IVolatility US Historical Intraday Options/Stocks Data Guide

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Intraday stock and options data provides a variety of trading possibilities opening the gates to a market's microstructure. Professionals use these data for high-frequency-trading (ALGO trading), traders for engaging in intraday option strategies and quants - for developing new models for more accurate forecasting and predicting of volatility or enhancing options pricing models, etc… backtesting strategies, applying custom analytics, analyzing intraday market performance and more.

The IVolatility Historical Intraday Options Data consists of 1 minute data snapshots for all US options (900,000+ as of now) and indexes & equities (5000+). Database includes history since August 2011 and comes with data updates for new day.

Intraday data includes:

- US OPRA options prices with volume & OI for all strikes and expirations (with IV&Greeks as a choice);
- US *non-standard* OPRA options prices with volume & OI for all strikes and expirations (with IV&Greeks as a choice);
- Implied Volatility Surface by Moneyness, IVIndex;
- Data frequency of snapshots: 1, 5, 15, 30, 60 minutes or any custom intervals/specific time snapshots during the day;
- Extra data such as dividends and corporate actions like splits and symbol changes can be included as well;
- Daily update service is available **intraday** or the same day after the close.

Intraday Options Database is built by the same team and based on the same methodology that created our award-winning End-Of-the-Day database used by the leading firms.

To order the data, contact us at sales@ivolatility.com or call +1-201-275-1111.

Population and cleansing

Based on 20 years' experience building and supporting the best-known end of the day Options Implied Volatility database, we developed the technology and methodology to capture, cleanse and calculate derived data on an intraday basis as well.

Since our goal is to provide accurate and reliable data timely, we do the following:

- Use well-regarded market data vendors. This is the first step to get accurate market information like price, dividends, volume, etc...
- Our dedicated team tracks all corporate events such as splits, mergers, spin-offs, distributions, etc applying any ticker changes to maintain equity history continuity.
- Our analysts manually verify the data for accuracy of dividend and prices based on our own proprietary filters.
- When calculating implied volatilities, proprietary algorithms automatically filter bad data and replacing with interpolated volatilities, avoiding occasional spikes.
- Use a combination of Black&Scholes and Binomial Tree 100 steps, providing accuracy for the implied volatilities and Greeks.
- Various algorithms allow us to control data capturing in real time.
- After markets close, we perform some additional reviews to check the integrity of data and apply corrections if required.
- We register all found gaps in a special table for future reference.
- Quality of our data was tested as well by our clients over 20 years.
- We deliver the final product - completely verified with corrected data.

Data Delivery of Intraday Options Data

Compressed CSV file delivery

Historical intraday data are delivered either via FTP, FTPS/HTTPS or via media device (HDD).

1 minute files delivery via FTP

By default, when intraday data is purchased in full format (full format stands for 1 min frequency including IV&Greeks calculations), the data is delivered in the following file structure hierarchy split by ticker/day, archived in gzip (*for options and stocks datasets*):

<table>/dt=<yyyy-mm-dd>/<file_name>.csv.gz

where <table> - the name of the dataset (options, stocks),

<yyyy-mm-dd> - trading date,

<file_name> - the file name in the format <table>_<current_stock_symbol>_<stock_id>_<date>

Intraday update data files are delivered via FTP, following choices are available for 1 minutely frequency:

- After 7pm EST, backup of whole day's 1 minute data in a structure similar to historical, split by ticker/day in GZIP is available via link on FTP.
- Intraday in a 20 minutes delayed or real-time mode, every 1 minute during market hours (9:30am EST to 4:19PM EST for real-time, and 9:50am EST to 4:39PM EST for delayed) GZIP file with all tickers data in it is published on FTP. These 1 minute files are available up until next day's opening and cleaned then. Additionally, after the 7PM EST, backup for the whole day's data in a format similar to historical split by ticker/day is available for download via link on FTP.

