RT Spread Scanner

Contents

Introduction

RT Spread Scanner service is a professional tool for scanning equity option universe for profit opportunities. It covers the most popular strategies, from plain naked or covered strategies and conversions to more sophisticated spreads, straddles and strangles. Intuitive, but flexible interface makes the service suitable for both novice and advanced users.

The scanner features:

- Instruments coverage – all US publicly traded options (700,000+ listed contracts)
- Position risk scenario simulation
- Fine-tuning stock and option filters including stock sentiment (using IVolatility.com 'Stock Sentiment' service data), expiry, moneyness etc.
- Scanning by risk/reward, risk/capital required, maximum return and probability of profit

Software requirements:

- Check that you have flash player installed for your browser.

Quick overview

When you open the service for the first time, you'll see 5 groups of filters

and some results for default search (straddle strategy).

All the filters are hidden by default - see the Strategy, Stocks, Options, Risk/Reward and Greeks groups below. You can expand any of these groups by pressing the arrow button to the right.

Let's see what comes up if you just press **Search** button after changing some filters' values:

After a short time (from just a couple of seconds to about two minutes, depending on the filters set) you'll see Results tab with the trades satisfying your criteria. The screen shows position legend, along with most important risk and reward characteristics.

You'll find the following feature very useful if you are considering different option strategies and wish to compare them - a **Pocket** window. You can select the trades seeming attractive in Results tab and "place" them into Pocket by pressing **Copy to Pocket** button.

	Stock	Position legend	Stock price	Cap Req	Pos Cost	2 STD Profit	2 STD Risk	Risk / Reward	Risk / Cap Req	Max Return	Probability of Pro
☐	ATHN	Buy 10 Jun, 19, 2015 150 C @ 10.70 Buy 10 Jun, 19, 2015 130 P @ 9.40	140.70	$20,100.00	$20,100.00	$54,450.29	$20,100.00	36.91%	100.00%	270.90%	26.96%
☐	NEE	Buy 10 Jun, 19, 2015 115 C @ 2.35 Buy 10 Jun, 19, 2015 105 P @ 3.20	110.57	$5,550.00	$5,550.00	$15,243.99	$5,550.00	36.41%	100.00%	274.67%	26.69%
☐	CBS	Buy 10 Jun, 19, 2015 60 C @ 1.97 Buy 10 Jun, 19, 2015 52.5 P @ 2.74	55.34	$4,710.00	$4,710.00	$13,524.97	$4,710.00	34.82%	100.00%	287.15%	25.83%

Clicking on the stock symbol in the **Stock** column (**Profile** window or **Pocket** window) opens the **Spread Details** window:

Position Copy to Clipboard

Stock	Stock price ▼	Cap Req	Position cost	2 STD Profit	2 STD Risk	Risk / Reward	Risk / Cap Req	Max return	Probability of profit
ATHN	140.65	$20,100.00	$20,100.00	$54,450.29	$20,100.00	36.91%	100.00%	270.90%	26.96%

IV & Greeks Copy to Clipboard

IV Greeks Leg	leg IV	Leg delta	Leg vega	Leg gamma	Leg theta	Leg alpha	Leg Calc Date
Buy 10 Jun 19 2015 15...	40.29%	448.51	343.56	11.31	-50.19	-0.23	30-Jan-2015 11:37:26
Buy 10 Jun 19 2015 13...	41.65%	-330.20	313.90	10.07	-46.88	-0.21	30-Jan-2015 11:37:26
Total		118.31	657.46	21.38	-97.07	-0.22	

Cost & Liquidity Copy to Clipboard

Cost liq leg	Leg bid	Leg ask	Leg bid size	Leg ask size	Leg IV bid	Leg IV ask	Leg volume	Leg Eod volume	Leg Eod Oi
Jun 19 2015 150 ...	$9.80	$10.70	44	118	$38.98	$41.60	0	0	77
Jun 19 2015 130 ...	$8.80	$9.40	88	68	$40.70	$42.61	0	0	140

Risk Scenario

Horizontal axis [Time ▼] Step [10] [days ▼]   Vertical axis [Underlying ▼] Step [10] [% ▼]

[Simulate]

This window gives a more detailed view on the position: volatility, Greeks, quote sizes, volumes etc. Here you can run a Risk Scenario and see how a position P&L will change under different levels of underlying price, implied volatility through time. This advanced functionality is described in a separate "Risk Scenario" section below.

