Predictive Relationship: Difference Relationship

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1 Relationship Description

In a difference relationship, recent changes in the current value of the signal directly affects future changes in the price:

$$\Delta P_{t+1} \propto k(S_t - P_t) + c \tag{1}$$

where ΔP_{t+1} represents the future price change, S_t represents the current value of the research signal, P_t represents the current price of market, k is a scalar, and c is a constant. Intuitively, this means that when the signal moves above the price, it is good to buy the market, as the price will tend to drift higher. When the signal moves below the price, it is good to sell the market as the price will tend to drift lower.

After finding the relationship which maximises risk adjusted returns, InferTrade runs tests for statistical significance to verify that the relationship gives a predictive edge. A predictive difference relationship can be used to invest when the current percentage gap between the price and the signal is high versus the historical average, and *sell* when current percentage gap between the price and the signal is high versus the historical average. If the scalar k is negative, inverting the signal will make this true.

Examples of time series that might show this kind of relationship are price forecasts or fair value models:

analyst or model thinks the security is cheap -> increases price target -> larger percentage difference -> price goes up as investors see value

We would typically not expect a signal that is a sentiment index to show a difference relationship, as the index is likely dimensionally inconsistent with the price and of a different scale. However if the share price is very stable versus the index changes then a partial (inefficient) relationship may occur as the level of difference will correlate closely with the absolute level of the signal.

Similarly a technical positioning indicator will be unlikely to show a Difference Relationship as the signal and price series are likely dimensionally inconsistent, such that the difference has limited predictive value except where stable price means the change in the gap correlates with the change in the signal level.

2 Trading Strategy Description

A predictive difference relationship can be reflected in many kinds of rules. InferTrade uses a 120 period (6 months for daily data) rolling regression of the percentage gap between the current signal and price against next day's price change as a benchmark. This trading rule recommends portfolio allocation based on the value of the rolling error obtained when comparing the historical ground truth prices with their predictions from research. The smaller the error, the greater the size of the recommended allocation.

The allocation is scaled by the Kelly Fraction, a mathematically proven formula for determining optimal bet sizing. This rule will show higher returns than usual after optimisation if a significant difference relationship is present between the price and signal series. The following equation shows how a Change Regression trading rule calculates a position sizing:

$$z_t = k_1 \left(\frac{R_t}{P_{t-1}} - 1 \right) + k_2 \tag{2}$$

where z_t is the portfolio allocation at time t, R_t is the Research value at time t, k_1 is the change coefficient and k_2 is the static coefficient.

3 Rule Parameters

Below is a table summarizing the parameters specific to this trading rule.

Parameter Name	Default Value	Description	Symbol
Amplitude	0.1	Amplitude weighting (Kelly Fraction). 1.0 is maximum growth if regression is exact. <1.0 scales down positions taken.	Symbol

4 Glossary

- **Bullish:** Positive outlook on the market. Expectation of positive returns.

- **Bearish:** Negative outlook on the market, Expectation of negative returns.

- **Allocation:** The allocation is the fractional amount of the portfolios value used to determine the size of the trading position.

- **Parameter:** Value used by the trading rule in the calculation for trading position

- **Trading Rule:** Strategy to determine when to buy, hold or sell a position.

Further Links

1. InferTrade: `https://www.infertrade.com`

2. Privacy Policy/Legal notice: `https://www.infertrade.com/privacy-policy`

3. InferStat Ltd: `https://www.inferstat.com`