



Volmaster FX

Payoff-Scripting FX Derivatives

Volmaster FX Pricing Tool

- Deployed as SaaS
- No servers, no maintenance
- Pro Edition, installed client
- Eikon Edition, directly inside Refinitiv Eikon
- Includes Refinitiv premium feeds
- Sabr-based smile with tails management
- SLV and SLV+J models
- Events weights
- Fast and accurate 1st gen exotics pricing
- Payoff-scripted 2nd gen exotics pricing
- Traffic/Rfq
- Historical tools
- API



Payoff-Scripting Technology

Advantages

- No external tools required
- Instruments created directly inside Volmaster App
- Debug and Release modes
- Validate and publish directly to all users
- Integrated with SLV model
- Object-oriented
- Based on Microsoft vb.net language
- Clear and natural representation
- Monte-Carlo path payoff
- Special objects (barriers, etc.)
- Natively compiled
- Automatic handling of numeraire
- Parallelization



Quants Environment

(5) Financial instrument design

Design Pricing

Clear Load Save Save As Import Export

Switch to pricing tab after succesful build ☐ Build Build Status:

Description	Definitions	Enumerators	Vector Handlers	Dates	Fixing Schedules	Scalars	Vectors	Single Triggers	Double Triggers	Extrema	Holder Choices	Bid/Ask Spread	Extras	Solver
Definition Name	Type	Default Value	Show to User	Allow user to toggle	Settings	Settings	Settings	Settings	Settings	Settings	Settings	Settings	Settings	Settings
Numeraire	CcyDefinition	Domestic												
Header					Ref.Fx Exchange	Ref.Cash Date	Force Nom.FOR					Requires Notional	Default Notional	
Pricing Mode	PriceNotation	Delivery			Strike	Expiry	False					False		
PayoffCcy	CcyDefinition	Domestic	AsApplicable	True										
MultiplePayoffs	MultiPayoff	False												
Header					Ref.StartDate	Ref.EndDate	Ref.Schedule	Path-Dependent	Method	Time Density				
OptionStyle	ExerciseStyle	European												
Cut/Source	FixingCalendar	Inherit CcyPair	True	True										

Main Code Secondary Code

```

1
2
3 If callput = [call] Then
4   payoff.Cash = Max(0, Expiry.Spot - Strike)
5 Else
6   payoff.Cash = Max(0, Strike - Expiry.Spot)
7 End If
8
9 payoff.DateRef = Expiry
10
11 Return payoff
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33

```

Errors (0) Warnings (0)


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Definition of Dates

(5) Financial instrument design

Design Pricing

Clear Load Save Save As Import Export

Switch to pricing tab after succesful build ☐ Build Build Status: 

Description Definitions Enumerators Vector Handlers Dates Fixing Schedules Scalars Vectors Single Triggers Double Triggers Extrema Holder Choices Bid/Ask Spread Extras Solver

Date Name	Date Type	Default Tenor	Validation Condition (boolean statement)	Error Message	Remarks to User
EvalDate	Date	TDY			
ForwardStartDate	Date	1M	ForwardStartDate >= EvalDate	Forward Start Date cannot fall before Eval Date	Forward Start Date
Expiry	Date	1Y	Expiry > ForwardStartDate	Expiry must fall after Forward Start Date	Expiry

Main Code Secondary Code

```

1 Dim S0 As Double = Forwardstartdate.Spot
2 Dim K1 As Double = Forwardstartdate.Spot * StrikeRatioBase
3 Dim K2 As Double = Forwardstartdate.Spot * StrikeRatioCap
4
5
6
7 If callput = [call] Then
8     payoff.Cash = (Max(0, Expiry.Spot - K1) - Max(0, Expiry.Spot - K2)) / S0
9 Else
10    payoff.Cash = (Max(0, K1 - Expiry.Spot) - Max(0, K2 - Expiry.Spot)) / S0
11 End If
12
13 payoff.DateRef = Expiry
14
15 Return payoff
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33

```

Errors (0) Warnings (0)



Scalar Variables

(5) Financial instrument design

Design Pricing

Clear Load Save Save As Import Export

Switch to pricing tab after succesful build ☐ Build Build Status: ●

Name	Mode	Type	Visible	Default Value	Allow Edit	Ccy	Ccy Toggle	Decimals	Scaling	Validation Condition (bool) / Computed Value	Error
Direction	Input	CalPutEnum	True	Call	True						
Strike	Input	Double	True	Spot*1	True			Inherit CcyPair	None	Strike>0	Strike
Target	Input	Double	True	10	True			Fixed 2	BigFigure	Target>0	Target
PaymentMode	Input	CustomEnum1	True	[Full_Payment]	True						

