Nasdaq Calypso

Bloomberg DL Market Data Integration Guide

Version 11.8.9

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Approved

Document History

Revision	Published	Summary of Changes
1.0	May 2021	First edition – Updates for version 11.3.0.
2.0	February 2022	Second edition – Updated for version 11.8.5.
3.0	May 2022	Third edition – Updated for version 11.8.9

This document describes how to integrate Calypso with Bloomberg Data License for market data.

For information on integrating products, corporate actions, and trades from Bloomberg DL, please refer to the *Calypso Bloomberg DL Products Integration Guide* for details.

For installation and setup requirements, please refer to the *Calypso Bloomberg DL Products Integration Guide* for details.

NOTE: The Calypso License to use this Calypso Integration Module does not include a license for any third-party data services to which this module can interface. Clients are responsible for contracting with the appropriate third-party data service(s) prior to using this Calypso Integration Module.

IMPORTANT NOTE: For Cloud deployments please contact your application management team as the deployment procedure for Cap Cloud is different.

Table of Contents

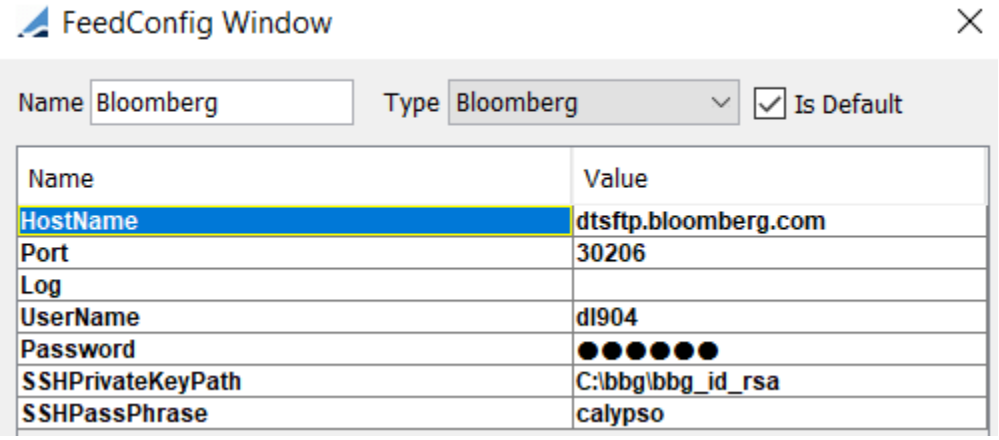
Quotes via the Feed Address Window 4
1.1 Feed Configuration 4
1.2 Feed Address Mapping 4
Historical Data 7
2.1 Overview 7
2.2 Using Gethistory 7
Snapshot Pricing Data 9
3.1 Overview 9
3.2 Getsnap Feed Config 9
3.3 Getsnap Feed Address Mapping 9
3.4 Using Getsnap 11
3.5 Send and Receive Getsnap Updates via BLOOMBERG_UPDATE 12
3.6 Manually Importing a Getsnap Reply File 12
3.7 Getsnap Request File Format 13
3.7.1 Header 13
3.7.2 Fields 14
3.7.3 Data 15
3.7.4 Sample Request File 15
3.8 Getsnap Reply File Format 16
3.8.1 TIMESTARTED 17
3.8.2 Data 17
3.8.3 Fields 18
3.8.4 TIMEFINISHED 18
3.8.5 Sample Reply File 19
Volatility Surfaces 20
4.1 Swaption Lognormal 20
4.2 Swaption Normal 22
4.3 Cap Floor 24

Quotes via the Feed Address Window

1.1 Feed Configuration

You need to specify a Feed Configuration to access the Bloomberg platform.

If you are using multiple user accounts, create a feed config for each user account for the Bloomberg type.



HostName replaces BLOOMBERG_FTP_HOST

Port replaces BLOOMBERG_FTP_PORT

UserName replaces BLOOMBERG_FTP_USER

Password replaces BLOOMBERG_FTP_PASSWORD

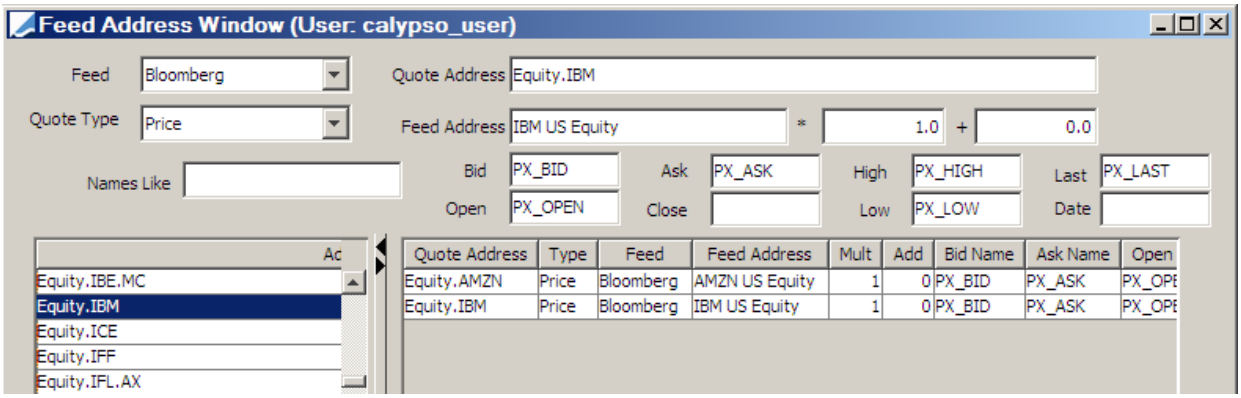
SSHPricateKeyPatch replaces BLOOMBERG_SFTP_PRIVATE_KEY_FILENAME

SSHPassPhrase replaces BLOOMBERG_SFTP_PASSPHRASE

The Feed Config can be selected in the Bloomberg Connect and Bloomberg Update windows.

1.2 Feed Address Mapping

Clients can use the Feed Address window to map and define a list of quotes to their corresponding Bloomberg fields for a given feed config.



Quote Address is a Calypso quote name.

Feed Address specifies the Bloomberg code for the quote corresponding to a Calypso Quote Address.

Examples

- Currency Quote Address

Calypso: FX.USD.JPY

Bloomberg: USDJPY Curncy

- Equity Quote Address (required for gethistory)

Calypso: Equity.IBM

Bloomberg: IBM US Equity

You can then use the specified feed address config in the Bloomberg Update Window, "Template" field to request the corresponding quotes.

Ensure that you also create Scheduled Tasks for making the request and processing the response.

