LRW FX Model Calibration Report

Model Calibration Team

August 15, 2025

1 Summary

This report presents the calibrated parameters for the LRW (Linear-Rational-Wishart) FX Model across multiple calibration dates and option maturities. The model is calibrated on domestic and foreign curves with various option tenor configurations.

1.1 Calibration Overview

- **Model Type:** LRW FX Model

- **Dimensions:** 2-factor model

- **Calibration Dates:** 5 dates from 2025-03-14 to 2025-05-30

- **Option Tenors:** 1Y, 2Y, 3Y, 4Y, 5Y, 7Y, 10Y, 3Y-7Y

- **Zero Coupon Curve Range:** 2Y to 11Y

- **Calibration Objectives:** Price (bonds), Volatility (options)

Parameter	Value
Model Type	LRW FX Model
Dimensions (n)	2
Jump Component	No Jump
$\alpha_i \neq \alpha_j$ relationship	Varies by date

Table 1: General Model Settings

- **The matrix u_i for the domestic curve:**

$$u_i = \begin{pmatrix} 1.0000 & 0.0000 \\ 0.0000 & 0.1250 \end{pmatrix}$$

- **The matrix u_j for foreign curve:**

$$u_j = \begin{pmatrix} 0.1000 & 0.0000 \\ 0.0000 & 1.0000 \end{pmatrix}$$

2 Calibration Quality Summary

Table 2: Calibration on yield data quality metrics by date (RMSE in b.p. - calibrated on price, on 2Y-10Y instruments)

Date	RMSE OIS Price	RMSE OIS Yield
03/14/2025	30.35	40.78
04/01/2025	34.13	48.46
04/15/2025	41.97	62.02
05/16/2025	41.86	54.60
05/30/2025	46.81	61.53

Table 3: Calibration on Vol data quality metrics by date and tenor (RMSE in b.p.)

Date	Tenor	RMSE Option Price	RMSE Option Vol
03/14/2025	1Y	12.28	58.01
03/14/2025	2Y	6.58	20.87
03/14/2025	3Y	9.99	28.71
03/14/2025	4Y	12.59	32.69
03/14/2025	5Y	17.26	24.96
03/14/2025	7Y	24.91	48.47
03/14/2025	10Y	74.23	109.35
03/14/2025	3Y-7Y	94.66	151.57
04/01/2025	1Y	12.48	56.25
04/01/2025	2Y	4.61	14.29
04/01/2025	3Y	8.81	24.87
04/01/2025	4Y	11.82	25.42
04/01/2025	5Y	15.84	24.55
04/01/2025	7Y	15.61	30.87
04/01/2025	10Y	64.16	95.24
04/01/2025	3Y-7Y	88.66	136.22
04/15/2025	1Y	5.82	25.63
04/15/2025	2Y	9.46	27.48
04/15/2025	3Y	145.91	226.78
04/15/2025	4Y	22.47	34.84
04/15/2025	5Y	23.07	43.99
04/15/2025	7Y	256.48	263.89
04/15/2025	10Y	344.29	329.32
04/15/2025	3Y-7Y	205.23	260.46
05/16/2025	1Y	9.18	26.64
05/16/2025	2Y	31.32	86.64
05/16/2025	3Y	35.73	73.77
05/16/2025	4Y	6.79	13.31
05/16/2025	5Y	66.56	109.06
05/16/2025	7Y	82.03	128.37
05/16/2025	10Y	111.96	145.20
05/16/2025	3Y-7Y	92.30	131.36
05/30/2025	1Y	9.50	18.92
05/30/2025	2Y	8.17	6.84
05/30/2025	3Y	57.49	117.08
05/30/2025	4Y	74.08	128.15
05/30/2025	5Y	7.89	13.81
05/30/2025	7Y	130.72	188.18
05/30/2025	10Y	123.79	138.86
05/30/2025	3Y-7Y	98.26	140.01

Table 4: Model paramters calibrated on yield curve by date

Date	FX Spot	$alpha_i$	$alpha_j$	x_{011}	x_{022}	ω_{11}	ω_{22}	m_{11}	m_{22}
03/14/2025	1.08800	0.039593	0.028338	0.199392	0.054721	0.033431	0.045622	-0.076556	-0.280272
04/01/2025	1.07875	0.038260	0.026502	0.205832	0.053567	0.030540	0.040193	-0.065827	-0.245932
04/15/2025	1.12730	0.040107	0.025612	0.017524	0.012915	0.010914	0.023815	-0.119239	-0.293287
05/16/2025	1.11525	0.041060	0.026136	0.095029	0.002022	0.025684	0.016454	-0.101037	-0.253732
05/30/2025	1.13590	0.041177	0.026113	0.070030	0.002481	0.022693	0.017231	-0.105884	-0.242980