Main Code Secondary Code

```

1
2
3 ' a long position is the one where buyer cumulates profit
4 ' at inception, a bank shall quote it as short
5 ' notional is always in FOR
6 ' payoff is always in DOM (irrespective of whether is the result of delivery or a cash-settlement)
7
8 ' gets total fixings from schedule
9 Dim N As Integer = schedule.TotalFixingScheduleItems
10
11
12 ' dimension payoff array
13 redim payoff(N)
14
15 ' assigns payoff-ccy and dates (no need to initialize cashflows, zero by definition)
16 For j As Integer = 1 To N
17     payoff(j).CashFlowCcy = Domestic
18     payoff(j).DateRef = schedule.FixingDates(j)
19 Next j
20
21 ' clears cumulative target
22 Dim cumul As Double = 0
23
24 ' ----- call side -----
25
26
27 If direction = [call] Then
28
29     ' loops each fixing date
30     For j As Integer = 1 To N
31
32         ' gets fixing or MC spot on such date
33         Dim S As Double = schedule.FixingDates(j).spot

```

Errors (0) Warnings (0)

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Vector Variables

(5) Financial instrument design

Design Pricing

Clear Load Save Save As Import Export Switch to pricing tab after succesful build Build Build Status

Description	Definitions	Enumerators	Vector Handlers	Dates	Fixing Schedules	Scalars	Vectors	Single Triggers	Double Triggers	Extrema	Holder Choices	Bid/Ask Spread	Extras	Solver
Name	Mode	Binding	Schedule/Handler	Type	Visible	Default Value	Allow Edit	Ccy	Ccy Toggle	Decimals	Scaling	Validation Condition (bool) /		
Leverage	Input	Schedule	Schedule	Double	True	2	True			Fixed 2	None	Leverage() >= 1 and Leverage		

Main Code Secondary Code

```

1
2
3 ' a long position is the one where buyer cumulates profit
4 ' at inception, a bank shall quote it as short
5 ' notional is always in FOR
6 ' payoff is always in DOM (irrespective of whether is the result of delivery or a cash-settlement)
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17     payoff(j).CashFlowCcy = Domestic
18     payoff(j).DateRef = schedule.FixingDates(j)
19 Next j
20
21 ' clears cumulative target
22 Dim cumul As Double = 0
23
24 ' ----- call side -----
25
26 If direction = [call] Then
27     ' loops each fixing date
28     For j As Integer = 1 To N
29         ' gets fixing or MC spot on such date
30         Dim F As Double = schedule.FixingDates(j).spot
31     Next j
32
33
  
```

Errors (0) Warnings (0)

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Pricing

(5) Financial instrument design

Design Pricing

Clear Load Save Save As Interbank grade 1way We Sell Mid-Mkt Calibrate StochasticLocalVol 5Y (43) VM Production Reload All

as of Fri, 01 Nov 19 ccypair USDJPY display 1 st.dev. context New instrument at inception

FX TARF with EKI spt 108.56 settl Wed, 06 Nov 19 prem/pv Wed, 06 Nov 19

Item	Type	Qualifier	Value	Label	(1)	Remarks
PayoffType	Delivery/Cash		Delivery			
OptionStyle	Exercise Style		European			
Cut/Source	Cut/Fixing Source		NY cut	Source		
StartFixingDate	Date		Wed, 04 Dec 19	1M		Initial fixing date
Expiry	Date		Wed, 04 Nov 20	1Y		Final fixing date
Schedule	Fixing Frequency	Mode	Monthly	Frequency	Fixings	
Direction	Call/Put		Call			Call/Put
Strike	Numeric		108.56			Forward rate
Target	Numeric (1BF=1)		10.00		Big Figures	Target profit in big figures
PaymentMode	TargetRoundingMode		Full Payment			Payment Mode
Barrier	Numeric		103.13			EKI barrier level
Leverage	Numeric (1)		2.00			Notional OTM Leverage
Notional USD	Amount	USD	24,000,000			Total ITM
Notional JPY	Amount	JPY	2,605,440,000			Total ITM
Rate USD	Rate		1.849	Act/360		(cont 1.863)
Rate JPY	Rate		-0.628	Act/360		(cont -0.641)
Forward	Forward		105.88			
Swap	Forward Points		-268.4			

Price Greeks Extras

USD P 3.75 USD % USD % P 3.452 USD pips Pay 899,459 We sell -101.2% -24,287,735 USD Delta 0.6% 138,040 Vega Compute Greeks

JPY P 3.75 JPY % JPY % P 406.9 JPY pips Pay 97.645M We sell -97.5% -23,388,276 USD Delta Price Histogram Vol Distribution

Market Data Advanced Correlation

Volatility Cut NY cut Admin 15:13

T	Atm	Spread	25 RR	10 RR	25 BF	10 BF
ON	5.47	0.00	-0.81	-1.57	0.21	0.79
1W	6.85	0.00	-1.02	-1.96	0.26	0.99
2W	7.00	0.00	-1.04	-2.00	0.24	0.94
1M	7.37	0.00	-1.10	-2.11	0.20	0.80
2M	7.61	0.00	-1.20	-2.29	0.21	0.86
3M	7.77	0.00	-1.36	-2.60	0.22	0.96
4M	7.94	0.00	-1.42	-2.70	0.25	1.07
6M	8.19	0.00	-1.54	-2.92	0.30	1.29
9M	8.53	0.00	-1.60	-3.03	0.36	1.53
1Y	8.82	0.00	-1.67	-3.13	0.42	1.78
18M	9.03	0.00	-1.70	-3.11	0.47	1.92
2Y	9.21	0.00	-1.69	-3.07	0.50	2.05
3Y	9.37	0.00	-1.59	-2.78	0.75	2.83
4Y	9.67	0.00	-1.61	-2.72	0.79	3.00
5Y	9.94	0.00	-1.62	-2.66	0.82	3.19
7Y	10.51	0.00	-1.65	-2.54	0.86	3.45
10Y	11.25	0.00	-1.70	-2.32	0.90	3.86

