Data Mining in Finance
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Mining for Short-Term Micro-Arbitrage

Guest Speaker

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Tentative Program

Introduction
- Focus for tonight: 1. Which data to pick for analysis? 2. Case studies
- Efficient markets vs. Arbitrage

Repo
- Spot yield, forward yield & repo
- Case study: Forward Implied Repo Trade

Credit
- Relationship between Swap Spread and Treasury yield
- Case study: Swap spread correlation
- Inter-bank interest-rate indices: BBA vs. local panels
- Case study: LIBOR/TIBOR trade

FX
- Interest rate parity
- Case study: Negative implied interest rates

Yield-curve modeling
- Assumption about yield-curve behavior
- Case study: Conditional curve steepener
- Case study: Non-normality in yields

Efficient markets vs. Arbitrage

Fama 1970 (Efficient capital markets: A review of theory and empirical work, JoF 25, 383-417). Weak-form, semi-strong-form and strong-form.

Implication: No excess return can be generated with trading models based on available (non-insider) information.

Assumption: Investors are rational, information is reflected in prices instantaneously.

Reality: Markets are dynamic, financial instruments have a variety of economic functions, limited rationality etc.

<u>True Arbitrage ("riskless" arbitrage)</u>

simultaneous buying and selling of different securities
does not require capital (self-financing)
locks in an instant profit or profit opportunity
no risks of any kind

<u>Market Micro-arbitrage</u>

simultaneous buying and selling of highly related securities
usually of short-term nature
no, or little, market directionality
exploiting temporary market imbalances due to lagging price adjustments in different markets and sudden, large order flows

<u>Relative Value</u>

general term that includes arbitrage but also refers to positions with residual risks
potential gains seem to out-weight potential losses (attractive risk/return profile)
historically unusual price constellations which are expected to revert back to mean

Repo

Repo (repurchase agreement) rate represents the interest rate charged for borrowed cash which is collateralized (secured) by an asset.

Uncollateralized inter-bank rate: LIBOR

Collateralized rate: higher or lower?

The ability to use a financial asset as a collateral (to obtain lower funding) is a financial function. LIBOR minus REPO = additional income to leveraged investors.

Relationship: spot price, carry, forward price.

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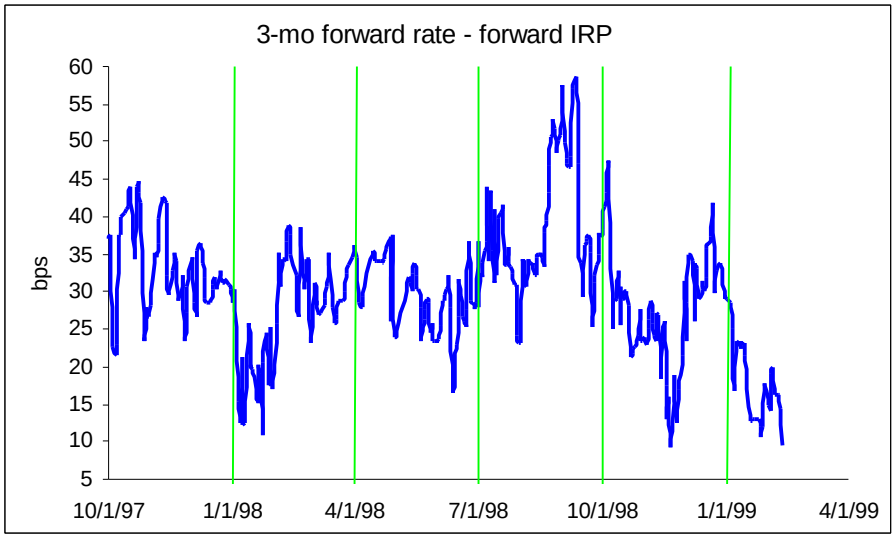
Feb' 15 Forward Implied Repo Trade Idea

The forward implied repo (IRP) between the March and June Bond Futures contract specifies the breakeven funding rate. If, for example, the forward IRP trades as LIBOR-10 bps one makes money if one buys the cale n-dar spread (i.e. buys March Futures and sells June Futures), takes delivery of the cheapest-to-delivery (11.25% Feb-15) and finances the issue at a term repo rate below L-10 bps.

Historically, repo trades around L-20 to L-25 bps. Not surprisingly forward IRPs are usually in the range b e-tween L-20 and L-30 bps (see graph below). Currently we observe a forward IRP of below L-10.



Source: Credit Suisse First Boston

Interestingly, the Bond roll (people selling March and buying June contracts, which puts additional pressure on the calendar spread) has not really started yet. We suggest watching the forward IRP to move out even further into the L-5 bps range and then take advantage of the imbalance.

Our trade suggestion is as follows:

Trade suggestion:

- Buy 1000 March/June Bond futures calendar spreads at an implied term repo rate of 4.70.
- Sell 126 EDH9 Eurodollar contracts.

	Today:	Settlement:					
	2/11/99	2/12/99					
	Treasury Basis			**USH9**		**Mar-99**	
	2/15/15	**11.25**		Bid	Ask	USH9	
	Bid	Ask		**124.65625**	**124.75000**	**124.68750**	
	14.5	**15.0**				Used:	
	Price:	Basis:				**124.68750**	
	161.05378	**15.0**		Delivery:	**3/31/99**	ED per 100 C	
				C Factor:	**1.2879**	**12.5749**	
				term IRP:	forw. IRP:	LIBOR sp.	
				4.70	**4.92**	**9.62**	
	ED Futures			**USM9**		**Jun-99**	
				Cal Spread		USM9	
	EDH9	**94.985**		**13.75000**		**124.25781**	
	EDM9	**94.970**				Used:	
	EDU9	**94.935**				**124.25781**	
	EDZ9	**94.625**		Delivery:	**6/30/99**		
				C Factor:	**1.2858**		

Source: Credit Suisse First Boston

We expect to capture the forward IRP – expected funding (L-23) spread over the trade's life, which, for a 13.4 bp spread between forward IRP and true funding, equals approximately $42,125 (≈12½% p.a. Return on Equity).

