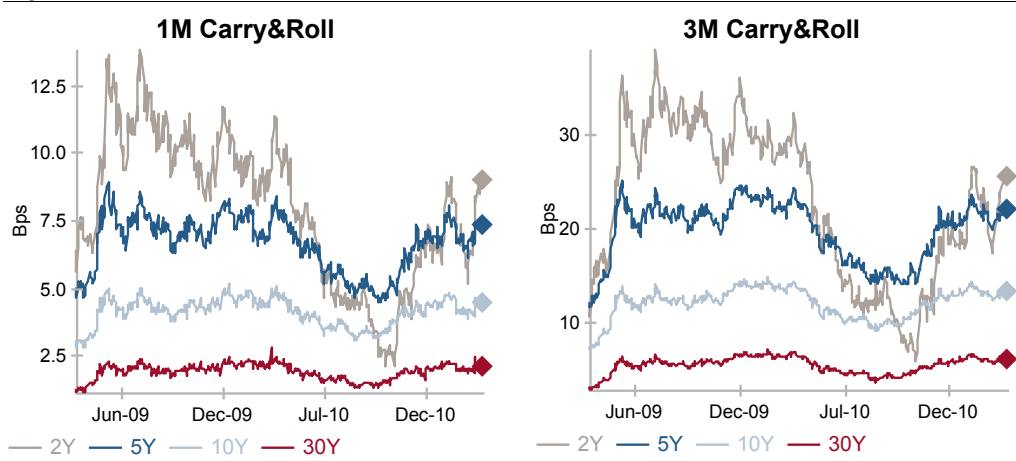
Exhibit 5: Rolldown (dark shading) represents the largest component of a zero volatility return at the front end while carry (light shading) represents the largest component of a zero volatility return at the back end



Source: Credit Suisse Locus

Historical time series (Exhibit 6) show that carry and rolldown on two-year swaps have only recently exceeded the carry and rolldown on five-year swaps when the market started to price for aggressive Fed tightening on the back of less-dovish Fed rhetoric and FOMC minutes. (The time series in Exhibit 6 can be generated by double clicking on cells in the carry and roll table found on Rates->Swap and Volatility Analytics-> Swap RV Tools-> Carry and Roll page on Locus.)

Exhibit 6: The front end now has the largest zero volatility return as the market reprices for a more restrictive Fed



Source: Credit Suisse Locus

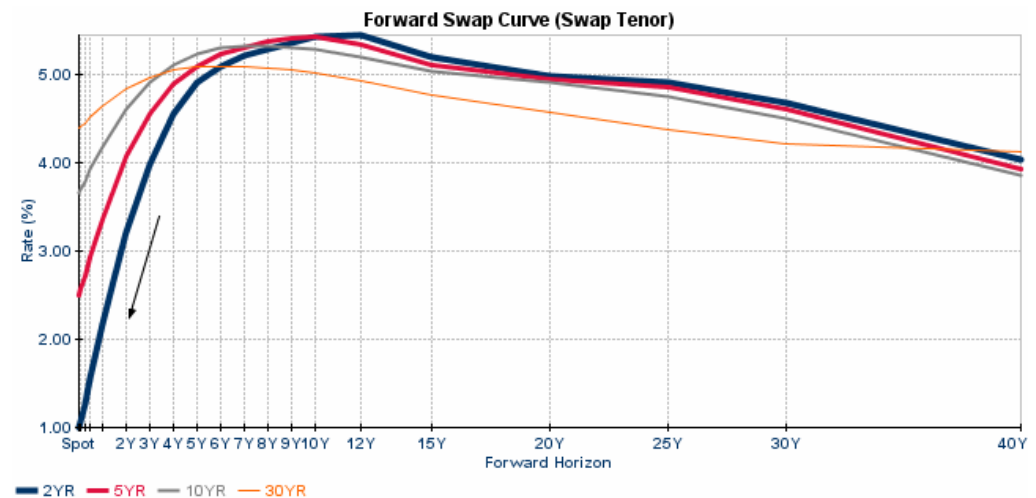
Source: Credit Suisse Locus

Forward-Starting Swaps

Zero volatility return assuming the forward curve remains unchanged is due to capital gains/losses alone since there is no exchange of interest payments

Unlike spot-starting swaps, no actual interest payments are exchanged in forward-starting swaps. Thus the expected total return on a forward-starting swap is comprised entirely of the capital gains/losses on the swaps assuming rolldown along the forward curve with none due to income carry. Investors think of rolldown for forward-starting swaps in terms of forward/spot “drop.” Assuming an “unchanged” scenario to a horizon date, a forward-starting swap would simply become closer to a spot-starting swap as it ages, or rolls down from the forward to spot (the drop). Note the difference in the zero-volatility assumption for a spot-starting versus forward-starting swap; the former assumes an unchanged par swap curve, the latter an unchanged forward curve for a fixed underlying swap tenor.

Exhibit 7: Rolldown to spot along the forward curve is the greatest for two-year tenors



Source: Credit Suisse Locus

In an upward-sloping par swap curve environment, the forward-spot drop initially increases as the forward settlement date increases but eventually starts decreasing (see Exhibit 7). (To create this chart on Locus, go to Rates->US Swap & Volatility Analytics and click on the Swap Curves and Roll Page under Swap RV Tools.) To compare the rolldown to spot across varying forward settlement dates and underlying tenors, use the average monthly rolldown instead, which is simply the drop to spot divided by the number of forward-starting months.

Average monthly spot-forward rolldown is the highest over short settlement dates on short tenors due to the steepness of the front end of the par swap curve

Currently, the six-month forward-starting 10-year swap rate is 3.89% versus the spot 10-year swap rate of 3.62%. The average monthly spot-forward rolldown is simply the forward rate less the spot rate divided by the number of forward months, or approximately 4.44 bps per month = $(3.89\% - 3.62\%) / 6$. The grid below in Exhibit 8 shows that the six-month forward settlement offers the highest average monthly spot-forward rolldown on the 10-year tail. Across the entire forward rate surface (thinking of forward settlement dates and underlying swap tenors as the two dimensions of the surface) however, the highest average spot-forward rolldown is found on shorter forward settlement dates on short tenors. This grid can be generated on Locus by going to the Rates->US Swap & Volatility Analytics and clicking on the Forward and Volatility Grids page under Volatility RV Tools. Then select the “Average Roll Down per Month (bps)” field in the drop-down menu. The time series in Exhibit 9 can be generated by double clicking on a cell in this grid.