[NOTE: Requesting additional fields invokes a normal Equity or Equity Index update.]

From the Feed dropdown, select the previously defined Bloomberg feed. Click **Load All** to display existing mappings.

Click **Refresh** to load the Addresses list (i.e., Calypso quote names). You can filter the list by selecting a quote type from the Quote Type dropdown or by entering a search string in Names Like (e.g., MM.USD.LIBOR) and clicking Refresh.

To Add a New Mapping

[NOTE: It is possible to map multiple assets to a single feed address.]

Select a Calypso quote name from the Addresses list.

Enter the corresponding Bloomberg quote name in the Feed Address. Enter a multiplier value and spread value as applicable.

Enter Bloomberg real-time field names as applicable.

[NOTE: The default date that the system saves with the quote is Today.]

Click **Add**.

Repeat for other quote names.

Historical Data

2.1 Overview

The **gethistory** program retrieves various historical data fields for a specified list of securities within a given date range. Bloomberg support for historical data includes Quotes (End-of-Day pricing) and Swaption Volatility.

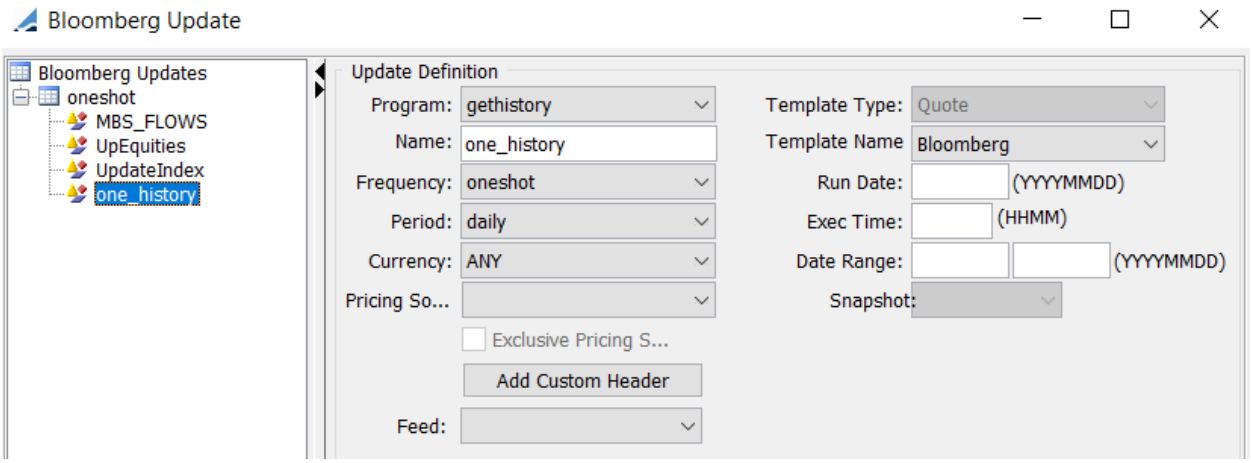
Calypso Bloomberg Integration supports Quotes (End-of-Day pricing) at this time. The following table provides a listing of Bloomberg fields available via the **gethistory** program:

Field Mnemonic	Field Description
PX_ASK	Ask Price
PX_BID	Bid Price
PX_MID	Mid Price
PX_LOW	Low Price
PX_HIGH	High Price
PX_OPEN	Open Price
PX_LAST	Last Price

Use the Calypso Feed Address window to map Calypso Quote Addresses to Bloomberg Quote Addresses.

2.2 Using Gethistory

To obtain historical pricing information, first open the Bloomberg Update window from Bloomberg Connect.



Historical pricing is retrieved using the **gethistory** program.

When the **gethistory** program is selected, the following additional fields are available:

- Delay Limit — The nominal frequency of use for this update template.
- Period — The nominal pricing period.
- Currency — The desired pricing currency.
- Date Range — An inclusive range of days to retrieve historical pricing. The limit set by Bloomberg is seven days before the Run date (typically, today). When Frequency is **oneshot**, Date Range is mandatory. **gethistory** will return a single day if Date Range is left blank (except for **oneshot** requests).
- Feed - You can select a feed config if you are using multiple user accounts. Otherwise, BLOOMBERG_STP_USER is used.

After saving, request the data either via a scheduled task or from the Bloomberg Connect window.

Snapshot Pricing Data

3.1 Overview

Calypso's Bloomberg Integration Module supports the retrieval of quote snapshots from the Bloomberg Data License Server using the **Getsnap** program. This includes the following:

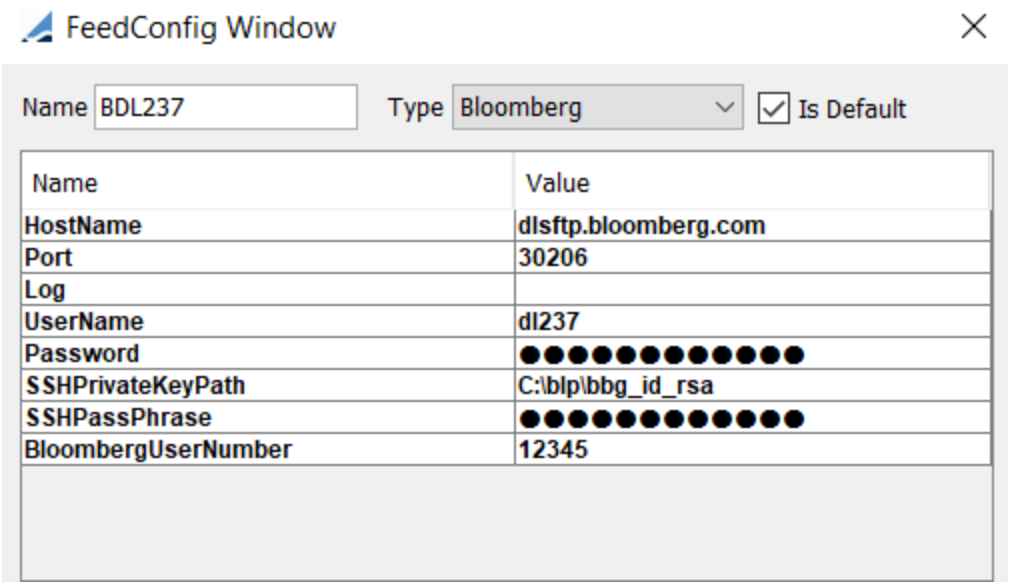
- Use **Getsnap** to request, receive, and process a quote snapshot.
- Process Bloomberg quote snapshots of past dates.

In conjunction with the ability to create daily scheduled requests, users can now reliably retrieve daily quote values with a precisely defined timestamp and with the possibility of a correct recovery in case of a failure.