Additionally, the trade may profit if one can lock in LIBOR–23ish in forward GC now.

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Take profits on Feb '15 Forward Implied Repo

On February 11th, 1999 the forward implied repo (IRP) between the March and June Bond Futures was LIBOR-9.62 bps.[1)] This spread is typically between 20 and 25 bps.

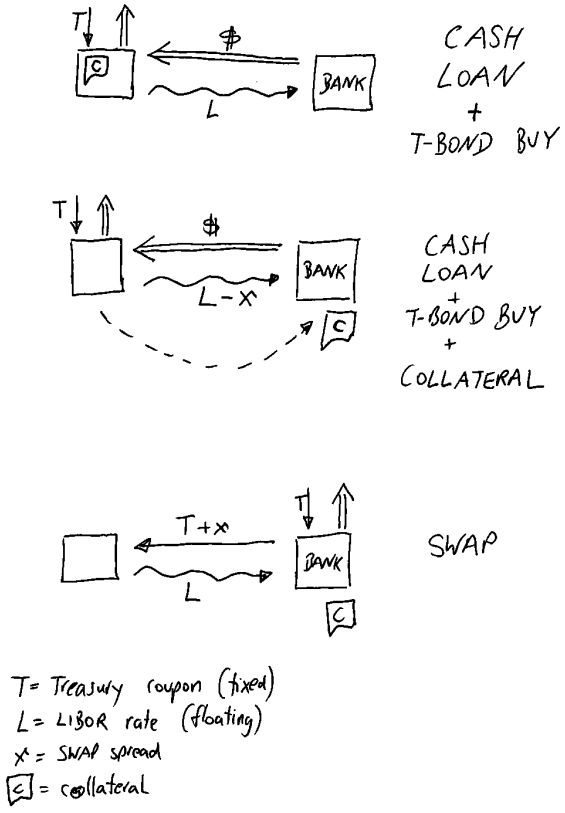
Since 2/11/99 the spread widened substantially. We suggest that those who put on the trade on take profits. This sheet summarises the performance from 2/11/99 current levels. All prices are currently observable market transaction levels and our calculations include transaction costs, bid/ask spreads margins, etc.

Futures			
Bot 1000 USH9 @	124-22	2/11/99	
Sold 1000 USH9 @	120-31	3/1/99	- 3,718,750
Sold 1000 USM9 @	124-8.25	2/11/99	
Bot 1000 USM9 @	120-14+	3/1/99	+ 3,804,688
Sold 126 EDH9 @	94.985	2/11/99	
Bot 126 EDH9 @	94.9525	3/1/99	+ 10,238
Transaction costs			
Futures commission: $8.50 round-trip per Futures contract			- 18,071
Net P/L			**+ 78,105**
Capital			
$500 margin requirement on ED Futures contract			63,000
no margin requirement on Bond Futures calendar spreads			
Total Capital			**63,000**
Interest earned on haircut/margin:			4.5% p.a.
Return on Equity p.a. (annualised)			**2518% p.a.**

[1)] Compare our trade note "Feb '15 Forward Implied Repo Trade Idea" from 2/11/99

Swap Spread

A swap is an agreement to exchange cash-flows between two counterparts. An interest-rate swap is similar to a self-financed Treasury Bond.



The swap spread reflects the credit quality of the financial institutions (banks) who set the LIBOR rates.

What is the relationship between swap spreads and the general level of interest rates?

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Swaption vs. Board Volatility

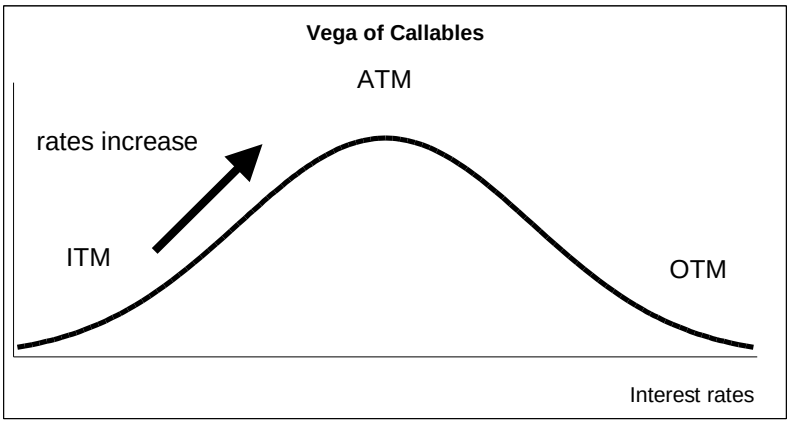
Summary

Short dated swaption volatility is cheap on a historical basis as well as in comparison to Board volatility. Implied correlation between Treasury yield and changes in swap spreads is currently outside the –1 to +1 band and suggests relative value opportunities. Current realised swap volatility is low but could increase substantially if the Asian and Eastern European situation becomes more dramatic.

Factors driving swaption vol

Swap option volatility, like any other volatility, is mainly influenced by the expected realised volatility. As the market is expected to be "quiet" for the duration of the option, the volatility used to price the option (implied volatility) is chosen to be small. Currently, there is extremely little volatility in U.S. rates and no immediate increase of volatility is expected. Thus, implied vols are very low for short dated options.

Additionally, swaption vol is directional. In a rally, vol tends to increase, while in a sell-off vol decreases. This is mainly due to the vega effects of callable bonds/swaps. U.S. agencies, amongst others, issue callable bonds that are usually overlaid by callable swaps. The agency effectively sells the call option inherent in the callable bond to the swap dealer by entering into a callable swap. By selling the call feature the agency gets a "subsidy" on the floating rate and achieves a sub-LIBOR funding. The strike of the call is struck in-the-money; i.e. if rates don't change the callable bond can be expected to be called away. As the market yield increases the vega on the callable swap increases (as the option approaches the area where vega is the largest, which is at-the-money). Thus, the street gets long and longer vol, as rates increase. In an attempt of matching their vol positions, traders become better sellers of vol. This leads to lower implied vols across the swaption market.