Interest Rates

Rate USD	Swap	Rate JPY
2.334	0.00	-0.209
1.241	-2.86	-0.341
1.502	-9.22	-0.850
1.634	-20.5	-0.638
1.699	-40.2	-0.495
1.786	-61.9	-0.457
1.834	-83.4	-0.467
1.922	-131.8	-0.489
1.944	-209.1	-0.624
1.849	-268.4	-0.628
1.718	-379.1	-0.634
1.734	-521.3	-0.696
1.853	-823.6	-0.751
1.918	-1,120.8	-0.782
1.958	-1,423.5	-0.827
2.029	-2,000.5	-0.855
2.105	-2,739.8	-0.780

Valid Calibr 5Y (*****) Warning Valid Sourced

Volmaster FX

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Schedules

First date

Wed, 04 Dec 19

Last date

Wed, 04 Nov 20

Dates generator

Automatic

Total fixings

12

Notional USD

24,000,000

Clear Dates

Baseline Notional

☐ Weighted

Import Dates

Import Notionals

(mouse right-click on the grid to insert or delete item)

N	Fixing Date	Notional USD	Fixing	Leverage
1	Wed, 04 Dec 19	2,000,000.00		2.00
2	Fri, 27 Dec 19	2,000,000.00		2.00
3	Tue, 04 Feb 20	2,000,000.00		2.00
4	Wed, 04 Mar 20	2,000,000.00		2.00
5	Thu, 02 Apr 20	2,000,000.00		2.00
6	Thu, 30 Apr 20	2,000,000.00		2.00
7	Thu, 04 Jun 20	2,000,000.00		2.00
8	Thu, 02 Jul 20	2,000,000.00		2.00
9	Tue, 04 Aug 20	2,000,000.00		2.00
10	Fri, 04 Sep 20	2,000,000.00		2.00
11	Fri, 02 Oct 20	2,000,000.00		2.00
12	Wed, 04 Nov 20	2,000,000.00		2.00

