Hedging Foreign Exchange Risk for Indian Exporters and Importers

Uwe Wystup

Version 2015

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Uwe Wystup

Professional

- Founder and managing director of MathFinance
- Ph.D. in Mathematical Finance, Carnegie Mellon University, Pittsburgh
- Professor of Foreign Exchange Derivatives at Antwerp University
- Honorary Professor of Quantitative Finance at Frankfurt School
- Several decades of Trading Floor experience at Citibank, UBS, Sal. Oppenheim, Commerzbank as Quant and Structurer, Consultant
- Expert witness / conflict resolution specialist

Uwe Wystup

Personal

- Married since 1993, two children
- Lives in Germany
- Enjoys Music (church organ / piano), Biking, Hiking, Swimming, Flying, Yoga and all aspects related to India

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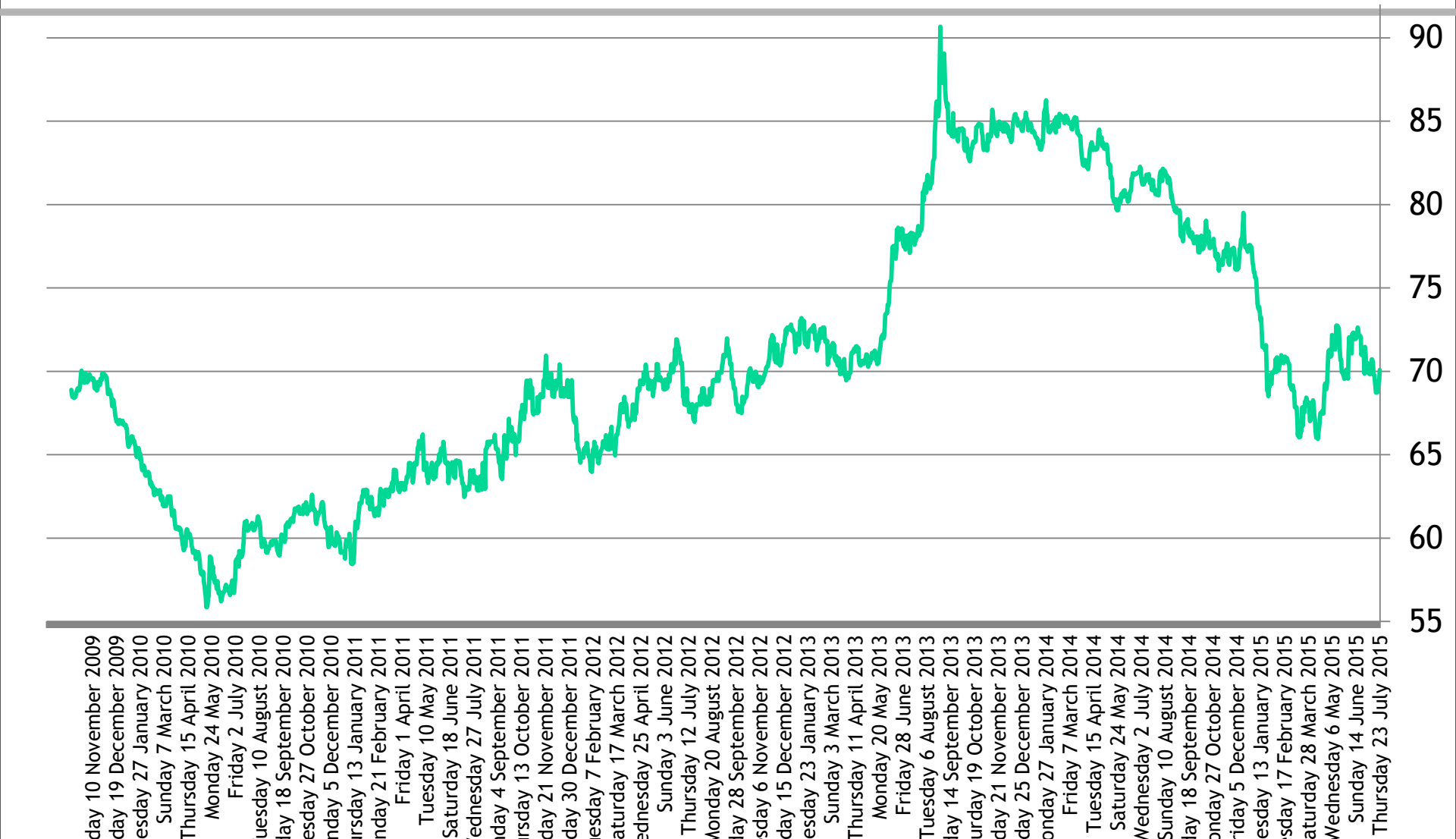
Overview

- **The FX Risk problem**
  - P&L fluctuations
  - Strategies
  - The role of management
- **Hedging for Importers**
  - Traditional strategies
  - Advanced strategies
  - Dangerous strategies
- **Hedging for Exporters**
  - Traditional strategies
  - Advanced strategies
  - Dangerous strategies

EUR-INR 2009-2015



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FX Risk - 3 simple questions

1) Is your P&L subject to currency fluctuations?
2) Do you know if your risk originates from one or several currencies?
3) Do you hedge these sources of risk?

FX Risk - 3 further questions

1) Can you tell your corporate banker, how a move of 1 INR in EUR-INR (or any other relevant currency pair) affects the year end P&L?
2) Do your employees inform you correctly and timely about the full scope of these risks?
3) Do you personally know and understand how your finance / treasurey department measures and hedges these risks?

FX Risk - 3 harder questions

1) Do you believe your employees can identify, gauge and hedge these risks?
2) Should you have any doubt about the in-house expertise, have you ever checked the hedging strategy your team has put in place?
3) In the past: has your hedging been broadly successful to protect your P&L?

FX Risk - 3 questions about the core responsibility of management

1) Which steps did you take to get a neutral expert verify the efficiency of the risk management strategy and validate the existing competence of your finance/treasury department?
2) Have you discussed the basic principles of your hedging strategy with your shareholders, to protect yourself from legal claims?
3) Has the hedging strategy been noted in writing and communicated internally to ensure its proper implementation?