While this relationship is overlaid by several other effects on the short-dated vol market, it is noticeable that vols in short-dated swaps have been decreasing recently despite the rally. Everything else being equal, this indicates that swaption vol is trading cheap.

Connection between swaption and Treasury option volatility

Swaption volatility and Treasury option volatility are related due to the fact that the swap rate (s) is the sum of the relevant Treasury yield (t) and the swap spread (ss).

$$s = t + ss \quad (1)$$

Thus, the variance of the swap rate is as follows:

$$\sigma^2_s = \sigma^2_t + \sigma^2_{ss} + 2\,\rho\,\sigma_t\,\sigma_{ss} \quad (2)$$

This demonstrates that the volatility of the swap rate depends on three factors:

- The volatility of the relevant Treasury rate
- The volatility of the swap spread
- The correlation, ρ, between the Treasury rate and the swap spread.

Of course, the correlation between Treasury rates and swap spreads is everything but stable. In fact, until a year ago the correlation even had a different sign than what we observe now. Until a year ago the swap spread tended to widen with higher Treasury yields. The explanation given at that time was often that, if rates are high, investors have to be compensated with a higher risk premium to make them switch from risk-free Treasury bonds to risky corporate bonds. In a low yield environment, in turn, investors would settle for a smaller risk premium in order to enhance their returns. With larger corporate spreads, the swap spread widens too, as the swap spread is a very specific "corporate spread" for unsecured banking debt.

About a year ago the paradigm has changed and swap spreads are negatively correlated to the Treasury yield level. The "old story" turned out to be the wrong explanation for the right observation. Instead of a credit relationship, supply and demand are the main factors influencing the relationship. With a huge public debt outstanding, the public issuance used to crowd-out corporate issuance. Now a public surplus has changed this situation completely.

Whatever the economic explanation, historical correlation can only be between –1 and +1 by definition.

Implied correlation

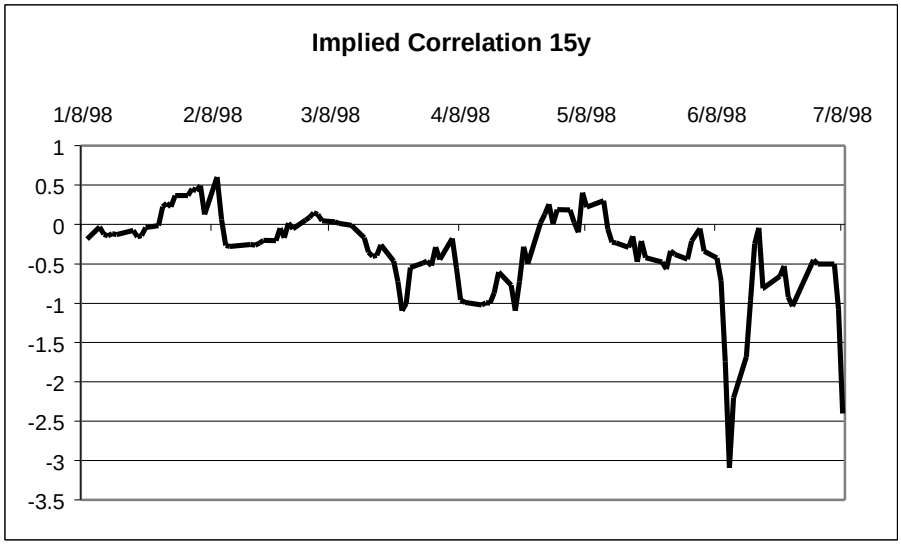
Similar to volatility, which can be measured using past data (historical/realised volatility) or observed from quoted option prices (implied volatility), correlation can be either computed from old data or extracted from implied Treasury and swap spread volatilities. To compute the implied correlation we have to re-arrange formula (2):

$$\rho = (\sigma^2_s - \sigma^2_t - \sigma^2_{ss}) / (2\,\sigma_t\,\sigma_{ss}) \quad (2a)$$

Implied swap spread volatility can be extracted directly from swaptions; implied Treasury yield volatility can be extracted from OTC bond options or exchange traded bond options ("Board vol", named after the Chicago Board of Trade). Swap spread volatility could be observed from swap spread options, but since those instruments are not liquid enough to provide a good history of data, historical swap spread volatility is used instead.

The following graph depicts the implied correlation for 3-months options on a 15-year swap/Treasury bond. The first remarkable observation is how stable correlation is. Notice, that this is not a moving average or any other form

of aggregation, rather than daily data points! Correlation has been fairly well behaved during most of the time of this year and ranged between 0 and –0.5.
However, we also notice some spikes up to +0.5, down to –1 and even below –1. While "actual" correlation has to range from –1 to +1, implied correlation could fall outside this range.



If implied correlation shoots through the +1/-1 range, relative value opportunities may occur. More concrete, if implied correlation is below –1, swaption vol is cheap compared to Board vol.
Another way to look at this is as follows: If you buy swaptions at the current level with implied correlations below –2, the implied volatility you pay for has been set under the assumption that the swap spread dampens the effects of Treasury yield shocks more than mathematically possible. If you additionally assume correlation to revert back to –0.5, or even zero, you expect the swap rate to be more volatile than originally estimated. In short, you buy a cheap option.

If you go even a step further and think about potential crisis situations, triggered by Asia or Eastern Europe, the attractiveness of the swaptions increases further. This is because you could argue that in a global meltdown banks would be hit most by decreasing asset quality, increasing yields and larger counterparty risk and, arguably, the correlation could become positive again.

Implied beta between swap and Treasury rates

Extracting the implied correlation has one minor flaw. Historical swap spread volatility is used instead of implied swap spread volatility. This is conceptually not rigorous and creates noise in the calculated implied correlation. For that reason an alternative concept is used quite often, which is to extract the implied beta between swap and Treasury rates. The beta is an estimate of how much the swap rate changes for a 1 bp change in the Treasury rate.

