

# Price Derivative and Fixed Income Instruments in Microsoft Excel

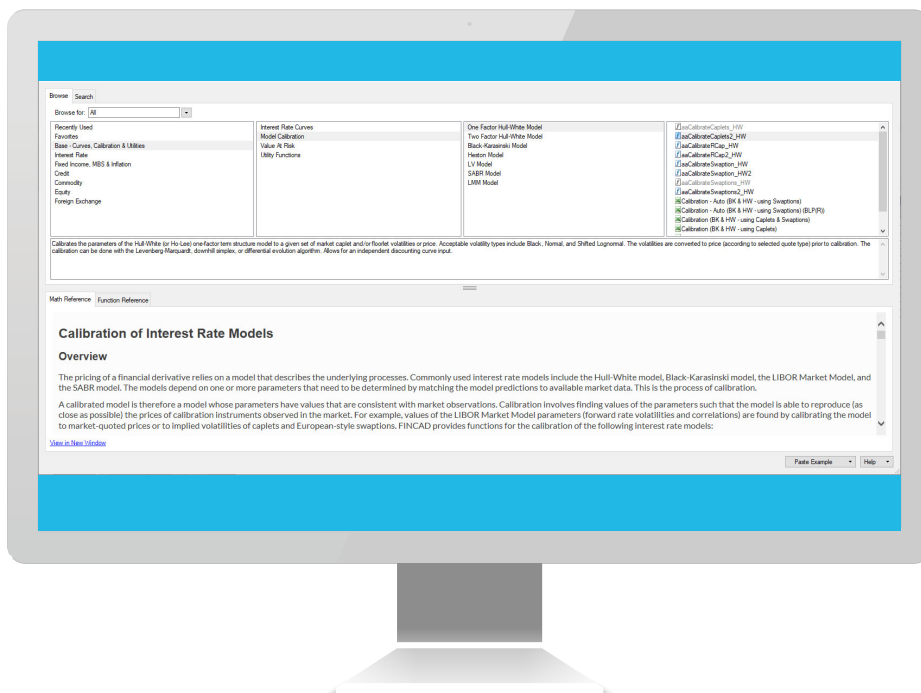
FINCAD makes pricing derivatives and fixed income products easier than ever.



Based on 30 years of experience, FINCAD's analytics for Microsoft Excel are the world's first standard library of predefined calculators and workbooks that simplify valuation and risk analytics for derivatives and fixed income products.

With over 2,000 pre-configured functions and over 200 workbooks at your fingertips, FINCAD's functional analytics library empowers you to calculate pricing, risk, and cash flows within minutes.

**GET STARTED RIGHT AWAY, VALUING YOUR PORTFOLIO WITH CONFIDENCE.**



## FINCAD offers an unmatched user experience.

Find models, workbook solutions and documentation quickly with an Analytics Finder. Review and understand function inputs with a Function Wizard, and get help with error debugging. Easy-to-use Excel tools enable calculation and array management.

# The widest range of instrument capabilities in the market

## Get out-of-the-box coverage

for vanilla, structured and exotic instruments across all major asset classes using industry standard models, supported by comprehensive curve-building and model calibration. Calculate risk and implied equivalent metrics. Use building blocks to configure customized trade types and analysis workflows.

