V-Thrusts v.1

Investment Strategy Testing Summary

The V-Thrusts v.1 strategy is Jeff Cooper's swing trading technique. In its long version, it combines **a trend filter based on the Donchian channel** with **an impulse to a new multi-week high,** followed by **a multi-session correction** of **significant amplitude** (a decline from the peak by several times **the ATR; Average True Range)**. The signal activates **a Reversal Day** at the end of the correction, and entry is achieved through **a buy stop** above the high of the reversal day. We define risk with a fixed stop below **the correction lows,** and the position is closed **after several sessions** (time-exit). The strategy has a mirror variant for short selling.

While the strategy's logic seems sound, <u>it hasn't even passed initial testing</u> because the number of test trades is so low that it's impossible to draw any reliable conclusions. Therefore, <u>it's not recommended for use in real-world trading.</u>

Our goal is to have a strategy that remains **profitable and effective across a wide range of parameters,** because the market is a volatile organism, and optimal parameters can change over time. <u>**I can't**</u> emphasize enough that for **a strategy to work** in real-world conditions, it must also perform under **suboptimal** <u>**parameters**</u> and <u>**conditions.**</u> In short, **it must be stable** to changing market conditions.

I don't know who said these words, but they perfectly capture the problem of many optimizations:

"I've never seen a strategy that didn't work in backtests."

We don't know the future, we don't know future market conditions, but if we know that our strategy **has historically generated acceptable results** in various market conditions and across various parameter ranges, then we are **one step ahead of other** market participants.

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Step 1: Formulate an investment strategy

V-Thrusts v.1 strategy joins **the ongoing trend** after a strong price impulse and **a deep, short correction** culminating in **a Reversal Day. The trend context** is confirmed by the price entering **the upper band of the Donchian Channel** (for longs) and the establishment of **a new multi-week high.** The market then performs **a multi-session correction** with a range several times **the ATR (Average True Range) calculated from the high to the low of this sequence. At the end of this correction, a Reversal Day** occurs (a day when the price drops below the previous session's low and then rises above the previous day's high). Entry is executed **with a buy stop order 1 tick** above the high of the reversal day, and **a stop loss** is set **at the low of the entire correction.** The position is closed **several sessions** after entry, unless a stop has already been triggered.

Short version is analogous: downtrend (lower Donchian band), **new multi-week low,** several times **ATR** upward correction lasting several sessions, **Reversal Day** down, sell stop 1 tick below its minimum, stop above the correction maximum, time-exit several sessions.

The strategy uses:

- **Trend filter (Donchian channel)** – price in the upper (long) or lower (short) band of the channel;
- **Momentum Impulse** – new multi-week high/low;
- **"V"correction** – a correction lasting several sessions with a total range of several times the ATR relative to the high/low;
- **Reversal Day** – precise turning point;
- **Trigger T+1** – buy/sell stop 1 tick above/below the high/low of the reversal day;
- **Constant risk management** – stop loss at the extreme of the entire correction;
- **Timed exit** – closing a position after several sessions.

Characteristics of the strategy and its strengths and weaknesses:

- **Minimalistic, easy to program** – a few simple rules ensure transparency and low computational costs;
- **Natural mean-reversion environment** – large instruments often rebound after a sharp decline within a trend;
- **Entry after a confirmed reversal following a significant correction** – often a favorable reward/risk ratio;
- **Fewer transactions in sideways trends** – in the absence of clear multi-day extremes, the system remains out of position for a long time;
- **High correction amplitude increases nominal stop distances** – strict control of position size is necessary.

V-Thrusts v.1 strategy, while simple, provides **a solid foundation for building algorithmic portfolios.** However, it requires **discipline and strict adherence to risk management methods.**

Step 2: Determine investment principles

Below is **the pseudocode** for the **V-Thrusts v.1 strategy** on daily data:

1. **Calculating Indicators:**
   a. **XXX-Donchian** – Donchian channel with XXX session window.
   b. **ATR(40)** – Average True Range over 40 sessions, used to measure correction amplitude.
   c. **Y-DayLowestLow** – the lowest price from the last Y sessions (including the current one).
   d. **Y-DayHighestHigh** – the highest price from the last Y sessions (including the current one).
   e. **Reversal Day (RD)** – Reversal Session:
      i. **Long position:** a bullish candle whose low and high are below/above the low/high of the previous day's candle, respectively.
      ii. **Short position:** a bearish candle whose low and high are below/above the low/high of the previous day's candle, respectively.