Note that the spot-forward rolldown for the forward curve and rolldown for the par swap curve are closely related concepts

As a technical aside, for a forward curve on a fixed underlying tenor, the spot-forward rolldown initially increases (see Exhibit 7) reflecting the steep yield pick at the front end of the par swap curve per unit extension of DV01; put differently, the rolldown at the front end of the par swap curve (See Exhibit 4) is the steepest. For the same reason, the forward curve for a fixed underlying tenor eventually slopes downward as in Exhibit 7; the yield pick-up per unit extension of DV01 declines at a rapid rate as the rolldown contribution progressively declines beyond the 10-year maturity of the par swap curve (see Exhibit 5).

Exhibit 8: The highest average monthly spot-forward roll down is over short settlement dates on short underlying tenors

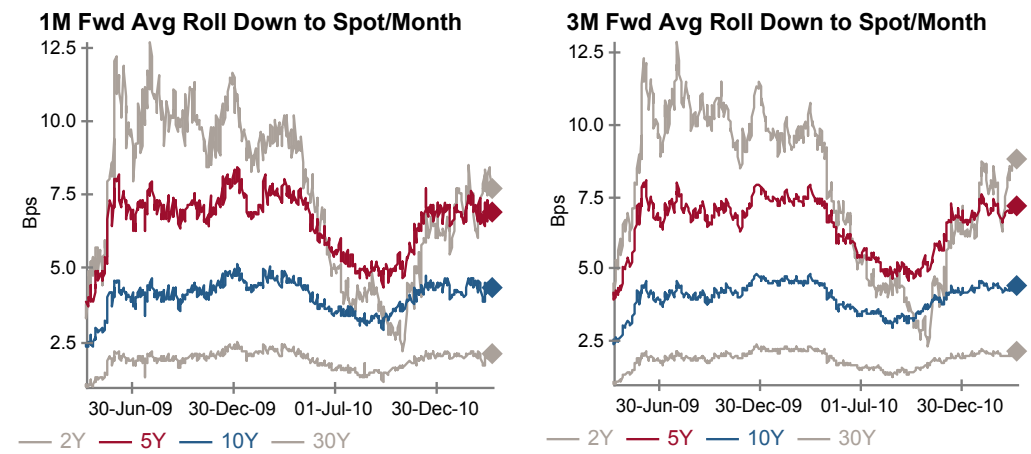
Spot	Swap1YR	2YR	3YR	4YR	5YR	6YR	7YR	8YR	9YR	10YR	15YR	20YR	30YR
1M	4.04	8.39	8.17	7.29	6.92	6.24	5.62	5.18	4.52	4.28	3.14	2.54	2.04
3M	5.36	8.65	8.40	7.80	7.13	6.39	5.73	5.17	4.72	4.40	3.21	2.58	2.07
6M	6.85	9.19	8.75	7.97	7.24	6.45	5.79	5.21	4.77	4.44	3.23	2.60	2.08
1Y	9.11	9.77	8.94	8.05	7.22	6.40	5.73	5.18	4.72	4.40	3.19	2.59	2.06
2Y	9.80	9.34	8.36	7.44	6.57	5.80	5.18	4.69	4.30	3.99	2.87	2.33	1.85
3Y	8.98	8.37	7.43	6.53	5.74	5.06	4.52	4.10	3.77	3.50	2.48	2.02	1.60
4Y	8.13	7.45	6.53	5.71	5.00	4.41	3.95	3.59	3.29	3.05	2.14	1.74	1.37
5Y	7.25	6.54	5.70	4.96	4.34	3.84	3.44	3.13	2.86	2.64	1.83	1.48	1.16
7Y	5.64	5.04	4.38	3.83	3.36	2.98	2.66	2.41	2.18	1.99	1.36	1.09	0.83
10Y	4.15	3.72	3.23	2.81	2.45	2.14	1.89	1.68	1.51	1.36	0.91	0.73	0.53
15Y	2.68	2.35	2.00	1.70	1.46	1.25	1.09	0.96	0.85	0.77	0.49	0.36	0.21
20Y	1.90	1.67	1.42	1.20	1.02	0.88	0.76	0.66	0.59	0.52	0.30	0.20	0.07

USD Avg Roll Down per month (bps)

-3 s.d. Z-Score 3 s.d.

Source: Credit Suisse Locus

Exhibit 9: Average monthly rolldown is the greatest for short forward settlement on two-year tenors as the market repriced for sooner Fed tightenings



Source: Credit Suisse Locus

Source: Credit Suisse

Curve Trades

Carry/roll for trades with multiple legs is equal to the net carry/roll of the individual underlying swaps based on their risk weightings

Calculating carry and roll for swap trades with multiple legs simply requires netting the carry and roll of the individual underlying swaps based on their risk weightings. For example, carry and roll for an equal DV01 weighted 2s10s curve steepener is equal to carry and roll on the receive 2-year fixed swap plus carry and roll on the pay 10-year fixed swap (which is equal to the negative carry and roll on the receive 10-year fixed swap). This makes intuitive sense because for a 2s10s curve steepener, the investor is long a 2-year swap and short a 10-year swap. The one-month carry and roll for a 2s10s steepener (4.18 bps) shown in Exhibit 10 is consistent with the netting of one-month carry and roll of the individual swaps (9 bps – 4.82 bps). (Go to Rates->Swap and Volatility Analytics->Swap RV Tools and click on the Carry and Roll page to generate this table on Locus.) The overwhelming positive carry and roll for nearly all the steepeners conversely suggests that carry and roll on curve flatteners are equally as punitive. The negative carry on the flatteners is consistent with the breakeven flattening that is already being priced by the market, especially for the back end of the curve. For example, the market is currently pricing for 6.25 bps of flattening in 5s30s over the next three months, as reflected in its carry. Thus an investor holding a 5s30s flattener needs the curve to flatten by more than 6.25 bps to be profitable on the trade.

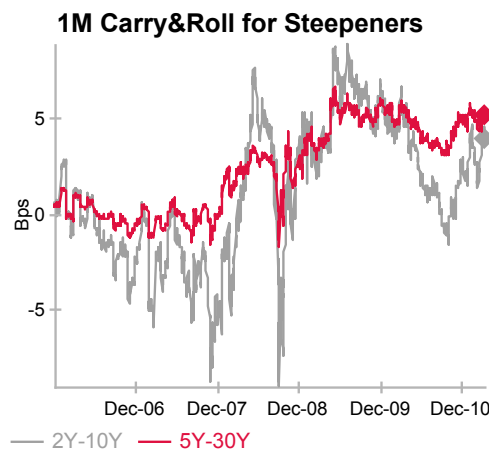
The amount of negative carry associated with the flatteners right now makes it difficult to hold curve flatteners as medium-term structural trades. Although we believe flatteners will ultimately be the right trade, timing will be critical to avoid the negative carry cost. For investors who are looking to put on flatteners immediately, 2s5s is the part of the curve that offers the least negative carry.