Status: Ok

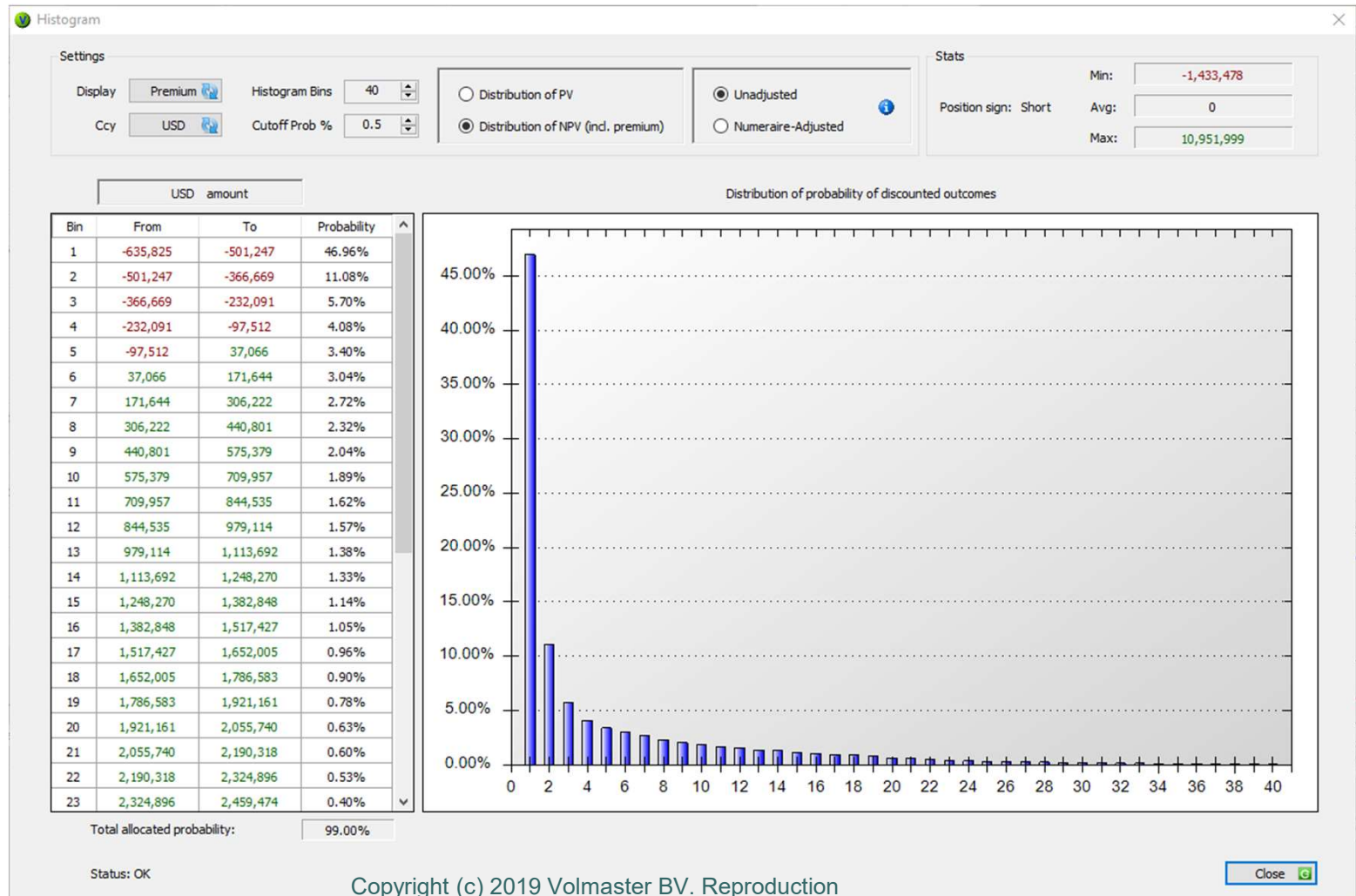
Warning: Ok

Export Grid

Ok

Cancel

Distribution of outcomes





Backward-Induction, Multinomial Lattice

Backward Induction Settings

Multinomial Lattice

Lattice spot process density: 51 (nodes)

Use adaptive density: ☐ 2.25 (power)

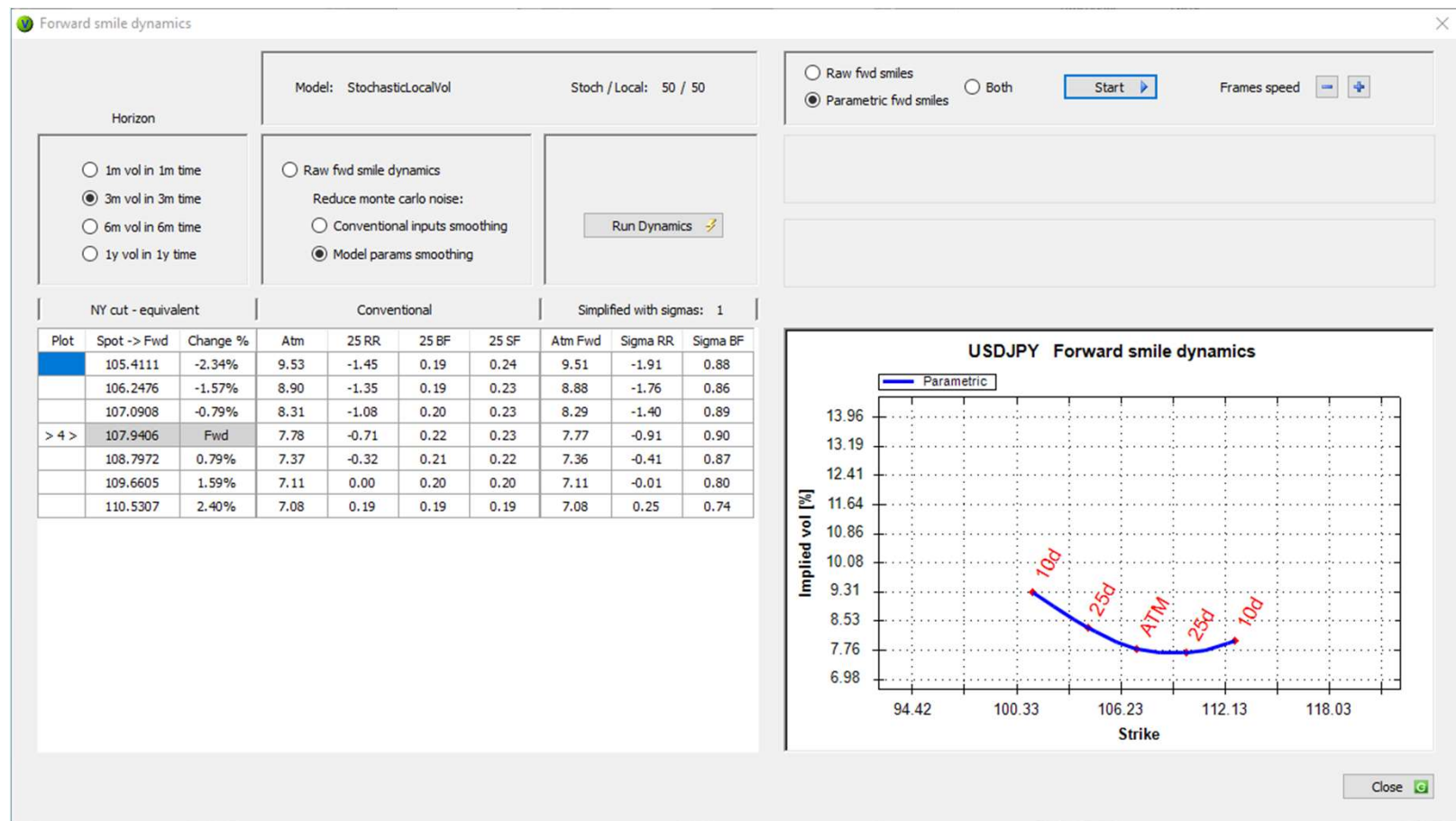
Spot process coverage: 3.25 (sigmas)

