Expansion Pivots v.2

Investment Strategy Testing Summary

The Expansion Pivots v.2 strategy is a **swing trading investment technique** that uses **price breakouts in line with the main trend after the market has corrected** to the area of the short-term moving average. The main assumption of the strategy is that **the breakout is accompanied by an extended daily price range** compared to the previous days.

Compared to Expansion Pivots v.1 this strategy **expands on Jeff Cooper's concept** by adding a requirement for **price to return to the short-term moving average** while **remaining above the long-term moving average.**

Although the logic of the strategy seems sound, **it has not even passed the initial test, because the drawdown of the strategy result has been going on for over 10 years. Therefore, it is not recommended to use it in real transactions.**

Our goal is to have a strategy that remains **profitable and effective over a wide range of parameters,** because the market is a changing organism and the optimal parameters can change over different periods. **I cannot** emphasize enough that for **a strategy to work** in real conditions, it must also work on **suboptimal parameters** and in **suboptimal conditions.** In a word - **it must be stable** to changing market conditions.

I don't know who said these words, but they perfectly reflect 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

Expansion Pivots v.2 strategy expands on Jeff Cooper's concept by adding **a requirement for price to return to the short-term moving average (SMA-S)** while **remaining** above **the long-term moving average (SMA-L).** Its goal remains to allow the trader to capitalize on **a sharp breakout in price after a period of consolidation around the SMA-S** – indicating a possible continuation of the dominant trend set by the SMA-L.

The strategy uses:

- **Daily Range Extension** – Today's range (high − low) must be the largest in the last few sessions;
- **Price position relative to averages** – long trades are only considered when the close is **above the SMA-L and SMA-S;** similarly, shorts are considered below both SMAs;
- **Interaction with SMA-S** – the low (for longs) or high (for shorts) from today or the previous day must violate **the SMA-S,** confirming that the breakout occurred from its immediate surroundings.

The strategy includes **both long (buy) and short (sell) positions,** depending on the position of quotes in relation to moving averages (SMA-S and SMA-L). The key element is the precise setting of activating orders and **strict risk management through stop loss orders.**

Characteristics of the strategy and its strengths and weaknesses:

- **Dual trend filter** – SMA-L defines the dominant trend, while SMA-S allows you to precisely determine the entry zone;
- **Clear, unambiguous criteria** – four simple conditions (scope, closure, relationship to SMA-L, interaction with SMA-S) favor automation;
- **Potential for stronger moves** – breakouts from consolidation around the SMA-S in the direction of the SMA-L often accelerate;
- **Higher frequency of signals** – returns to SMA-S are more frequent than to SMA-L, which increases the number of opportunities, but also the risk of false entries;
- **Sensitivity to volatility and consolidation** – the strategy loses in a flat market, although a shorter average can generate exits faster;
- **The need for daily monitoring** – parameters must be updated after each session.

Expansion Pivots strategy uses simple yet precise rules to allow traders to join in on the rapid price action after the market rebounds from the short-term moving average. However, its effectiveness depends on sustained volatility and consistent risk management to minimize the impact of false signals.

Step 2: Define investment principles

Below is **the pseudocode** for the **Expansion Pivots v.1 strategy** on daily data:

1. **Calculation of indicators**
    a. **Daily range** – is the difference between the daily maximum (high) and minimum (low) of the last candle; measures the size of the movement within one session.
    b. **Largest Daily Range Over the Last X Sessions** – Determine the maximum value of the "Daily Range" over the previous X candles; this will serve as a reference point to determine whether the current move is unusually large.
    c. **SMA-L (YY days)** – calculates the YY-day **long-term** moving average of the closing price; determines the dominant trend.
    d. **SMA-S (ZZ days)** – calculate ZZ-day **short-term** moving average of the closing price; defines the breakout retracement and start zone.
2. **Generating entry signals – long position (buy)**
    a. **Trend Conditions:**
        i. The current "daily range" must be greater than the largest range of the previous X sessions, which indicates a decisive breakout.
        ii. The closing price of the current candle should be above the SMA-L and above the SMA-S, confirming the advantage of buyers.
    b. **Expansion Pivot formation (long) –** the low of the current or previous candle crossed the SMA-S from above (i.e. was below the average), which signals that the breakout started directly in its zone of influence.
    c. **Entering the trade** – in the next session, set a buy stop order 1 tick above the high of the last candle, to be activated only if momentum continues.
    d. **Risk Management –** Set a stop-loss 1 tick below the low of the last candle, limiting your maximum loss in case of a false move.
3. **Generating entry signals – short position (sell)**
    a. **Trend Conditions:**
        i. The current "daily range" is larger than the largest range of the previous X sessions, which indicates a strong breakout to the downside.
        ii. The closing price of the current candle should be below the SMA-L and below the SMA-S, confirming the advantage of sellers.
    b. **Expansion Pivot formation (short)** – the high of the current or previous candle crossed the SMA-S from below (i.e. was above the average), which signals that the breakout started directly in its zone of influence.
    c. **Entering the trade** – in the next session, set a sell stop order 1 tick below the low of the last candle, to be activated only if the momentum continues.
    d. **Risk Management –** Place a stop-loss 1 tick above the high of the breakout candle, limiting your maximum loss in case of a false move.
4. **Closing a position** – if a stop-loss has not been previously activated, close the trade at the opening ZZ of the session after entry, which limits exposure to adverse moves after the initial impulse.
5. **Daily monitoring**