Some hints on usage

- If you are novice in option trading, you can use the very basic interface, without setting all the filters; we've tried to set reasonable default values for all the parameters
- Do not try setting high probability of profit and low risk filter values at the same time - there's no free lunch
- You can save filters' configuration to a file (**Save As** button) and load it later (**Open Profile** button)
- You can restore all defaults of filters (**Restore All Defaults** button)
- You can delete "unnecessary" trades from results by pressing **Delete** button on the top of Result tab; you'll need to select the trades first, by checking the box(es) in the first column.
- You can select the trades seeming attractive in Results window and "place" them into Pocket (**Copy to Pocket** button on the top of Result tab). Pocket window provides you the ability to save list of trades to a file (**Save As** button) and upload the trades from the file later (**Open**

Pocket button). So **Save As** button (Pocket window) provides saving trades, but **Save As** button (Profile window) provides only saving settings of filters.

- Every window (Profile, Pocket and Spread Details) has **Copy to Clipboard** button. So can copy the data you need into, for example, Excel, Word, etc.
- If you see the sign "?" in column / parameter name it means that the column / parameter has a prompt.

Strategy filters

Strategy filters allow selecting a strategy, sorting, number of contracts and how much results will be shown:

You can read more about options strategies on the site of The Options Industry Council: http://www.optionseducation.org/content/oic/en/strategies_advanced_concepts/strategies.html

By default the strategy is Long Straddle and number of contracts is 10 (meaning contract on 10 x 100 = 1000 underlying shares). Default sorting is by Risk/Reward, so you'll see less risky trades on top. (We calculate "2 STD Profit" and "2 STD Risk" at expiry and use these values as proxy to max loss/profit). So "less risky" here stands for "low max risk to max profit ratio" trades. Other possible sortings are:

- by **Capital Required** – by initial investment required to open the position (including margin requirement); the amount by which your "buying power" is decreased
- by **Risk/Cap Req** - by "2 STD Risk" to "Capital Required" ratio
- by **Max return** - by "2 STD Profit" to "Capital Required" ratio
- by **Probability of Profit** - by how probable is the "win" scenario for the trade
- by **Stock Price**
- by **2 STD Profit** – by maximum profit received at expiry when the underlying price varies within two standard deviations from its current value
- by **2 STD Risk** – by maximum loss at expiry when the underlying price varies within two standard deviations from its current value
- by **Position Cost** – by position open value (positive for debit, negative for credit)

Stock filters

Stock filters allow selecting a stock universe, stock sentiment and options' cost level (IV Index):

You can select already specified stock list for scan from drop down list or you can just enter stock symbols you need into the **Stocks** text box to the right (comma delimited string).

For example, in the stock filter below we set concrete companies: QUALCOMM (qcom) and Hershey (hsy).

You can read more on how we calculate stock sentiment here:
http://www.ivolatility.com/doc/StockSentimentRanker.pdf

If you press the **Edit Filters** button, the other (advanced) stock filters will become available. We'll describe all them in a separate section below.
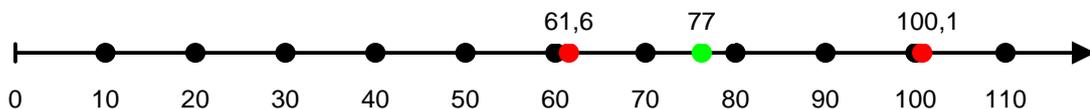
Option filters

This section allows setting filters on options; it looks most sophisticated for Diagonal spreads:

Here, you set Expiry and moneyness for "Leg 1" and difference (offset) in expiry, strike, and implied volatility for the "Leg 2". Here are the rules to determine "Leg 1" for a strategy:

- − if one option is bought, and other is sold - the bought option is "Leg 1"
- − if both options are bought or sold, the Call option is "Leg 1"