Exhibit 10: 5s30s steepeners present the most attractive positive carry and roll

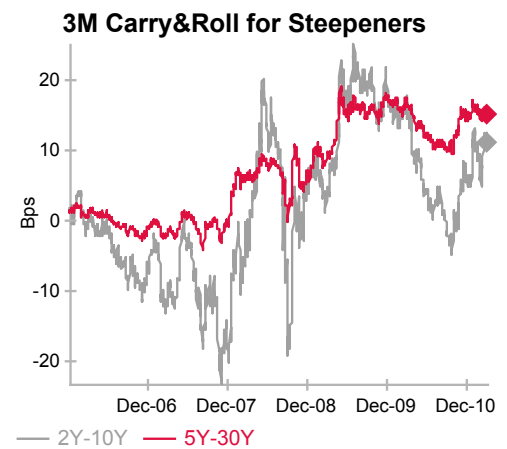
Curve	Spread (bps)	1M			3M			6M			9M		
		Carry	Roll	C+R	Carry	Roll	C+R	Carry	Roll	C+R	Carry	Roll	C+R
1s2s	51.57	-2.10	-2.29	-4.39	-5.09	-8.57	-13.66	-10.49	-19.06	-29.55	-	-	-
2s5s	147.77	-1.19	2.32	1.13	-2.49	5.18	2.69	-3.89	9.62	5.93	-3.17	11.49	8.32
3s5s	90.66	-0.33	1.40	1.08	-0.48	3.48	3.00	-0.21	7.55	7.34	0.97	11.62	12.59
2s10s	265.59	-0.65	4.59	3.95	-0.60	11.66	11.06	0.76	22.77	23.53	4.57	31.60	36.17
3s10s	208.48	0.22	3.68	3.90	1.42	9.96	11.37	4.24	20.70	24.94	8.71	31.73	40.44
5s10s	117.82	0.54	2.27	2.82	1.90	6.48	8.37	4.45	13.15	17.59	7.74	20.11	27.85
5s30s	192.40	1.83	3.36	5.19	5.73	9.50	15.23	12.48	19.59	32.06	20.40	30.16	50.56
10s30s	74.58	1.29	1.08	2.37	3.83	3.03	6.86	8.03	6.44	14.47	12.66	10.05	22.71
20s30s	12.04	0.40	0.16	0.56	1.19	0.38	1.56	2.45	0.79	3.23	3.80	1.21	5.02

Source: Credit Suisse Locus

Exhibit 11: Carry and roll is at the high end of its historical range over the past five years for steepeners



Source: Credit Suisse Locus



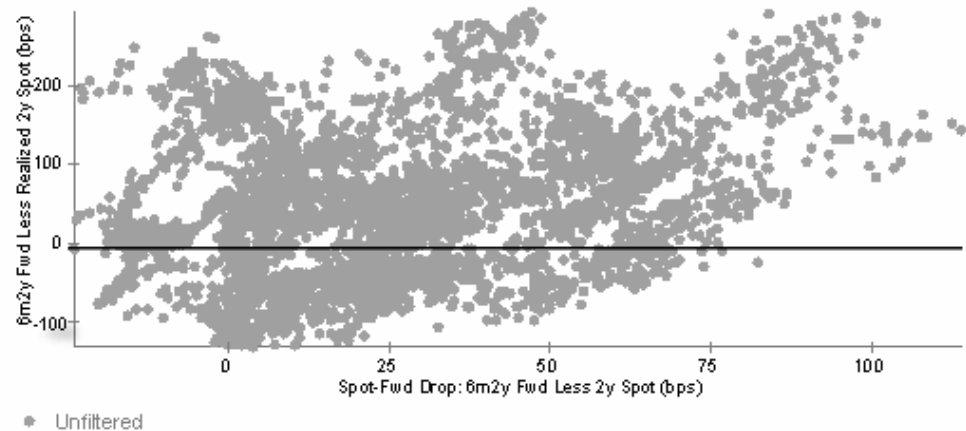
Source: Credit Suisse

Volatility-Adjusted Carry and Roll

As we have noted previously, carry and roll represent only the potential return for a very specific unchanged par swap rate scenario and often not the actual realized return in the presence of yield-curve volatility. Historically, carry and roll have generally not been fully realized because the par swap rate curve almost never stays unchanged.

Looking at receiving fixed on a 6m2y forward swap as an example, the scatter plot below shows the historical three-month rolldown (x-axis: 6m2y forward less 2y spot drop) against the historical realized P&L (y-axis: 6m2y forward less realized 2y spot rate in the subsequent six months). The scatter plot clearly shows no correlation between the expected returns and the realized returns. Additionally, the market generally understated the magnitude of the returns, i.e., the range of zero-volatility returns (spot-forward drop) is much smaller than the range of realized returns.

Exhibit 12: Terminal P&L on receiving in a 6-month forward 2-year swap is uncorrelated to the spot-forward drop at initiation of the trade



Source: Credit Suisse Locus

Adjusting carry/roll for volatility increases the likelihood of carry/roll being earned over time

Because carry and roll represent the expected return for an unchanged par swap rate scenario, intuitively it is more likely that they will be realized in a low volatility environment. Thus rather than looking at carry and roll as a standalone measure, we recommend adjusting it for volatility to take into account the likelihood of carry and roll actually being earned over the defined time horizon. For two swaps that offer the same carry and roll, investors should prefer the one that is likely to be less volatile and has a higher chance of capturing the positive carry and roll.

Our preferred measure of volatility-adjusted carry/roll is a ratio of the forward-spot rolldown in upfront dollar terms, $(\text{forward} - \text{spot}) * \text{forward DV01}$, divided by the upfront premium for a receiver that expires on the same forward settlement date of the swap. Embedded in the upfront premium is the current level of implied volatility. Exhibit 13 shows the volatility-adjusted rolldown ratios across all forward settlement dates and swap tenors. This grid can also be generated on Locus by going to the Rates->US Swap & Volatility Analytics and clicking on the Forward and Volatility Grids page under Volatility RV Tools. Then select the "Payoff Ratio" field in the drop-down menu.