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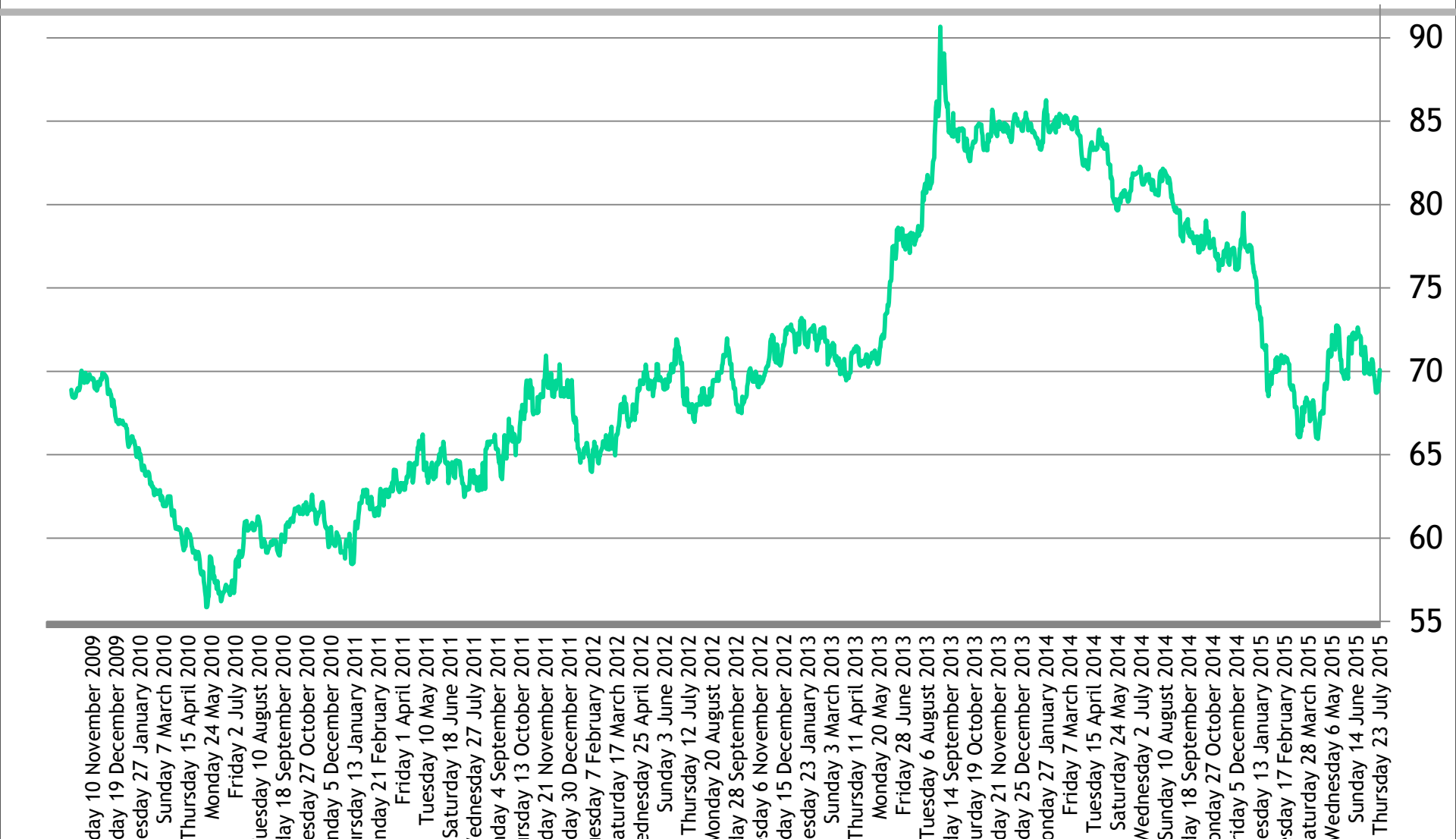
EUR-INR 2009-2015



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FX Risk Problem

- Think of an **importer** in India that has to pay 1 crore (10 million) EUR in 1 year
- Need protection against rising EUR-INR spot
- Market data: EUR-INR spot 70.00, 1Y forward 75.15
- Trading at spot in 1Y may ruin the company if EUR-INR increases,
- E.g. A rise from 70 to 90 requires 1 crore EUR x (90 – 70) = 20 crore INR **extra**
- Upside risk is unlimited
- A rise of 20 big figures in 1 Y has happened in the past
- Markets assume EUR-INR to be in the interval 60 - 102 with 95% probability

- Other relevant market data: INR 1Y MM 7.29%, EUR 1Y MM 0.058%, Swap 5.147, ATM volatility 11.75%, Risk Reversal 1.64%, Butterfly 0.50%, ATM B/O 1.00%

FX Risk – Traditional Hedging Methods

- Think of an importer in India paying EUR in 1Y
- Need protection against rising EUR-INR spot

1) Do nothing, wait for better spot

2) Long EUR forward, outright, zero cost, no participation downside: buy EUR forward for 75.15 crore INR

3) Long EUR call INR put, full cost, full participation on downside: e.g. buy EUR for 82 crore INR or lower; premium 2%EUR = 1.4 crore INR

FX Risk – Advanced Hedging Methods

- Think of an importer in India paying EUR in 1Y
- Need protection against rising EUR-INR spot

1) **Risk Reversal: Buy EUR best at 70, worst at 82, spot in between, zero premium**

2) **Shark Forward: Buy EUR worst at 82, or spot if spot stays above 61, zero premium** (alternatively 77/65.25)

3) **Target Forward: Buy EUR 1 crore/12 at 70.00 every month, subject to a target of 30 INR per EUR, i.e. 30 crore INR.**

Structured Products Workshop: Shark Forward

Current Situation (for an importer in India):