Bloomberg's Data License Pricing Snapshot offers a service to satisfy existing Data License Per Security clients needing a price returned with higher precision at a specified time or valuation point.

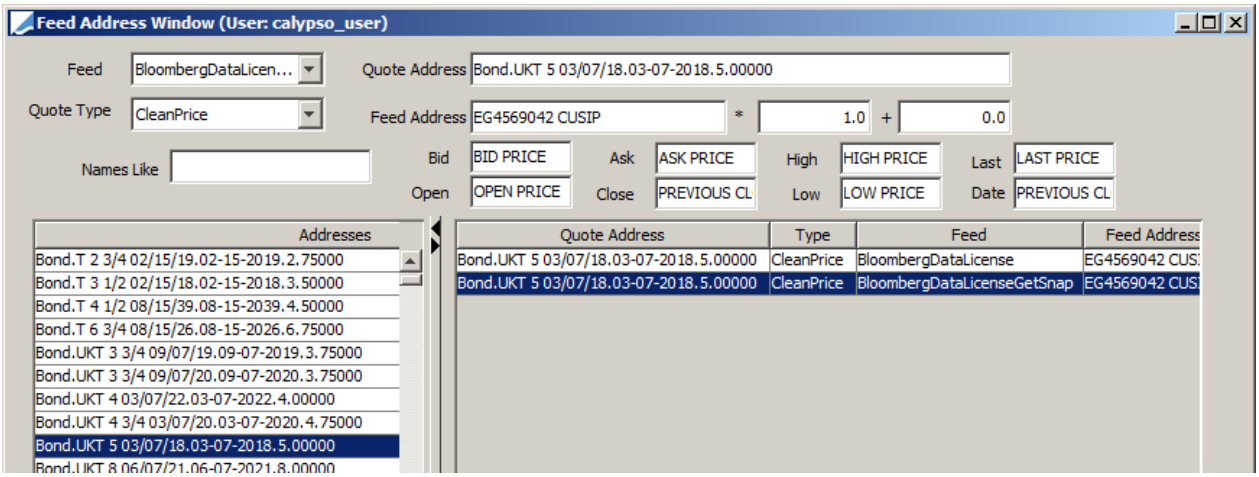
3.2 Getsnap Feed Config

You need to define a different Feed Config for getsnap as the Feed Address Mapping differs from which of the other programs.



3.3 Getsnap Feed Address Mapping

In the Feed Address Window (**Configuration > Market Data > Feed Address Mapping** from the Calypso Navigator), define a mapping for each security you wish to use with Getsnap for this new Feed Config. When the **Getsnap** program is run, it will not execute for securities that do not have an appropriate mapping defined.

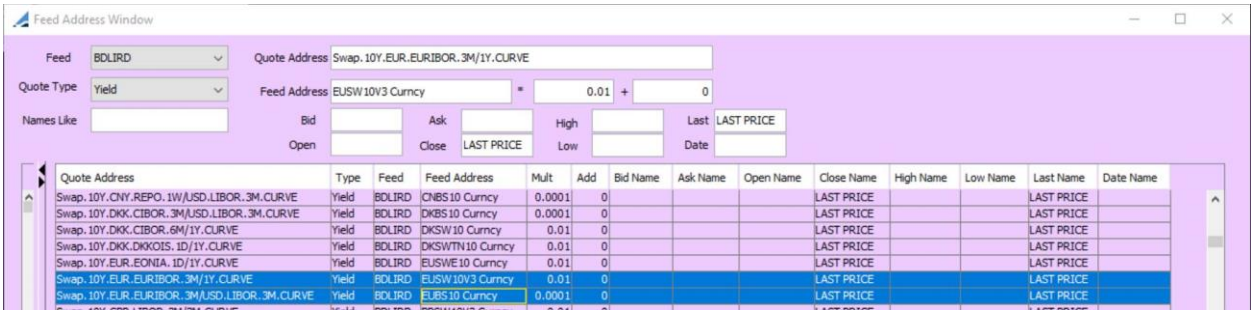


Take note that the fields for **Getsnap** differ from those available for other programs:

Calypso Field	Bloomberg Getsnap Field (Typical)
Bid	BID PRICE
Ask	ASK PRICE
High	HIGH PRICE
Last	LAST PRICE
Open	OPEN PRICE
Close	PREVIOUS CLOSE PRICE
Low	LOW PRICE
Date	PREVIOUS CLOSE DATE

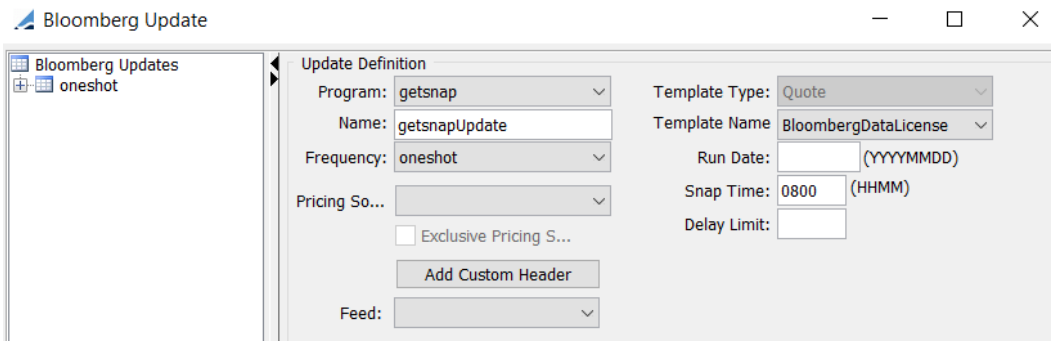
It is possible to map the Close field with "LAST PRICE" if the user wants to feed LAST PRICE into the close instance of a quote. If the user wants to feed data on Today's market data set, then while defining mapping, the Date field can be left empty and the quote received will be fed in Today's quote set. The response file can also be used to feed the previous close price into the previous close date. In that case, Close should be mapped to "PREVIOUS CLOSE PRICE" and Date should be mapped to "PREVIOUS CLOSE DATE". This setting will feed the value in the Previous Close price field into the close instance of quote set for date corresponding to "PREVIOUS CLOSE DATE" field of the response file.

Below is an example that shows how to feed LAST PRICE in the close instance for today.



3.4 Using Getsnap

To obtain Snapshot pricing from Bloomberg, open the Bloomberg Update window:



Snapshot pricing is retrieved using the **Getsnap** program.

When the **Getsnap** program is selected, the following additional field is available:

- Delay Limit — The number of minutes in which Bloomberg must produce a response file. Securities having longer embargoes are not included in the response and reply files.

