TrendSpider®

Backtesting
Masterclass

Hello, and welcome to today's masterclass on backtesting and strategic trading. I'm your host, Jason Krutzky, Senior Evangelist at TrendSpider and I am excited you have found yourself here to learn the importance of data in crafting successful trading strategies.

Today we'll explore best practices for distinguishing a genuine market edge from the common pitfalls of curve fitting, ensuring your strategies are resilient across varying market conditions. I'll also show you how to enhance your trading toolkit by integrating hypothetical trades from external data sources into your analysis.

This session is designed to elevate your trading skills with actionable insights, leveraging the sophisticated tools offered by TrendSpider. Let's begin this journey to refine your approach and achieve superior market performance.

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WHY BACKTEST

Chapter One: Why backtest?

This isn't just about validating strategies—it's about building them on a foundation of certainty and scientific rigor.

Imagine having a tool that allows you to see into the past to predict future outcomes—this is what backtesting offers to traders.

The real power of backtesting lies in its ability to teach us about the behavior and character of our strategies. Think of it as the scientific method applied to trading. We start with assumptions, test these assumptions under historical data, and observe the outcomes. This process helps identify whether our strategies are robust, providing a platform to make informed adjustments.

Why do we correlate backtesting with the scientific method?

Because it involves hypothesis, experimentation, and verification. Each strategy you test undergoes consistent rigorous scrutiny, allowing you to refine your approach based on reproducible results. This methodical testing ensures that your strategies are not just theoretical but practical and applicable in real market conditions.

However, backtesting is not without its limitations. The most critical is understanding that past performance is not always indicative of future results. It's not about beating the market consistently but about achieving consistency and risk control within your strategy. Remember, backtesting doesn't guarantee success; it merely helps us avoid strategies that are likely to fail.

While backtesting can guide us in refining strategies, it's crucial to acknowledge that no method, including the scientific one, is foolproof. Yet, this acknowledgment doesn't diminish its value. Instead, it reinforces the need for continual learning and adaptation.

So, why backtest? Because it equips us with the insights to craft strategies that are as fail-proof as possible within the unpredictable nature of markets. It's about making smarter, data-driven decisions that elevate our trading beyond mere speculation to calculated execution.

As we move forward in this masterclass, keep these thoughts in mind. Understanding the 'why' behind backtesting sets the stage for the 'how,' which we will explore in our next chapter.

HOW TO BACKTEST A SIMPLE STRATEGY

Now that we understand why backtesting is essential, let's walk through how to actually perform a backtest using a simple strategy. Our goal here is to turn theory into practice and see how our theory would have historically performed in the past.

For demonstration purposes, let's use a well known daily timeframe moving average crossover strategy like the 8/21 EMA cross to test its validity.

This strategy involves two moving averages of a stock's price — one short-term and one long-term. A buy or entry signal is generated when the short-term average crosses above the long-term average, and a sell or close signal when it crosses below.

To begin, you'll need backtesting software. Most require some type of coding skills to operate but today we will build our backtest in TrendSpider, a modern backtesting tool that allows users to set up and run backtests with ease without needing to code individual parameters.

With the Backtester open we can set the parameters for our hypothetical strategies entry and exit signals going long or buying when the 8 period daily exponential moving average crosses up through the 21 period daily exponential moving average and selling

when the same signal crosses to the downside. We will use the $QQQ as our test asset but this process can be repeated for results on any asset you are interested in trading.

With our strategy programmed we can define the amount of historical time, or candles we want to test and then run it to see the performance of this strategy in the past 3,000 candles or periods. TrendSpider will simulate trades based on the rules we defined across the selected historical data. It will record each trade's outcome, allowing you to observe how the strategy would have performed.

After the backtest completes, it's crucial to analyze the results carefully. Review performance indicators such as total return vs the asset, percentage of profitable trades or win rate, maximum drawdown, and its risk to reward multiple for an average trade. These metrics will give you direct insight into the expectancy profile of your strategy and you can evaluate whether the strategy met your risk tolerance and investment goals. It's also vital to check for periods of underperformance and consider if these are acceptable given your trading objectives.

03

ANALYZING BACKTESTING RESULTS

Welcome to Chapter Three where we dive into one of the most crucial aspects of backtesting—analyzing the results and understanding their meaning.

Understanding what your backtest results are telling you is key to refining your strategy and ensuring it stands up to real-world trading conditions. When your backtest is complete, you'll be presented with a variety of performance statistics.