- **Client is obliged to pay EUR 10.000.000,00 in 1 year**
- **Her market expectation is that EUR-INR will develop in her favor in the coming 12 months, but will not trade higher than 9 big figures below the current spot.**
- **By using a Shark Forward she could profit form a weaker EUR (stronger INR), in order to improve her worst-case scenario of 185 pips above the current EUR-INR outright.**

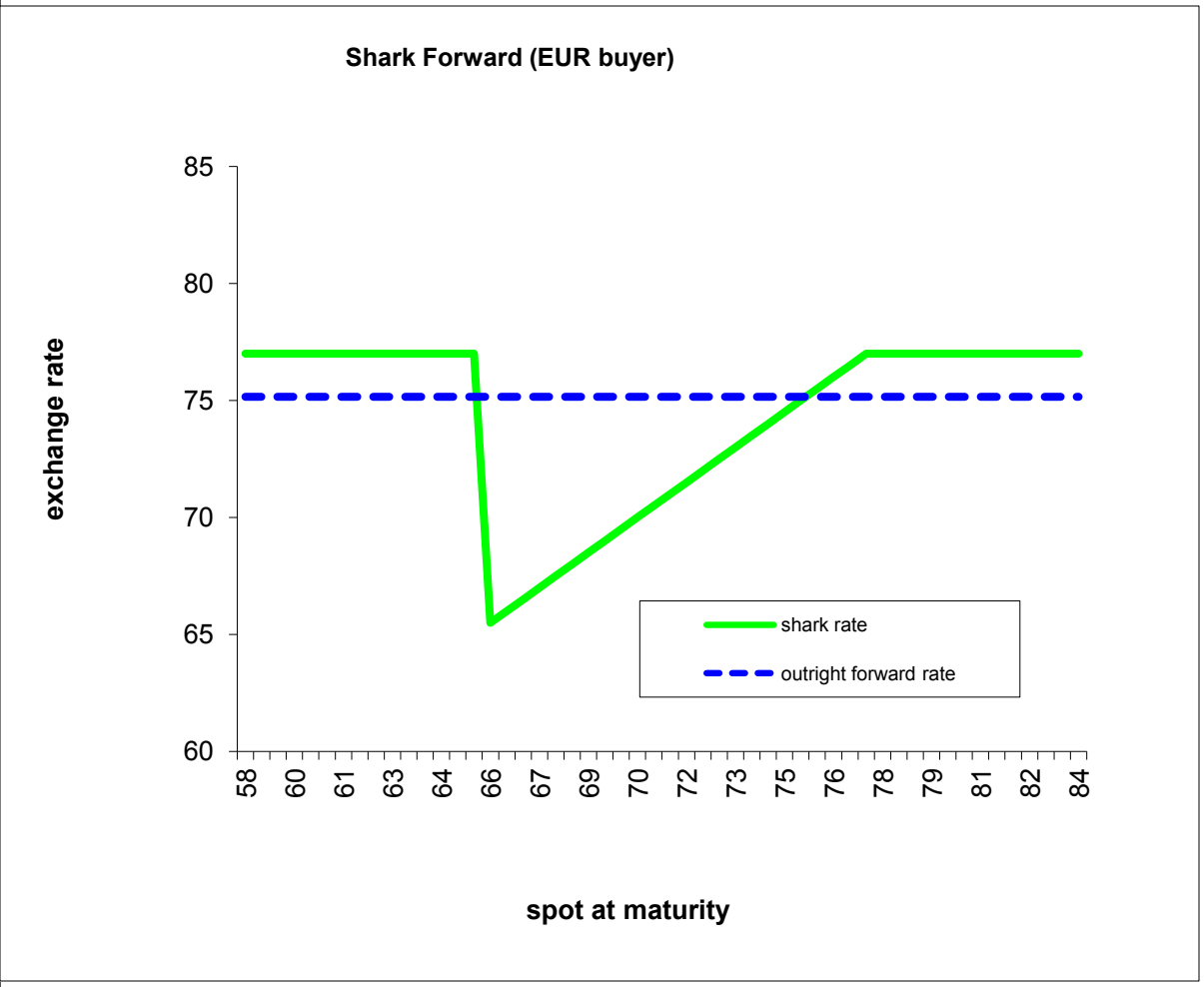
What can be done?

Structured Products Workshop: Shark Forward

Description (for an importer in India paying EUR):

Currency pair	EUR-INR
Notional	Company buys 1 crore EUR
Spot reference	70
6 Months forward rate	75.15
Expiry	1 Year
Worst case	185 pips above forward
Trigger	900 pips below spot
Final exchange rate	Min(worst case, spot at expiry) if trigger not touched
Upfront premium	zero

EUR buyer Shark Forward



Building Blocks

- Company sells a INR put with strike = worst case
- Company buys a EUR call with strike = worst case
- Company buys a EUR RKO put with same strike
- Breakeven level is current outright forward

FX Risk – Dangerous (but Tempting) Hedging Methods

- Think of an **importer** in India paying EUR in 1Y
- Need protection against rising EUR-INR spot

1) Do nothing, wait for better spot

2) Long EUR call spread, buy EUR at 82 and at most 10 big figures below market; premium lower than vanilla EUR call: 1.8%EUR compared to 2%EUR

3) Long EUR call INR put RKO, low cost, full participation on downside: e.g. buy EUR for 82 crore INR or lower unless EUR-INR trades at 90 or higher; premium 0.6%EUR

FX Risk Problem

- Think of an **exporter** in India that has to sell 1 crore EUR in 1 year
- Need protection against falling EUR-INR spot
- Market data: EUR-INR spot 70.00, 1Y forward 75.15
- Trading at spot in 1Y may ruin the company if EUR-INR decreases,
- E.g. EUR falling from 70 to 50 lowers the profit by 1 crore EUR x (70 – 50) = 20 crore INR
- Downside risk is unlimited (in EUR terms)
- EUR falling by 15 big figures in 1 Y has happened in the past
- Markets assume EUR-INR to be in the interval 60 - 102 with 95% probability

- Other relevant market data: INR 1Y MM 7.29%, EUR 1Y MM 0.058%, Swap 5.147, ATM volatility 11.75%, Risk Reversal 1.64%, Butterfly 0.50%, ATM B/O 1.00%