2. **Generating Entry Signals – Long Position:**
   a. **Trend:** Y days ago the maximum price of the instrument formed a XXX-day high (XXX-day Donchian channel).
   b. **Correction:** This high was followed by a downward correction, the low of which is the lowest price of the last Y sessions (Y-DayLowestLow), and its amplitude is at least Z × ATR(40) (where Z is the ATR multiplier).
   c. **Ending Signal:** Current session meets Reversal Day (RD) condition up.
   d. **Entry:** Set a buy stop order 1 tick above the high of the Reversal Day (RD) candle; the order is active only on the next session.

3. **Generating Entry Signals – Short Position:**
   a. **Trend:** Y days ago the minimum price of the instrument formed a XXX-day low (XXX-day Donchian channel).
   b. **Correction:** After this bottom, there was an upward correction whose high is the highest price in the last Y sessions (Y-DayHighestHigh) and its amplitude is at least Z × ATR(40) (where Z is the ATR multiplier).
   c. **Ending Signal:** Current session meets Reversal Day (RD) condition down.
   d. **Entry:** Set a sell stop order 1 tick below the low of the Reversal Day (RD) candle; the order is active only on the next trading session.

4. **Generating Output Signals:**
   a. **Timed exit:** if the stop loss has not been activated earlier, close the position after the WW sessions from the entry date (closing the position at the opening price of the next day after the WW session has expired).

5. **Stop Loss Management:**
   a. **Long position:** set stop loss 1 tick below the Reversal Day (RD) low.
   b. **Short position:** Set stop loss 1 tick above the Reversal Day (RD) high.

6. **Daily Monitoring:**
   a. Every day calculate the values: XXX-Donchian, ATR(40), Y-DayLowestLow, Y-DayHighestHigh and check for the occurrence of Reversal Day.

b. The system verifies entry/exit conditions and sets appropriate buy stop/sell stop orders for the following day; keeps a day counter to the WW session for active positions.

The above rules are described in a way that allows them to be directly converted into a script in the chosen testing platform, which ensures the accuracy of the historical simulation and the reliability of the test results.

Tests are performed assuming that the risk of one position is **1.0% of total capital.**

Step 3: Pre-test your investment strategy

Below are some purchase and sale transactions that allow you to verify the following aspects:

- **Correctness of generated signals;**
- **Direction of opening a position;**
- **Moment of opening the position;**
- **The opening price of the position;**
- **Moment of closing the position;**
- **Closing price of the position;**
- **Compliance of the transaction with the theoretical assumptions of the investment strategy.**

At this stage, **it doesn't matter** whether the trades are **profitable,** what **instrument was used,** or whether they occurred **recently** or **in the distant past.** The key is **to verify that the trades are generated correctly** and in line with the assumptions described in the previous step.

The first transaction was executed on an S&P 500 index futures contract (e-mini). At the end of May 2024, prices formed **a new 100-day high** (the first candle in the left-hand rectangle), after which prices entered a multi-day correction. **For a buy signal to be generated,** the correction's minimum must be a 5-day low (orange line on the chart), it must have a range of 2.5 times the ATR (the ATR value is located below the price chart), and a Reversal Day (RD) formation must occur. **These conditions were met five days after the formation of a new 100-day high** (the sixth candle in the left-hand rectangle), which generated a signal to open a long position. The following day, we placed a buy stop order one tick above the high of the Reversal Day candle and a stop loss order one tick below the low of that candle. The position was opened the following day (**the seventh candle in the left-hand rectangle)**. **The system worked correctly.**