Exhibit 13: The payoff ratio represents the upfront spot-forward drop as a fraction of the receiver swaption premium

	1yr	2yr	3yr	5yr	7yr	10yr	15yr	20yr	30yr
1m(fwd)	0.90	0.96	0.78	0.58	0.50	0.39	0.31	0.26	0.21
3m	1.74	1.61	1.37	0.99	0.81	0.65	0.51	0.42	0.35
6m	2.12	2.01	1.76	1.36	1.11	0.88	0.69	0.57	0.48
1yr	2.68	2.60	2.34	1.88	1.52	1.20	0.93	0.78	0.65
2yr	3.41	3.25	2.94	2.37	1.90	1.51	1.16	0.98	0.81
3yr	3.80	3.59	3.23	2.55	2.05	1.63	1.25	1.06	0.87
5yr	4.14	3.77	3.33	2.59	2.09	1.65	1.24	1.05	0.86
7yr	4.06	3.65	3.21	2.51	2.03	1.56	1.16	0.98	0.78
10yr	3.92	3.53	3.11	2.41	1.89	1.41	1.02	0.86	0.65
15yr	3.56	3.18	2.75	2.06	1.56	1.12	0.78	0.60	0.37

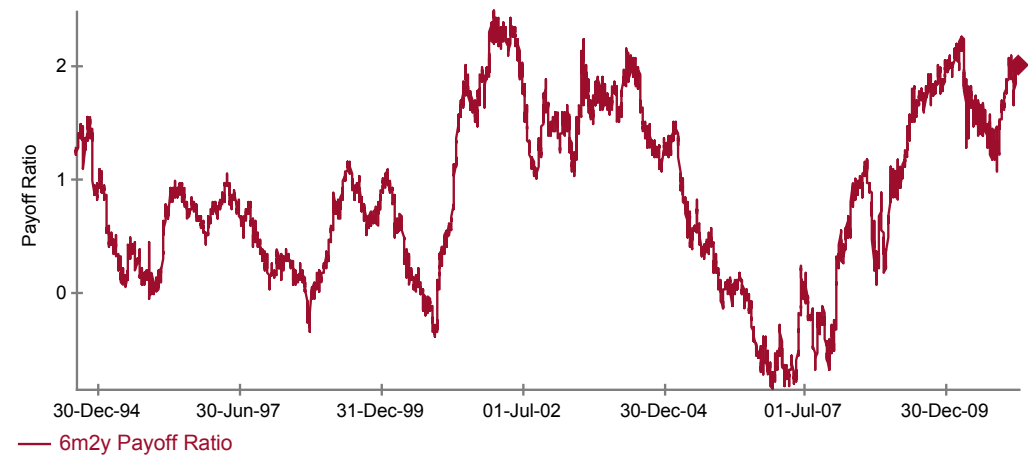
Payoff Ratio Lower Neutral Higher

Source: Credit Suisse Locus

Volatility has not increased commensurately with recent curve steepening at the front end

Going back to our example of receiving fixed on a 6m2y forward swap, we see in the grid above that currently the forward-spot rolldown in dollar term is about 2x the cost of a 6m2y receiver. Even though implied volatility on 6m2y has been increasing recently, which would increase the cost of the receiver swaption, the ratio is actually at the high end of its recent range largely due to the steepening of the forward curve and increasing spot – forward rolldown. Put differently, levels of volatility have not increased commensurately with the recent steepening at the front end.

Exhibit 14: The payoff ratio in the 6m2y sector is at the high end of its historical range (payoff ratio equals upfront rolldown /receiver premium)

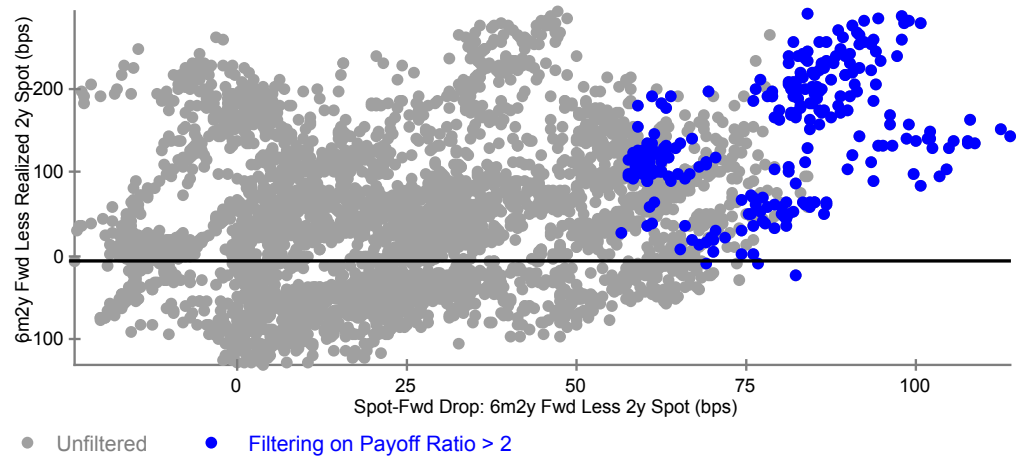


Source: Credit Suisse Locus

Historically, when this payoff ratio is greater than 2.0, receiving fixed in a 6m2y swap has resulted in positive realized returns on all occasions. The filtered result in Exhibit 15 greatly contrasts the unfiltered result from earlier, suggesting that the current steepness in the front end of the curve more than compensates for the level of market volatility. Although historical performance does not guarantee future returns, results from filtering based on the payoff ratio exceeding 2.0 suggest that carry and rolldown can be useful measures in determining value across the curve if investors account for market volatility.

Note that filtering on high levels of the spot-forward drop alone, for example greater than 50 bps, would not be effective in separating potentially winning trades from losing trades.

Exhibit 15: Filtering on the payoff ratio exceeding 2.0 (i.e., curve too steep relative to volatility), favors receiving outright in 6m2y

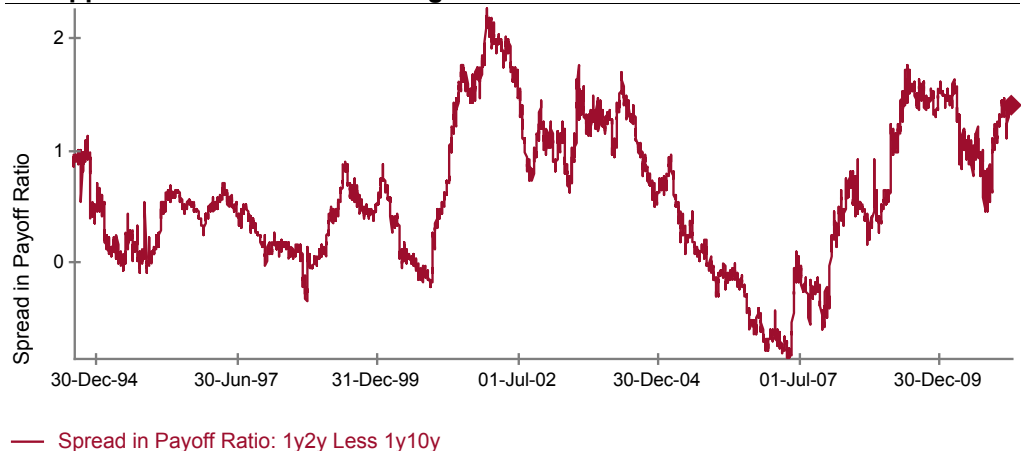


Source: Credit Suisse Locus

Similarly, we adjust the spot-forward rolldown for market levels of volatility to swap curve trades. Specifically, we look at the 1-year forward-starting 2s10s steepener, which rolls positively down to spot. Historically, the terminal P&L on a 1-year forward 2s10s swap curve steepener has been uncorrelated to the spot-forward drop at the initiation of the trade (grey dots in the scatter plot below). But after adjusting for market volatility, the profitability of positive carrying steepeners increases significantly.