FX Risk – Traditional Hedging Methods

- Think of an **exporter** in India receiving 1 crore EUR in 1Y
- Need protection against falling EUR-INR spot

1) Do nothing, wait for better spot

2) Short EUR forward, outright, zero cost, no participation upside: sell EUR forward for 75.15 crore INR

3) Long EUR put INR call, full cost, full participation on downside: e.g. sell EUR for 70 crore INR or lower; premium 1.85%EUR = 1.28 crore INR

FX Risk – Advanced Hedging Methods

- Think of an exporter in India receiving 1 crore EUR in 1Y
- Need protection against falling EUR-INR spot

1) Risk Reversal: Sell EUR best at 83, worst at 70, spot in between, zero premium
2) Shark forward: Sell EUR worst at 73, or spot if spot stays below 86.75, zero premium (alternatively 70/94.62)
3) Target forward: Sell EUR 1 crore/12 at 76.00 every month, subject to a target of 30 INR per EUR, i.e. 30 crore INR

Structured Products Workshop: Shark Forward

Current Situation (for an exporter in India):

- **Company receives EUR 10.000.000,00 in 1 year**
- **Her market expectation is that EUR-INR will develop in her favor in the coming 12 months, but will not trade higher than 16 big figures below the current spot.**
- **By using a Shark Forward she could profit form a stronger EUR (weaker INR), in order to improve her worst-case scenario of 215 pips below the current EUR-INR outright.**

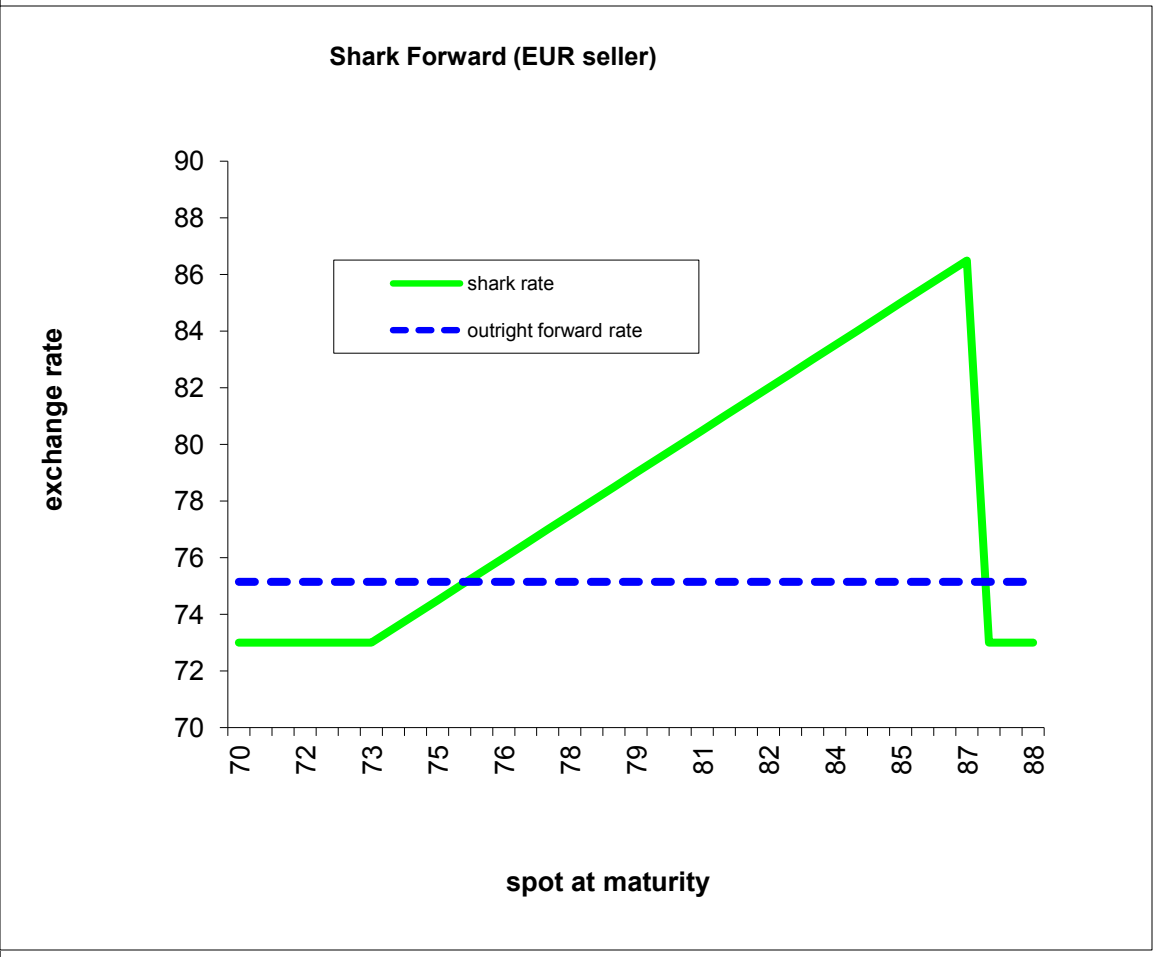
What can be done?

Structured Products Workshop: Shark Forward

Description (for an exporter in India paying EUR):

Currency pair	EUR-INR
Notional	Company sells 1 crore EUR
Spot reference	70
6 Months forward rate	75.15
Expiry	1 Year
Worst case	215 pips below forward
Trigger	1678 pips above spot
Final exchange rate	Max(worst case, spot at expiry) if trigger not touched
Upfront premium	zero

EUR Seller Shark Forward



Building Blocks

- Client buys a EUR put with strike = worst case
- Client sells a EUR call with strike = worst case
- Client buys a EUR RKO call with same strike
- Breakeven level is current outright forward

Target Forward (TRF)

The TRF is a way to sell EUR at a higher rate than current spot / forward rates. The difference in this product is that company has a total target profit that, once accumulated, terminates all future settlements.