[NOTE: Calypso provides a means to automatically convert the SNAPTIME sent in the Request file to the Data License Server timezone.]

- Feed - You can select a feed config if you are using multiple user accounts. Otherwise, BLOOMBERG_STP_USER is used.

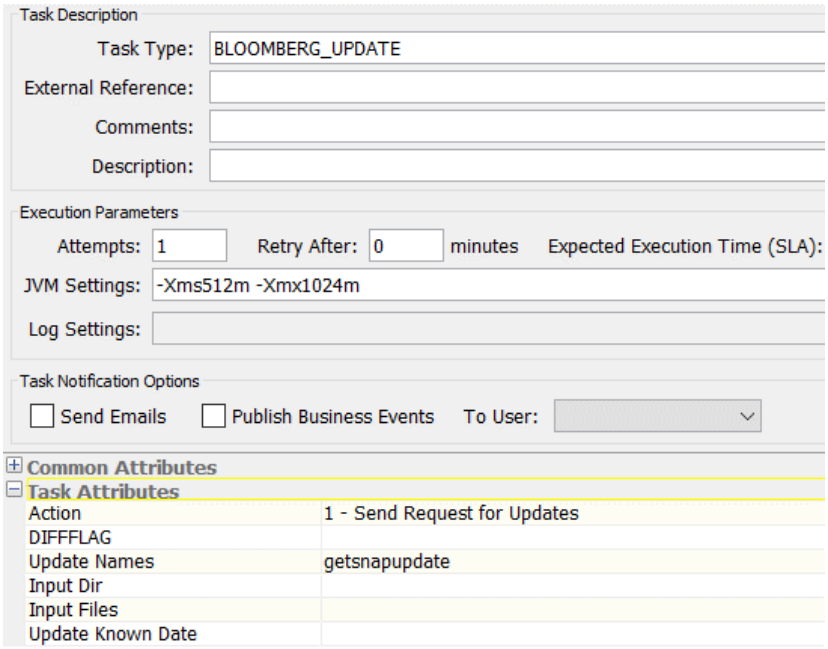
After saving, request the data either via a scheduled task or from the Bloomberg Connect window.

The user must also create a Feed Config and Feed Address mapping for **Getsnap**.

[NOTE: Make sure that all currencies have an ISO code.]

3.5 Send and Receive Getsnap Updates via BLOOMBERG_UPDATE

The Scheduled Task window (**Configuration > Scheduled Tasks** from the Calypso Navigator) can be used to define a BLOOMBERG_UPDATE scheduled task. Parameters can be set to include **getsnap** updates in the Scheduled Task.



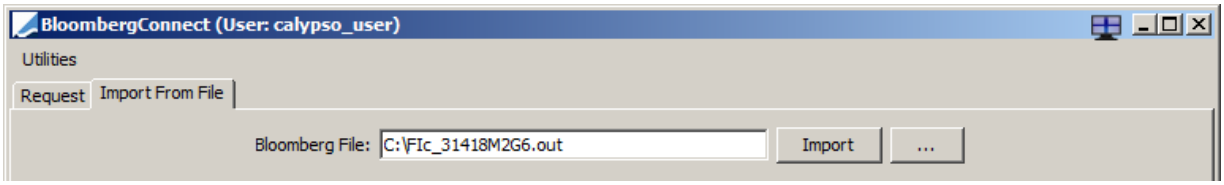
Getsnap updates use the same workflow as the other Program types. When the BLOOMBERG_UPDATE scheduled task is run and includes Getsnap Updates:

- Calypso generates request files for each selected update, including selected Getsnap updates.
- Calypso uploads the request files to the Bloomberg FTP.
- Bloomberg generates the response and reply files. The response files contain verification that each requested security has a valid ID, while the reply files contain the requested quotes as well as the verification.
- Calypso downloads the corresponding reply files. Calypso will not download or process the **Getsnap** response files since the verification information is already captured in the reply file.
- Calypso will refer to the Feed Address Mappings defined for **Getsnap** to map the Bloomberg Quotes in the **Getsnap** reply files to the appropriate Calypso Quotes.
- As with other program types, Bloomberg exceptions and information for **Getsnap** updates are viewable in Calypso Task Station.

3.6 Manually Importing a Getsnap Reply File

You can manually import and reprocess a **Getsnap** reply file obtained from the Bloomberg FTP.

To import the file, open the Bloomberg Connect window and select the Import From File tab:



Select the reply file you wish to work with, then click **Import**.

Cancelling a Getsnap Request

You can cancel a periodic Getsnap request using the cancel program.

3.7 Getsnap Request File Format

Format:

```
START-OF-FILE
Header
START-OF-FIELDS
Fields (Fixed and Additional) END-OF-FIELDS
START-OF-DATA
Data
END-OF-DATA END-OF-FILE
```

3.7.1 Header

Getsnap Header Fields

Field	Value	Notes
SNAPTIME	If the environment property BLOOMBERG_SERVERTZ is not set, will be the value entered in Bloomberg Update Window Exec Time field. If BLOOMBERG_SERVERTZ is set, the application converts the value entered in Bloomberg Update Window Exec Time field from the local timezone to the timezone specified by BLOOMBERG_SERVERTZ.	Determines the time that Bloomberg will process request file.
DELAY_LIMIT	Entered in Bloomberg Update window Delay Limit field.	Requires Bloomberg to produce reply file within this number of minutes; securities with longer embargoes are not included in the response file.

Field	Value	Notes
PROGRAMFLAG	Entered in Bloomberg Update window Frequency field	Determines how often to process the request.
PROGRAMNAME	getsnap	Identifies the request file as for the getsnap program.
FIRMNAME	Entered in Environment Property or Feed Config	BLOOMBERG_FTP_USER or BLOOMBERG_ACCOUNT_NAME if BLOOMBERG_FTP_USER is already used, or user name from Feed Config if specified
RUNDATE	Entered in Bloomberg Update window Run Date field	Determines the start date for which the request is to be processed.
REPORT	Yes	The Getsnap report generated by Bloomberg is neither downloaded nor processed by Calypso, however, this flag is set to remain consistent with other Bloomberg Update programs.
REPLYFILENAME	request_file_name without the .out.enc extension	
SN	Entered in Environment Property BLOOMBERG_SN	Serial number. Needed for terminal user designation. This field is included only if the Environment Property has a value.
WS	Entered in Environment Property BLOOMBERG_WS	Workstation number. Needed for terminal user designation. This field is included only if the Environment Property has a value.
USERNUMBER	Entered in Environment Property BLOOMBERG_USERNUMBER	Needed for terminal user designation. This field is included only if the Environment Property has a value.
VOL_SURFACE	Yes	Used for importing Money Market bonds.
CLOSINGVALUES	Yes	Used for importing Money Market bonds.