Correct lattice bias: ☒

Lattice numerical precision: ☐ Single ☒ Double



Model-dependent forward smile dynamics





Derivatives on realized volatility

(4) Financial instrument design

Design Pricing

Clear Load Save Save As

Interbank grade 1way We Buy Mid-Mkt

as of Fri, 01 Nov 19 ccypair USDJPY display 1 st.dev. context New instrument at inception

Option on Realized Vol spt 108.56 sett Wed, 06 Nov 19 prem/pv Wed, 06 Nov 19

Item	Type	Qualifier	Value	Label	(1)	Remarks
PayoffType	Delivery/Cash		CashSettled			
PayoffCcy	Payoff Ccy		USD			
OptionStyle	Exercise Style		European			
Cut/Source	Cut/Fixing Source		NY cut	Source	Agent	
StartDate	Date		Fri, 01 Nov 19	Date	TDY	
Expiry	Date		Tue, 04 Feb 20	Date	3M	
Sched	Fixing Frequency	Mode	Daily	Frequency	Fixing	
CallPut	Call/Put		Call			
VolStrike	Numeric %		8.000		%	
AnnualizationFactor	Numeric (Integer)		262			
PricingMethod	VolMethod		Discrete Sampling			
Notional USD	Amount	USD	1,000,000			Per 1% Vol
Rate USD	Rate		1.786	Act/360		(cont 1.826)
Rate JPY	Rate		-0.457	Act/360		(cont -0.469)
Forward	Forward		107.94			
Swap	Forward Points		-61.9			
Atm Vol	Atm		7.77	NY cut		
Butterfly	25d Fly		0.23	NY cut		
Risk Reversal	25d Rev		-1.36	NY cut		

Price Greeks Extras

USD P 104.32 USD % e ±0.95 USD pips

We buy Pay 1,043,176 e ±9,505 0.0% nil Delta 56.3% 563,497 Vega

JPY - JPY % - JPY pips

We buy Pay 113,247M e ±1,031,815 104.3% 1,043,176 USD Delta

Compute Greeks Price Histogram Vol Distribution

Ready

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Market Data Advanced Correlation

Volatility

Cut NY cut Admin 15:13

T	Atm	Spread	25 RR	10 RR	25 BF	10 BF
ON	5.47	0.00	-0.81	-1.57	0.21	0.79
1W	6.85	0.00	-1.02	-1.96	0.26	0.99
2W	7.00	0.00	-1.04	-2.00	0.24	0.94
1M	7.37	0.00	-1.10	-2.11	0.20	0.80
2M	7.61	0.00	-1.20	-2.29	0.21	0.86
3M	7.77	0.00	-1.36	-2.60	0.22	0.96
4M	7.94	0.00	-1.42	-2.70	0.25	1.07
6M	8.19	0.00	-1.54	-2.92	0.30	1.29
9M	8.53	0.00	-1.60	-3.03	0.36	1.53
1Y	8.82	0.00	-1.67	-3.13	0.42	1.78
18M	9.03	0.00	-1.70	-3.11	0.47	1.92
2Y	9.21	0.00	-1.69	-3.07	0.50	2.05
3Y	9.37	0.00	-1.59	-2.78	0.75	2.83
4Y	9.67	0.00	-1.61	-2.72	0.79	3.00
5Y	9.94	0.00	-1.62	-2.66	0.82	3.19
7Y	10.51	0.00	-1.65	-2.54	0.86	3.45
10Y	11.25	0.00	-1.70	-2.32	0.90	3.86