The calculations start out with formula (1) again which states the basic relationship between swap rates, Treasury rates and swap spreads:

$$s = t + ss$$

For the moment we assume the swap spread, ss, to be constant and independent of the level of interest rates. Through differentiation we get

$$ds = dt + dss \quad (3)$$

which, because of ss being a constant, equals

$$ds = dt \quad (3a)$$

or

$$s\,\sigma_s\,d\omega = t\,\sigma_t\,d\omega \quad (3b)$$

yielding

$$\sigma_t = s/t\,\sigma_s \quad (4)$$

Now we relax our assumption of the swap spread being independent and assume a beta between changes in swap rates and Treasury rates:

$$\beta\,\Delta s = \Delta t \quad (5)$$

Combining (4) and (5) yields

$$\sigma_t = \beta\, s/t\,\sigma_s \quad (6)$$

Equipped with this equation one can extract the beta from implied swap & Treasury volatilities and the current levels of swap and Treasury rates.

For example, assume the following market situation:

	vol	yield
Swaps	14%	6%
Treasury	15%	5%

Substituting those numbers into equation (6) results in a beta of 0.8929. Comparing implied beta with historical betas allows for detecting relative value opportunities. If, for example, the implied beta was 1.2 one would buy Treasury vol and sell swaption vol.

Swaption vol vs. Board vol

The following graph shows the daily implied basis point volatility for the Bond futures contract and a 3-month into 15-year swaption. Basis point volatility is expressed as a basis point yield move, rather than a percentage change of a yield. Basis point volatility is computed as the product of annual yield volatility and the current yield level. To transform annual bp volatility into daily bp volatility one has to divide it by the square root of 252.

Board vol and swaption vol both trended down during the last month. Swaption vol is lower than Board vol, which is consistent with our argument that swap spreads are negatively correlated to Treasury yields.

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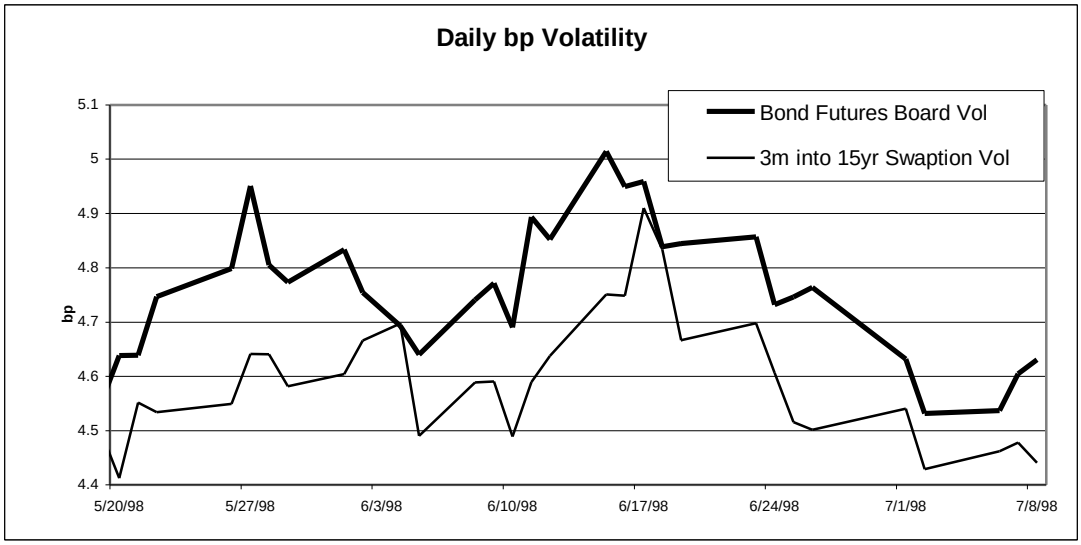

We would argue that the current spread between swaption vol and Board vol it too large on a historical basis as well as given our implied correlation analysis. Short dated volatility, thus, can be bought most attractively in the swaption market. As an additional premium to the comparably low volatility level the investor buys correlation at a very attractive level. This is particularly interesting to everyone who seeks some protection against systemic risks caused by a potential Asia/Eastern Europe crisis.

LIBOR vs. TIBOR

The BBA LIBOR is the British Bankers' Association fixing of the London Inter-Bank Offered Rate. It is based on offered inter-bank deposit rates contributed by BBA contributor banks.

http://www.bba.org.uk/

JPY LIBOR Panel:

The Bank of Tokyo Mitsubishi
Barclays Bank Plc
Deutsche Bank AG
The Dai-Ichi Kangyo Bank Ltd
The Fuji Bank Ltd
HSBC
Industrial Bank of Japan
JP Morgan
Lloyds Bank Plc
National Westminster Bank Plc
The Norinchukin Bank
Rabobank
The Sanwa Bank Ltd
The Sumitomo Bank Ltd
UBS AG
Westdeutsche Landesbank AG

TIBOR Panel:

Dai-Ichi Kangyo Bank
Sakura Bank,
Fuji Bank
Bank of Tokyo-Mitsubishi
Asahi Bank
Sanwa Bank
Sumitomo Bank
Tokai Bank
Bank of Yokohama
Mitsui Trust & Banking
Mitsubishi Trust & Banking
Yasuda Trust & Banking
Sumitomo Trust & Banking
Industrial Bank of Japan
Barclays Bank
Credit Suisse First Boston
Zenshinren Bank
Norinchukin Bank

TIBOR: special EuroYen TIBOR panel of 18 banks, with top and bottom four rates discarded for futures fix. 2 non-Japanese banks => 100 pct Japanese fixing. Panel to be redenominated at the end of March, with effect from 01 July. The rebuilt panel will include some non-Japanese banks, stronger Japanese banks etc., all designed to bring it lower.

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<HELP> for explanation.
Enter n <PAGE> to scroll contracts.