FTPS/HTTPS delivery for other cases

In case of any combination of tickers or data frequency different from 1 min (it could be 5, 15, 30, 60 minutes or any custom intervals/specific time snapshots during the day) intraday historical and update data files are delivered via FTPS/HTTPS after 10pm EST (through a link). The file structure is as follows:

- For historical files it can be represented as

<table>/<file_name>.csv.gz

where <table> - the name of the dataset (options, stocks, ivs[IV surface], ivx[IV index], nsoptions),

<file_name> - the archive name is built according to the following 4 possibilities (it depends on an estimated data size to be processed and our current server setup/source pools):

a) *<table>_xxx* – used for small orders. It's usually applied for 'stocks' dataset;

b) *<table>_<yyyy>_xxx*;

c) *<table>_<yyyy-mm>_xxx* – the most widely used data breakdown type;

d) *<table>_<yyyy-mm-dd>_xxx* – used when the total size of the data is quite large;

where *xxx* is an archive's sequential number (000, 001, …, 999). The last archive (chunk) could be empty (20 bytes) while our engine splits minutes data, but it's not a mistake, it means that the rest of the data fit into a previous chunk. See examples below:

stocks_2017_000.csv.gz,
options_2017-08_000.csv.gz, options_2017-08_001.csv.gz, … , options_2017-08_004.csv.gz
options_2018-05-01_000.csv.gz

- For daily files

<table>/<file_name>.csv.gz

where <table> - the name of the dataset (options, stocks, ivs[IV surface], ivx[IV index], nsoptions),

<file_name> = *<table>_<yyyy-mm-dd>_xxx*

HTTPS mode

A client receives the link going to the web user interface:
https://cloud.ivolatility.com/downloads/
Login = **login**
Password = **11 characters password** (special characters are also used)
It's easy to use and has clear folder hierarchy.

FTPS mode

A client receives credentials (or a link) which gives an access to the purchased data through the FTP with support for the Secure Sockets Layer (SSL). It's a more preferable way to download if there are a lot of files.
host name = **ftps://cloud.ivolatility.com**
Login = **login**
Password = **11 characters password** (special characters are also used)
Encryption = **Require implicit FTP over TLS** (through 990 port)
Via the link - ftps://login:password@cloud.ivolatility.com (*WARNING!* The link may not work properly, it depends on operating system is used, PC configuration and other related reasons)

In case of using the above link the client should have some kind of FTP-client application installed on their PC, we recommend FileZilla, the free FTP solution.

Data size examples

The size of data grows every day and the market structure becomes wider. Data increasing is basically monotonic.

Full size for all US market per day with 1-minute data in archive is:

- 8/22/2011 (start date): Raw IV (Options prices + IV&Greeks) – 3.9 Gb, Underlying Prices – 38Mb.
- 2/14/2017: Raw IV (Options prices + IV&Greeks) – 9.5 Gb, Underlying Prices – 47Mb.
- 11/05/2019: Raw IV (Options prices + IV&Greeks) – 13 Gb, Underlying Prices – 48Mb.

The approximate size of US market data in archive per 1 year is:

- 8/22/2011-12/31/2011: Raw IV (Options prices + IV&Greeks) – 0.4 Tb, Underlying Prices – 3.5 Gb.
- Whole 2012: Raw IV (Options prices + IV&Greeks) – 1.2 Tb, Underlying Prices – 8.7 Gb.
- 2013: Raw IV (Options prices + IV&Greeks) – 1.4 Tb, Underlying Prices – 9.2 Gb.
- 2014: Raw IV (Options prices + IV&Greeks) – 2.2 Tb, Underlying Prices – 11 Gb.
- 2015: Raw IV (Options prices + IV&Greeks) – 2.5 Tb, Underlying Prices – 12 Gb.
- 2016: Raw IV (Options prices + IV&Greeks) – 2.6 Tb, Underlying Prices – 11.8 Gb.
- 2017: Raw IV (Options prices + IV&Greeks) – 2.5 Tb, Underlying Prices – 11.5 Gb.
- 2018: Raw IV (Options prices + IV&Greeks) – 2.9 Tb, Underlying Prices – 12 Gb.

The size per certain stock per day with 1-minute data in archive is:

- 8/22/2011: Raw IV (Options prices + IV&Greeks): for SPX Index – 25.16 Mb, for SPY – 34.97 Mb, for AAPL – 15.56 Mb. Stock prices: SPX – 8.5 Kb, SPY – 10.14 Kb, AAPL – 10.06 Kb.
- 2/14/2017: Raw IV (Options prices + IV&Greeks): for SPX Index – 127.8 Mb, for SPY – 81.8 Mb, for AAPL – 20.98 Mb. Stock prices: SPX – 9.9 Kb, SPY – 12.43 Kb, AAPL – 12.23 Kb.