3.7.2 Fields

Fixed Fields

The fields below are automatically included to return values in the reply file. They are not listed in the request file.

- SECURITIES
- ERROR CODE
- NUM FLDS

- OPEN PRICE
- HIGH PRICE
- LOW PRICE
- BID PRICE
- MID PRICE
- ASK PRICE
- BID YIELD
- MID YIELD
- ASK YIELD
- LAST PRICE
- LAST YIELD
- LAST UPDATE TIME
- PREVIOUS CLOSE PRICE
- PREVIOUS CLOSE DATE
- PRICING SOURCE

Additional Fields

Users can specify additional fields.

NOTE: Additional fields specified in this region will be included in the Bloomberg update files.

However, Calypso does not process these additional fields. Calypso uses pre-existing functionality to map and incorporate reference data from the Bloomberg Data Server. The function of Getsnap is to retrieve quote data from Bloomberg, not reference data.

Quote value mapping is handled in the data feed map window, and incorporating quotes only requires the security ID and quote values. The existing mapping functionality will remain in place for pulling reference data, but mapping simply does not apply to pulling quotes for Getsnap.

3.7.3 Data

Securities listed here are from the Template selected in the Bloomberg Update Window. The securities must also have their mappings defined in the Data Feed Mapping window for the Getsnap feed. Securities without a defined mapping are ignored.

3.7.4 Sample Request File

```
START-OF-FILE


REPORT=yes FIRMNAME=dlxxxxx
REPLYFILENAME=testgetsnap.out.enc
SNAPTIME=0900 DELAY_LIMIT=3
PROGRAMNAME=getsnap
PROGRAMFLAG=oneshot
```

```
START-OF-FIELDS MARKET_SECTOR_DES END-OF-FIELDS

START-OF-DATA
BMW GY Equity IBM US Equity
AHA LN 03/18/11 C2600 Equity GB0033280339|ISIN| CH0114507210 Corp EQ0017443700001000|BB_UNIQUE| END-OF-DATA

END-OF-FILE
```

3.8 Getsnap Reply File Format

Format:

```
START-OF-FILE
Header
START-OF-FIELDS
Fields
END-OF-FIELDS TIMESTARTED START-OF-DATA
Data
END-OF-DATA TIMEFINISHED END-OF-FILE
```

Field	Value
PROGRAMFLAG	Same value as in request file
FIRMNAME	Same value as in request file
REPLYFILENAME	Same value as in request file
SNAPTIME	Same value as in request file
DELAY_LIMIT	Same value as in request file
RUNDATE	Same value as in request file
PROGRAMNAME	Same value as in request file
REPORT	Same value as in request file
SN	Same value as in request file
WS	Same value as in request file
USERNUMBER	Same value as in request file

3.8.1 TIMESTARTED

Time Bloomberg started to process request file.

3.8.2 Data

```
Security ID | Return Code | Number Fields | Fixed Fields (| Delimited) | Fields Listed in Request File (| Delimited)
```

The return codes are:

Return Code	Definition
0	Good return. No errors occurred.
10	Bloomberg cannot find the security as specified.
11	Restricted Security. Must link to Bloomberg Professional™ with access.
100	Maximum number of securities exceeded (20,000)
150	Security blocked due to embargo not being met
988	System Error on security level
989	Unrecognized pricing source
990	System Error (Contact Technical Support)
991	Invalid override value (e.g., bad date or number)
992	Unknown override field
993	Maximum number of overrides (20) exceeded
994	Permission denied.
995	Maximum number of fields exceeded.
996	Buffer Overflow (some data for this security is missing).
997	General override error (e.g., formatting error)
998	Security identifier type (e.g., CUSIP) is not recognized.
999	Unloadable security

3.8.3 Fields

Fixed Fields

The Fixed Fields, in order, are:

- SECURITIES
- ERROR CODE
- NUM FLDS
- OPEN PRICE
- HIGH PRICE
- LOW PRICE
- BID PRICE
- MID PRICE
- ASK PRICE
- BID YIELD
- MID YIELD
- ASK YIELD
- LAST PRICE
- LAST YIELD
- LAST UPDATE TIME
- PREVIOUS CLOSE PRICE
- PREVIOUS CLOSE DATE
- PRICING SOURCE

Additional Fields

Users can specify additional fields.

NOTE: Additional fields specified in this region will be included in the Bloomberg update files.

However, Calypso does not process these additional fields. Calypso uses pre-existing functionality to map and incorporate reference data from the Bloomberg Data Server. The function of Getsnap is to retrieve quote data from Bloomberg, not reference data.

Quote value mapping is handled in the data feed map window, and incorporating quotes only requires the security ID and quote values. The existing mapping functionality will remain in place for pulling reference data, but mapping simply does not apply to pulling quotes for Getsnap.

3.8.4 TIMEFINISHED

The time that Bloomberg finished processing request file.

Calypso uses the date and time of TIMEFINISHED as the quote date when entered into the Calypso database.