We define moneyness as relative position of the boundaries, in which options' strikes should be, with respect to the current price of an underlying asset (current price is a starting point, i.e. 0 %)

For example, we have a set of options with strikes 10, 20, 30, … etc. (black dots)

The stock price is 77 (green dot) and we set moneyness filter from -20% to 30%

$$Left\ boundary = 77 * \left(1 - \frac{20\%}{100\%}\right) = 61,6$$

$$Right\ boundary = 77 * \left(1 + \frac{30\%}{100\%}\right) = 100,1$$

So our engine will search among the options with strikes that greater than 61,6 (left red dot) and less than 100,1 (right red dot). According to picture we see that 4 strikes (70, 80, 90 and 100) satisfy this criteria.

Again, if you press the **Edit Filters** button, the other (advanced) option filters will become available. Stock and option advanced filters are described in a separate section below.

Stock and option advanced filters

If you press the 'Edit Filters' button in the Stocks section, you'll see the following window:

You can select any (or all) of these filters and press **Apply** button. If you do so, these filters will be added to the **Stocks** section of the Search window and you will be able to specify desired range for selected filters.

Finally the 'Long' and 'Short' terms can be used for advanced traders who would like to use such criteria as differences in long term IV index and short term IV index – suffix "_S" stands for short term, "_L" for long terms. So when you specify IVX Short term as 30 and IVX long term as 180 you can apply a filter that will have a ratio of IVX 30d to IVX 180d in desired range (specified in the main Search window).

Options section also has similar filtering window, the only difference is that there are 2 sets of filters for each leg:

Below we describe what each of these filters means in detail. Note that if you wish to cancel some advanced filter, you need to erase the criteria.

Stock advanced filters

Here is the entire list of the advanced stock filters available:

Filter name	Meaning
Price, $	Current stock price
Price % chg from close	Stock price, change from close
Volume % chg from close	Stock volume change from previous trade day total stock volume
Volume EoD % of 1m avg	Previous trade day total stock volume to 1 month average ratio
Capitalization, $bln	Stock capitalization
HV_S - HV_L, %	Difference between Short and Long term HV
IVX_S - IVX_L, %	Difference between Short and Long term IVX
IVX_S / HV_S, %	Ratio of Short term IVX to HV
IVX_L / HV_L, %	Ratio of Long term IVX to HV
Total options volume % of EoD OI	Total option volume to total end of day open interest ratio
Call/Put volume ratio, %	Total Call volume to total Put volume ratio
IVX_S Call/IVX_S Put, %	Call IV Index to Put IV Index ratio, Short term
IVX_L Call/IVX_L Put, %	Call IV Index to Put IV Index ratio, Long term

Using these filters, you can select stocks with given change in stock price, volume, volatility etc. Also, you can monitor unusual option trading activity using **Total options volume % of EoD OI**

filter. Finally, **Call/Put ratio** filters allow making an additional check for the stock sentiment (reading above 1 considered to be Bullish; however, too high reading may mean Overbought sentiment).

Short and Long term in the above are set in the same **Edit Filters** window - you can select them close to options' expiries or using other considerations. By default, they are set to 30 and 180 calendar days for IV Index (IVX) and to 20 and 120 trading days for HV (the closest to 30 and 180 calendar days' values).

Option advanced filters

Advanced option filters are available for each leg of the strategy and listed below:

Filter name	Meaning
Bid	Option bid quote
Ask	Option ask quote
(Ask-Bid) % of stock	(Ask-Bid) spread to stock price ratio
Price % chg from yest	Option mid-price change from close
IV	Option implied volatility
IV % chg from yest	Option implied volatility change from close
Volume % of OI	Option volume to end of day option open interest ratio
Delta	Delta greek
Gamma	Gamma greek
Vega	Vega greek
Theta	Theta greek

Mind, that all these filters are per individual contract and independent of the quantity of contracts you are going to buy or sell. You can monitor change in option price and IV, assess option liquidity ((**Ask-Bid) % of stock** filter) and unusual option trading activity (**Volume % of OI** filter). Finally, for really fine-tuned scan you can set filters on each individual greek for the option contract.