Because the implied curve volatility market is less liquid, we used the spread between the payoff ratios on the individual legs of the trade as a filtering indicator. Historically, when the spread in the payoff ratio between 1y2y and 1y10y is greater than 1.6 (currently it is 1.3), 1-year forward 2s10s steepeners have resulted in positive realized returns most of the time (blue dots in the scatter plot below), sharply improving the potential profitability on the trade and strongly suggesting a steepening bias. The last time the spread in the payoff ratio was above 1.6 was in April 2010 and we look to approach that threshold before establishing the 1-year forward 2s10s steepener.

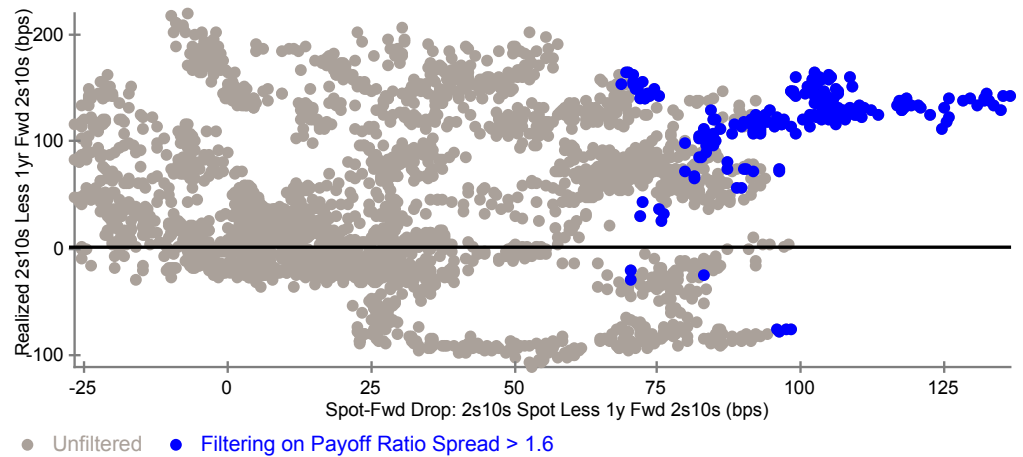
Exhibit 16: The spread in payoff ratio between 1y2y and 1y10y is currently near the upper end of its historical range



Source: Credit Suisse Locus

Again note that filtering on elevated levels of spot-forward drop alone is not effective in separating profitable from losing outcomes. (Setting the filter on a spot-forward drop that is too high excludes multiple profitable outcomes; setting it too low includes frequent losses .)

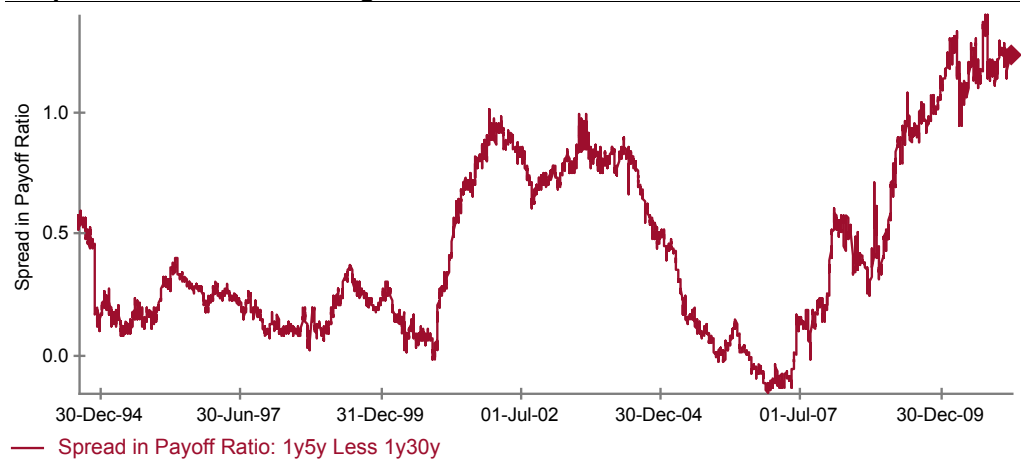
Exhibit 17: Conditional on the payoff ratio spread exceeding 1.6 favors curve steepeners in 1-year forward 2s10s



Source: Credit Suisse Locus

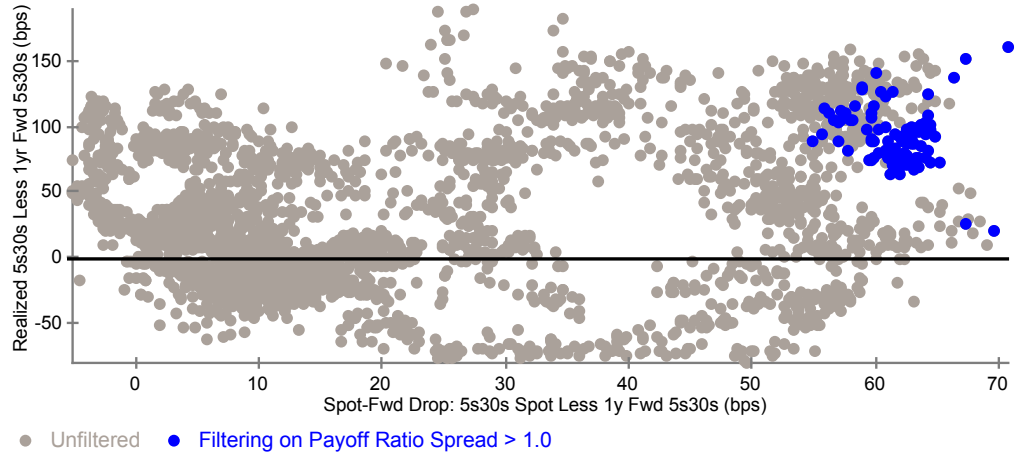
The same analysis when applied to a 1-year forward-starting 5s30s steepeners leads to similar results. Historically, when the spread in payoff ratio between 1y5y and 1y30y is greater than 1.0 (it is currently 1.2), 1-year forward 5s30s steepeners have resulted in positive realized returns on all occasions (blue dots in the scatter plot below).