Interest Rates

Volmaster 15Jun Volmaster 15Jun

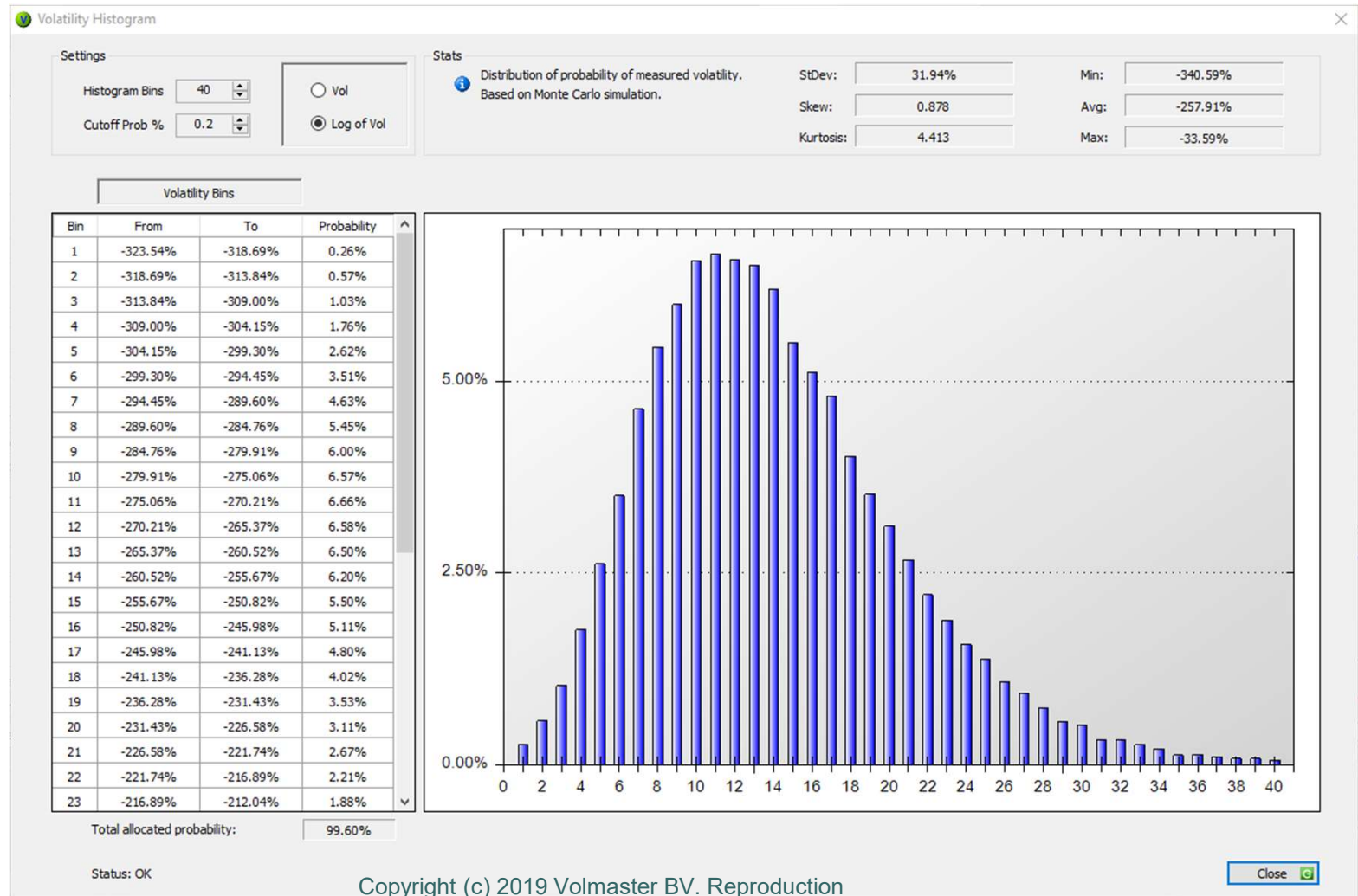
Rate USD	Swap	Rate JPY
2.334	0.00	-0.209
1.241	-2.86	-0.341
1.502	-9.22	-0.850
1.634	-20.5	-0.638
1.699	-40.2	-0.495
1.786	-61.9	-0.457
1.834	-83.4	-0.467
1.922	-131.8	-0.489
1.944	-209.1	-0.624
1.849	-268.4	-0.628
1.718	-379.1	-0.634
1.734	-521.3	-0.696
1.853	-823.6	-0.751
1.918	-1,120.8	-0.782
1.958	-1,423.5	-0.827
2.029	-2,000.5	-0.855
2.105	-2,739.8	-0.780