Full size for SPX index data in archive is:

Raw IV – 100 Gb, stock prices – 14 Mb.

Uncompressed data is 6-7 times larger.

Intraday Data files description

The intraday historical database contains snapshot with given frequency (1, 5, 15, or other interval) of Underlying Prices & Raw IV data types beginning 08/22/2011. For IV Surface by Moneyness history starts since 03/08/2019, for IV Index – from 05/05/2017, for non-standard Raw IV – from 08/29/2018.

There are 410 records (minutes) during each trading date (9:30 AM – 16:19 PM EST).

Data are divided into two groups: historical intraday tables and EOD (end of the day) tables.

Intraday historical tables: Stocks, Options, IVS, IVX, NSOptions. These tables and files are captured during each trading day with 1-minute frequency. The process of taking market data for all US equities and options, further calculations of IV, Greeks and placing these data into the database and files takes exactly 1 minute. The process is organized so stock and options prices used for calculations are taken simultaneously.

End of the day tables are: Dividends, Split, Yield, Interest Rate, etc.

Below is a description of all tables. Depending on the dataset choice, the set of tables will correspond to the selected dataset.

The stock ID in many tables is an internal IVolatility equity identifier used as a key to link the data/tables. This field allows tracking corporate actions like stock renaming – the stock ID remains the same while the stock symbol could change.

Intraday data tables/files

These are high frequency intraday data containing a market snapshot with the required frequency and available in the intraday update service during the trading day.

Stock Price (stocks)

This table includes intraday historical prices of stocks, indexes and ETFs for the requested frequency. Prices are not adjusted for splits and dividends. Information about all corporate actions is available in a separate end of the day tables (Splits, CorpActions).

Column	Type	Comment	Example
t_date	timestamp	t_date as is in the names of files and folders	2015-01-29 15:26:00
stock_id	int	Internal stock identifier.	18155
symbol	string	Symbol of the security	VIX
type	string	Type of the security(S – stock, F – ETF, I/X – index)	I
currency	string	Currency of trading	USD
price_bid	float	Bid price	0
price_ask	float	Ask price	0
price_last	float	Last trade price	18.97
date_bid	timestamp	Time of bid quote	2015-01-29 00:00:00
date_ask	timestamp	Time of ask quote	2015-01-29 00:00:00
date_last	timestamp	Time of last trade	2015-01-29 15:24:31
size_bid	int	Bid size	0
size_ask	int	Ask size	0
size_last	int	Last trade size	0
exchange_bid	string	Bid exchange	*
exchange_ask	string	Ask exchange	*
exchange_last	string	Last exchange	*
volume	int	Volume	0
calc_date	timestamp	Date and time of the last changes made to the row	1/29/2015 15:24:57
dump_time	timestamp	Date and time of data snapshot	1/29/2015 15:26:00

Note: column “calc_date” is filled only since 2/21/2014.

Raw IV (options)

Individual option contract data (bid/ask, volume) along with implied volatility and Greeks. This table includes all traded expirations and strikes: regular options expired on 3rd Friday/Saturday, weeklies, quarterlies, and leaps, except non-standard options issued after corporate actions.

If only options price data is requested then the IV & Greeks columns marked (*) will be excluded.

Column	Type	Comment	Example
t_date	timestamp	t_date as is in the names of files and folders	2015-01-29 12:13:00
stock_id	int	Internal stock identifier.	9327
stock_symbol	string	Underlying symbol	SPX
expiration_date	timestamp	Expiration date.	2015-03-13
strike	float	Strike price	2275
call_put	string	Type(C – Call, P – Put)	P
style	string	Option style(A – American, E – European)	E
symbol	string	Option symbol	SPXW 150313P02275000
price_bid	float	Bid price	275
price_ask	float	Ask price	278.7
date_bid	timestamp	Bid time	2015-01-29 12:11:31
date_ask	timestamp	Ask time	2015-01-29 12:11:31
size_bid	int	Bid size	100
size_ask	int	Ask size	101
exchange_bid	string	Bid exchange	W
exchange_ask	string	Ask exchange	W
volume	int	Option Volume	0
iv*	float	Implied volatility is equal to pre_iv (see below) in cases where it was calculated or interpolated linearly between strikes and linearly by variance between expirations for missing points based on pre_iv	0.2085
price_opt	float	Underlying price used in calculations, this price is synchronized with options bid/ask prices.	2004.6
delta*	float	Delta	-0.95853
gamma*	float	Gamma	0.000589
theta*	float	Theta	-0.235246
vega*	float	Vega	0.58266
rho*	float	Rho	-2.59741
pre_iv*	float	implied volatility calculated directly from option price, if volatility is not calculated it is set to "-1"	0.2085
implied_yield*	float	Implied yield calculated during the trading day. All ETFs are calculated by implied yield from 1/2/2014.	
calc_date	timestamp	Date and time of the last changes made to the row	2015-01-29 12:12:46
dump_time	timestamp	Date and time of data snapshots	2015-01-29 12:13:00