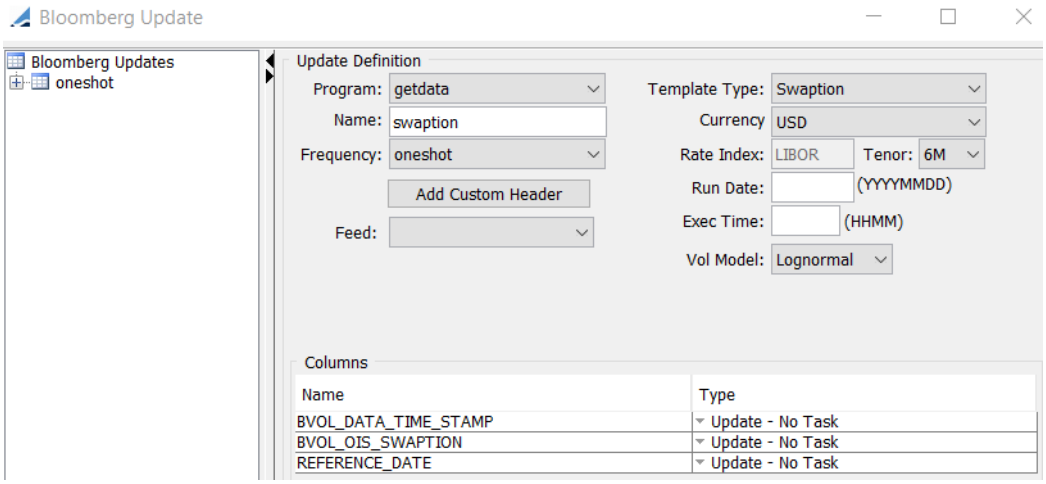
3.8.5 Sample Reply File

This sample reply file corresponds is a response to the sample request file.

```
START-OF-FILE RUNDATE=20110311

PROGRAMFLAG=oneshot FIRMNAME=dlxxxxx REPLYFILENAME=testgetsnap.out.enc SNAPTIME=0900

DELAY_LIMIT=3

PROGRAMNAME=getsnap


START-OF-FIELDS MARKET_SECTOR_DES END-OF-FIELDS


TIMESTARTED=Fri Mar 11 09:00:00 EST 2011


START-OF-DATA

SECURITIES|ERROR CODE|NUM FLDS|OPEN PRICE|HIGH PRICE|LOW PRICE|BID PRICE|MID PRICE|ASK PRICE|BID YIELD|MID
YIELD|ASK YIELD|LAST PRICE|LAST YIELD|LAST UPDATE TIME|PREVIOUS CLOSE PRICE|PREVIOUS CLOSE DATE|PRICING
SOURCE|MARKET_SECTOR_DES|

BMW GY Equity|150|16| | | | | | | | | | | | | |Equity| IBM US

Equity|0|16|164.640000|164.670000|161.380000|162.030000|162.025000|162.

020000| | | |162.020000| |03/10/2011|162.020000|03/10/2011|US|Equity| AHA LN 03/18/11 C2600 Equity|0|16| | |

|519.500000|534.000000|548.500000| | | |513.500000|

|03/10/2011|513.500000|03/10/2011|LN|Equity|
GB0033280339|0|16|109.962500|110.230000|109.962500|110.155000|110.16500
0|110.175000|2.349000|2.346800|2.344500|110.165000|2.346800|08:58:58|10

9.840000|03/10/2011|BGN|Govt| CH0114507210

Corp|0|16|100.439000|100.780000|100.439000|100.446000|100.648000|100.85
1000|2.159000|2.119000|2.078000|100.648000|2.119000|08:58:53|100.597000

|03/10/2011|BGN|Corp|

EQ00174437000001000|0|16|212.000000|215.000000|208.250000|211.700000|211

.500000|211.300000| | | |211.300000|

|06:06:18|211.300000|03/11/2011|IN|Equity| END-OF-DATA


TIMEFINISHED=Fri Mar 11 09:00:10 EST 2011


END-OF-FILE
```

Volatility Surfaces

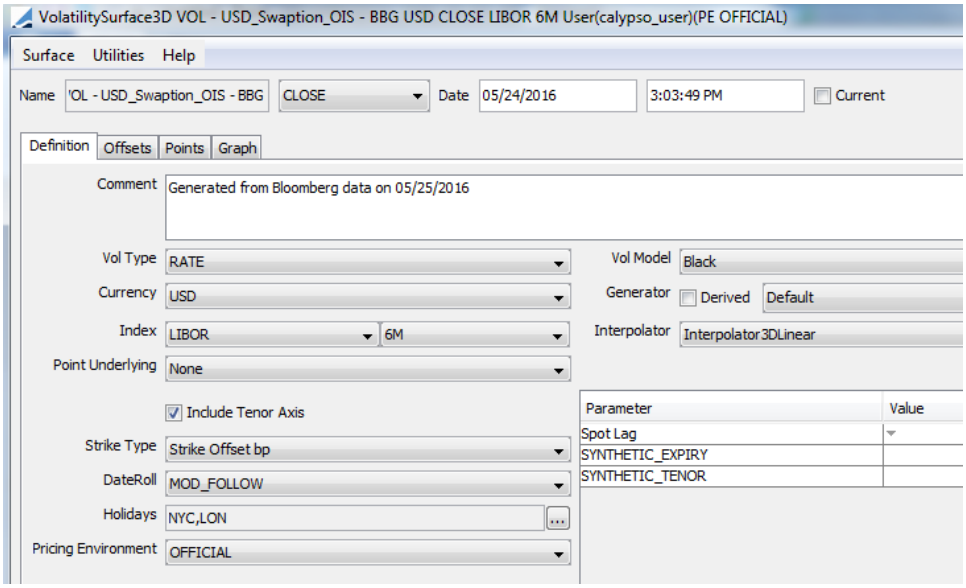
4.1 Swaption Lognormal



BLOOMBERG_UPDATE:

Attribute	Value
Action	1 - Send Request for Updates
DIFFFLAG	
Update Names	
Input Dir	
Input Files	swaption

Attribute	Value
Action	2 - Process Updates Received
DIFFFLAG	
Update Names	
Input Dir	
Input Files	swaption