SIMEX EUROYEN FUTURES ANALYSIS

2/18/99 Valuation	1-mth	2-mth	3-mth	4-mth	5-mth	6-mth	9-mth	1year
TIBOR RATES	0.305	0.532	0.53	0.53	0.532	0.532	0.582	0.609

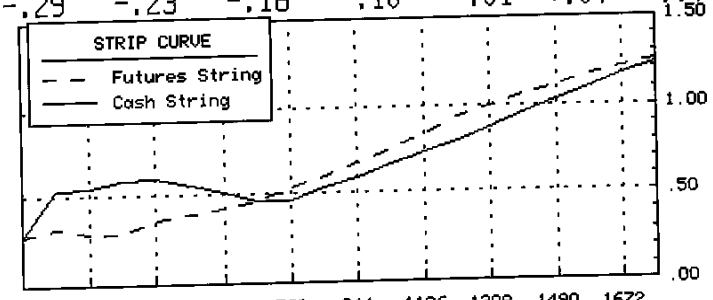
SWAP RATES 2Y 0.44 3Y 0.7 4Y 0.99 5Y 1.27 7Y 1 3/4 10Y 2.2

FUTURES 1 <Go> for convexity bias analysis

Contract:	Mar99	Jun99	Sep99	Dec99	Mar00	Jun00	Sep00	Dec00	Mar01	Jun 1
Price	99.670	99.730	99.705	99.410	99.530	99.460	99.260	98.980	98.820	98.680
Rate cvx-adj Y/N N	0.330	0.270	0.295	0.590	0.470	0.540	0.740	1.020	1.180	1.320
Fut Valuatn	3/17	6/16	9/16	12/15	3/15	6/21	9/20	12/20	3/21	6/20
Days	27	118	210	300	391	489	580	671	762	853

YIELD CURVES

			.8YR		1.3YR			1.8YR		2.3YR
Cash String	0.282	0.530	0.547	0.590	0.604	0.556	0.512	0.468	0.462	0.528
Fut String	0.282	0.319	0.298	0.297	0.370	0.392	0.416	0.461	0.530	0.601
Spread	+.00	-.21	-.25	-.29	-.23	-.16	-.10	-.01	+.07	+.07



FORWARD ANALYSIS

LIBOR Fwd	0.60	0.57	0.69
Futures	0.33	0.27	0.29
Spread	+.27	+.30	+.39

Futures daytype: actual/360
Strip yield: < 1 yr: actual/360
Strip/Coupn: > 1 yr: bond equiv

S Freq S Daytype ACT/365

Princeton:609-279-3000 Frankfurt:69-920410 Singapore:226-3000 Hong Kong:2-977-6000 Sydney:2-9777-8686 London:171-330-7500 Tokyo:3-3201-8900 New York:212-318-2000 Sao Paulo:11-3048-4500

<HELP> for explanation. P067 **Index** **EYS**

Enter n <PAGE> to scroll contracts.

SIMEX EUROYEN FUTURES ANALYSIS

2/18/99 Valuation	7-day	1-mth	2-mth	3-mth	4-mth	5-mth	6-mth	9-mth	1year
LIBOR RATES	0.213	0.237	0.3	0.299	0.299	0.299	0.299	0.31	0.32

SWAP RATES 2Y 0.44 3Y 0.7 4Y 0.99 5Y 1.27 7Y 1 3/4 10Y 2.2

FUTURES 1 <Go> for convexity bias analysis

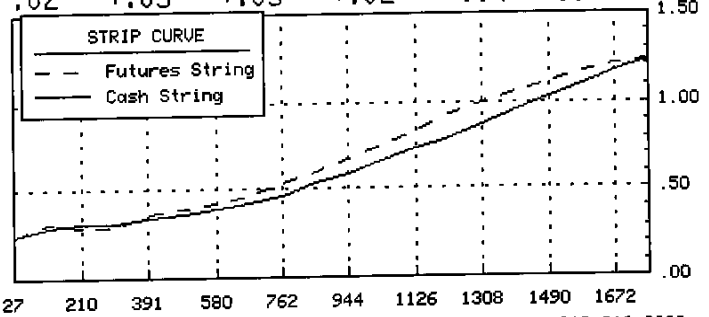
Contract:	Mar99	Jun99	Sep99	Dec99	Mar00	Jun00	Sep00	Dec00	Mar01	Jun 1
Price	99.670	99.730	99.705	99.410	99.530	99.460	99.260	98.980	98.820	98.680
Rate cvx-adj Y/N N	0.330	0.270	0.295	0.590	0.470	0.540	0.740	1.020	1.180	1.320
Fut Valuatn	3/17	6/16	9/16	12/15	3/15	6/21	9/20	12/20	3/21	6/20
Days	27	118	210	300	391	489	580	671	762	853

YIELD CURVES

				.8YR		1.3YR		1.8YR		2.3YR
Cash String	0.234	0.299	0.302	0.313	0.332	0.364	0.393	0.421	0.463	0.528
Fut String	0.234	0.308	0.292	0.293	0.367	0.389	0.414	0.460	0.528	0.600
Spread	+.00	+.01	-.01	-.02	+.03	+.03	+.02	+.04	+.07	+.07

FORWARD ANALYSIS

LIBOR Fwd	0.32	0.31	0.34
Futures	0.33	0.27	0.29
Spread	-.01	+.04	+.04



Futures daytype: actual/360

Strip yield: < 1 yr: actual/360

Strip/Coupn: > 1 yr: bond equiv

S Freq S Daytype ACT/365

Interest rate parity

Expected interest rates earned on risk-free investments are the same across assets denominated in different currencies. Differences in interest rates will be equalized through expected changes in currency exchange rates.

Economic utility of a bank deposit: Money earns interest and money is “safe”. The latter aspect may be worth up to 80 bp.