Raw Rate Bumps Analysis										
Select Bucket	Point	Overnight Deposits	FRAs	Overnight Futures	Overnight Swaps	Overnight FRNs	Fixed Rate Bonds	Overnight Caps/Floors	Overnight Swaptions	Net Exposure
<input checked="" type="checkbox"/> TRUE	parallel shift - deposit rates	-11.86	-18.97	-58.82	250.59	16.51	26.17	-0.38	199.14	402.39
<input checked="" type="checkbox"/> TRUE	parallel shift - futures rates	-3.57	211.01	326.46	-229.19	-101.40	342.03	-9.96	-2,670.04	-2,134.95
<input checked="" type="checkbox"/> TRUE	parallel shift - swap rates	0.00	-8.47	-0.83	-835.85	4.77	-375.30	4.13	0.00	-1,211.54
<input checked="" type="checkbox"/> TRUE	AllPAs	-11.86	-18.97	-58.82	250.59	16.51	26.17	-0.38	199.14	402.39
<input checked="" type="checkbox"/> TRUE	11-01-2020	-11.86	-11.81	-19.33	250.59	16.51	25.29	2.65	61.24	313.30
<input checked="" type="checkbox"/> TRUE	12-01-2020	0.00	-15.63	-40.31	252.25	4.77	24.86	1.34	125.45	352.73
<input checked="" type="checkbox"/> TRUE	01-01-2021	0.00	-8.47	-0.83	252.25	4.77	24.54	3.89	30.20	306.75
<input checked="" type="checkbox"/> TRUE	AllPAs futures	-3.57	211.01	326.46	-229.19	-101.40	342.03	-9.96	-2,670.04	-2,134.95
<input checked="" type="checkbox"/> TRUE	V20 futures	-3.57	2.56	54.29	101.47	-24.57	61.88	-4.32	-164.52	23.22
<input checked="" type="checkbox"/> TRUE	F21 futures	0.00	17.91	138.98	100.25	-26.80	62.36	1.82	-292.12	2.40
<input checked="" type="checkbox"/> TRUE	J21 futures	0.00	20.09	27.29	92.49	-26.80	62.30	11.96	-315.59	-128.25
<input checked="" type="checkbox"/> TRUE	N21 futures	0.00	269.57	27.51	234.14	-28.25	62.00	2.23	-304.28	262.92
<input checked="" type="checkbox"/> TRUE	V22 futures	0.00	269.57	27.51	234.14	-28.25	62.00	2.23	-304.28	262.92
<input checked="" type="checkbox"/> TRUE	J22 futures	0.00	-10.68	0.26	252.00	-1.43	62.27	3.09	-297.07	8.44
<input checked="" type="checkbox"/> TRUE	N22 futures	0.00	-8.12	-1.03	251.96	7.26	61.64	5.53	-294.75	22.49
<input checked="" type="checkbox"/> TRUE	V22 futures	0.00	-8.47	-0.83	252.42	18.89	61.38	5.09	-289.53	38.95
<input checked="" type="checkbox"/> TRUE	J23 futures	0.00	-8.47	-0.83	251.84	17.33	45.10	-3.02	-287.84	14.11
<input checked="" type="checkbox"/> TRUE	N23 futures	0.00	-8.47	-0.83	251.76	9.59	20.71	-1.01	-34.42	237.33
<input checked="" type="checkbox"/> TRUE	V23 futures	0.00	-8.47	-0.83	251.69	3.81	23.97	-1.04	6.42	275.55
<input checked="" type="checkbox"/> TRUE	N23 futures	0.00	-8.47	-0.83	252.20	4.77	24.46	10.07	3.86	286.06
<input checked="" type="checkbox"/> TRUE	AllPAs swap	0.00	-8.47	-0.83	-835.85	4.77	-375.30	4.13	0.00	-1,211.54
<input checked="" type="checkbox"/> TRUE	3y swap	0.00	-8.47	-0.83	259.89	4.77	-293.73	4.13	0.00	-34.24
<input checked="" type="checkbox"/> TRUE	4y swap	0.00	-8.47	-0.83	412.99	4.77	-109.53	4.13	0.00	303.87
<input checked="" type="checkbox"/> TRUE	5y swap	0.00	-8.47	-0.83	593.58	4.77	19.49	4.13	0.00	-514.49
<input checked="" type="checkbox"/> TRUE	7y swap	0.00	-8.47	-0.83	-233.63	4.77	97.69	4.13	0.00	-136.34
<input checked="" type="checkbox"/> TRUE	10y swap	0.00	-8.47	-0.83	296.44	4.77	18.29	4.13	0.00	314.34
<input checked="" type="checkbox"/> TRUE	12y swap	0.00	-8.47	-0.83	252.25	4.77	24.46	4.13	0.00	276.31
<input checked="" type="checkbox"/> TRUE	15y swap	0.00	-8.47	-0.83	897.26	4.77	23.87	4.13	0.00	720.73
<input checked="" type="checkbox"/> TRUE	20y swap	0.00	-8.47	-0.83	1,004.01	4.77	17.42	4.13	0.00	1,021.04
<input checked="" type="checkbox"/> TRUE	25y swap	0.00	-8.47	-0.83	1,310.77	4.77	10.97	4.13	0.00	1,321.34
<input checked="" type="checkbox"/> TRUE	30y swap	0.00	-8.47	-0.83	1,617.52	4.77	4.53	4.13	0.00	1,621.65
<input checked="" type="checkbox"/> TRUE	40y swap	0.00	-8.47	-0.83	1,924.28	4.77	-1.92	4.13	0.00	1,921.96
<input checked="" type="checkbox"/> TRUE	AllPAs bonds swap	0.00	-8.47	-0.83	2,231.03	4.77	-8.37	4.13	0.00	2,222.27