a. After each session, recalculate: "daily range", the largest X-session range, SMA-S and SMA-L to verify the current strategy parameters.
b. Once all conditions for a long or short position are met, set appropriate orders (buy stop or sell stop) for the next trading day.

The above rules have been 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.

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

Step 3: Conduct a preliminary test of the investment strategy

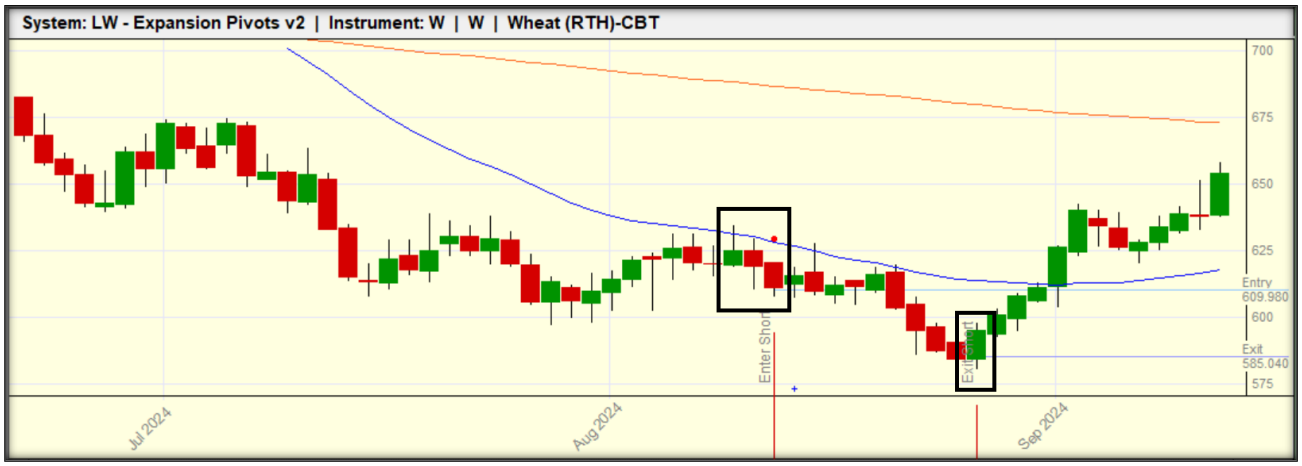
Below are some purchase and sale transactions that allow you to verify the following aspects:

- **Correctness of generated signals;**
- **Direction of opening position;**
- **Moment of opening a position;**
- **Position opening price;**
- **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 does not matter** whether the transactions are **profitable,** what **instrument was used** or whether they took place **recently** or **in the distant past.** The key is **to check whether the transactions are generated correctly** and in accordance with the assumptions described in the previous step.

The first transaction is on a wheat futures contract. In August 2024, prices **were moving around the 30-day average,** and were also in a dominant **downtrend** (quotes below the 100-day average). Then the market formed **a downward candle** (the second candle in the rectangle on the left) **with the largest price range (high-low) in the last 5 days.** The previous day's high candle (the first candle in the rectangle on the left) **fell above the 30-day average,** and today's close (the second candle) was below this moving average. **Therefore, all the elements necessary to initiate a short position were met,** so the next day we set **a sell stop order one tick below the low of the largest candle.** This order was **activated the next day** (the third candle in the rectangle on the left) and **a defensive order was set** one tick above the high of the largest candle (red dot). **The system worked correctly.**