The key tabular metrics most platforms will include with backtest results are total return vs the asset, percentage of profitable trades or win rate, maximum drawdown, risk to reward multiple, and average trade return.

More advanced platforms like TrendSpider offer an extensive array of data points like the strategies Sharpe and Sortino ratio, CAGR for the asset or strategy, max and average Win or Loss streaks, Exposure percentage, Net performance over time and more. But for top level analysis we will explain how to tell if your strategy is valid quickly using the key metrics mentioned before.

Total Return vs. the Asset: This measures the overall performance of your strategy compared to the asset itself over the same period. It helps you assess whether your strategy added value compared to simply holding the asset.

Percentage of Profitable Trades (Win Rate): This is the ratio of trades that ended profitably to the total number of trades. High win rates can be encouraging, but they must be viewed in context with other metrics such as Reward to Risk ratios. A strategy could have a high win rate but still be unprofitable if losses from losing trades exceed gains from winning ones.

Maximum Drawdown: This metric shows the largest single drop from peak to trough in your strategy's performance, before a new peak is achieved. It is crucial for understanding the potential risk and emotional toll associated with a trading strategy. Lower drawdowns are preferable as they indicate less risk and volatility.

Reward to Risk: Often expressed as a ratio, this metric evaluates the average gain of winning trades relative to the average loss of losing trades. A ratio greater than 1 indicates that the strategy earns more on winners than it loses on losers, which can be a sign of a robust strategy. However, it needs to be balanced with the win rate to get a full picture of the strategy's effectiveness.

Average Trade Return: This gives the average return per trade executed, factoring in both winning and losing trades. It provides a straightforward measure of the overall effectiveness of a trading strategy on a per-trade basis. Consistently positive average trade returns suggest a strategy that effectively capitalizes on market movements.

These 5 key tabular metrics tell you most of what you need to know when backtesting basic strategies. While no single number will tell you the full truth, these statistics evaluated together tell a story of forward expectation.

Specifically, when knowing a strategies win rate and risk to reward ratio, there is a basic model to follow for profitable forward testing.

As you can see in this chart, the higher your rewarded unit of return the less win rate you need to be profitable. Strategies with a risk to reward ratio of two, need to have a win rate above 40 percent to be profitable so it is imperative for any trader to know these two key historical statistics to plan their trade.

Win% vs Reward/Risk ratio
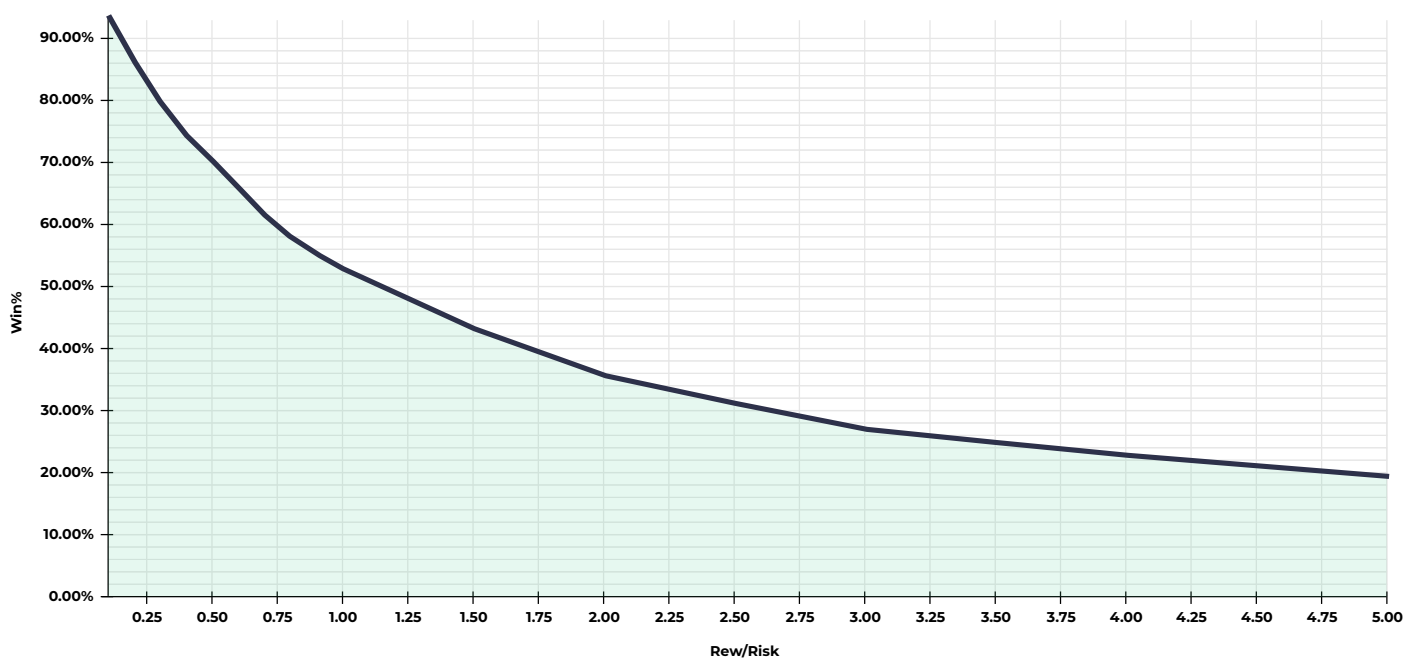
By thoroughly analyzing these metrics, traders can gain a comprehensive understanding of their strategy's performance, identify potential areas for improvement, and make more informed decisions about strategy adjustments or adherence.