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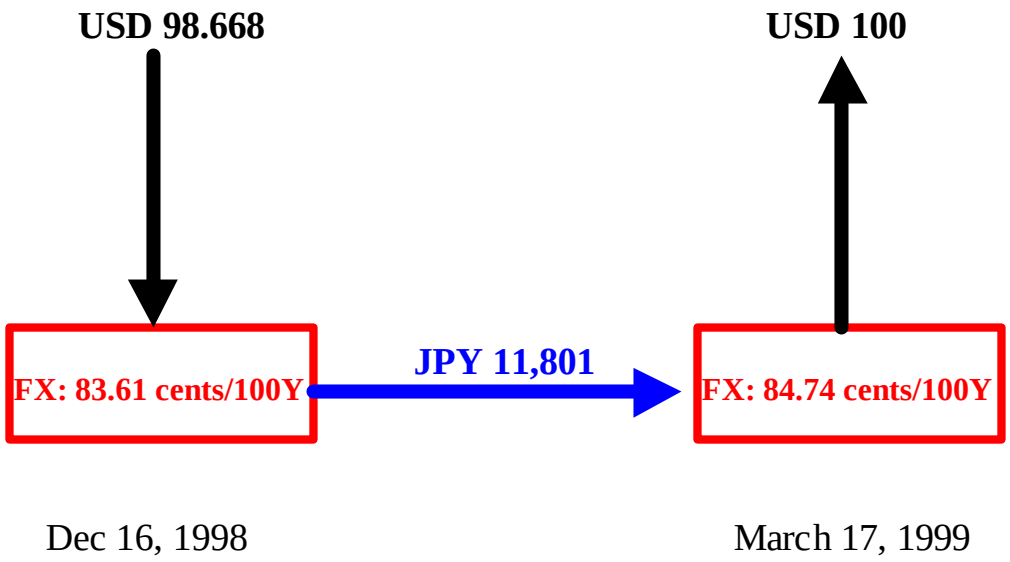
Yen Carry Trade

Because of negative interest rates in Japan an interesting situation has occurred. If you buy Japanese Yen (and sell US Dollars) as of December 16, 1998 at an exchange rate which can be locked in with December '98 Dollar-Yen Currency Futures and sell the Yen as of March 17, 1999 at the rate locked in through the March '99 Dollar-Yen Futures you earn an implicit interest rate of LIBOR+16 bps on your Dollar investment. This is under the assumption that you hold the Yen interest-free in a cash account.



This is equivalent to an act/360 interest rate of 5.347% compared to the 3-month LIBOR implied by the December '98 ED Futures, which is currently 5.185%

It should be noticed that this trade is an investment into a risk-free asset (cash) and the only counterparty or credit risk is versus the Clearing Organisation of the Futures Exchange. Thus, LIBOR+16 bps is actually about 100 bps above a comparable risk-free investment into Treasury Discount papers.

The risk of this trade is that the Yen cannot be deposited at a zero interest rate rather than at a negative interest rate.

Yield-curve behavior

3-factor model to explain yield-curve behavior.

Steepness of the curve as a function of Fed action and inflation expectations.

Even though one may consider yield-curve changes a “fair game” (current price reflects future possible outcomes correctly) one may disagree with conditional prices implied in options.

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U.S. Conditional Curve Steepener

Exposure to curve steepening through Futures Options

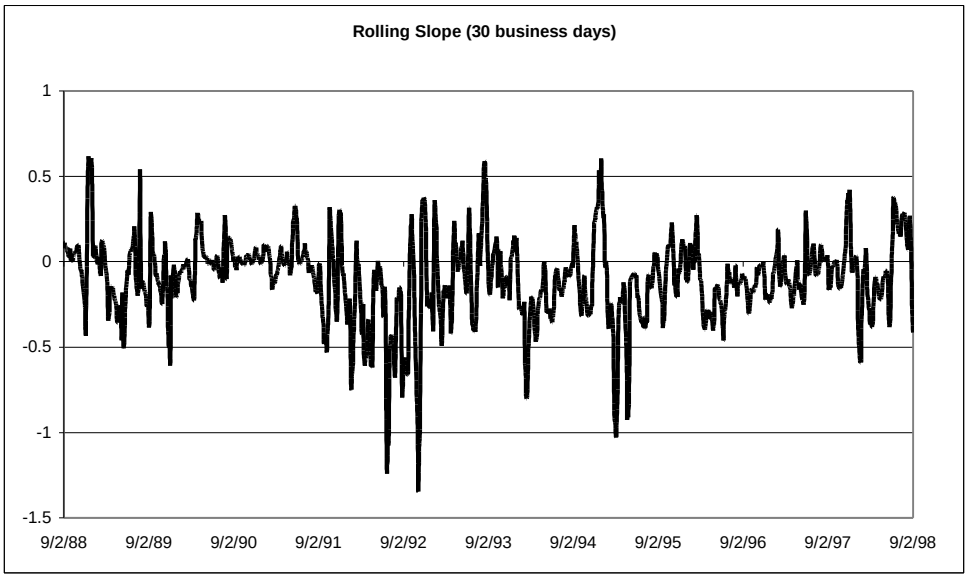
Buy 1000 119 Call Options on the December 10-year Futures contract for $531,250
Sell 638 130 Call Options on the December Bond Futures contract for $528,343
Pay an upfront premium of $2,907 and benefit from curve flattening conditional on a rally

Over the last 10 years, the relationship between the level of general interest rate and the slope of the yield curve has been mostly inverted. That is, in sell-offs (higher interest rates) the difference between long rates and short rates decreased (curve flattening). In rallies the curve tends to steepen.

The following graph depicts the rolling slope (b) of the following regression:

30-year Treasury yield – 10-year Treasury yield = a + b (30-year Treasury yield)

If you believe that this relationship remains negative over the next couple of months you can expect the yield curve to steepen in a rally and to flatten in a sell-off.



Source: Credit Suisse First Boston

An increasing number of Fed watchers predict an upcoming ease of rates in the 4 th quarter of 1998. If the relationship between the yield level and curve slope holds, one would expect the curve to steepen in a Fed-easing scenario. However, there is a substantial risk that the Fed remains on hold which makes outright steepening trades very risky.

We suggest a conditional curve steepener that eliminates this undesirable risk. Buy putting on the curve trade through call options on Futures contracts the trade ceases to exist if the market sells off. Only if the market rallies the trade comes to existence.

Scenario	Curve steepens	Curve flattens
Market sells off	0 (options expire worthless)	0 (options expire worthless)
Market rallies	+ (options in the money)	- (options in the money)

The grey fields are less likely given the assumed relationship between yield levels and the slope of the yield curve.