Table 5: Model paramters calibrated on Vol data by date and by tenor

Date	Tenor	σ_{11}	σ_{22}	Correl-σ	Correl-x_0	Correl-ω
03/14/2025	1Y	0.048149	0.104592	0.417794	0.299886	0.352399
03/14/2025	2Y	0.086735	0.155892	0.067034	0.070916	0.188956
03/14/2025	3Y	0.115547	0.209549	0.017583	0.131158	0.269489
03/14/2025	4Y	0.142608	0.288022	0.149541	0.196754	0.327120
03/14/2025	5Y	0.171886	0.315597	0.128263	0.120524	0.285681
03/14/2025	7Y	0.196883	0.395746	0.258847	-0.012087	0.099275
03/14/2025	10Y	0.283572	0.877673	0.023354	0.036176	0.352668
03/14/2025	3Y-7Y	0.157672	0.219135	0.035675	0.155305	0.326858
04/01/2025	1Y	0.043521	0.112467	0.392693	0.311332	0.366536
04/01/2025	2Y	0.078913	0.169948	0.130060	0.226049	0.320741
04/01/2025	3Y	0.106774	0.212325	0.002812	0.088384	0.304616
04/01/2025	4Y	0.134075	0.279122	0.128935	0.188360	0.306159
04/01/2025	5Y	0.158821	0.311801	0.161090	0.115301	0.275926
04/01/2025	7Y	0.182382	0.335337	0.363974	0.023833	0.243541
04/01/2025	10Y	0.252547	0.738833	-0.031850	0.036301	0.327762
04/01/2025	3Y-7Y	0.150440	0.348989	0.344920	0.573781	0.738241
04/15/2025	1Y	0.110610	0.167913	-0.469171	0.338866	0.539619
04/15/2025	2Y	0.181211	0.246447	0.580332	-0.224206	-0.343220
04/15/2025	3Y	0.638536	0.638536	0.170000	0.025000	0.250000
04/15/2025	4Y	0.286226	0.374657	0.616818	-0.290657	-0.433651
04/15/2025	5Y	0.320645	0.414507	0.648782	0.097325	-0.535648
04/15/2025	7Y	1.398511	0.978765	0.349758	-0.000541	-0.106172
04/15/2025	10Y	1.452547	1.306530	0.517990	-0.001971	-0.233062
04/15/2025	3Y-7Y	0.867485	0.820381	0.296084	0.014923	0.049784
05/16/2025	1Y	0.059448	0.137378	-0.466384	0.117401	0.343617
05/16/2025	2Y	0.121601	0.472124	0.102438	0.352313	0.439334
05/16/2025	3Y	0.158561	0.434221	-0.158377	0.180471	0.290439
05/16/2025	4Y	0.174196	0.267905	0.528161	-0.180374	-0.141901
05/16/2025	5Y	0.258649	0.646250	0.275923	0.020441	0.149252
05/16/2025	7Y	0.510693	1.010088	0.383548	-0.049770	-0.373469
05/16/2025	10Y	0.700389	0.989595	0.434313	0.009407	-0.017875
05/16/2025	3Y-7Y	0.206640	0.343459	0.430933	-0.015431	0.114433
05/30/2025	1Y	0.071655	0.139067	-0.471358	0.062448	0.285215
05/30/2025	2Y	0.118039	0.191006	-0.445822	0.521397	0.380089
05/30/2025	3Y	0.202973	0.614903	0.176331	0.156164	0.272337
05/30/2025	4Y	0.271227	0.619849	0.216720	0.023299	0.220960
05/30/2025	5Y	0.220458	0.298461	0.570973	-0.174474	-0.285795
05/30/2025	7Y	0.928587	1.036051	0.400396	0.012902	-0.015855
05/30/2025	10Y	1.447348	1.391217	0.574545	0.012833	-0.254068
05/30/2025	3Y-7Y	0.216083	0.293019	0.493946	-0.091590	-0.165838

3 Cross-Tenor Analysis

3.1 Calibration Quality by Tenor

The following analysis compares calibration quality across different option tenors:

Tenor	Avg RMSE Option Price	Avg RMSE Option Vol
1Y	9.85	37.09
2Y	12.03	31.22
3Y	51.58	94.24
4Y	25.55	46.88
5Y	26.12	43.27
7Y	101.95	131.95
10Y	143.69	163.59
3Y-7Y	115.82	163.92

Table 6: Average Calibration Quality Metrics by Tenor.

Note, for the yield curve, the average RMSE on price is 39.02, and the average RMSE on yield is 53.48.

4 Calibration Result Charts

This section presents the calibration results through various charts showing the yield curves and implied volatility surfaces for each calibration date.

4.1 Calibration Results for March 14, 2025

4.1.1 Domestic Curve Analysis
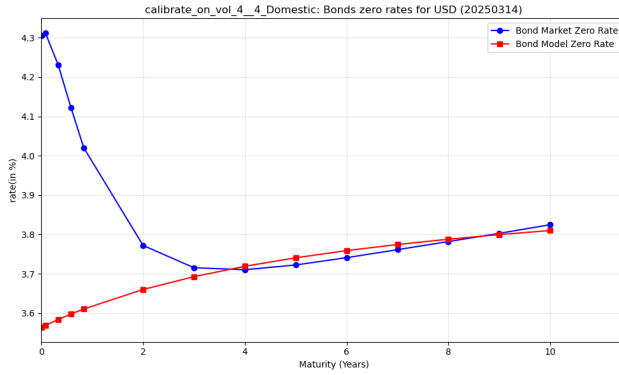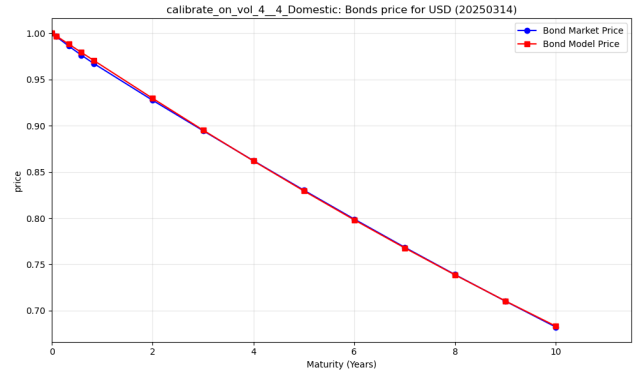
(a) Zero Rate Curve

(b) Zero Coupon Bond Price Curve

Figure 1: Domestic Curve Calibration Results for March 14, 2025

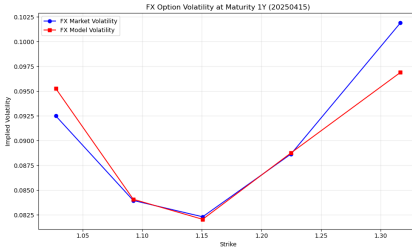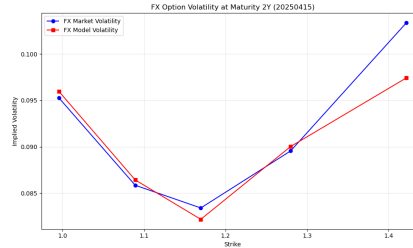### 4.1.2 Foreign Curve Analysis
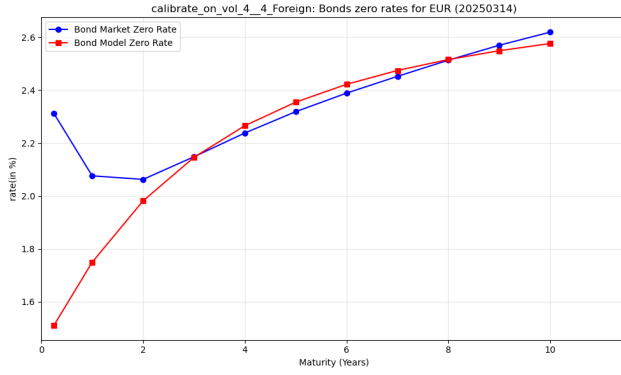
(a) Zero Rate Curve
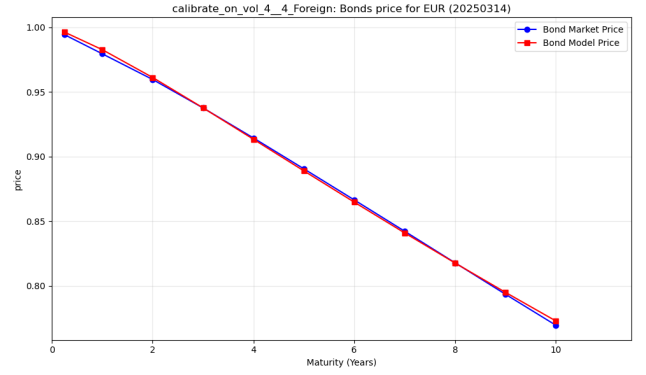
(b) Zero Coupon Bond Price Curve