Note: columns "price_opt" and "calc_date" are filled only since 2/21/2014. Column" implied_yield" is filled since 8/29/2018.

NS Raw IV (nsoptions)

Individual non-standard option contract data (bid/ask, volume) along with implied volatility and Greeks.

If only ns options price data is requested then the IV & Greeks columns marked (*) will be excluded.

Column	Type	Comment	Example
t_date	timestamp	t_date as is in the names of files and folders	2019-11-04 15:00:00
stock_id	int	Internal stock identifier.	22498
stock_symbol	string	Underlying symbol	UVXY
expiration_date	timestamp	Expiration date.	1/17/2020
strike	float	Strike price	6
call_put	string	Type(C – Call, P – Put)	P
style	string	Option style(A – American, E – European)	A
symbol	string	Option symbol	UVXY2 200117P00006000
price_bid	float	Bid price	2.400000095
price_ask	float	Ask price	2.619999886
date_bid	timestamp	Bid time	2019-11-04 14:55:11
date_ask	timestamp	Ask time	2019-11-04 14:59:33
size_bid	int	Bid size	824
size_ask	int	Ask size	21
exchange_bid	string	Bid exchange	W
exchange_ask	string	Ask exchange	Y2
volume	int	Option Volume	0
iv*	float	Implied volatility is equal to pre_iv (see below) in cases where it was calculated or interpolated linearly between strikes and linearly by variance between expirations for missing points based on pre_iv	1.070500016
price_opt	float	Underlying price used in calculations, this price is synchronized with options bid/ask prices.	3.648999929
delta*	float	Delta	-0.786840022
gamma*	float	Gamma	0.169578001
theta*	float	Theta	-0.003268
vega*	float	Vega	0.00469
rho*	float	Rho	-0.00712
pre_iv*	float	implied volatility calculated directly from option price, if volatility is not calculated it is set to “-1”	1.070500016
implied_yield*	float	Implied yield calculated during the trading day. All ETFs are calculated by implied yield from 1/2/2014.	
calc_date	timestamp	Date and time of the last changes made to the row	2019-11-04 14:59:48

IV Surface (ivs)

Implied Volatility Surface (normalized by maturities and moneyness).

Column	Type	Comment	Example
t_date	timestamp	t_date as is in the names of files and folders	2019-11-04 12:00:00
stock_id	int	Internal stock identifier.	627
stock_symbol	string	Underlying symbol	SPY
otm	int	Out-of-the-moneyness	5
period	int	Virtual maturity in calendar days (7, 14, 21, 30, 60, 90, 120, 150, 180, 270, 360, 720, 1080) – see note below	21
call_put	string	Option type (call or put)	P
iv	float	Implied volatility of a virtual contract	0.161899999
delta	float	Delta greek	-0.085869998
strike	float	Virtual strike price	292.0490112
calc_date	timestamp	Date and time of last changing of the particular row. It is used to track changes (recalculations) in data over time (technical field)	2019-11-04 12:00:00

Note: 7, 14, 21 and 270 days maturities start 10/10/2019

IV Index (ivx)

Implied Volatility Index (averaged implied volatility).