Exhibit 18: The spread in payoff ratio between 1y5y and 1y30y is currently near the peak of its historical range



Source: Credit Suisse Locus

Exhibit 19: Filtering on the payoff ratio spread exceeding 1.0 favors curve steepeners in 1-year forward 5s30s



Source: Credit Suisse Locus

INTEREST RATE STRATEGY

NORTH AMERICA

Carl Lantz, Director
US Head

+1 212 538 5081
carl.lantz@credit-suisse.com

Scott Sherman, Vice President

+1 212 325 3586
scott.sherman@credit-suisse.com

Ira Jersey, Director

+1 212 325 4674
ira.jersey@credit-suisse.com

Sonam Leki Dorji, Associate

+1 212 325 5584
sonam.dorji@credit-suisse.com

Michael Chang, Vice President

+1 212 325 1962
michael.chang.2@credit-suisse.com

Eric Van Nostrand, Analyst

+1 212 538 6631
eric.vannostrand@credit-suisse.com

US FIXED INCOME DERIVATIVES STRATEGY

George Oomman, Managing Director
Derivatives Head

+1 212 325 7361
george.oomman@credit-suisse.com

TECHNICAL ANALYSIS

David Sneddon, Managing Director

+44 20 7888 7173
david.sneddon@credit-suisse.com

Christopher Hine, Vice President

+44 20 7888 7171
christopher.hine@credit-suisse.com

Steve Miley, Director

+44 20 7888 7172
steve.miley@credit-suisse.com

Pamela McCloskey, Vice President

+44 20 7888 7175
pamela.mccloskey@credit-suisse.com

Cilline Bain, Associate

+44 20 7888 7174
cilline.bain@credit-suisse.com

LONDON

Stuart Sparks, Director
European Head

+44 20 7888 6687
stuart.sparks@credit-suisse.com

Panos Giannopoulos, Vice President

+44 20 7883 6947
panos.giannopoulos@credit-suisse.com

Michelle Bradley, Director

+44 20 7888 5468
michelle.bradley@credit-suisse.com

Thushka Maharaj, Vice President

+44 20 7883 0211
thushka.maharaj@credit-suisse.com

Douglas Huggins, Director

+44 20 7883 2337
douglas.huggins@credit-suisse.com

PARIS

Giovanni Zanni, Director
European Economics – Paris

+33 1 70 39 0132
giovanni.zanni@credit-suisse.com

SINGAPORE

Jarrod Kerr, Director

+65 6212 2078
jarrod.kerr@credit-suisse.com

TOKYO

Kenro Kawano, Director
Japan Head

+81 3 4550 9498
kenro.kawano@credit-suisse.com

Shinji Ebihara, Vice President

+81 3 4550 9619
shinji.ebihara@credit-suisse.com

Disclosure Appendix

Analyst Certification

George Oomman and Michael Chang each certify, with respect to the companies or securities that he or she analyzes, that (1) the views expressed in this report accurately reflect his or her personal views about all of the subject companies and securities and (2) no part of his or her compensation was, is or will be directly or indirectly related to the specific recommendations or views expressed in this report.

Important Disclosures

Credit Suisse's policy is only to publish investment research that is impartial, independent, clear, fair and not misleading. For more detail, please refer to Credit Suisse's Policies for Managing Conflicts of Interest in connection with Investment Research: http://www.csfb.com/research-and-analytics/disclaimer/managing_conflicts_disclaimer.html

Credit Suisse's policy is to publish research reports as it deems appropriate, based on developments with the subject issuer, the sector or the market that may have a material impact on the research views or opinions stated herein.

The analyst(s) involved in the preparation of this research report received compensation that is based upon various factors, including Credit Suisse's total revenues, a portion of which are generated by Credit Suisse's Investment Banking and Fixed Income Divisions.

Credit Suisse may trade as principal in the securities or derivatives of the issuers that are the subject of this report.

At any point in time, Credit Suisse is likely to have significant holdings in the securities mentioned in this report.

As at the date of this report, Credit Suisse acts as a market maker or liquidity provider in the debt securities of the subject issuer(s) mentioned in this report.

For important disclosure information on securities recommended in this report, please visit the website at <https://firesearchdisclosure.credit-suisse.com> or call +1-212-538-7625.

For the history of any relative value trade ideas suggested by the Fixed Income research department as well as fundamental recommendations provided by the Emerging Markets Sovereign Strategy Group over the previous 12 months, please view the document at http://research-and-analytics.csfb.com/docpopup.asp?ctbdocid=330703_1_en. Credit Suisse clients with access to the Locus website may refer to <http://www.credit-suisse.com/locus>.

For the history of recommendations provided by Technical Analysis, please visit the website at <http://www.credit-suisse.com/techanalysis>.

Credit Suisse does not provide any tax advice. Any statement herein regarding any US federal tax is not intended or written to be used, and cannot be used, by any taxpayer for the purposes of avoiding any penalties.

Emerging Markets Bond Recommendation Definitions

Buy: Indicates a recommended buy on our expectation that the issue will deliver a return higher than the risk-free rate.

Sell: Indicates a recommended sell on our expectation that the issue will deliver a return lower than the risk-free rate.

Corporate Bond Fundamental Recommendation Definitions

Buy: Indicates a recommended buy on our expectation that the issue will be a top performer in its sector.

Outperform: Indicates an above-average total return performer within its sector. Bonds in this category have stable or improving credit profiles and are undervalued, or they may be weaker credits that, we believe, are cheap relative to the sector and are expected to outperform on a total-return basis. These bonds may possess price risk in a volatile environment.

Market Perform: Indicates a bond that is expected to return average performance in its sector.

Underperform: Indicates a below-average total-return performer within its sector. Bonds in this category have weak or worsening credit trends, or they may be stable credits that, we believe, are overvalued or rich relative to the sector.

Sell: Indicates a recommended sell on the expectation that the issue will be among the poor performers in its sector.

Restricted: In certain circumstances, Credit Suisse policy and/or applicable law and regulations preclude certain types of communications, including an investment recommendation, during the course of Credit Suisse's engagement in an investment banking transaction and in certain other circumstances.

Not Rated: Credit Suisse Global Credit Research or Global Leveraged Finance Research covers the issuer but currently does not offer an investment view on the subject issue.

Not Covered: Neither Credit Suisse Global Credit Research nor Global Leveraged Finance Research covers the issuer or offers an investment view on the issuer or any securities related to it. Any communication from Research on securities or companies that Credit Suisse does not cover is factual or a reasonable, non-material deduction based on an analysis of publicly available information.

Corporate Bond Risk Category Definitions

In addition to the recommendation, each issue may have a risk category indicating that it is an appropriate holding for an "average" high yield investor, designated as **Market**, or that it has a higher or lower risk profile, designated as **Speculative** and **Conservative**, respectively.