Figure 2: Foreign Curve Calibration Results for March 14, 2025
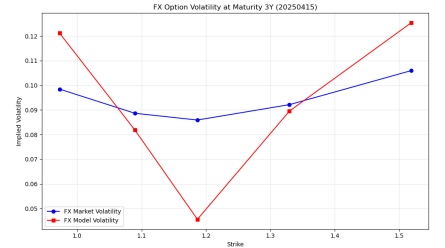
4.1.3 FX Volatility Surface - Calibration by tenor
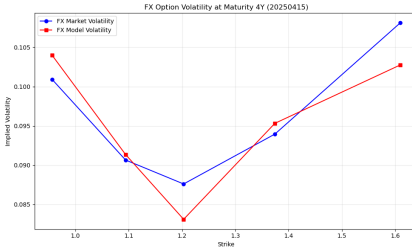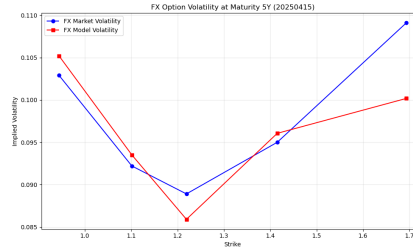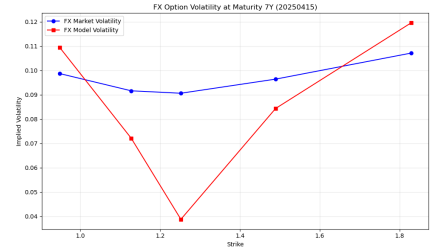

(a) 1Y

(b) 2Y

(c) 3Y
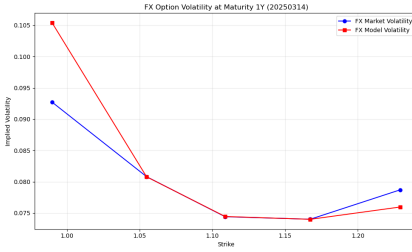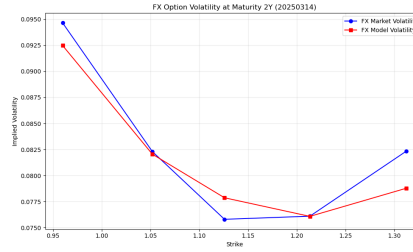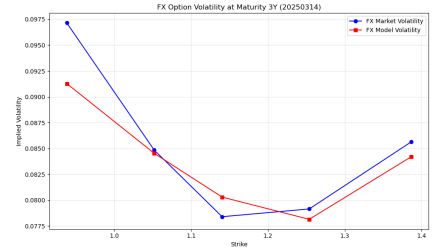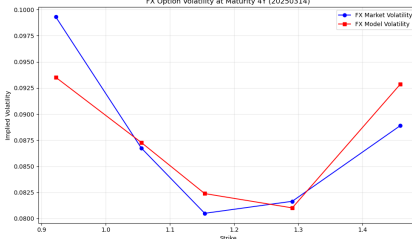
(d) 4Y
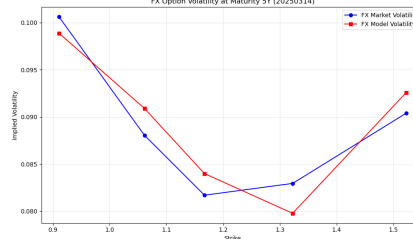
(e) 5Y
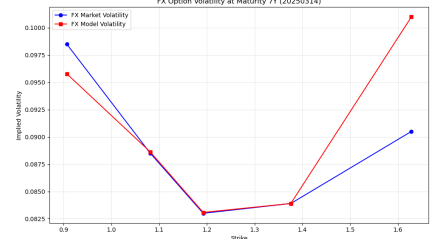
(f) 7Y

Figure 3: FX Implied Volatility Surfaces for All Tenors (separate calibration by tenor) - March 14, 2025