Valid Calibr 5Y (*****) Warning Valid Sourced

Volmaster FX

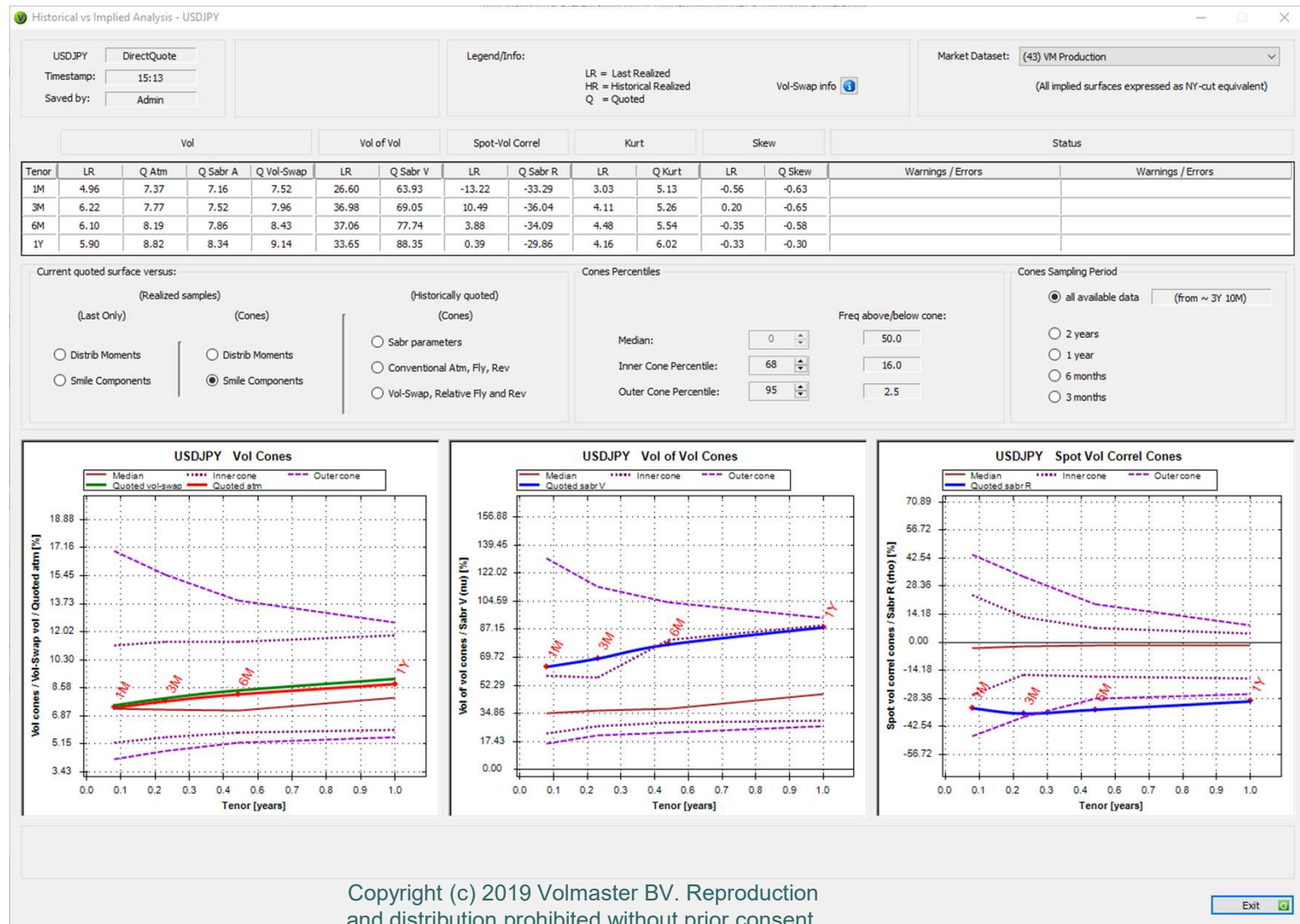


Model-dependent distribution of future volatility



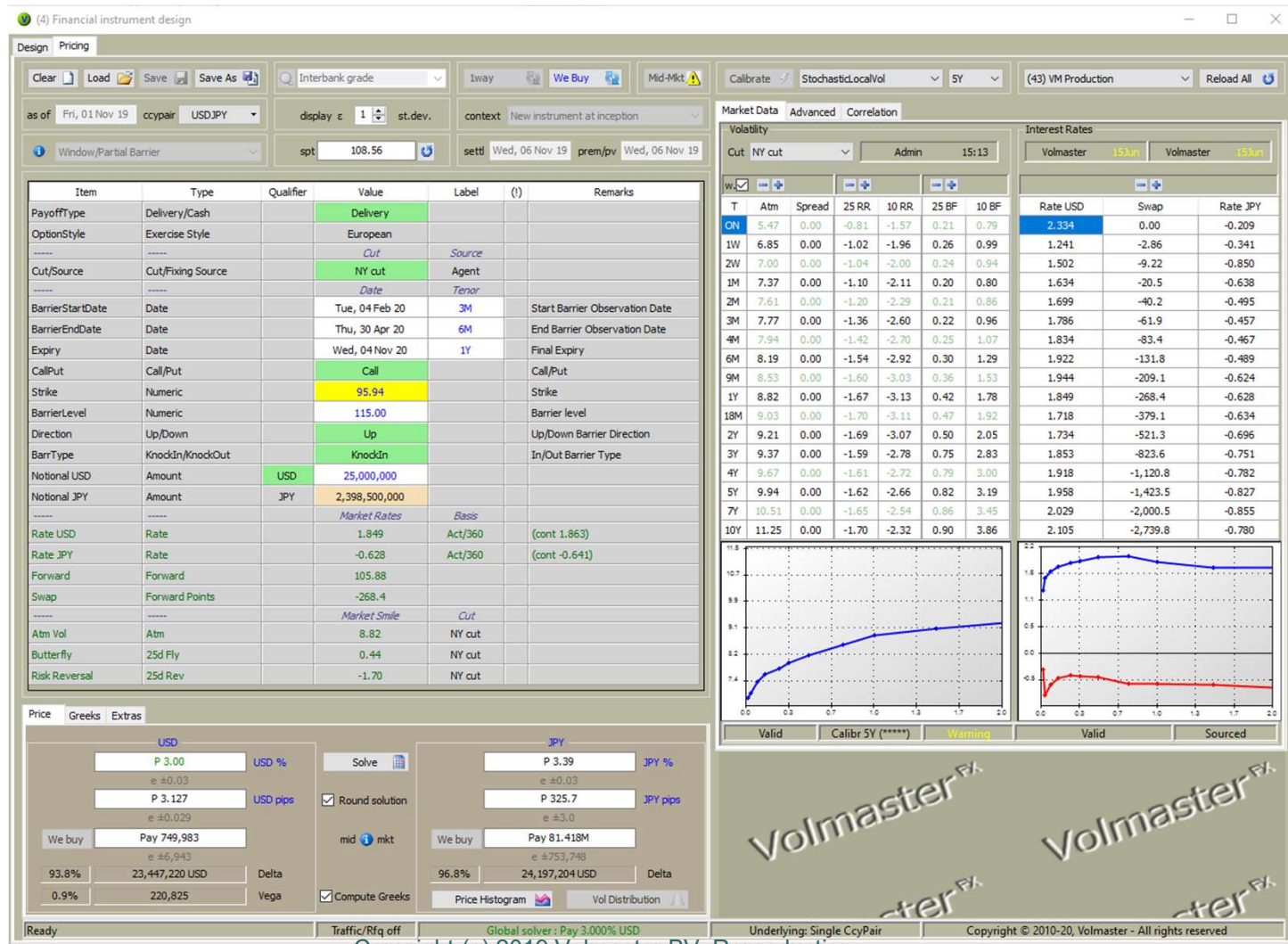


Historically realized vol-of-vol





Solver in action



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Solver to compute fair price

(4) Financial instrument design

Design Pricing

Clear Load Save Save As Interbank grade 1way We Buy Mid-Mkt Calibrate StochasticLocalVol 5Y (43) VM Production Reload All

as of Fri, 01 Nov 19 ccypair USDJPY display 1 st.dev. context New instrument at inception

Volatility Swap spt 108.56 settl Wed, 06 Nov 19 prem/pv Wed, 06 Nov 19

Item	Type	Qualifier	Value	Label	(I)	Remarks
PayoffType	Delivery/Cash		CashSettled			
PayoffCcy	Payoff Ccy		USD			
OptionStyle	Exercise Style		European			
Cut/Source	Cut/Fixing Source		NY cut	Source		
StartDate	Date		Fri, 01 Nov 19	TDY		
Expiry	Date		Tue, 04 Feb 20	3M		
Sched	Fixing Frequency	Simple	Daily	(68)		
QuotedVol	Numeric %		7.978	%		
AnnualizationFactor	Numeric (Integer)		262			
PricingMethod	VolMethod		Discrete Sampling			
Notional USD	Amount	USD	1,000,000			Vega 1%
Rate USD	Rate		1.786	Act/360		(cont 1.826)
Rate JPY	Rate		-0.457	Act/360		(cont -0.469)
Forward	Forward		107.94			
Swap	Forward Points		-61.9			
Atm Vol	Atm		7.77	NY cut		
Butterfly	25d Fly		0.23	NY cut		
Risk Reversal	25d Rev		-1.36	NY cut		

Price Greeks Extras