The strategy assumes **closing the position after 10 days or when a defensive order is triggered.** Since the stop loss order wasn't reached within the ten-day period, we close the position on the eleventh day at the opening (the second candle in the right-hand rectangle). **The system worked correctly.**
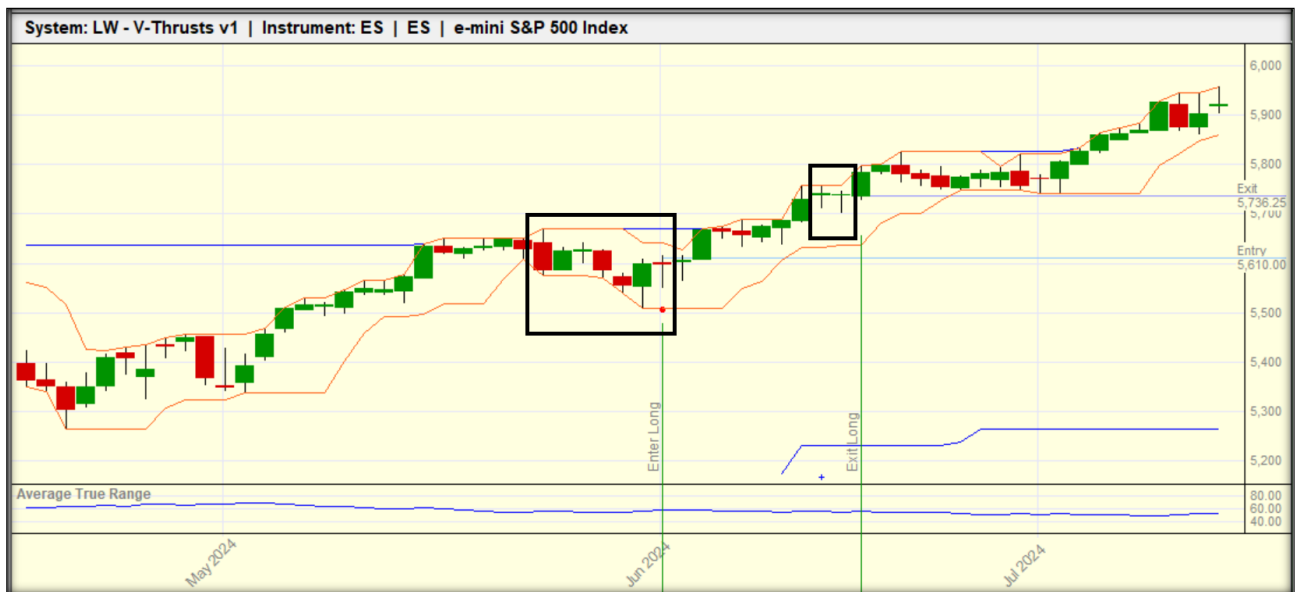
The second transaction was executed on an S&P 500 index futures contract (e-mini). At the end of January 2008, prices formed **a new 100-day low** (the first candle in the left-hand rectangle), after which prices entered a multi-day correction. **For a sell signal to be generated,** the correction's maximum must be a five-day high (orange line on the chart), it must have a range of 2.5 times the ATR (the ATR value is located below the price chart), and a Reversal Day (RD) formation must occur. **These conditions were met three days after the formation of a new 100-day low** (the fourth candle in the left-hand rectangle), which generated a signal to open a short position. The following day, we placed a sell stop order one tick below the low of the Reversal Day candle and a stop loss order one tick above the high of that candle. The position was opened the following day (**the fifth candle in the left-hand rectangle)**. **The system worked correctly.**