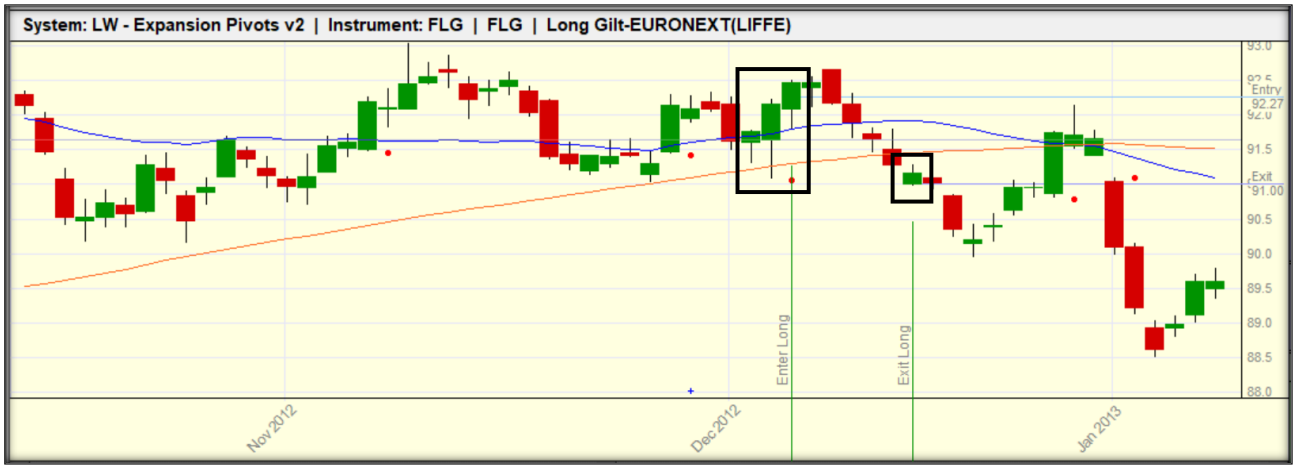
Quotes were falling slightly and **on the eleventh day the position was closed to the opening** (the rectangle on the right). Counting from the opening day, the position was active for ten days and closed on the eleventh day to the opening. **The system worked correctly.**



The second transaction is on a futures contract for British bonds. In December 2012, prices **were moving around the 30-day average,** and were also in a dominant **upward trend** (quotes below the 100-day average).

Then the market formed **a bullish candle** (the second candle in the rectangle on the left) **with the largest price range (high-low) in the last 5 days.** The low of the previous day's candle (the first candle in the rectangle on the left) **fell below the 30-day average,** and today's close (the second candle) above this moving average. **Therefore, all the elements necessary to initiate a long position have been met,** so the next day we set a **buy stop order one tick above the high of the largest candle.** This order was activated the next day (the third candle in the rectangle on the left) and **a defensive order** (red dot) was set one tick below the low of the largest candle. **The system worked correctly.**

On the seventh day from the opening of the position, **the quotes fell to the stop loss level and the position was closed at a loss** (the rectangle on the right). **The system worked correctly.**



Once we are sure that the trades are generated correctly, we can proceed to the first test of the strategy on the full **in-sample data set.** These tests are performed on **the basic parameters,** which – according to my assessment – should correspond to the assumed goals of the strategy.

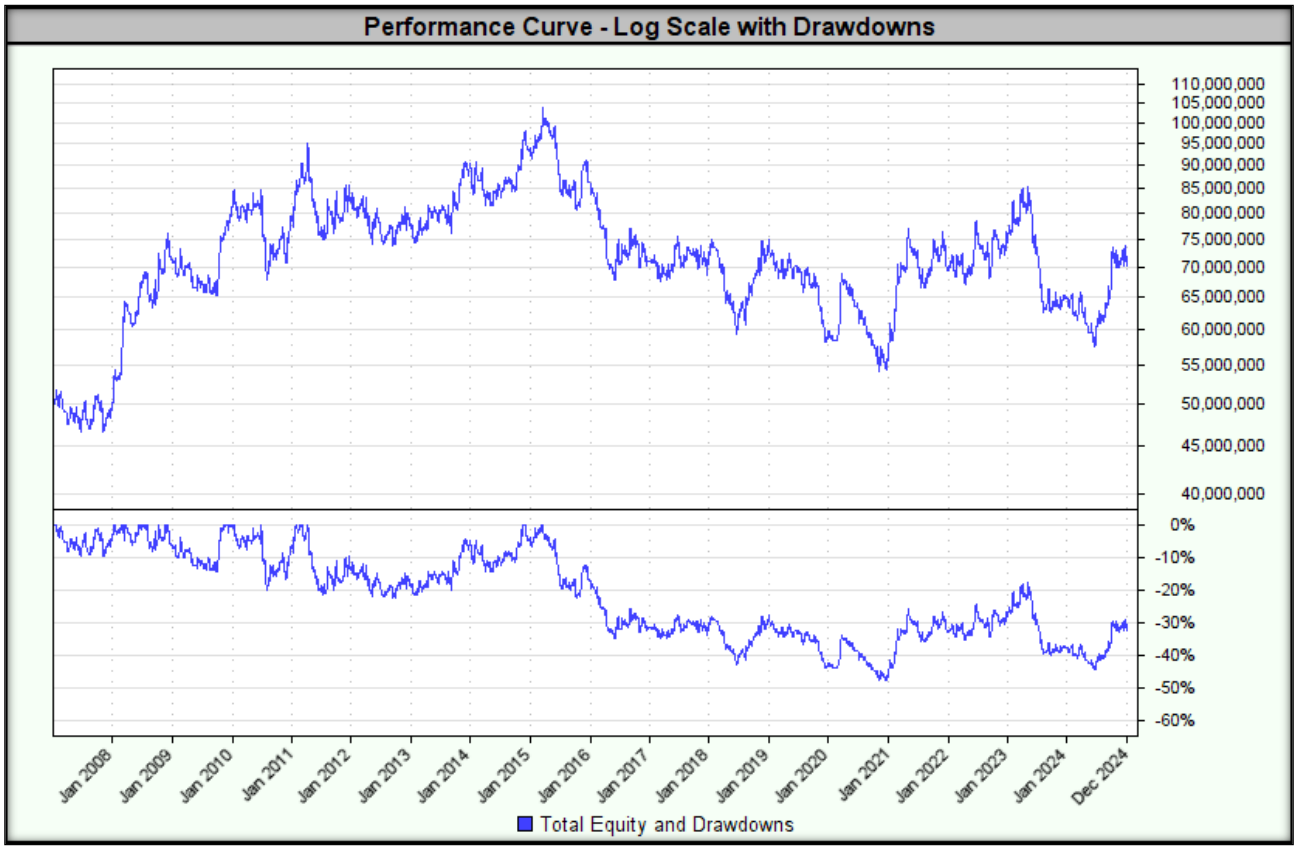
First of all, **we reject strategies that linearly lose capital.** If a strategy exhibits such a pattern, it is a clear signal that any parameter optimization does not make sense.