The idea is to place the strike 6 big figures above spot to allow the company to quickly accumulate profits and have the trade knocked out after 5 or 6 months.

Spot ref: 70.00

Trade - EURUSD 1 year Target Redemption Forward
Sell EUR 1 crore / 12 per month at 76.00, subject to KO condition

KO condition - if the sum of the client profits reaches the TARGET, all future settlements are cancelled.
TARGET 30 INR per EUR = measured weekly as Profit = Max (0 , 76.00 - Fix)

Fix = monthly ECB currency fixing

Premium: Zero

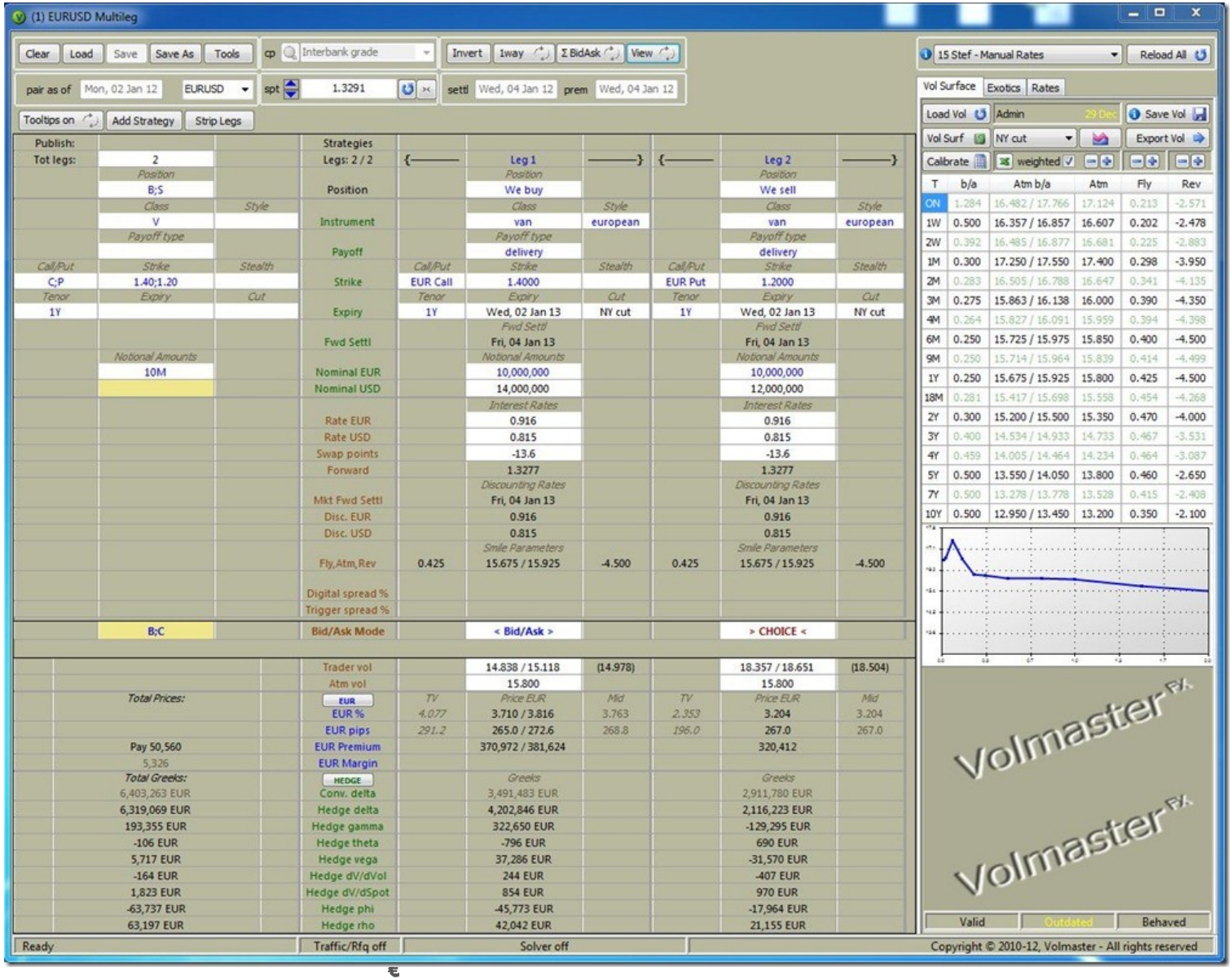
Target Redemption FWD

Example:

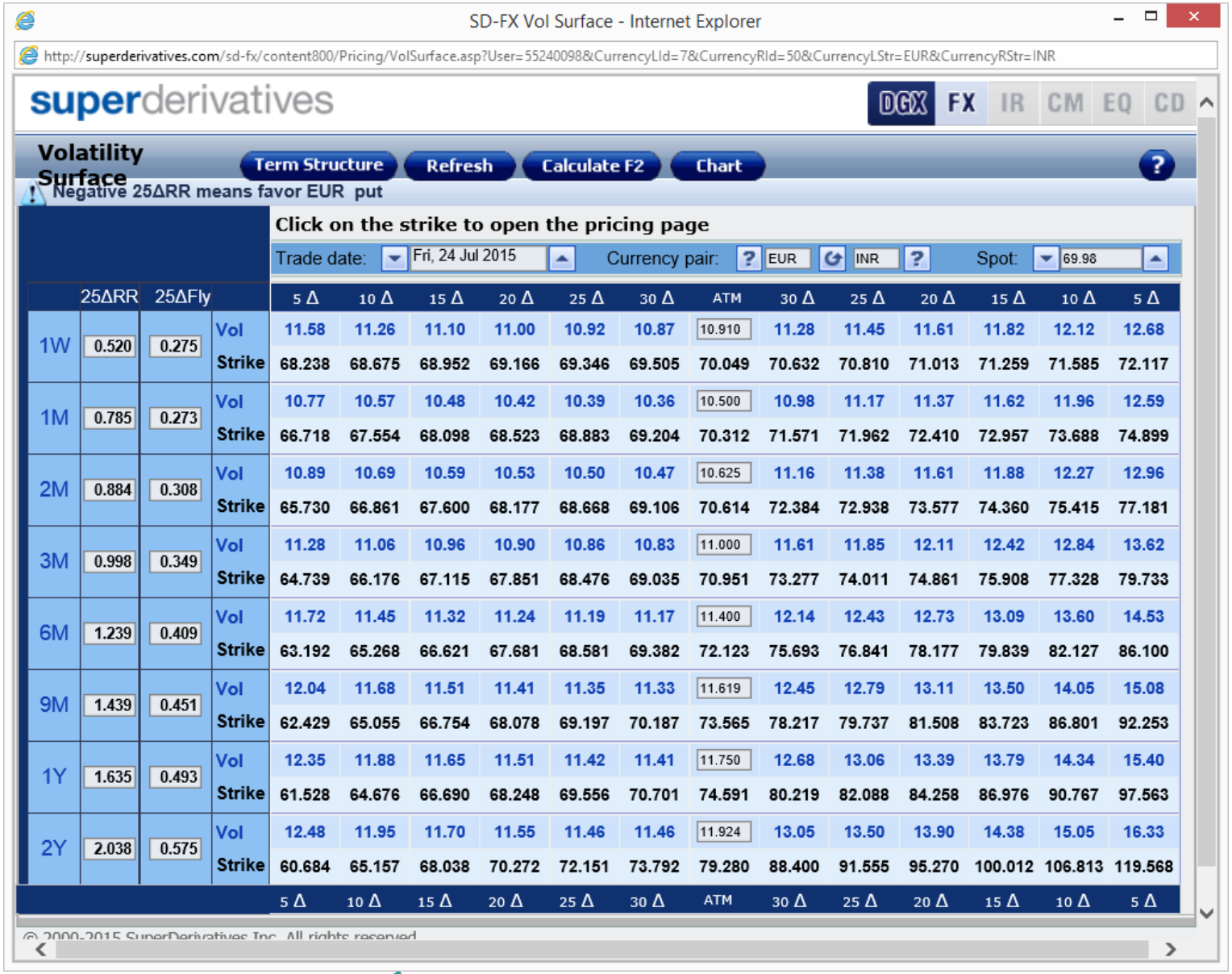
1st month fix	70.00	Profit = 6.00 = Max(76.00 – 70.00 , 0)	
2nd month fix	71.00	Profit = 5.00	Accumulated Profit = 11.00
3rd month fix	70.00	Profit = 6.00	Accumulated Profit = 17.00
4th month fix	72.00	Profit = 8.00	Accumulated Profit = 25.00
5th month fix	71.00	Profit = 5.00	Accumulated Profit = 30.00

Profit is capped at 30, so TRF terminates after 5 months

Volmaster FX: multi-leg pricing page



EUR-INR Volatility Surface 24 July 2015



SD-FX Vol Surface - Internet Explorer

http://superderivatives.com/sd-fx/content800/Pricing/VolSurface.asp?User=55240098&CurrencyLId=7&CurrencyRId=50&CurrencyLStr=EUR&CurrencyRStr=INR