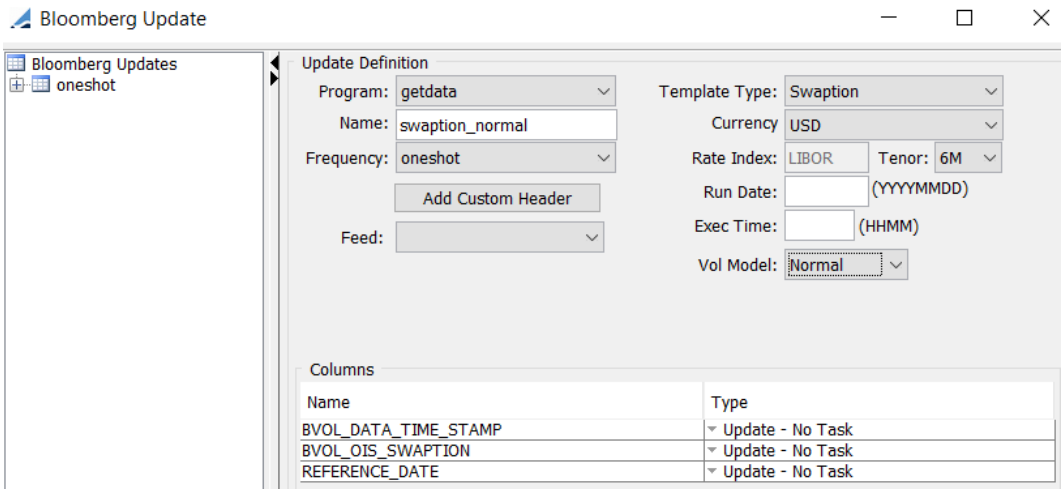


Definition | Offsets | Points | Graph

Tenor | Expiry | Strike Tenor 1Y VolatilityModel: Black MID

Expiry/Offset bp	0	-200	-100	-50	-25	25	50
06/24/2016	45.2218000000	20.7736000000	20.7736000000	20.7736000000	6.9459000000	-3.1438000000	-4.219
08/24/2016	44.2877000000	206.2047000000	206.2047000000	18.0156000000	6.1875000000	-2.8490000000	-3.826
11/24/2016	46.0637000000	88.1483000000	88.1483000000	15.3891000000	5.6937000000	-3.3342000000	-5.244
02/24/2017	48.0753000000	48.0753000000	48.0753000000	48.0753000000	48.0753000000	48.0753000000	48.075
05/24/2017	49.3014000000	54.0394000000	54.0394000000	12.9338000000	5.1110000000	-3.4756000000	-5.890
05/24/2018	53.1901000000	38.7856000000	38.7856000000	11.4960000000	5.1284000000	-3.6211000000	-6.076
05/24/2019	57.5886000000	57.5886000000	57.5886000000	57.5886000000	57.5886000000	57.5886000000	57.588
05/24/2020	54.2070000000	54.2070000000	54.2070000000	54.2070000000	54.2070000000	54.2070000000	54.207
05/24/2021	50.2588000000	20.9568000000	20.9568000000	7.7493000000	3.6429000000	-2.9154000000	-4.974
05/24/2022	46.5512000000	46.5512000000	46.5512000000	46.5512000000	46.5512000000	46.5512000000	46.551
05/24/2023	43.7305000000	43.7305000000	43.7305000000	43.7305000000	43.7305000000	43.7305000000	43.730
05/24/2024	41.0422000000	41.0422000000	41.0422000000	41.0422000000	41.0422000000	41.0422000000	41.042
05/24/2025	38.7223000000	38.7223000000	38.7223000000	38.7223000000	38.7223000000	38.7223000000	38.722
05/24/2026	36.5602000000	58.9290000000	9.6045000000	3.9912000000	1.9708000000	-1.6434000000	-2.794
05/24/2031	30.2179000000	38.9310000000	6.8106000000	2.9299000000	1.4927000000	-1.2487000000	-2.066
05/24/2036	27.5348000000	49.6726000000	6.3183000000	2.7227000000	1.4064000000	-1.1655000000	-1.881
05/24/2041	25.8184000000	25.8184000000	25.8184000000	25.8184000000	25.8184000000	25.8184000000	25.818
05/24/2046	25.9184000000	8.4873000000	8.4873000000	3.3464000000	1.6332000000	-1.3124000000	-2.235

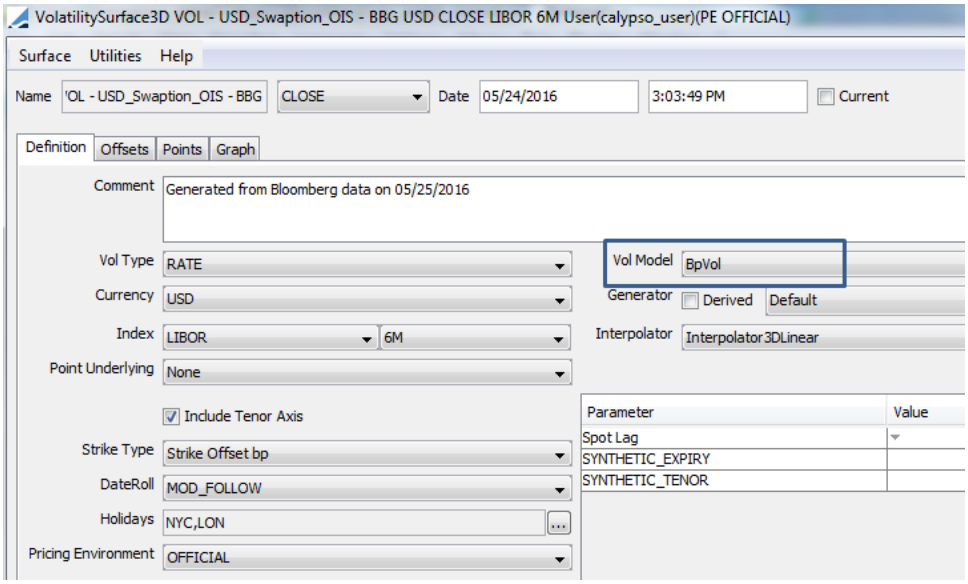
4.2 Swaption Normal



BLOOMBERG_UPDATE:

Attribute	Value
Action	1 - Send Request for Updates
DIFFFLAG	
Update Names	
Input Dir	
Input Files	swapn_normal

Attribute	Value
Action	2 - Process Updates Received
DIFFFLAG	
Update Names	
Input Dir	
Input Files	swapn_normal