Credit Suisse Credit Rating Definitions

Credit Suisse may assign rating opinions to investment-grade and crossover issuers. Ratings are based on our assessment of a company's creditworthiness and are not recommendations to buy or sell a security. The ratings scale (AAA, AA, A, BBB, BB, B) is dependent on our assessment of an issuer's ability to meet its financial commitments in a timely manner. Within each category, creditworthiness is further detailed with a scale of High, Mid, or Low – with High being the strongest sub-category rating: **High AAA, Mid AAA, Low AAA** – obligor's capacity to meet its financial commitments is extremely strong; **High AA, Mid AA, Low AA** – obligor's capacity to meet its financial commitments is very strong; **High A, Mid A, Low A** – obligor's capacity to meet its financial commitments is strong; **High BBB, Mid BBB, Low BBB** – obligor's capacity to meet its financial commitments is adequate, but adverse economic/operating/financial circumstances are more likely to lead to a weakened capacity to meet its obligations; **High BB, Mid BB, Low BB** – obligations have speculative characteristics and are subject to substantial credit risk; **High B, Mid B, Low B** – obligor's capacity to meet its financial commitments is very weak and highly vulnerable to adverse economic, operating, and financial circumstances; **High CCC, Mid CCC, Low CCC** – obligor's capacity to meet its financial commitments is extremely weak and is dependent on favorable economic, operating, and financial circumstances. Credit Suisse's rating opinions do not necessarily correlate with those of the rating agencies.

Structured Securities, Derivatives, and Options Disclaimer

Structured securities, derivatives, and options (including OTC derivatives and options) are complex instruments that are not suitable for every investor, may involve a high degree of risk, and may be appropriate investments only for sophisticated investors who are capable of understanding and assuming the risks involved. Supporting documentation for any claims, comparisons, recommendations, statistics or other technical data will be supplied upon request. Any trade information is preliminary and not intended as an official transaction confirmation.

OTC derivative transactions are not highly liquid investments; before entering into any such transaction you should ensure that you fully understand its potential risks and rewards and independently determine that it is appropriate for you given your objectives, experience, financial and operational resources, and other relevant circumstances. You should consult with such tax, accounting, legal or other advisors as you deem necessary to assist you in making these determinations. In discussions of OTC options and other strategies, the results and risks are based solely on the hypothetical examples cited; actual results and risks will vary depending on specific circumstances. Investors are urged to consider carefully whether OTC options or option-related products, as well as the products or strategies discussed herein, are suitable to their needs.

CS does not offer tax or accounting advice or act as a financial advisor or fiduciary (unless it has agreed specifically in writing to do so). Because of the importance of tax considerations to many option transactions, the investor considering options should consult with his/her tax advisor as to how taxes affect the outcome of contemplated options transactions.

Use the following link to read the Options Clearing Corporation's disclosure document: <http://www.theocc.com/publications/risks/riskstoc.pdf>

Transaction costs may be significant in option strategies calling for multiple purchases and sales of options, such as spreads and straddles. Commissions and transaction costs may be a factor in actual returns realized by the investor and should be taken into consideration.

Backtested, Hypothetical or Simulated Performance Results

Backtested, hypothetical or simulated performance results have inherent limitations. Unlike an actual performance record based on trading actual client portfolios, simulated results are achieved by means of the retroactive application of a backtested model itself designed with the benefit of hindsight.

Backtested performance does not reflect the impact that material economic or market factors might have on an adviser's decision-making process if the adviser were actually managing a client's portfolio. The backtesting of performance differs from actual account performance because the investment strategy may be adjusted at any time, for any reason, and can continue to be changed until desired or better performance results are achieved. The backtested performance includes hypothetical results that do not reflect the reinvestment of dividends and other earnings or the deduction of advisory fees, brokerage or other commissions, and any other expenses that a client would have paid or actually paid. No representation is made that any account will or is likely to achieve profits or losses similar to those shown. Alternative modeling techniques or assumptions might produce significantly different results and prove to be more appropriate. Past hypothetical backtest results are neither an indicator nor guarantee of future returns. Actual results will vary, perhaps materially, from the analysis. As a sophisticated investor, you accept and agree to use such information only for the purpose of discussing with Credit Suisse your preliminary interest in investing in the strategy described herein.

References in this report to Credit Suisse include all of the subsidiaries and affiliates of Credit Suisse AG operating under its investment banking division. For more information on our structure, please use the following link: https://www.credit-suisse.com/who_we_are/en/.

This report is not directed to, or intended for distribution to or use by, any person or entity who is a citizen or resident of or located in any locality, state, country or other jurisdiction where such distribution, publication, availability or use would be contrary to law or regulation or which would subject Credit Suisse AG or its affiliates ("CS") to any registration or licensing requirement within such jurisdiction. All material presented in this report, unless specifically indicated otherwise, is under copyright to CS. None of the material, nor its content, nor any copy of it, may be altered in any way, transmitted to, copied or distributed to any other party, without the prior express written permission of CS. All trademarks, service marks and logos used in this report are trademarks or service marks or registered trademarks or service marks of CS or its affiliates.

The information, tools and material presented in this report are provided to you for information purposes only and are not to be used or considered as an offer or the solicitation of an offer to sell or to buy or subscribe for securities or other financial instruments. CS may not have taken any steps to ensure that the securities referred to in this report are suitable for any particular investor. CS will not treat recipients of this report as its customers by virtue of their receiving this report. The investments and services contained or referred to in this report may not be suitable for you and it is recommended that you consult an independent investment advisor if you are in doubt about such investments or investment services. Nothing in this report constitutes investment, legal, accounting or tax advice, or a representation that any investment or strategy is suitable or appropriate to your individual circumstances, or otherwise constitutes a personal recommendation to you. CS does not advise on the tax consequences of investments and you are advised to contact an independent tax adviser. Please note in particular that the bases and levels of taxation may change.

Information and opinions presented in this report have been obtained or derived from sources believed by CS to be reliable, but CS makes no representation as to their accuracy or completeness. CS accepts no liability for loss arising from the use of the material presented in this report, except that this exclusion of liability does not apply to the extent that such liability arises under specific statutes or regulations applicable to CS. This report is not to be relied upon in substitution for the exercise of independent judgment. CS may have issued, and may in the future issue, other reports that are inconsistent with, and reach different conclusions from, the information presented in this report. Those reports reflect the different assumptions, views and analytical methods of the analysts who prepared them and CS is under no obligation to ensure that such other reports are brought to the attention of any recipient of this report. CS may, to the extent permitted by law, participate or invest in financing transactions with the issuer(s) of the securities referred to in this report, perform services for or solicit business from such issuers, and/or have a position or holding, or other material interest, or effect transactions, in such securities or options thereon, or other investments related thereto. In addition, it may make markets in the securities mentioned in the material presented in this report. CS may have, within the last three years, served as manager or co-manager of a public offering of securities for, or currently may make a primary market in issues of, any or all of the entities mentioned in this report or may be providing, or have provided within the previous 12 months, significant advice or investment services in relation to the investment concerned or a related investment. Additional information is, subject to duties of confidentiality, available on request. Some investments referred to in this report will be offered solely by a single entity and in the case of some investments solely by CS, or an associate of CS or CS may be the only market maker in such investments.