superderivatives

DGX FX IR CM EQ CD

Volatility Surface

Term Structure | Refresh | Calculate F2 | Chart

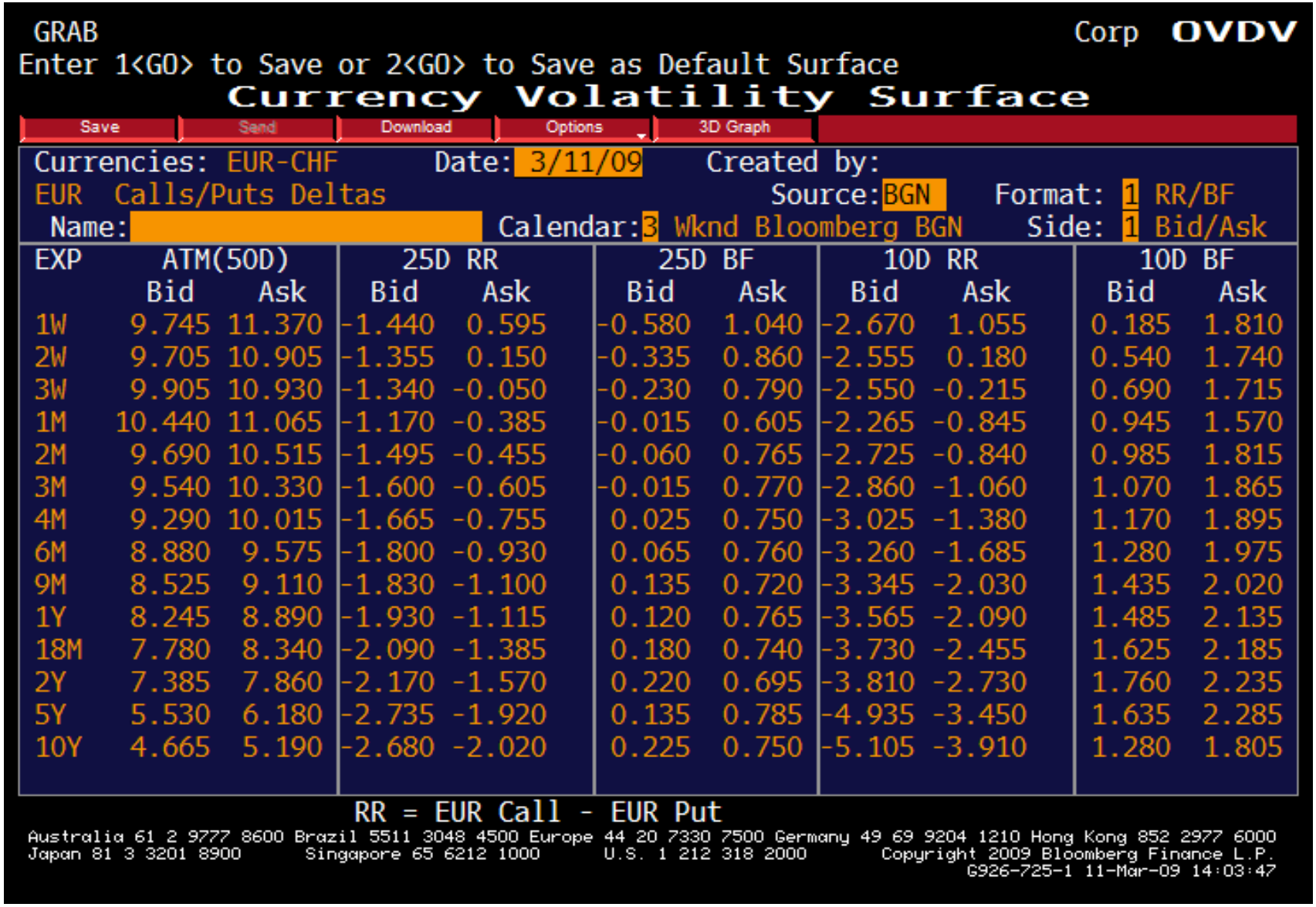
Negative 25ΔRR means favor EUR put

Click on the strike to open the pricing page

Trade date: Fri, 24 Jul 2015 Currency pair: EUR INR Spot: 69.98

	25ΔRR	25ΔFly		5 Δ	10 Δ	15 Δ	20 Δ	25 Δ	30 Δ	ATM	30 Δ	25 Δ	20 Δ	15 Δ	10 Δ	5 Δ
1W	0.520	0.275	Vol	11.58	11.26	11.10	11.00	10.92	10.87	10.910	11.28	11.45	11.61	11.82	12.12	12.68
			Strike	68.238	68.675	68.952	69.166	69.346	69.505	70.049	70.632	70.810	71.013	71.259	71.585	72.117
1M	0.785	0.273	Vol	10.77	10.57	10.48	10.42	10.39	10.36	10.500	10.98	11.17	11.37	11.62	11.96	12.59
			Strike	66.718	67.554	68.098	68.523	68.883	69.204	70.312	71.571	71.962	72.410	72.957	73.688	74.899
2M	0.884	0.308	Vol	10.89	10.69	10.59	10.53	10.50	10.47	10.625	11.16	11.38	11.61	11.88	12.27	12.96
			Strike	65.730	66.861	67.600	68.177	68.668	69.106	70.614	72.384	72.938	73.577	74.360	75.415	77.181
3M	0.998	0.349	Vol	11.28	11.06	10.96	10.90	10.86	10.83	11.000	11.61	11.85	12.11	12.42	12.84	13.62
			Strike	64.739	66.176	67.115	67.851	68.476	69.035	70.951	73.277	74.011	74.861	75.908	77.328	79.733
6M	1.239	0.409	Vol	11.72	11.45	11.32	11.24	11.19	11.17	11.400	12.14	12.43	12.73	13.09	13.60	14.53
			Strike	63.192	65.268	66.621	67.681	68.581	69.382	72.123	75.693	76.841	78.177	79.839	82.127	86.100
9M	1.439	0.451	Vol	12.04	11.68	11.51	11.41	11.35	11.33	11.619	12.45	12.79	13.11	13.50	14.05	15.08
			Strike	62.429	65.055	66.754	68.078	69.197	70.187	73.565	78.217	79.737	81.508	83.723	86.801	92.253
1Y	1.635	0.493	Vol	12.35	11.88	11.65	11.51	11.42	11.41	11.750	12.68	13.06	13.39	13.79	14.34	15.40
			Strike	61.528	64.676	66.690	68.248	69.556	70.701	74.591	80.219	82.088	84.258	86.976	90.767	97.563
2Y	2.038	0.575	Vol	12.48	11.95	11.70	11.55	11.46	11.46	11.924	13.05	13.50	13.90	14.38	15.05	16.33
			Strike	60.684	65.157	68.038	70.272	72.151	73.792	79.280	88.400	91.555	95.270	100.012	106.813	119.568
				5 Δ	10 Δ	15 Δ	20 Δ	25 Δ	30 Δ	ATM	30 Δ	25 Δ	20 Δ	15 Δ	10 Δ	5 Δ

Bloomberg OVDV example



GRAB Corp **OVDV**

Enter 1<GO> to Save or 2<GO> to Save as Default Surface

Currency Volatility Surface

Save | Send | Download | Options | 3D Graph

Currencies: EUR-CHF Date: 3/11/09 Created by:

EUR Calls/Puts Deltas Source: BGN Format: 1 RR/BF

Name: Calendar: 3 Wknd Bloomberg BGN Side: 1 Bid/Ask

EXP	ATM(50D)		25D RR		25D BF		10D RR		10D BF	
	Bid	Ask	Bid	Ask	Bid	Ask	Bid	Ask	Bid	Ask
1W	9.745	11.370	-1.440	0.595	-0.580	1.040	-2.670	1.055	0.185	1.810
2W	9.705	10.905	-1.355	0.150	-0.335	0.860	-2.555	0.180	0.540	1.740
3W	9.905	10.930	-1.340	-0.050	-0.230	0.790	-2.550	-0.215	0.690	1.715
1M	10.440	11.065	-1.170	-0.385	-0.015	0.605	-2.265	-0.845	0.945	1.570
2M	9.690	10.515	-1.495	-0.455	-0.060	0.765	-2.725	-0.840	0.985	1.815
3M	9.540	10.330	-1.600	-0.605	-0.015	0.770	-2.860	-1.060	1.070	1.865
4M	9.290	10.015	-1.665	-0.755	0.025	0.750	-3.025	-1.380	1.170	1.895
6M	8.880	9.575	-1.800	-0.930	0.065	0.760	-3.260	-1.685	1.280	1.975
9M	8.525	9.110	-1.830	-1.100	0.135	0.720	-3.345	-2.030	1.435	2.020
1Y	8.245	8.890	-1.930	-1.115	0.120	0.765	-3.565	-2.090	1.485	2.135
18M	7.780	8.340	-2.090	-1.385	0.180	0.740	-3.730	-2.455	1.625	2.185
2Y	7.385	7.860	-2.170	-1.570	0.220	0.695	-3.810	-2.730	1.760	2.235
5Y	5.530	6.180	-2.735	-1.920	0.135	0.785	-4.935	-3.450	1.635	2.285
10Y	4.665	5.190	-2.680	-2.020	0.225	0.750	-5.105	-3.910	1.280	1.805