Another crucial component to examine is the profit curve, which plots the cumulative profit or loss over time. A smooth upward curve suggests a consistent strategy, while erratic dips might indicate periods of high risk or an ineffective strategy.

Look for patterns or trends within these curves that could inform potential adjustments. For example, if significant losses consistently occur under certain market conditions, you might need to incorporate filters that avoid these scenarios.

BACKTESTING CAN NEVER TELL YOU "GO"

Chapter 4: Backtesting can never tell you "GO". As we touched on briefly in Chapter One, a critical aspect of backtesting is understanding its limitations and why backtesting alone can never definitively say you will be safe trading a backtested strategy.

A fundamental limitation of backtesting is its inability to guarantee future profits. A backtester can tell you when a strategy might not work, by highlighting flaws or underperformance during certain periods. However, it can never assure you that a strategy will be profitable. It simply doesn't have the capability to predict future market conditions or external factors that could affect trading performance.

The best outcome from backtesting is finding that there are no immediate red flags for your strategy across the tested periods. But remember, other untested periods may reveal issues, or market conditions could change.

In the scientific spirit, backtesting is about trying to disprove a strategy rather than prove it. This is about falsifiability—the capacity for a hypothesis to be proven wrong. Our goal is to attempt to break our strategy under as many different conditions as possible to see if it holds up.

To truly test the robustness of a strategy, consider adjusting your backtest parameters like depth and breadth, varying the number of candles, or testing across different market phases such as bullish, bearish, and sideways markets.

Observe how the core metrics like reward/risk ratio, win percentage, and drawdown react to these changes. Significant fluctuations in these metrics can indicate potential fragility in your strategy.

The frequency of trades and the distribution of returns are also crucial in assessing a strategy. A strategy that rarely trades may not provide reliable income, whereas one that trades frequently with consistent outcomes can be more dependable.

Look at the distribution of your strategy's returns. Are they consistent, or do a few outlier trades disproportionately influence the results? Strategies with more evenly distributed returns are generally more robust, allowing for more predictable performance under similar market conditions in the future.

While backtesting is an indispensable tool for developing trading strategies, we want to be clear that its purpose is not a green light system. It doesn't provide guarantees but rather guides us in refining our strategies to better withstand the complexities of real-world trading. As traders, our task is to use this tool wisely, constantly seeking to challenge and improve our strategies based on the insights it provides.

As you move forward, keep challenging your strategies. Use backtesting not as a final verdict, but as a continuous test under an array of conditions to sculpt robust, adaptable trading strategies.

IDENTIFYING AND AVOIDING CURVE FITTING

One common pitfall in backtesting is overfitting, or creating a strategy that performs well on historical data but fails in live markets. This typically happens when a strategy is too finely tuned to the specific data set used in the backtest.

To detect overfitting, compare your backtest results with out-of-sample tests or forward performance testing. If the strategy performs noticeably worse on new data, it may be overfitted.

In TrendSpider, you can quickly select date ranges for your backtest to view performance in select or random market environments.

Overfitting is like tailoring a suit to fit one person perfectly in a particular pose but finding it doesn't fit well when they move. In trading, this means the strategy works exceptionally

well for the historical data it was tested on but lacks the flexibility to adapt to new conditions or unseen market scenarios.