Column	Type	Comment	Example
t_date	timestamp	t_date as is in the names of files and folders	2019-11-04 12:00:00
stock_id	int	Internal stock identifier.	799
stock_symbol	string	Underlying symbol	AAPL
period	int	Virtual maturity in calendar days (7, 14, 21, 30, 60, 90, 120, 150, 180, 270, 360, 720, 1080) – see note below	21
ivx_call	float	IV Index Call	0.209000006
ivx_put	float	IV Index Put	0.207399994
calc_date	timestamp	Date and time of last changing of the particular row. It is used to track changes (recalculations) in data over time (technical field)	2019-11-04 11:59:36

Note: 7, 14, 21, 270, 360, 720, 1080 days maturities start 10/10/2019

Column “calc_date” is a column which contains an exact time when an entry had been changed/recalculated, there are situations when “t_date” time (and times of bid and ask prices for an option) differs from “calc_date” one. It’s not an error, such behavior occurs due to the calculation time needed to process the whole market and post results. So “t_date“ can be greater than “calc_date“ even by one or two minutes (especially for old data).

End of the day data/files

End of the tables are updated in the mornings before market is open. All of the tables are rewritten daily except of InterestRate, OptionsEOD and StockPricesEOD tables, which are only updated with new data daily.

Dividends

We keep regular dividend data in this table.

For US stocks and ETFs before 1/28/2014, we use periodical dividends in the form of date, amount and frequency for implied volatility calculations. After 1/28/2014, we use implied yield for all US ETFs. Vendors provide the data from the exchanges, or it comes directly from the companies. As for the dividend date and amount data we use either data from the last paid dividend or information about the next declared dividend.

Column	Type	Comment
stock_id	int	internal stock identifier
t_date	timestamp	start date of the period where this dividend record is valid
term_date	timestamp	end date of the period where this dividend record is valid
last_dividend_amount	float	dividend amount (in currency of underlyings)
last_dividend _date	timestamp	dividend ex-date
dividend_frequency	int	times per year (1 - annually, 2 - semiannually, 4 - quarterly, 12 - monthly)
calc_date	timestamp	Date and time of last changing of the particular row. It is used to track changes (recalculations) in data over time.

Splits

Splits and irregular dividends data.

column	Type	comment
t_date	timestamp	split ex-date
stock_id	int	internal stock identifier
cause	int	0 - split, 1 - irregular cash dividend, 2 - stock dividend
factor	float	split factor (1.5 for 3:2 split etc.)
amount	float	dividend amount in $ per share (for cause = 1 only)
status	int	Status of data (0 – Not adjusted yet, 1- Adjusted, -1 - Suspected price, not adjusted, -2 - Invalid amount or factor, not adjusted)
calc_date	timestamp	Date and time of last changing of the particular row. It is used to track changes (recalculations) in data over time.

Yield

Stock indexes yield are the Average 12 month dividend and used in implied volatility calculations for the indexes.

Column	Type	Comment
t_date	timestamp	trading date the data is as of
stock_id	int	internal stock identifier
yield	float	yield
calc_date	timestamp	Date and time of last changing of the particular row. It is used to track changes (recalculations) in data over time. (calc_date>t_date for records containing fixes in history)

Interest Rates

We use interpolated interbank offered rates such as LIBORs with 1 day delay.

Column	Type	Comment
dt	string	Trade date in format yyyy-mm-dd
currency	string	currency code
period	int	period in trading days. Standard periods are 30, 60, 90, 120, 150, 180, 210, 240, 270, 300, 330, 360, 720,1080, 1440,1800. Rates for other periods are interpolated
rate	float	interest rate % value
calc_date	timestamp	Date and time of last changing of the particular row. It is used to track changes (recalculations) in data over time.

Contract Specifications

The table information content for open, close time, time at expiration is used to calculate last trading time together with Shift in OptioinsEOD table.

Column	Type	Comment
contractspecid	int	internal identifier
OpenTime	timestamp	open time on common trading day
CloseTime	timestamp	close time on common trading day
SettlementTimeAtExpiration	timestamp	close time at expiration
Description	string	Description

Stock

Base underlying instrument (stock, ETF, index) and Corporate Actions information (IPO, delisting).

Column	Type	Comment
stock_id	int	internal stock identifier
region_id	int	region identifier (currently only 1-USA)
currency	string	currency code
type	string	'S' - stock, 'I' - index, 'F' – ETF, ‘X’ – FX Index
create_date	timestamp	IPO date (the date we've "opened" the stock in our database - might not be the same as the actual IPO)
term_date	timestamp	instrument delist date (or date when we've "closed" the stock in our database)
ca_date	timestamp	last corporate action date

Stock Symbol

Instrument information (ticker, company name) and change history.