RR = EUR Call - EUR Put

Australia 61 2 9777 8600 Brazil 5511 3048 4500 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852 2977 6000
Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000 Copyright 2009 Bloomberg Finance L.P.
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EUR-INR ATM and RR 2014-2015

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MathFinance Added Value

- Propose/compare hedging solutions for FX / IR risk
- Precalculation of levels
- Negotiation with banks/best execution
- Independent valuation (pre-trade and post trade)
- Verification of accounting suitability
- Help selecting pricing / risk management tools
- Help avoid „bad deals“
- Help win litigation if a „bad deal“ has happened
- Training of management and staff

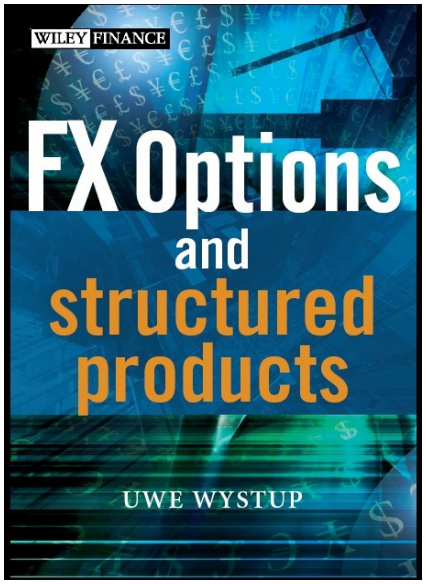
Selected Publications

Jürgen Hakala and Uwe Wystup

Foreign Exchange Risk

Risk Publications, London 2002

http://www.mathfinance.com/FXRiskBook/



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FX Options and Structured Products

Wiley Finance, 2006

http://mathfinance2.com/Products/Books

Efficient computation of option price sensitivities using homogeneity and other tricks, joint with Oliver Reiss, The Journal of Derivatives Vol. 9 No. 2, Winter 2001

Valuation of exotic options under short selling constraints, joint with Steven E. Shreve and Uwe Schmock, Finance and Stochastics VI, 2 (2002)

The market price of one-touch options in foreign exchange markets, Derivatives Week Vol. XII, no. 13, London 2003

Unifying exotic option closed formulas by Carlos Veiga, Uwe Wystup and Manuel L. Esquível. Review of Derivatives Research, 2012 Volume 15, Number 2, Pages 99-128

A Guide to FX Options Quoting Conventions by Uwe Wystup and Dimitri Reiswich. The Journal of Derivatives, Winter 2010, Vol. 18, No. 2: pp. 58-68.

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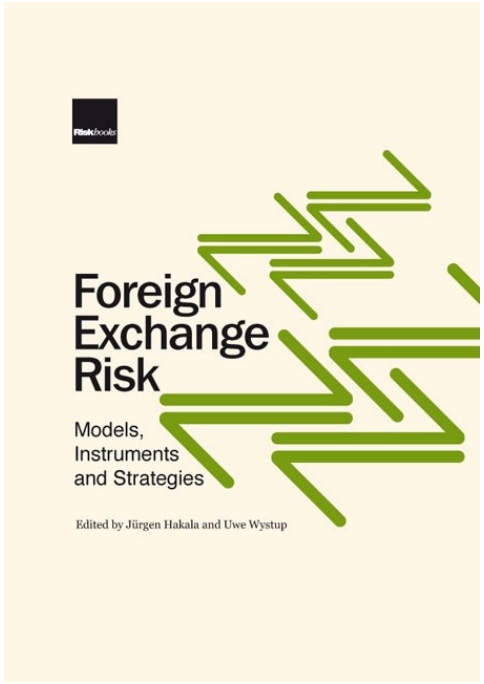
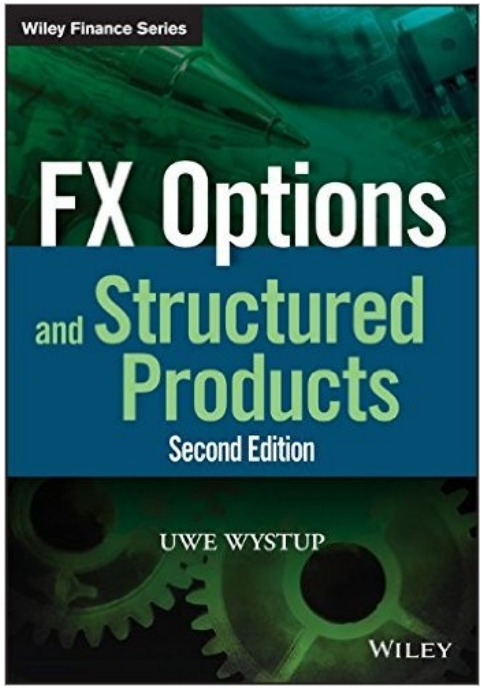
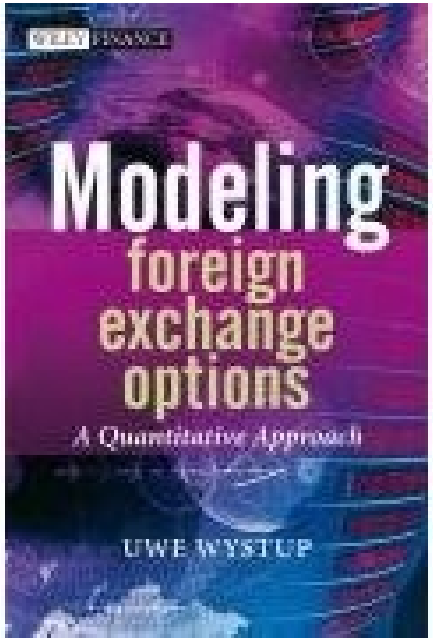
FX Options Related Publications







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