This often results from using too many indicators or overly complex rules that 'chase' historical price movements. While it might seem effective initially, it's typically not sustainable because financial markets are influenced by countless factors that can change dynamically.

Simplifying the strategy can often help. Focus on broader, more robust indicators and fewer decision points. This can make the strategy more adaptable and less likely to be thrown off by market noise.

Another technique is cross-validation. This involves splitting your historical data into several parts, using one time window to develop your strategy and another to test it. This helps ensure that your strategy is robust across different time periods. The more variance you add, the more robust your expectation can be.

As a final technique to avoid overfitting, many traders will choose to use a walk-forward analysis and slowly size into their trust in the strategy. This approach mirrors real-world conditions where market dynamics are constantly changing, helping traders maintain an adaptive and robust strategy. However, it is important to recognize that walk-forward analysis can be computationally intensive and may risk over-optimizing historical data, potentially leading to a false sense of security. Additionally, the continuous adjustment of parameters can introduce data snooping bias, making it crucial for traders to balance in-sample and out-of-sample periods effectively and remain cautious about backtested performance.

Remember, the most important thing to remember is to always be able to explain a rationale behind your strategy's logic. Ensure that there is an explanation for why it should work, beyond just statistical performance on past data. Strategies grounded in sound fundamental or technical theory are less likely to be overfitted and more likely to succeed in the long term.

By incorporating these practices, traders can develop more resilient strategies that stand a better chance of performing well not only in backtests but also in actual trading environments.

PRACTICAL APPLICATION OF RESULTS

Analyzing backtesting results isn't just about improving numbers; it's about understanding the behavior of your strategy under various market conditions and making it robust enough to handle unpredictability.

Use the insights gained from your backtest to refine your strategy. This might mean adjusting your risk management rules, tweaking entry or exit criteria, or even reevaluating the assets or time frames you trade.

The real value in backtesting isn't just found in the raw data and performance metrics; it lies in our ability to translate these numbers into actionable insights. Every analysis should lead us to ask why a strategy succeeded or failed and under what conditions.

For instance, if you notice that your strategy performs exceptionally well in bullish markets but falls short during bear phases, you might consider incorporating market condition filters. These can help your strategy to activate or deactivate based on the prevailing market environment.

Adjusting risk management rules is also crucial. For example, if your maximum drawdown levels are higher than you're comfortable with, you might look into tightening stop-loss orders or reducing position sizes during periods of high volatility.

Tweaking entry and exit criteria can significantly affect your strategy's performance. If the results show that entries are too early or exits too late, refining these points could enhance the overall efficiency of the strategy. This might involve shortening or extending indicator periods or integrating different technical signals for more precise triggers.

Backtesting might reveal that certain assets or time frames do not align well with your strategy's strengths. In such cases, reevaluating and possibly narrowing your focus can lead to more consistent results. For example, some strategies may be more effective on daily charts rather than on minute charts, or vice versa, depending on their design and the trader's execution capabilities.

Implementing these changes effectively requires a cycle of continuous feedback and adjustment. Use each round of backtesting as a learning tool, iteratively refining your strategy until it meets your predefined standards of success and stability.

The goal is to build a strategy that not only looks good on paper but also holds up in the live markets, adapting to changes with resilience and reliability. Each adjustment should bring you closer to this objective, ensuring that your trading approach is both pragmatic and profitable.

07

VARIANCE TESTING ACROSS SYMBOLS

The "Strategy Variance Explorer" introduced by TrendSpider represents a significant advancement in strategy and backtesting optimization.

This tool allows traders to analyze and refine their strategies by testing variations across different assets and timeframes.

As we review the basic practical applications of backtesting results, it's crucial to address the role of variance testing in strategy optimization.

Variance testing is not just a method; it's a revelation. It allows us to rigorously evaluate how different markets or time frames can affect our strategy's performance.

The Strategy Variance Explorer tool is designed to assess the robustness of your backtests by applying them across various assets and time frames. This kind of testing is invaluable because it helps you identify which markets or assets resonate best with your trading approach.

By utilizing variance testing, you can:

- Apply your strategy to multiple markets to see where it performs best. This helps ensure that your strategy is not just theoretically sound but practically effective.
- Tweak your strategy's parameters like moving averages or stop-loss levels across different assets to reveal more optimal settings that enhance performance.
- Determine which asset or timeframe offers the most consistent and favorable results for your strategy, enhancing your confidence in where to allocate your capital.