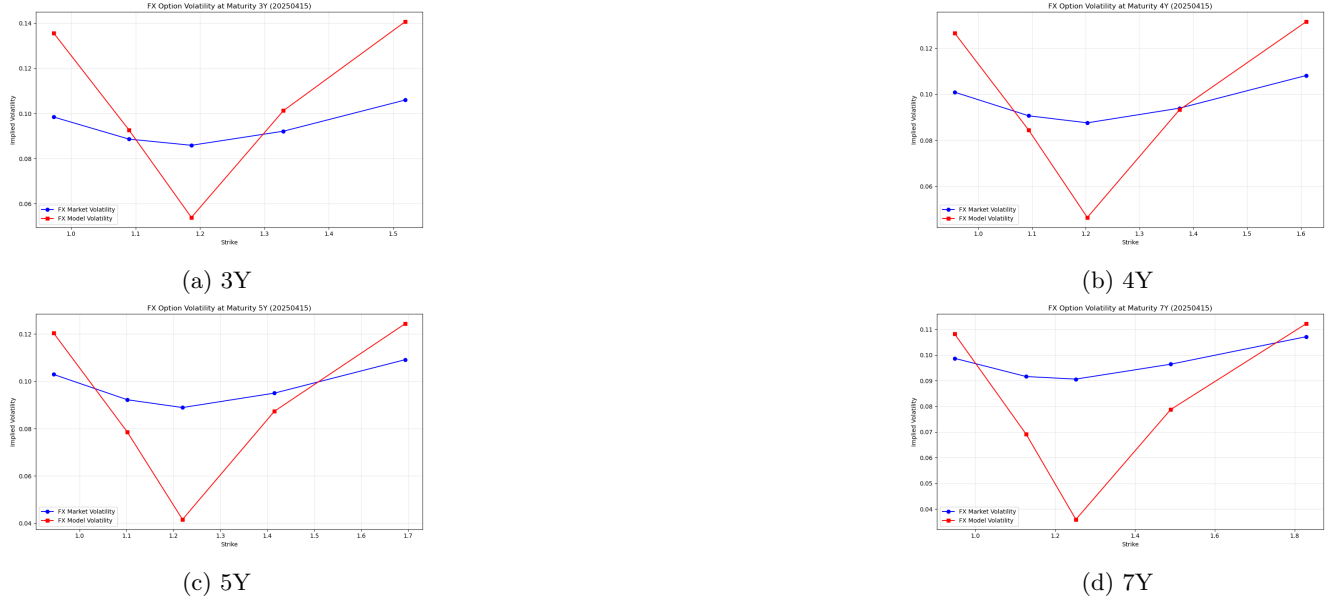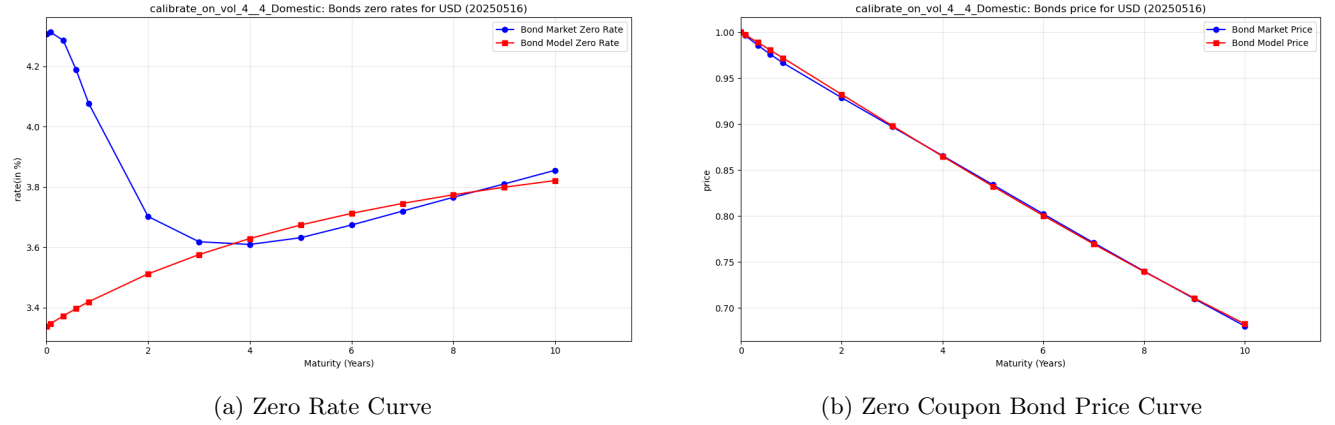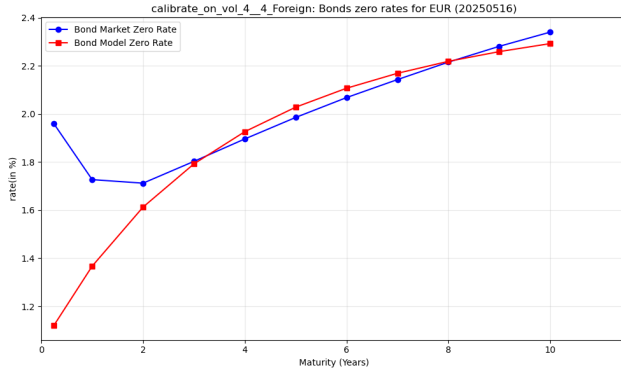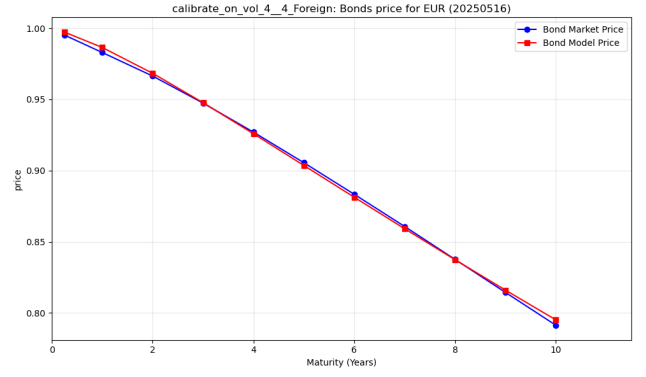### 4.1.4 FX Volatility Surface - joint calibration for tenors 3Y, 4Y, 5Y, and 7Y

(a) 3Y

(b) 4Y

(c) 5Y

(d) 7Y
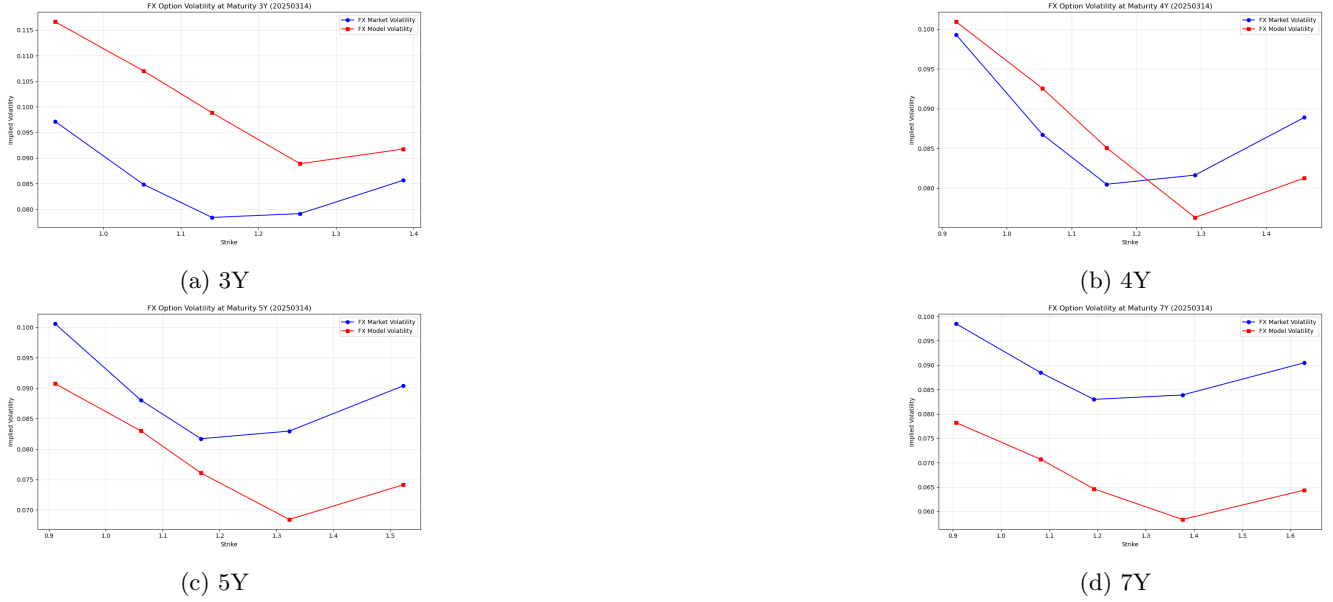
Figure 4: FX Implied Volatility Surfaces for joint calibration for 3Y, 4Y, 5Y, and 7Y - March 14, 2025