The strategy assumes **closing the position after 10 days or when a defense order is activated.** On the third day after opening the position, the defense order was activated (the candle in the right-hand rectangle). **The system worked correctly.**
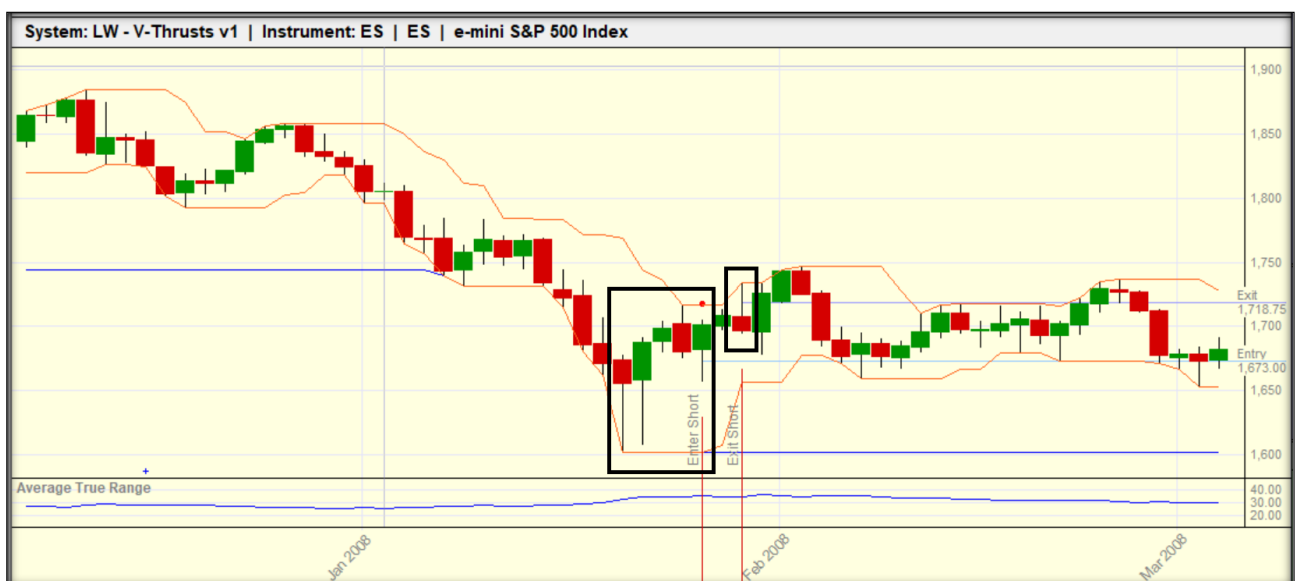
Once we are sure that the trades are generated correctly, **we can move on to the first test of the strategy on the full in-sample dataset**. These tests are conducted on **baseline parameters** that, in my opinion, should align with the strategy's stated goals.

First, **we reject strategies that linearly lose capital.** If a strategy exhibits this pattern, it's a clear signal that any parameter optimization is pointless.

Our basic expectation is that the strategy generates **positive results,** even if they are at a low level.

Tested base parameters:

- **Donchian Canal:** 100 days;
- **Y-DayLowestLow/Y-DayHighestHigh:** lowest/highest price of the last 5 sessions;
- **Correction range:** 2.5 x ATR(40);
- **Reversal Day formation –** the low of the candle is below the low of the previous day, and the high is above the high of the previous day;
- **Position opening method:** buy/sell stop one tick above/below the high/low of the Reversal Day candle (for long/short position respectively);
- **Order validity:** the order remains active only during the next session;
- **Stop loss:** one tick below/above the low/high of the Reversal Day candle (for long/short position respectively);
- **Closing the position:** 10 days after opening (11th day for opening);
- **Position direction:** long and short;
- **Position sizes:** corresponding to a risk of 1.0% of total capital.

The test result is shown below.