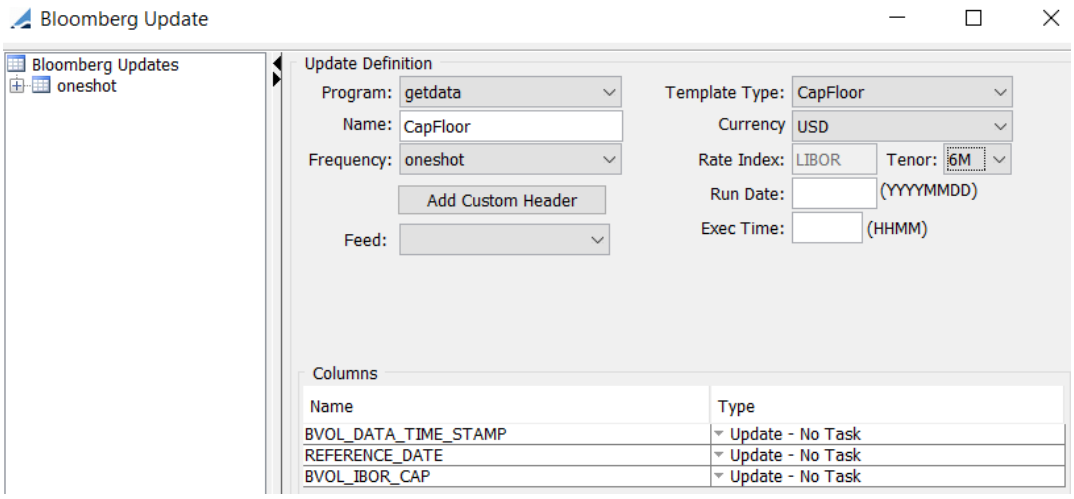


Definition | Offsets | Points | Graph

Tenor | Expiry | Strike | Tenor 1Y | VolatilityModel: BpVol MID

Expiry/Offset bp	0	-200	-100	-75	-50	-25
06/24/2016	4213.6200000000	4213.6200000000	4213.6200000000	4213.6200000000	4213.6200000000	4213.6200000
08/24/2016	4460.6000000000	1566.7100000000	538.5300000000	283.5000000000	74.4700000000	-39.2300000
11/24/2016	4993.2500000000	734.1000000000	179.8200000000	55.0600000000	-33.7100000000	-60.4600000
02/24/2017	5558.0000000000	5558.0000000000	5558.0000000000	5558.0000000000	5558.0000000000	5558.0000000
05/24/2017	5984.3700000000	80.7100000000	-127.2100000000	-148.0100000000	-138.8900000000	-91.4000000
05/24/2018	7523.8500000000	7523.8500000000	7523.8500000000	7523.8500000000	7523.8500000000	7523.8500000
05/24/2019	8472.1300000000	8472.1300000000	8472.1300000000	8472.1300000000	8472.1300000000	8472.1300000
05/24/2020	8841.1800000000	8841.1800000000	8841.1800000000	8841.1800000000	8841.1800000000	8841.1800000
05/24/2021	8966.8300000000	8966.8300000000	8966.8300000000	8966.8300000000	8966.8300000000	8966.8300000
05/24/2022	8892.3600000000	8892.3600000000	8892.3600000000	8892.3600000000	8892.3600000000	8892.3600000
05/24/2023	8806.5000000000	8806.5000000000	8806.5000000000	8806.5000000000	8806.5000000000	8806.5000000
05/24/2024	8642.6100000000	8642.6100000000	8642.6100000000	8642.6100000000	8642.6100000000	8642.6100000
05/24/2025	8482.1000000000	8482.1000000000	8482.1000000000	8482.1000000000	8482.1000000000	8482.1000000
05/24/2026	8315.3500000000	8315.3500000000	8315.3500000000	8315.3500000000	8315.3500000000	8315.3500000
05/24/2031	7230.6500000000	7230.6500000000	7230.6500000000	7230.6500000000	7230.6500000000	7230.6500000
05/24/2036	6337.2500000000	6337.2500000000	6337.2500000000	6337.2500000000	6337.2500000000	6337.2500000
05/24/2041	5754.0900000000	5754.0900000000	5754.0900000000	5754.0900000000	5754.0900000000	5754.0900000
05/24/2046	5411.5600000000	5411.5600000000	5411.5600000000	5411.5600000000	5411.5600000000	5411.5600000

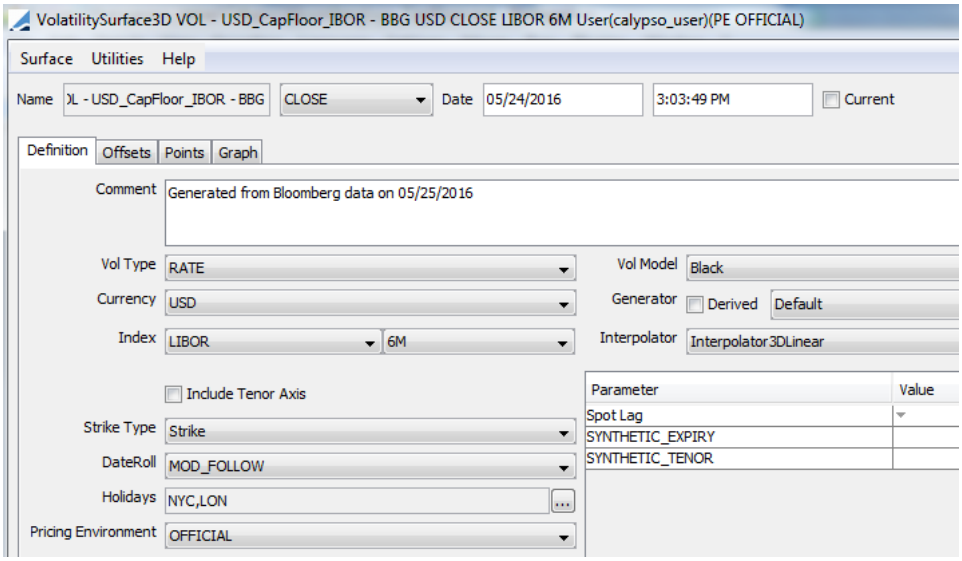
4.3 Cap Floor



BLOOMBERG_UPDATE:

Attribute	Value
Action	1 - Send Request for Updates
DIFFFLAG	
Update Names	
Input Dir	
Input Files	CapFloor

Attribute	Value
Action	2 - Process Updates Received
DIFFFLAG	
Update Names	
Input Dir	
Input Files	CapFloor



Definition | Offsets | Points | Graph

VolatilityModel: Black MID

Expiry/Strike	0	1	1.5	2	3	3.5	4
05/24/2017	49.6026000000	48.6870000000	42.2571000000	40.7113000000	41.3377000000	42.0495000000	42.78540000
05/24/2018	49.2584000000	51.0996000000	44.7427000000	41.9191000000	39.7751000000	39.4752000000	39.40850000
05/24/2019	54.3301000000	59.0319000000	50.4257000000	46.3130000000	42.6292000000	41.7817000000	41.24790000
05/24/2020	57.6891000000	64.9588000000	54.3182000000	49.0666000000	44.1571000000	42.9331000000	42.10290000
05/24/2021	58.8300000000	68.8298000000	56.5580000000	50.3411000000	44.3648000000	42.8187000000	41.73880000
05/24/2022	58.0732000000	70.5305000000	57.1967000000	50.2766000000	43.4061000000	41.5673000000	40.25890000
05/24/2023	56.8381000000	71.4885000000	57.3661000000	49.9626000000	42.5551000000	40.5721000000	39.16650000
05/24/2024	55.0998000000	71.6154000000	56.9406000000	49.1745000000	41.2880000000	39.1500000000	37.63030000
05/24/2025	53.5288000000	71.7055000000	56.5596000000	48.5227000000	40.3255000000	38.1039000000	36.53080000
05/24/2026	52.1200000000	71.8272000000	56.2397000000	47.9788000000	39.5566000000	37.2857000000	35.68770000
05/24/2028	48.3451000000	70.1011000000	54.2055000000	45.7558000000	37.1269000000	34.8319000000	33.24000000
05/24/2031	44.9588000000	69.3808000000	52.7387000000	44.0308000000	35.2651000000	32.9919000000	31.44530000
05/24/2036	40.3699000000	66.6640000000	49.6874000000	41.0039000000	32.4960000000	30.3996000000	29.01830000
05/24/2041	38.7339000000	67.4581000000	49.0578000000	40.0684000000	31.5479000000	29.5320000000	28.23520000
05/24/2046	38.2487000000	70.2099000000	49.4979000000	39.9899000000	31.2842000000	29.2917000000	28.03320000