4.2 Calibration Results for April 01, 2025

4.2.1 Domestic Curve Analysis

(a) Zero Rate Curve

(b) Zero Coupon Bond Price Curve
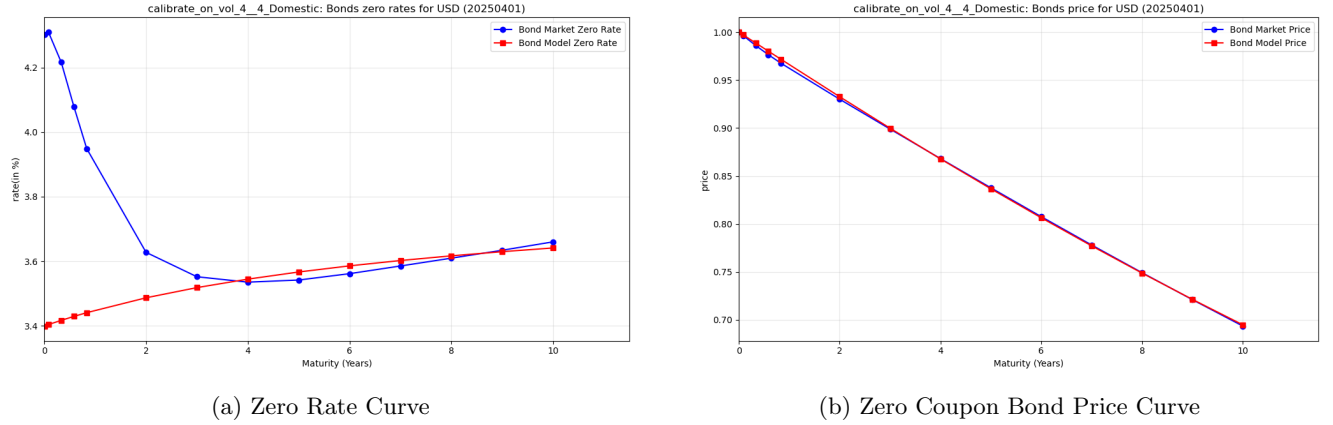
Figure 5: Domestic Curve Calibration Results for April 01, 2025
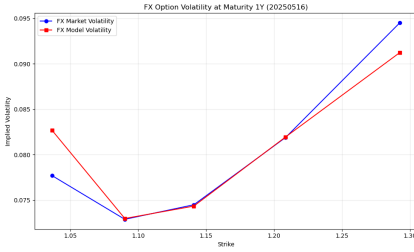
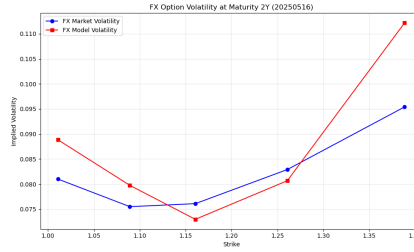## 4.2.2   Foreign Curve Analysis
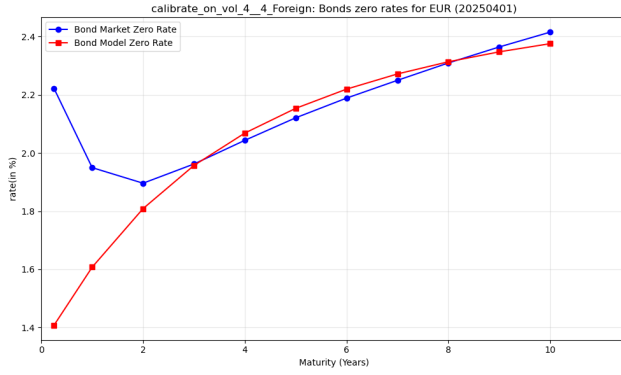
(a) Zero Rate Curve
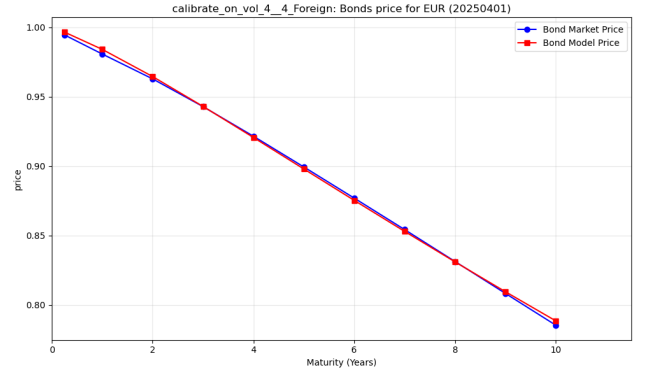
(b) Zero Coupon Bond Price Curve

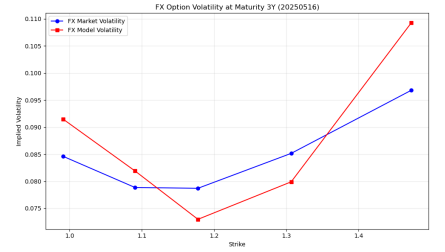Figure 6: Foreign Curve Calibration Results for April 01, 2025
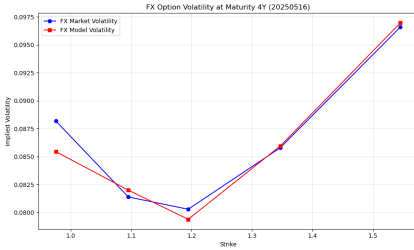
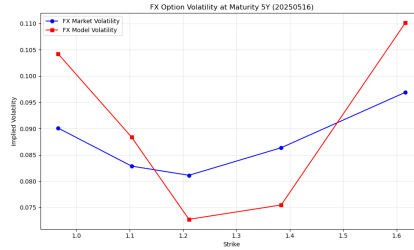## 4.2.3   FX Volatility Surface - Calibration by tenor
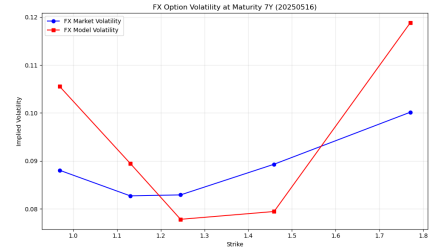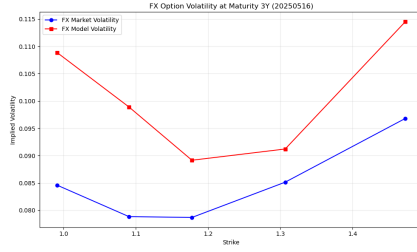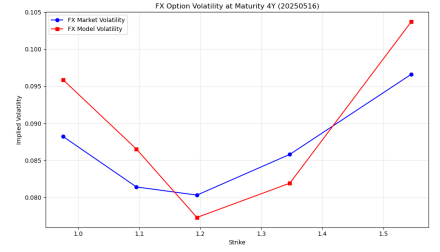