Implementing variance testing is straightforward with the Strategy Variance Explorer. You start by selecting your strategy and then choosing different assets and timeframes to apply it to. The tool then provides comprehensive visual and tabular data, highlighting performance metrics across these variants.

For example, if testing a simple moving average crossover strategy, you might apply it to both high-volatility tech stocks and more stable utility stocks across several time frames. The results will help you pinpoint where your strategy maximizes returns and minimizes risks.

Ultimately, variance testing is about refining your trading strategy to ensure it is as effective in live markets as it is in backtests. It's about transforming good strategies into great ones by finding their best applications. This rigorous testing ensures you're not just running a strategy; you're optimizing it for maximum profitability and minimal risk.

PRICE BEHAVIOR ANALYSIS

The Price Behavior Explorer is a sophisticated tool designed to enhance your strategy testing by providing a visual and analytical deep dive into how your trades perform under various market conditions.

This tool is particularly beneficial for identifying the nuances of your strategy's

performance, which can help in refining it further.

It shows metrics like entry counts, the duration of trades, and performance over different periods, helping you spot patterns in trade success or failure.

By segmenting trade outcomes into winners and losers, you can distinctly see the behaviors that distinguish profitable trades from unprofitable ones. This segregation helps identify specific conditions under which trades tend to succeed or fail, allowing for precise tweaks to entry and exit strategies.

The tool's ability to dissect pre-entry and post-entry price action is invaluable. By examining how the market behaves before and after your entries, you can adjust your timing to better coincide with optimal market conditions. This might mean entering trades earlier or later based on the observed momentum and trends prior to your typical entry point.

Using this tool, you can refine your strategy by adjusting risk management protocols based on the duration and outcome of trades. Tweaking entry and exit criteria to better align with successful trade profiles observed.

In essence, the Price Behavior Explorer offers a dynamic way to test and optimize your trading strategies, making it easier to adapt to and capitalize on market behaviors of the past, and apply them in the future.

This tool is integral for traders who want to ensure their strategies are robust and adaptable across different market conditions and assets.

09

IMPORTING CUSTOM TRADES (ARK)

Congratulations on reaching the final chapter of our masterclass! In this segment, we'll

explore how leading quant trading funds like ARK utilize TrendSpider's Strategy Tester to assess their proprietary strategies discreetly and efficiently.

TrendSpider's flexibility allows you to import custom trades directly into the Strategy Tester. This feature is especially useful if you already have a system generating signals and you wish to utilize TrendSpider's powerful visualizations to analyze the results of your backtests.

You can input timestamps for triggering candles rather than configuring backtester criteria directly in TrendSpider. This allows for precise control over entry and exit points based on your existing trading signals.

To demonstrate I have configured a 10 trade series of entries and exit candles for the system to analyze. All I need to do is paste them in the list of signals section and select run to see the results.

TrendSpider supports various timestamp formats—from Unix and JavaScript timestamps to various human-readable formats. It's important to include the correct time zone with your timestamps to ensure accuracy. For optimal consistency, we recommend using UTC.

When importing signals, remember a few key guidelines:
- The order of signals doesn't affect the backtest, and only the timestamp of the triggering candle open is needed.
- If a signal for entry is received while already in a position, it will be ignored, as the system prioritizes current active trades.

This feature isn't just for straightforward backtesting. It's also ideal for those who wish to share their strategy without revealing the underlying criteria. For example, you can run a backtest with your real strategy, download the list of trade positions, and then create a new strategy using just the timestamps. This allows you to share strategic insights while keeping the core intellectual property confidential.

As we wrap up our comprehensive exploration of Backtesting, I hope you feel empowered to take your trading to the next level. You now have the knowledge to simulate and

scrutinize every aspect of your strategies, ensuring they stand the test of varied market conditions.

Remember, the sophistication of tools like the Strategy Tester does more than just automate processes—it deepens your understanding of market dynamics and your strategy's interaction with them. This is crucial for anyone looking to operate at the forefront of trading technology, much like the world-renowned quant funds.

I trust that this masterclass has equipped you with not only the technical know-how but also the strategic foresight to enhance your trading approach. As you move forward, implement these observations to refine your strategies, mitigate risks, and capture the opportunities that markets present.

Your commitment to learning and improvement today lays the groundwork for the successes of tomorrow. So go forth, apply these insights, and carve your path in the trading world. Happy trading, and may your decisions be as informed as they are fruitful!