**Calibration of Interest Rate Models**

The pricing of a financial derivative relies on a model that describes the underlying process. Commonly used interest rate models include the Hull-White model, Black-Karasinski model, the LIBOR Market Model, and the SABR model. The models depend on one or more parameters that need to be determined by matching the model predictions to available market data. This is the process of calibration.

A calibrated model is therefore a model whose parameters have values that are consistent with market observations. Calibration involves finding values of the parameters such that the model is able to reproduce (as close as possible) the prices of calibration instruments observed in the market. For example, values of the LIBOR Market Model parameters (forward rate volatilities and correlations) are found by calibrating the model to market-quoted prices or to implied volatilities of capslets and European-style swaptions. FINCAD provides functions for the calibration of the following interest rate models:

- One-Factor Short Rate Models: Hull-White, Ho-Lee, Black-Karasinski, Black-Derman-Toy (BDT), also Lognormal Short Rate<sup>1</sup>.
- Two-Factor Short Rate Models: Hull-White, Two-Additive-Factor Gaussian
- LIBOR Market Model: standard log-normal, as well as enhanced LMM with Constant Elasticity of Variance (CEV) and Displaced Diffusion (DD) local volatility processes
- SABR Model of Stochastic Volatility

For all of these interest rate models, the calibration instruments (the market data) are interest rate capslets/floors and European-style swaptions.

A rate cap can be specified as a series of capslets. For this reason have deprecated the rate cap calibration functions and recommend that users use the caplet calibration functions.

The functional forms of the modeled processes and the parameters associated with each model are shown in subsequent tables. The Two-Factor Model, the LIBOR Market Model and the SABR model are described in more detail in Multi-Factor Short Rate Models, LIBOR Market Model and Option Pricing with the SABR Model of Stochastic Volatility respectively. For additional information on all interest rate models, see Reference<sup>4</sup>.

Table 1: Models that are supported by FINCAD calibration functions

Model	Process model(s)	FINCAD calibration parameters	Comments
One-Factor Short Rate	Hull-White $dr = \theta(r)dt + \sigma(r)dW$	Short rate mean reversion and volatility: $\theta, \sigma$	$W(t)$ is determined from the initial term structure.
	Ho-Lee $dr = \theta(r)dt + \sigma dt$	Short rate volatility: $\sigma$	Same as Hull-White with $\theta = 0$ .
	Black-Karasinski $d(\ln r) = \theta(\ln r)dt + \sigma dW$	Short rate mean reversion and volatility: $\theta, \sigma$	$W(t)$ is determined from the initial term structure.
	BDT $d(\ln r) = \theta(r)dt + \sigma dW$	Short rate volatility: $\sigma$	Same as Black-Karasinski with $\theta = 0$ .
Two-Factor Short Rate	Hull-White $dr = \theta(r)dt + \sigma_1 dW_1 + \sigma_2 dW_2$ $dW_1 dW_2 = \rho dt$	Reversions and volatilities: $\theta, \sigma_1, \sigma_2$ ; correlation: $\rho$	$W(t)$ is determined from the initial term structure.
	Two-Additive-Factor Gaussian $dW_1 dW_2 = \rho dt$ $dW_1 dW_2 = \rho dt$ $dW_1 dW_2 = \rho dt$ $dW_1 dW_2 = \rho dt$	Reversions and volatilities: $\theta, \sigma_1, \sigma_2$ ; correlation: $\rho$	Deterministic shift, $W(t)$ is determined from the initial term structure.

## Access comprehensive documentation

explaining what each instrument is, all the way down to the mathematical formulas used in each calculation. With FINCAD, you will have utmost confidence in the math and models underlying your valuation and risk.

Get the answers you need fast with FINCAD's analytics for Microsoft Excel.



Stay ahead of the curve. Schedule a conversation with a solutions specialist today.

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