(a) 1Y

(b) 2Y

(c) 3Y
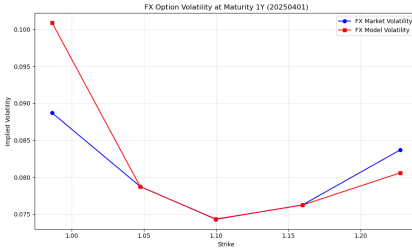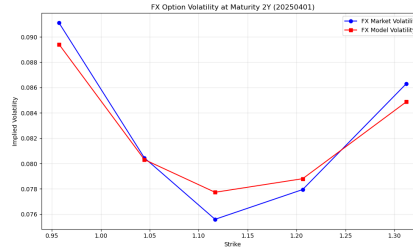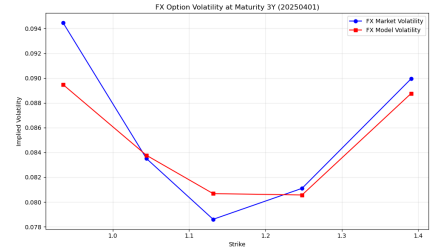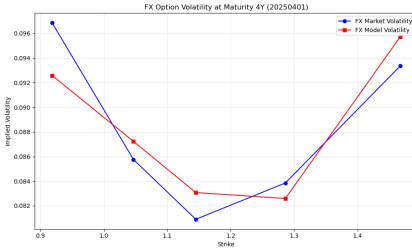
(d) 4Y
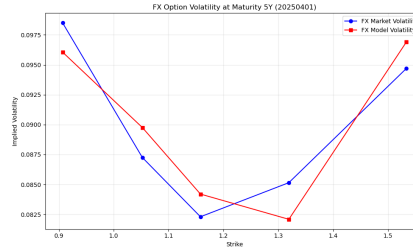
(e) 5Y
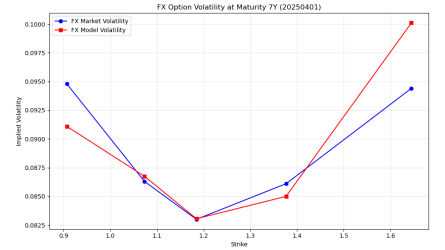
(f) 7Y

Figure 7: FX Implied Volatility Surfaces for All Tenors (separate calibration by tenor) - April 01, 2025
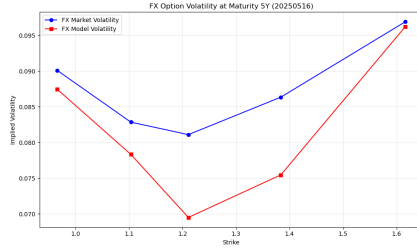
4.2.4 FX Volatility Surface - joint calibration for tenors 3Y, 4Y, 5Y, and 7Y

(a) 3Y

(b) 4Y

(c) 5Y

(d) 7Y
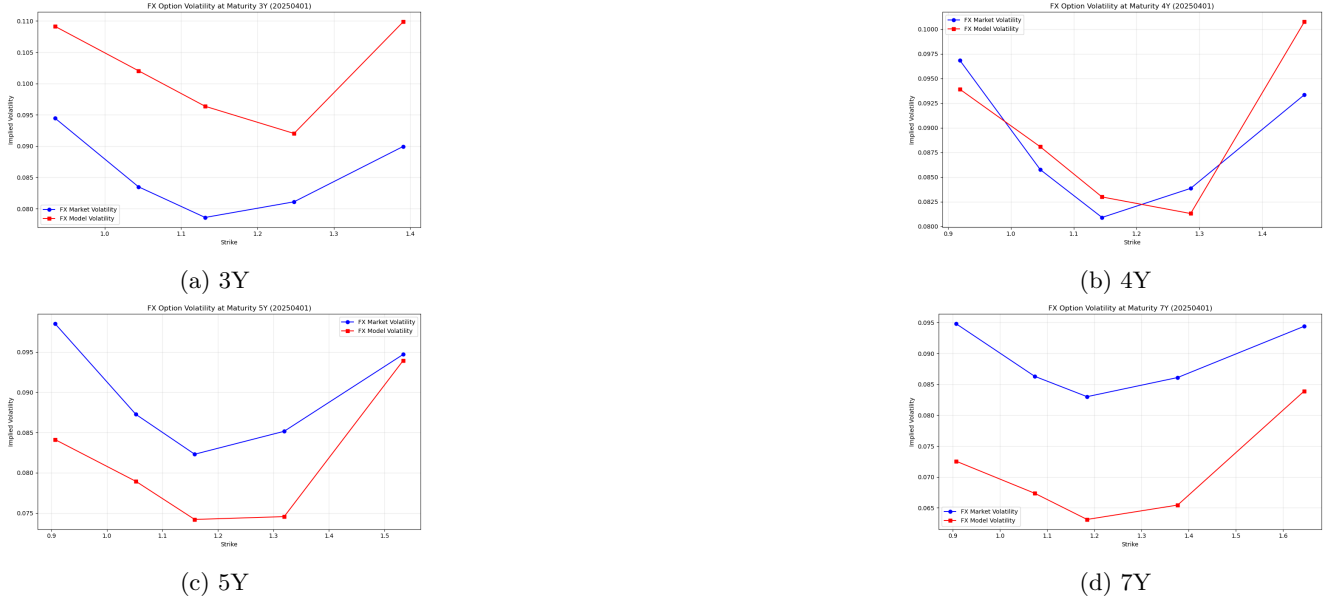
Figure 8: FX Implied Volatility Surfaces for joint calibration for 3Y, 4Y, 5Y, and 7Y - April 01, 2025