Risk/Reward filters

Risk/Reward filters are always empty by default; you can use them for more sophisticated and fine-tuned scan.

Capital Required - this is the initial investment required to open the position. Note, that this value is always positive - even if you are entering the credit trade. So your "buying power" is diminished in any case - if you enter debit or credit strategy, whatever.

Debit (Credit) – position open value (positive for Debit, negative for Credit)

- if you enter a debit strategy, the amount of money = debit is taken from your account;

- if you enter a credit strategy, the amount of money = credit is deposited to your account.

Risk/Reward ratio - is a ratio of "maximum" theoretical loss to "maximum" theoretical profit.

$$\text{Risk/Reward} = \frac{2 \text{ STD Risk}}{2 \text{ STD Profit}}$$

We do not use absolute maximum loss and profit, since they are infinite for certain strategies and cannot be used in calculations and scanning. We use a reasonable assumption that underlying price can vary within two standard deviations from its current value. We calculate "2 STD Profit" and "2 STD Risk" at expiry and use these values as proxy to max loss / profit. Same assumption is used for implied volatility. For Calendar and Diagonal spreads, we calculate risk at the short expiry, additionally assuming that option contract implied volatility can vary within two standard deviations too.

These estimates give a feeling of how risky and profitable the trade is; if you need the exact estimates - you can always use the Risk Scenario functionality of our service.

Risk/Capital Required ratio - is a ratio of 2 STD loss to Capital Required.

$$\text{Risk/Capital Required} = \frac{2 \text{ STD Risk}}{\text{Capital Required}}$$

This is an alternative way to estimate risk, comparing it with the initial investment, instead of maximum theoretical profit.

Max Return ratio - is a ratio of 2 STD profit to Capital Required

$$\text{Max Return} = \frac{2 \text{ STD Profit}}{\text{Capital Required}}$$

This is the return to expiry, not annualized figure.

Probability of Profit - an estimate of the probability that the trade will yield a profit. We use a simple model to calculate this value, **p**. Consider a case, when there are only two possible outcomes: you get maximum profit **Pmax** with probability **p** or maximum loss –**Lmax** with probability **(1-p)** ("maximum" here stands for "2 STD" too). Assuming that position is fairly priced, your expected outcome should be zero, so

Expected outcome = 0 = p*Pmax - (1-p)*Lmax

From this we derive the probability of profit as

p = Lmax / (Pmax + Lmax)

This formula is just another illustration to the "no free lunch" concept: high probability of profit means either high risk (Lmax) or low maximum profit (Pmax) - or both.

$$\text{Probability of profit} = \frac{2 \text{ STD Risk}}{2 \text{ STD Profit} + 2 \text{ STD Risk}}$$

So, a general guideline to using these filters is as follows: do not try setting very high probability of profit and low risk to reward ratio at the same time; most probably, such a search will return nothing.

Greeks filters

Greeks filters are always empty by default too.

Delta is shown in shares; in other words, it is a position value change in case when underlying price advances by $1.

Vega is a position value change in case when option contract's implied volatility increases by 1% (absolute, say, from 20% to 21%). We just sum vegas for two options without any adjustments for simplicity (the same is true for other greeks).

Gamma is a change in Delta in case when underlying price advances by 1%. Large negative Gamma shows that a position will loose much under large change in underlying price and hence very risky.

Theta is a position value change from today to tomorrow; it is negative for long option positions. Large negative Theta means that the position will loose in value ("waste") through time, all other factors being unchanged.

Alpha is a ratio of Gamma to Theta. It compares profits (losses) due to underlying price move with losses (profits) due to option extrinsic value decay. Generally, you want large Alpha if your Gamma is positive and small Alpha if Gamma is negative.