USD P 0.04 USD % e ±1.20 - USD pips We buy Pay 370 e ±12,042 0.0% nil Delta 111.7% 1,117,209 Vega

Solve Round solution mid mkt Compute Greeks

JPY - JPY % - JPY pips We buy Pay 40,162 e ±1,307,255 0.0% 370 USD Delta Price Histogram Vol Distribution

Ready Traffic/Rfq off Global solver: Zero cost Underlying: Single CcyPair Copyright © 2010-20, Volmaster - All rights reserved

Market Data Advanced Correlation

Volatility Cut NY cut Admin 15:13

T	Atm	Spread	25 RR	10 RR	25 BF	10 BF
ON	5.47	0.00	-0.81	-1.57	0.21	0.79
1W	6.85	0.00	-1.02	-1.96	0.26	0.99
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1M	7.37	0.00	-1.10	-2.11	0.20	0.80
2M	7.61	0.00	-1.20	-2.29	0.21	0.86
3M	7.77	0.00	-1.36	-2.60	0.22	0.96
4M	7.94	0.00	-1.42	-2.70	0.25	1.07
6M	8.19	0.00	-1.54	-2.92	0.30	1.29
9M	8.53	0.00	-1.60	-3.03	0.36	1.53
1Y	8.82	0.00	-1.67	-3.13	0.42	1.78
18M	9.03	0.00	-1.70	-3.11	0.47	1.92
2Y	9.21	0.00	-1.69	-3.07	0.50	2.05
3Y	9.37	0.00	-1.59	-2.78	0.75	2.83
4Y	9.67	0.00	-1.61	-2.72	0.79	3.00
5Y	9.94	0.00	-1.62	-2.66	0.82	3.19
7Y	10.51	0.00	-1.65	-2.54	0.86	3.45
10Y	11.25	0.00	-1.70	-2.32	0.90	3.86

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1.922	-131.8	-0.489
1.944	-209.1	-0.624
1.849	-268.4	-0.628
1.718	-379.1	-0.634
1.734	-521.3	-0.696
1.853	-823.6	-0.751
1.918	-1,120.8	-0.782
1.958	-1,423.5	-0.827
2.029	-2,000.5	-0.855
2.105	-2,739.8	-0.780

Valid Calibr 5Y (*****) Warning Valid Sourced

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