4.3 Calibration Results for April 15, 2025

4.3.1 Domestic Curve Analysis

(a) Zero Rate Curve

(b) Zero Coupon Bond Price Curve
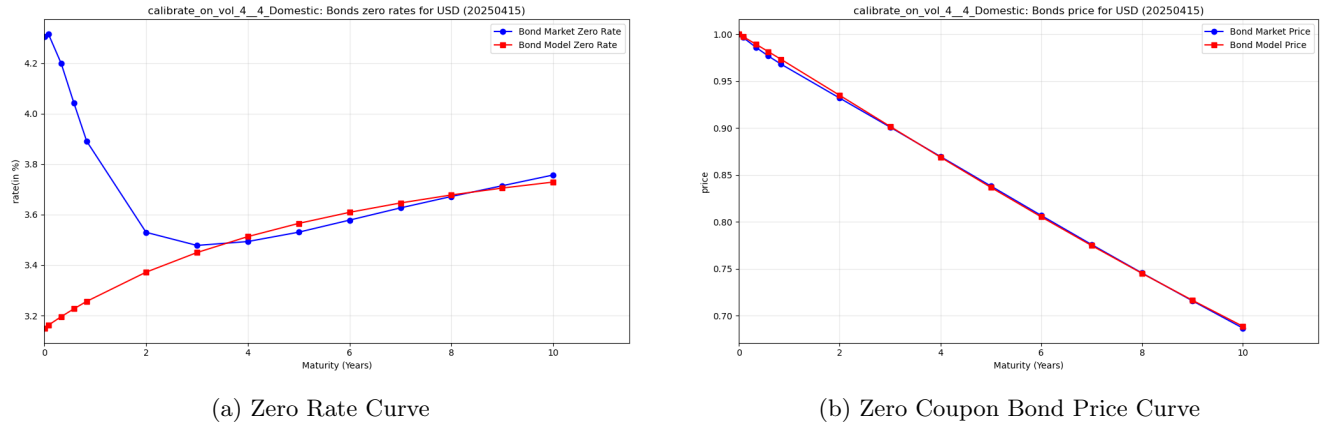
Figure 9: Domestic Curve Calibration Results for April 15, 2025

4.3.2   Foreign Curve Analysis
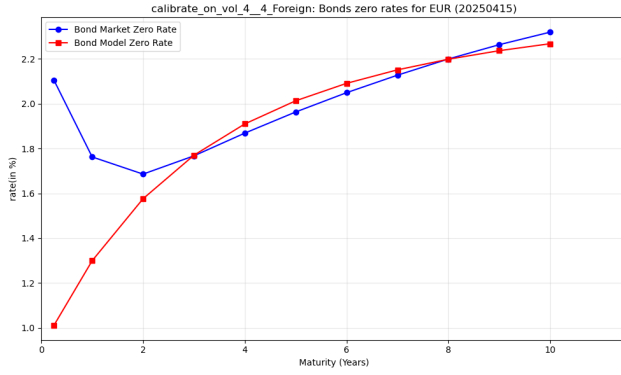
(a) Zero Rate Curve
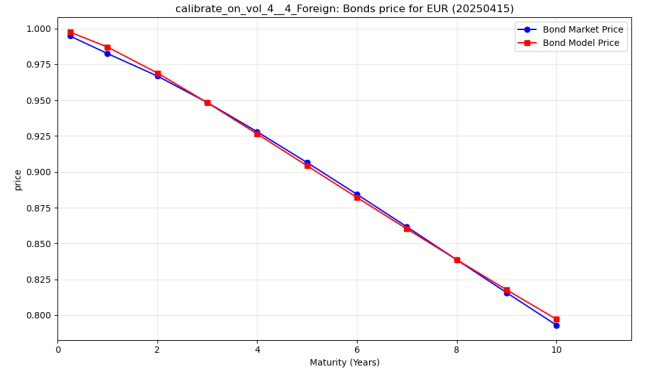
(b) Zero Coupon Bond Price Curve

Figure 10: Foreign Curve Calibration Results for April 15, 2025

4.3.3   FX Volatility Surface - Calibration by tenor

(a) 1Y

(b) 2Y

(c) 3Y

(d) 4Y

(e) 5Y

(f) 7Y

Figure 11: FX Implied Volatility Surfaces for All Tenors (separate calibration by tenor) - April 15, 2025

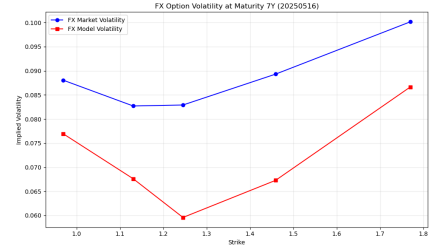### 4.3.4 FX Volatility Surface - joint calibration for tenors 3Y, 4Y, 5Y, and 7Y
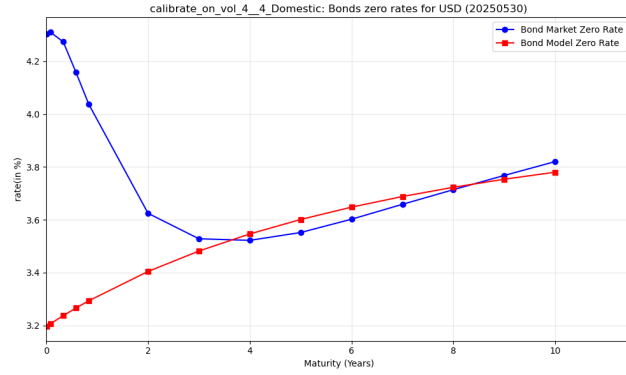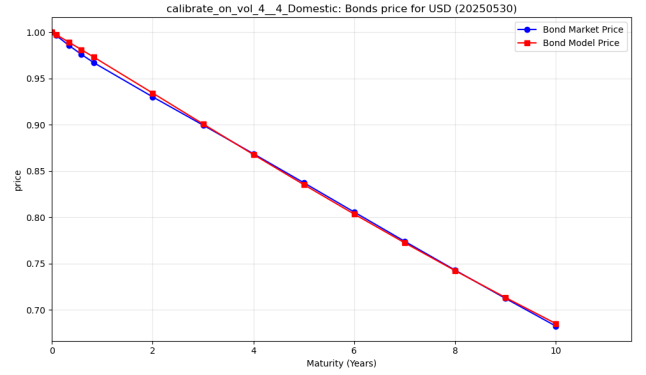

(a) 3Y

(b) 4Y

(c) 5Y

(d) 7Y

Figure 12: FX Implied Volatility Surfaces for joint calibration for 3Y, 4Y, 5Y, and 7Y - April 15, 2025