Risk Scenario

You'll see this feature at the bottom of the **Spread Details** page:

It is a flexible tool for simulation of the position P&L and return under different levels of options' volatility and forward underlying price for fixed time horizons in the future. It is an invaluable tool allowing to check "what happens if" with your position under different market conditions. The following risk factors are taken into account:

- Sensitivity of position value to underlying price and option volatility
- Additional loss due to bid/ask spread

How to use

You can simulate P&L as a function of underlying price, time and volatility - just choose two of these as X and Y axes and simulate P&L and return as a function of these two (the third variable will be fixed). You can also customize your axes step (as absolute value of percentage). You will see the matrix of P&Ls and returns like the one below:

Risk Scenario

Horizontal axis	Time ▼	Step	10	days ▼		Vertical axis	Underlying ▼	Step	10	% ▼	

Recalculate P&L — Reset All

Leg 1 volatility:	19.16%	Leg 2 volatility:	18.17%	
	Time Steps	10	20	30
$30.04		-5% (-1075$)	-5% (-1075$)	-5% (-1075$)
$33.79		-4% (-1008$)	-4% (-1021$)	-4% (-1035$)
$37.55		-2% (-557$)	-2% (-580$)	-2% (-607$)
$41.30		0% (207$)	1% (224$)	1% (241$)
$45.06		3% (712$)	3% (750$)	3% (801$)

Some hints on usage:

- Each cell in the matrix shows theoretical return (to date) and P&L
- All the axes' white background fields (time steps, underlying, leg 1(2) volatility) are editable (After editing the fields, please press **Recalculate P&L** button to see recalculated Risk Scenario)
- There are 2 ways to refresh the data:
  – manually, with adjustment of axes values according to market movement (by request): press **Reset all** button when you need to refresh the axes and P&L values. This mode suits for analysis of risks, having default values for underlying price and volatility.
  – manually, fixed axes: press **Recalculate P&L** button when you need to refresh the data. This mode suits for analysis of risks using custom (edited by user) values for underlying price and volatility.

Appendix. Greeks representation

This section covers information on the Greeks representation in the Risk Management system.

Definitions

- **S** - underlying spot price ("raw," not adjusted for dividends)
- **Vol** - implied volatility for an option contract, decimal
- **t** - time to expiry, days
- **r** - continuous interest rate for a given option expiry, decimal
- **C** - option price; C (.) is written below with different arguments.
- **Amt** - number of underlying shares

Greeks are always calculated by finite differences – the option price is calculated in neighbor point(s) and approximate Greeks by finite differences.

Delta and Gamma are calculated by their mathematical definitions:

- Delta = (C(S+dS) - C(S)) / dS, where dS = S*((r-Vol2/2)/365+0.0523*Vol) [1]
- Gamma = (C(S-dS) - 2*C(S) + C(S+dS)) / dS / dS

Vega, Theta, Rho are calculated as specific increments:

- **Vega** = C(Vol + 0.01) - C(Vol) - change in price for a 1% (absolute) change in volatility
- **Theta** = C(t - 1) - C(t) - change in price from today (days to expiry = t) to tomorrow (days to expiry = t-1)
- **Rho** = C(r + 0.01) - C(r) - change in price for a 1% (absolute) change in the interest rate;

Some exotic Greeks such as DeltaVega, DeltaTheta, GammaVega, GammaTheta, Alpha (= Gamma / Theta) are calculated by a combination of the above formulas.

For one contract

Delta in shares = Delta * Amt -- this amount of underlying shares should be sold to establish delta-hedging of the contract

Delta in $ = Delta in shares * S -- this is a cost of delta-hedging; this amount of money should be realized to hedge the contract. (The amount to spend would be (-Delta in $) USD)

Gma$1 (Gamma in Shares for a$1 spot move) = Gamma * Amt

Gam1% (Gamma in shares for a 1% spot move) = Gma$1 * S/100 = Gamma * Amt * S / 100 -- this represents the number of underlying shares that should be sold to hedge the resulting delta from a 1% move in spot (if spot increases by 1%, the current delta should be kept for this contract). If it is needed to hedge PL, not Delta, from a 1% change in spot, a half of this quantity; then Gamma in shares / 2 should be sold.

$Gamma1% (Gamma in $) = Gam1% *S = Gma$1 *S^2/100 - dollar equivalent. The cost of a gamma hedge for PL is Gamma in $ / 2.

Values of Gamma in shares and Gamma in $ are a common market practice.

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[1] 0.0523 stands for 1 / sqrt(365). Testing shows that it is a rather reasonable choice for dS