The trade should be structured in a DV01- and yield-beta-weighted manner. Current values are as follows:

DV01 USZ8: $ 117.39
DV01 TYZ8: $ 62.977
Yield Beta between T 11¼% of 2/15 and T 6½% of 8/05: 1.19

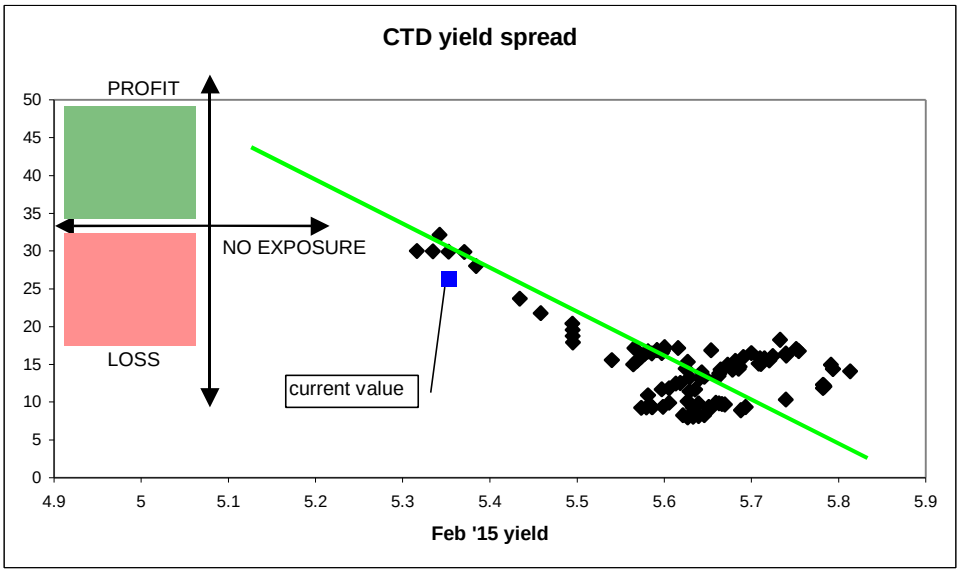
The weighting should be 638 USZ8 calls per 1000 TYZ8 calls.

Indicative pricing (as of 9/2/98 10:30 AM):

	#	strike	option	price	total
SELL	638	130	Call options on USZ8	53/64th	+ $528,343
BUY	1000	119	Call options on TYZ8	34/64th	- $ 531,250
					- $ 2,907

Break-even analysis:

	Spot	Forward	Strike	Costs	B/E Spread
USZ8	5.353%	5.345%	5.061%	($528,343)	
TYZ8	5.090%	5.085%	4.719%	$531,250	
	26.3 bps	26.0 bps	34.2 bps	$2,907	34.1 bps



Source: Credit Suisse First Boston

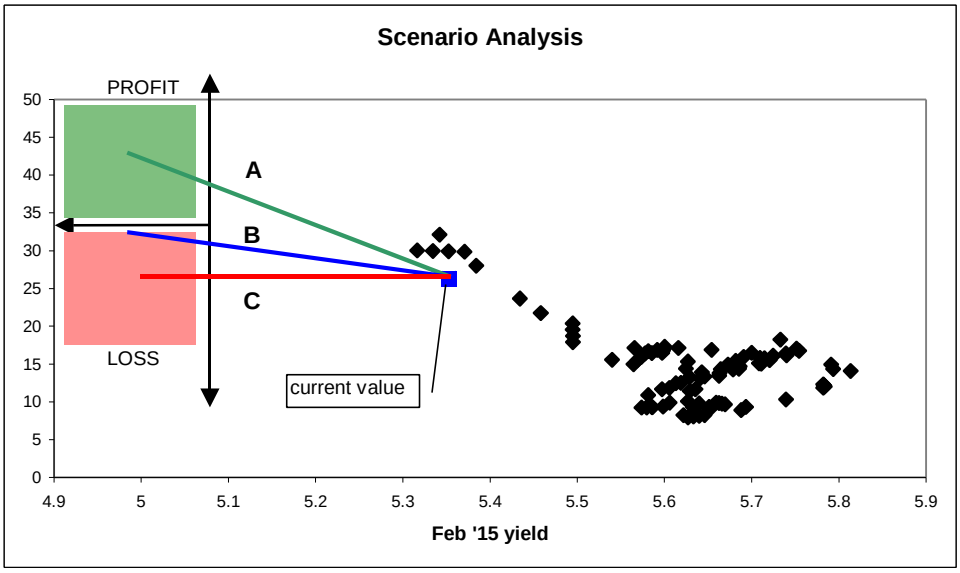
Scenario analysis

In order to better understand the price-dynamics of the suggested trade we run the P/L for alternative scenarios. Since the trade is conditional on a rally we can ignore the cases of constant or increasing yields as the options expire worthless in these scenarios. Rather, we examine the situation of a market rally during which the Feb '15 yield drops from its current level to 5%. Assuming different yield betas we compute the associated Aug '05 yield. Finally, we turn yields into prices and calculate the options pay-off at maturity.

The three scenarios we consider are:

Scenario A: Yield Beta of 1.5
Scenario B: Yield Beta of 1.19 (current yield beta)
Scenario C: Yield Beta of 1.0

Scenario	Beta	Feb '15 yield	Aug '05 yield	USZ8	TYZ8	USZ8 Call	TYZ8 Call	pay-off	net P/L
A	1.5	5.000%	4.561%	130.766	120.046	$ 766	$1,046	+$ 557,292	+$ 554,385
B	1.19	5.000%	4.670%	130.766	119.328	$ 766	$ 328	-$ 160,708	-$ 163,615
C	1.0	5.000%	4.737%	130.766	118.890	$ 766	$ 0	-$ 488,708	-$ 491,615