Past performance should not be taken as an indication or guarantee of future performance, and no representation or warranty, express or implied, is made regarding future performance.

Information, opinions and estimates contained in this report reflect a judgement at its original date of publication by CS and are subject to change without notice. The price, value of and income from any of the securities or financial instruments mentioned in this report can fall as well as rise. The value of securities and financial instruments is subject to exchange rate fluctuation that may have a positive or adverse effect on the price or income of such securities or financial instruments. Investors in securities such as ADR's, the values of which are influenced by currency volatility, effectively assume this risk.

Structured securities are complex instruments, typically involve a high degree of risk and are intended for sale only to sophisticated investors who are capable of understanding and assuming the risks involved. The market value of any structured security may be affected by changes in economic, financial and political factors (including, but not limited to, spot and forward interest and exchange rates), time to maturity, market conditions and volatility, and the credit quality of any issuer or reference issuer. Any investor interested in purchasing a structured product should conduct their own investigation and analysis of the product and consult with their own professional advisers as to the risks involved in making such a purchase. Some investments discussed in this report may have a high level of volatility. High volatility investments may experience sudden and large falls in their value causing losses when that investment is realised. Those losses may equal your original investment. Indeed, in the case of some investments the potential losses may exceed the amount of initial investment and, in such circumstances, you may be required to pay more money to support those losses. Income yields from investments may fluctuate and, in consequence, initial capital paid to make the investment may be used as part of that income yield. Some investments may not be readily realisable and it may be difficult to sell or realise those investments, similarly it may prove difficult for you to obtain reliable information about the value, or risks, to which such an investment is exposed.

This report may provide the addresses of, or contain hyperlinks to, websites. Except to the extent to which the report refers to website material of CS, CS has not reviewed any such site and takes no responsibility for the content contained therein. Such address or hyperlink (including addresses or hyperlinks to CS's own website material) is provided solely for your convenience and information and the content of any such website does not in any way form part of this document. Accessing such website or following such link through this report or CS's website shall be at your own risk.

This report is issued and distributed in Europe (except Switzerland) by Credit Suisse Securities (Europe) Limited, One Cabot Square, London E14 4QJ, England, which is regulated in the United Kingdom by The Financial Services Authority ("FSA"). This report is being distributed in Germany by Credit Suisse Securities (Europe) Limited Niederlassung Frankfurt am Main regulated by the Bundesanstalt fuer Finanzdienstleistungsaufsicht ("BaFin"). This report is being distributed in the United States and Canada by Credit Suisse Securities (USA) LLC; in Switzerland by Credit Suisse AG; in Brazil by Banco de Investimentos Credit Suisse (Brasil) S.A.; in Mexico by Banco Credit Suisse (México), S.A. (transactions related to the securities mentioned in this report will only be effected in compliance with applicable regulation); in Japan by Credit Suisse Securities (Japan) Limited, Financial Instruments Firm, Director-General of Kanto Local Finance Bureau (*Kinsho*) No. 66, a member of Japan Securities Dealers Association, The Financial Futures Association of Japan, Japan Securities Investment Advisers Association; elsewhere in Asia/ Pacific by whichever of the following is the appropriately authorised entity in the relevant jurisdiction: Credit Suisse (Hong Kong) Limited, Credit Suisse Equities (Australia) Limited, Credit Suisse Securities (Thailand) Limited, Credit Suisse Securities (Malaysia) Sdn Bhd, Credit Suisse AG, Singapore Branch, and elsewhere in the world by the relevant authorised affiliate of the above. Research on Taiwanese securities produced by Credit Suisse AG, Taipei Branch has been prepared by a registered Senior Business Person. Research provided to residents of Malaysia is authorised by the Head of Research for Credit Suisse Securities (Malaysia) Sdn Bhd, to whom they should direct any queries on +603 2723 2020. This research may not conform to Canadian disclosure requirements.

In jurisdictions where CS is not already registered or licensed to trade in securities, transactions will only be effected in accordance with applicable securities legislation, which will vary from jurisdiction to jurisdiction and may require that the trade be made in accordance with applicable exemptions from registration or licensing requirements. Non-U.S. customers wishing to effect a transaction should contact a CS entity in their local jurisdiction unless governing law permits otherwise. U.S. customers wishing to effect a transaction should do so only by contacting a representative at Credit Suisse Securities (USA) LLC in the U.S.

This material is not for distribution to retail clients and is directed exclusively at Credit Suisse's market professional and institutional clients. Recipients who are not market professional or institutional investor clients of CS should seek the advice of their independent financial advisor prior to taking any investment decision based on this report or for any necessary explanation of its contents. This research may relate to investments or services of a person outside of the UK or to other matters which are not regulated by the FSA or in respect of which the protections of the FSA for private customers and/or the UK compensation scheme may not be available, and further details as to where this may be the case are available upon request in respect of this report.

CS may provide various services to US municipal entities or obligated persons ("municipalities"), including suggesting individual transactions or trades and entering into such transactions. Any services CS provides to municipalities are not viewed as "advice" within the meaning of Section 975 of the Dodd-Frank Wall Street Reform and Consumer Protection Act. CS is providing any such services and related information solely on an arm's length basis and not as an advisor or fiduciary to the municipality. In connection with the provision of the any such services, there is no agreement, direct or indirect, between any municipality (including the officials, management, employees or agents thereof) and CS for CS to provide advice to the municipality. Municipalities should consult with their financial, accounting and legal advisors regarding any such services provided by CS. In addition, CS is not acting for direct or indirect compensation to solicit the municipality on behalf of an unaffiliated broker, dealer, municipal securities dealer, municipal advisor, or investment adviser for the purpose of obtaining or retaining an engagement by the municipality for or in connection with Municipal Financial Products, the issuance of municipal securities, or of an investment adviser to provide investment advisory services to or on behalf of the municipality.

Copyright © 2011 CREDIT SUISSE GROUP AG and/or its affiliates. All rights reserved.

Investment principal on bonds can be eroded depending on sale price or market price. In addition, there are bonds on which investment principal can be eroded due to changes in redemption amounts. Care is required when investing in such instruments. When you purchase non-listed Japanese fixed income securities (Japanese government bonds, Japanese municipal bonds, Japanese government guaranteed bonds, Japanese corporate bonds) from CS as a seller, you will be requested to pay purchase price only.