Performance Curve - Log Scale with Drawdowns
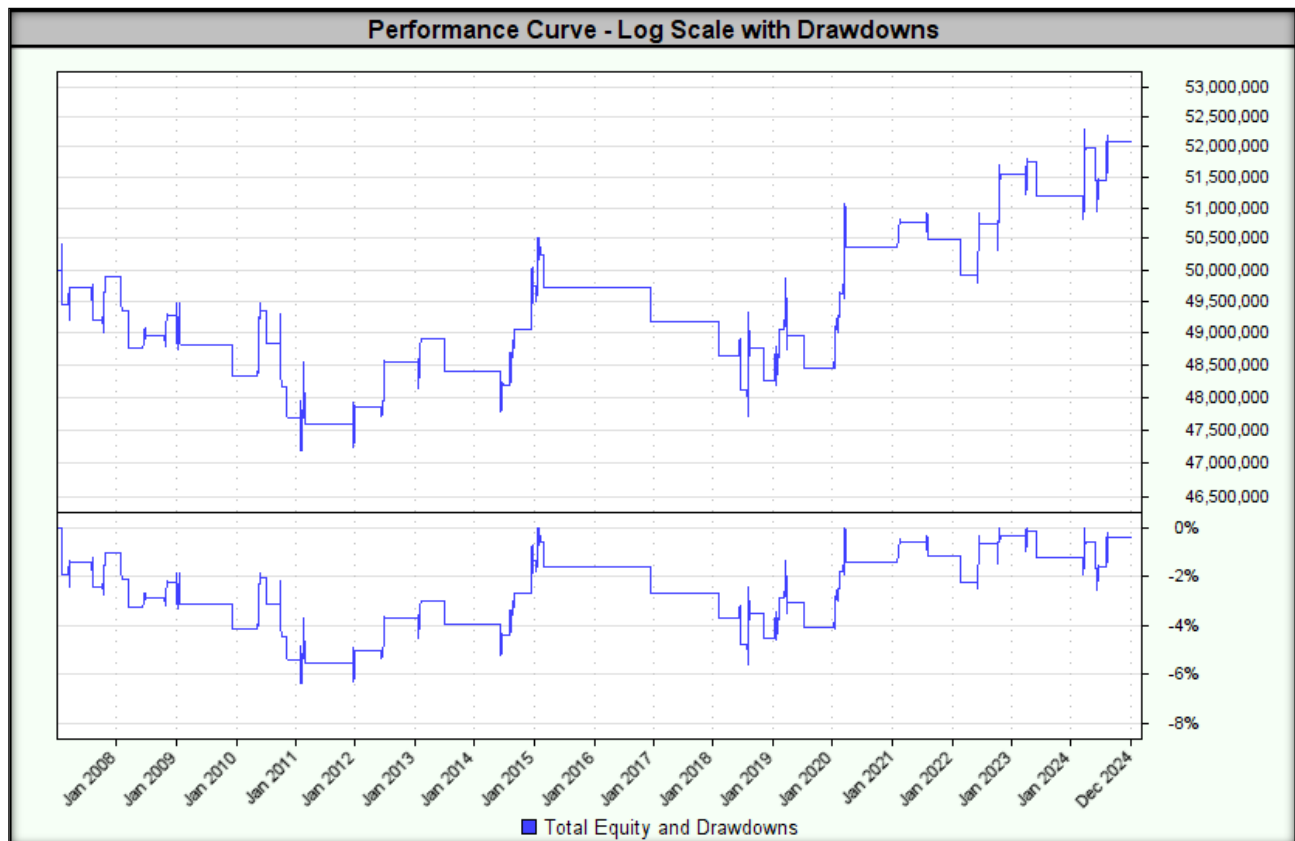
Indicators/Measures	Concluding a transaction at the opening price
CAGR%	0.23%
MAR Ratio	0.04
RAR%	0.30%
R-Cubed	0.02
Robust Sharpe Ratio	0.16
Max Drawdown	6.4%
Wins	55.4%
Losses	44.6%
Average Win%	0.97%
Average Loss%	1.03%
Win/Loss Ratio	0.94
Average Trade Duration (days)	10
Percent Profit Factor	1.17
SQN	0.12
Number of transactions	56

In summary, the system worked properly and generated signals as expected. **However, the number of test transactions is low, which prevents us from drawing reliable conclusions. This means that the reliability of this strategy leaves much to be desired, and at this stage we are ending testing and refraining from further development of the strategy.**

Step 4: Optimizing and assessing the stability of the investment strategy

This stage of strategy development and testing is **crucial** because it determines how **effective** the strategy will be in **real-world conditions.** **I cannot** emphasize enough that for **a strategy to work** in real-world conditions, it must also perform under **suboptimal parameters** and **conditions.** In short, **it must be stable** to changing market conditions.

I don't know who said these words, but they perfectly capture the problem of many optimizations:

"I've never seen a strategy that didn't work in backtests."

My goal is not to find **optimal parameter values** – **my goal** is to find **a wide range of parameters** for which the strategy will generate **acceptable results.** **We don't know the future,** we don't know future market conditions, but if we know that our strategy **has historically generated acceptable results** in various market conditions and across various parameter ranges, then we are **one step ahead of other** market participants.

What **parameters to choose** for the next period is the topic of consideration in **Step 5,"Walk-Forward Analysis",** but before we get to that, **we need to know** whether our strategy is even **stable.**

1. **Stability across a wide range of optimized parameters**

The step was skipped due to **failure of the preliminary tests.**

2. **Monte Carlo simulation**

The step was skipped due to **failure of the preliminary tests.**

3. **Stability over a moving time window**

The step was skipped due to **failure of the preliminary tests.**

4. **Long/short stability**

The step was skipped due to **failure of the preliminary tests.**

5. **Stability in the portfolio of financial instruments**

The step was skipped due to **failure of the preliminary tests.**

6. **Money Management (Position Sizing)**

The step was skipped due to **failure of the preliminary tests.**

7. **Strategy Risk Management**

The step was skipped due to **failure of the preliminary tests.**

Step 5: Walk-Forward Analysis

Walk-Forward Analysis (WFA) is a key tool for assessing **a strategy's ability to perform in real-world market conditions.** It provides **reliable measures of reward and risk** after the optimization process and allows you to answer several key questions:

1. **What rate of return can you expect from the strategy?**
   - The optimization result often overestimates the expected rate of return, which can lead to unrealistic forecasts.
   - WFA provides more **reliable and realistic measures of return** by minimizing the impact of overfitting to historical data.
2. **What set of parameters should be used in the next period?**
   - Thanks to **WFA,** it is possible **to dynamically adjust the strategy parameters** to **the latest market changes,** increasing its adaptability.

WFA tests the strategy over multiple time periods, minimizing the risk of overfitting (overfitting the strategy to historical data). The WFA process consists of **two repeated steps:**

1. **Optimization (In-Sample):**
   - The strategy is optimized over a specific **training period** (**in-sample**).
   - This step adjusts the parameters to obtain **the best results.**
2. **Testing (Out-of-Sample):**
   - The strategy, using **the parameters optimized in step 1,** is tested on **a test period** (**out-of-sample**).
   - This stage verifies the effectiveness of the strategy in new market conditions that **were not used** during optimization.

Walk-Forward Efficiency (WFE) is a key metric that assesses a strategy's potential to perform under real-world market conditions. WFE compares:

- **The rate of return achieved in the in-sample window** (where parameters were optimized)
- **Rate of return in the out-of-sample window** (where the strategy was running on unknown data)

Similarly, **for the drawdown value,** WFE checks whether the strategy does not lose significant stability outside the optimization period.

A strategy considered **stable (robust) should meet the following conditions:**

- **WFE ≥ 50% for the rate of return** – means that the strategy retains at least half of its effectiveness beyond the optimization period.
- **WFE ≤ 150% for drawdown** – means that the drawdown outside the optimization period is not significantly higher than during the optimization period.

The step was skipped due to **failure of the preliminary tests.**

Step 6: Using the strategy in real time

After **extensive testing, implementing a real-time** trading strategy becomes **relatively simple. Buy/sell signals and stop loss orders are generated automatically** by the computer based on pre-established rules and formulas.

The most important element **of strategy execution** is **consistent execution of all signals, without exception. As Larry Williams noted:** *"Trading strategies work. Traders do not."*

Before making **a final decision to implement a strategy,** it's important to verify **whether it actually adds value** to the overall portfolio performance. It doesn't make sense to implement a strategy that **generates similar signals** or **has a similar equity curve.**

Key criteria for evaluating strategies before implementation:

1. **Daily return correlation**
   - The **lower the correlation** with other strategies, the better.
   - **Optimal values:** Correlation **close to zero or negative.**
2. **Reducing maximum drawdown**
   - If adding a strategy to a portfolio results in **a lower maximum drawdown,** this is **a strong positive signal.**
3. **Objective Function Improvement (MAR)**
   - If adding a strategy causes **the MAR to increase,** this indicates that **it has added value** to the portfolio.
4. **Better results in Monte Carlo simulation**
   - Monte Carlo simulation determines the potential **maximum drawdown.**
   - If Monte Carlo results **improve** after adding a strategy, this is **a strong positive signal.**

The above elements are often interrelated – usually **all** or **none of them** are met.

Once you decide to add a strategy to your portfolio, **the question arises:** *Should you implement the strategy immediately or is it better to wait?*

Some studies suggest **an incubation period** of **3-6 months,** during which:

- The strategy is **monitored** but **does not execute real transactions.**
- **Generated signals, positions and results** are observed to detect **potential anomalies.**

In our case, **the incubation period** lasts from the moment **the strategy is launched in a live environment** until **a drawdown occurs at approximately half the maximum drawdown** observed in historical data. **Only after this threshold is reached does the strategy begin to be used with real funds.**

Thanks to this:

- **We avoid investing real money in an untested environment.**
- **We wait for a drawdown to occur** before launching the strategy, which **reduces the risk of starting at an unfavorable moment.**

The final decision on its full implementation should be based on **thorough testing and analysis of the value added to the portfolio,** so that the strategy actually supports long-term investment goals and does not increase unnecessary risk.