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

The tested output parameters are:

- **The largest range (maximum – minimum) of daily price change:** 5 days;
- **Long-Term Moving Average Length (SMA-L):** 100 days;
- **Short-term moving average length (SMA-S):** 100 days;
- **How to open a position:** buy/sell stop one tick above/below the high/low of the previous candle, which is the highest in 5 days (for a long/short position respectively);
- **Stop loss:** one tick below/above the low/high of the previous candle, which was the highest in 5 days (for long/short position respectively);
- **Closing a position:** 10 days after opening (11 days after opening);
- **Position direction:** long and short;
- **Position sizes:** corresponding to a risk of 1.0% of total capital.

The test result is shown below.



Indicators/Measures	Concluding a transaction at the opening price
CAGR%	1.9%
MAR Ratio	0.04
RAR%	0.0%
R-Cubed	0.00
Robust Sharpe Ratio	0.00
Max Drawdown	47.8%
Wins	43.8%
Losses	56.2%
Average Win%	1.24%
Average Loss%	0.91%
Win/Loss Ratio	1.36
Average Trade Duration (days)	10
Percent Profit Factor	1.03
SQN	0.24
Number of transactions	1733

In summary, the system worked properly and generates signals as expected. **However, the tests on the output parameters are weak, because the drawdown of the strategy result lasts for more than 10 years. Therefore, at this stage we will end the tests and reject the strategy.**

Step 4: Optimization and assessment of investment strategy stability

This stage of strategy creation and testing is **crucial,** as it determines how **effective** the strategy will be in **real conditions. I cannot** emphasize enough that for **a strategy to work** in real conditions, it must also work on **suboptimal parameters** and in **suboptimal conditions.** In a word – **it must be stable** to changing market conditions.

I don't know who said these words, but they perfectly reflect 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 subject of consideration in **Step 5 of the "Walk-Forward Analysis,"** but before we get to that, **we need to know whether our strategy is stable** at all.

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 under real market conditions.** It provides **reliable measures of reward and risk** after the optimization process and allows us 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 a more **reliable and realistic measure 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, which helps **minimize 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)**.
    - In this step, parameters are adjusted 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 whether a strategy has the potential to perform under real market conditions. WFE compares:

- **The rate of return achieved in the in-sample window** (where parameters were optimized)
- **The rate of return in the out-of-sample window** (where the strategy was operating 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 outside 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 easy. 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 is necessary to check **whether it really adds value** to the results of the entire portfolio. It does not make sense to implement a strategy that **generates similar signals** or **is characterized by a similar course of the equity curve.**

Key criteria for evaluating the strategy 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 of them are met** or **none of them are met.**

Once you decide to add a strategy to your portfolio, **the question arises:** *Should you implement your strategy right away 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 identify **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 a level of about half of the maximum drawdown** observed in historical data. **Only after reaching this threshold 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 to fully implement it 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.