Column	Type	Comment
stock_id	int	internal stock identifier
t_date	timestamp	start date of the period where this record is valid
symbol	string	stock symbol
name	string	company name
exchange_id	int	internal exchange identifier
actiontype	string	corporate action type
term_date	timestamp	end date of the period where this record is valid
calc_date	timestamp	calculation date – technical field

CorpActions

Corporate actions information.

Column	Type	Comment
ex_date	timestamp	date when corporate action happened
stock_id	int	internal identifier of stock
actiontype	string	internal corporate action identifier

CorpActionType

Corporate action code/description information.

Column	Type	Comment
actiontype	string	internal corporate action identifier
description	string	corporate action description (split, merger, stock dividend, etc…)

RootProperty

Option classes (roots) description data.

column	Type	comment
root_id	Int	internal root identifier
t_date	timestamp	start date of the period where this record is valid
stock_id	int	internal stock identifier
symbol	string	root symbol
exchange_id	int	internal exchange identifier
actionType	string	internal corporate action identifier
IsEnabled	int	whether a root is standard (IsEnabled=0) or non-standard IsEnable=0)
term_date	timestamp	end date of the period where this record is valid
contractspecid	int	internal identifier (reference to the table “ContractSpec”)
spc	float	shares per contract
multiplier	int	multiplier
cash	float	cash
calc_date	timestamp	calculation date – technical field

Exchanges

Exchange code/name data (reference table).

column	Type	comment
exchange_id	int	internal exchange identifier
code	string	exchange code
name	string	exchange name

Expirations

Information about expirations.

column	Type	comment
expiration_id	int	Internal expiration identifier
e_date	timestamp	real expiration date as it is in option dataset
exp_row	int	internal identifier of the expiration type. 1 – standard expiration (the 3rd Friday), 7 – VIX expirations, 8- quarterly expirations, 9 - weekly options and so on.
contract	string	symbol of the expiration
region_id	int	region identifier (currently only 1-USA)

Expiration Rules

Information about expiration types.

column	Type	comment
exp_row	int	internal identifier of the expiration type. 1 – standard expiration (the 3rd Friday), 7 – VIX expirations, 8- quarterly expirations, 9 - weekly options and so on.
name	string	Expiration type (standard, weekly,quaterly etc.)

OptionsEOD

Information about option volumes, open interest and other EOD option parameters.

column	Type	comment
dt	string	Trade date in format yyyy-mm-dd
stock_id	int	internal stock identifier (PARTITIONING)
symbol	string	Option symbol
expiration_date	timestamp	Expiration_date
expirations_id	int	Internal expirations identifier (reference to the table “Expirations”). Useful to filter out different types of expirations.
strike	float	Strike price
call_put	string	Type(C – Call, P – Put)
shift	int	shift of expiration date in days
openinterest	int	Open interest value
volumes	int	EOD options Volumes
calc_date	timestamp	calculation date (calc_date>t_date for records containing fixes in history)

StockPricesEOD

Information about EOD stock prices.

column	Type	comment
dt	string	Trade date in format yyyy-mm-dd
stock_id	int	internal stock identifier (PARTITIONING)
symbol	string	stock symbol
name	string	stock name
price_open	float	open price
price_high	float	high price
price_low	float	low price
price	float	official close price
volume	int	EOD stock volume

QuoteExchanges

Contains information about data provider exchanges codes referring to exchange symbols in the StockPrice and Options tables.

column	Type	comment
exchange_symbol	string	Symbol of the exchange
name	string	Name of the exchange
mic	string	MIC code of the exchange

Our clients

20 years working and constantly developing data resulted in more than 70,000 clients from all over the world using **IVolatility.com** trading and risk management systems for US, European and Asian market data and analytics.

IVolatility.com clients represent all segments of the global derivatives market. More than half of the top 30 options market makers and US options brokers use **IVolatility.com** financial data services. In addition, **IVolatility.com** clients include 3 out of 5 of the largest US banking institutions and more than half of the top 50 investment banks. Other important clients include the CBOE, the NYSE - along with the Options Clearing Corporation, as well as hundreds of investment and hedge funds.