4.4 Calibration Results for May 16, 2025
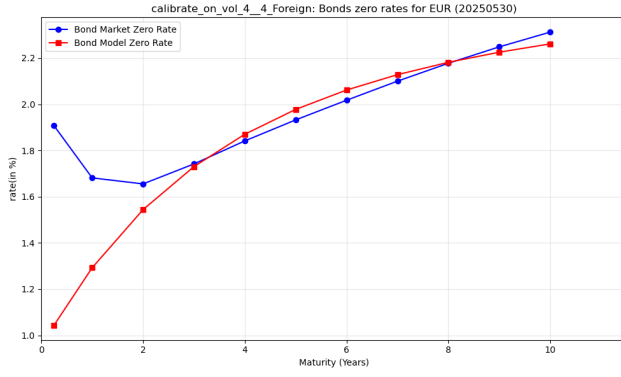
4.4.1 Domestic Curve Analysis


(a) Zero Rate Curve

(b) Zero Coupon Bond Price Curve

Figure 13: Domestic Curve Calibration Results for May 16, 2025

4.4.2 Foreign Curve Analysis


(a) Zero Rate Curve

(b) Zero Coupon Bond Price Curve

Figure 14: Foreign Curve Calibration Results for May 16, 2025
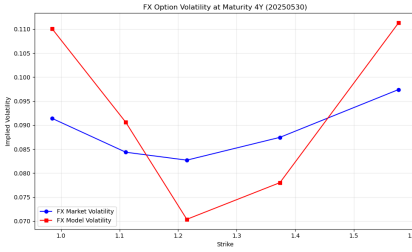
4.4.3 FX Volatility Surface - Calibration by tenor
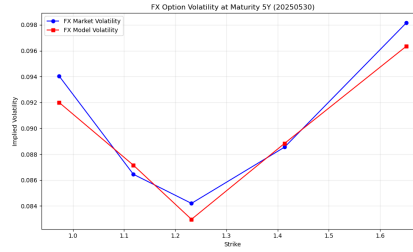

(a) 1Y

(b) 2Y

(c) 3Y

(d) 4Y

(e) 5Y

(f) 7Y

Figure 15: FX Implied Volatility Surfaces for All Tenors (separate calibration by tenor) - May 16, 2025

4.4.4 FX Volatility Surface - joint calibration for tenors 3Y, 4Y, 5Y, and 7Y

(a) 3Y

(b) 4Y

(c) 5Y

(d) 7Y

Figure 16: FX Implied Volatility Surfaces for joint calibration for 3Y, 4Y, 5Y, and 7Y - May 16, 2025

4.5 Calibration Results for May 30, 2025

4.5.1 Domestic Curve Analysis

(a) Zero Rate Curve

(b) Zero Coupon Bond Price Curve

Figure 17: Domestic Curve Calibration Results for May 30, 2025

4.5.2 Foreign Curve Analysis

(a) Zero Rate Curve
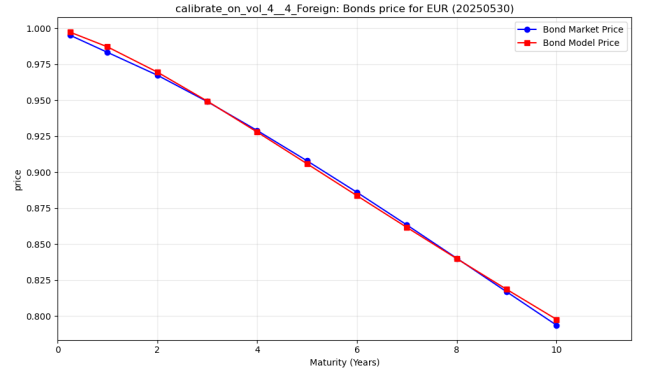
(b) Zero Coupon Bond Price Curve

Figure 18: Foreign Curve Calibration Results for May 30, 2025

4.5.3 FX Volatility Surface - Calibration by tenor
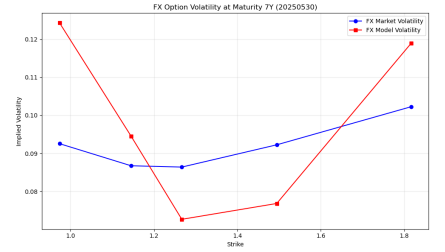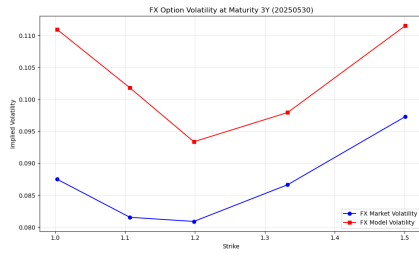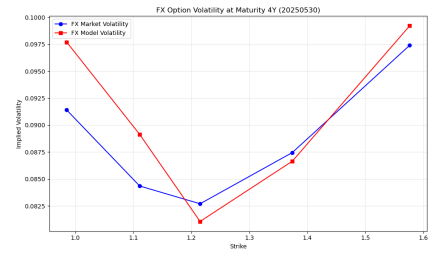

(a) 1Y

(b) 2Y

(c) 3Y
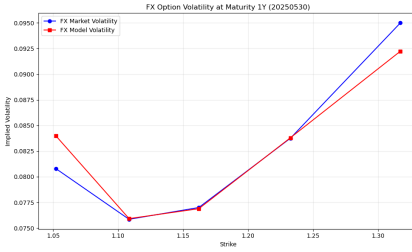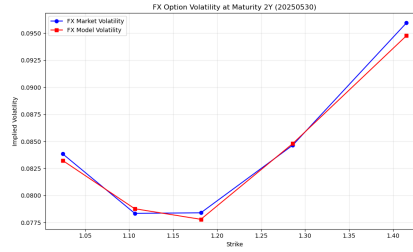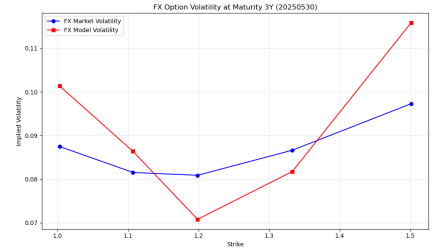
(d) 4Y

(e) 5Y

(f) 7Y

Figure 19: FX Implied Volatility Surfaces for All Tenors (separate calibration by tenor) - May 30, 2025
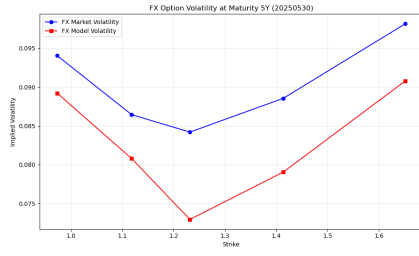
4.5.4 FX Volatility Surface - joint calibration for tenors 3Y, 4Y, 5Y, and 7Y
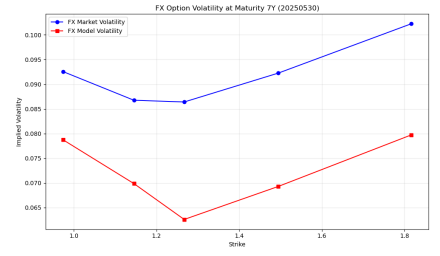

(a) 3Y

(b) 4Y

(c) 5Y

(d) 7Y

Figure 20: FX Implied Volatility Surfaces for joint calibration for 3Y, 4Y, 5Y, and 7Y - May 30, 2025