Source: Credit Suisse First Boston

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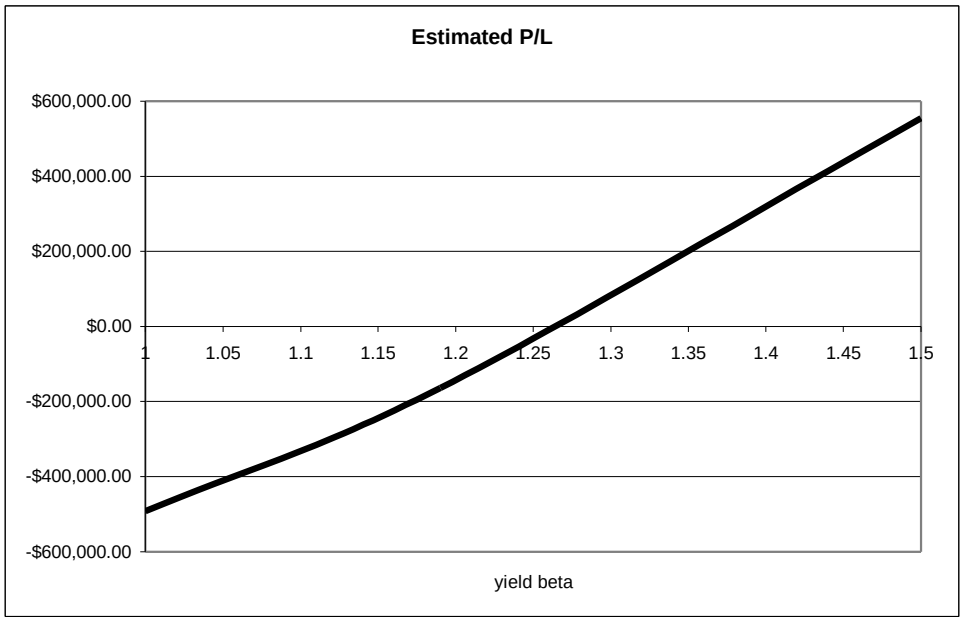

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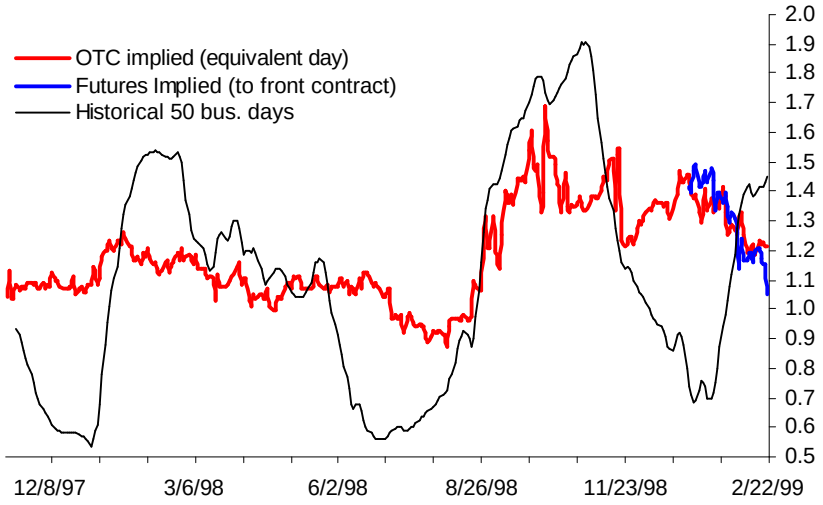
Buy 5Y Futures Straddle, Sell Bond Futures Straddle

> *"[...] after eight years of economic expansion, the economy appears stretched in a number of dimensions, implying considerable upside and downside risks to the economic outlook. [...] Monetary policy must be ready to move quickly in either direction should we perceive imbalances and distortions developing that could undermine the economic expansion."*
>
> Alan Greenspan, February 23, 1999

We believe that if, as indicated in Alan Greenspan's speech, the Fed has to "move quickly in either direction" in case of distortions, the front end of the yield curve will experience higher volatility compared to the long end. The following graph indicates that in periods of financial distress the historical yield beta between the 5-year point of the yield curve and the long end of the curve tends to spike up. Currently, yield betas implied by Futures and OTC Bond options are below historical yield betas.

Implied and Historical Beta 5-year vs. 30-year Bond



Source: Credit Suisse First Boston

Current prices suggest that the market is "believing" in low volatility in the short end of the curve. This could be attributed to the common believe that the Fed is on hold. Given Greenspan's recent comments, however, one should not rule out the real possibility of a quick and substantial Fed move.

We suggest selling a-t-m June staddles on the Bond Futures and buying a premium-neutral amount of a-t-m June straddles on the 5-year note Futures.

Indicative pricing:

	Price	Amount	Premium	Vol	Fut. DV01	Position DV01	Implied Beta
June 122 USM9 Straddle	4-20/4-23	1,000	4,312,500	9.1%	115.86	57,930	
June 112 FVM9 Straddle	1-41/1-45	2,532	-4,312,500	3.85%	48.16	60,973	1.053

Global Listed Derivatives

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Take profits on 5Y/30Y Straddle Trade

On February 23rd, 1999 the implied beta between the 5-year Futures and Bond Futures was 1.053. [1)] This spread is typically between 1.1 and 1.3.

Since 2/23/99 the implied beta increased to a 1.2 level. We suggest that those who put on the trade on take profits. This sheet summarises the performance from 2/23/99 to current levels. All prices are currently observable market transaction levels and our calculations include transaction costs, bid/ask spreads margins, etc.

Futures Options				
Sold 1000 USM9 June 122 Straddles @	4-20	(9.1% Vol)	2/23/99	
Bot 1000 USM9 June 122 Straddles @	4-54	(9.92% Vol)	3/4/99	- 531,250
Bot 2532 FVM9 June 112 Straddles @	1-45	(3.85% Vol)	2/23/99	
Sold 2532 FVM9 June 112 Straddles @	2-11	(4.49% Vol)	3/4/99	+ 1,186,875
Transaction costs				
Commission: $10 round-trip per Futures straddle				- 35,320
Net P/L				**+ 620,305**
Capital				
No initial margin requirement since trade is delta-neutral				0
Total Capital				**0**
Return on Equity p.a. (annualised)				**N/A**

[1)] Compare our trade note "Buy 5Y Futures Straddle, Sell Bond Futures Straddle" from 2/23/99