



Tandem Study Analysis

Explained

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What is Tandem Study

Tandem study is a novel way of looking at the market and anticipating the market developments that can take place in the immediate future. It's a tool whose main purpose is analysis of the structure of the market.

The market phases, referred to as trends, sideways movements, consolidations and so on provide a basis for the market movement. To this basis are added smaller price movements that are subject to great fluctuations (noise) and are thus difficult to analyze unambiguously. The trader should, first of all, understand which of the phases he is in now and what the likelihood of this phase being replaced by some other phases is at the moment. And only after this the relevant TA tools should be applied, since following all the price changes is virtually impossible.

For example, the behavior of the market and it's participants during the current phase will be different after a weak bullish trend in the previous phase and a strong bullish trend in the previous phase. Similarly, one and the same chart pattern that formed at the end of a rapid, extended trend and within a sideways movement sends different signals to the trader. Tandem study allows taking into account the important differences between the phases and their influence on the state of the market and behavior of its participants.

The essence of Tandem study is an in-depth juxtaposition of two adjacent market phases, – the Primary phase and the Secondary phase. For each phase, a value is calculated that reflects its momentum, energy, acceleration/deceleration, buying/selling pressure, volatility or other parameter of interest. The values, derived for each of the phases, are compared or otherwise used in the calculation of the result for a specific Tandem study.

A typical problem one can solve by applying Tandem study to the two previous adjacent phases is answering the question how strong a new market phase will be after the completion of the current phase and what the profit/loss potential of the new phase will be.

For example, in this article we will discuss a development of a Tandem study used to determine whether a bullish trend will continue after a strung-out, convoluted correction and whether the continuation will be strong enough to profit from it.

Phase Rover Tool

By using the Phase Rover tool, you can create Tandem Studies to determine when different market developments taking place and trade accordingly.

The screenshot shows the 'Phase Rover' software window. On the left is a list of study types, with 'BarsRatio' selected. The main area is divided into several sections:

- Tandem Study name:** BarsRatio
- Description:** Bars Ratio shows the ratio in the number of bars during the first phase and that in the second phase. This ratio will allow you to evaluate for how many times the duration of the first phase exceeded the duration of the second phase. The Bars
- Primary Phase:**
 - Primary Phase calculation: `return CurrentPhaseBarsNumber();` (with an 'Edit...' button)
 - Use the same calculation formula for the Secondary Phase
- Secondary Phase:**
 - Secondary Phase calculation: `return CurrentPhaseBarsNumber();` (with an 'Edit...' button)
- Tandem Study result:**
 - Calculate a value for Tandem Study result: `return PrimaryPhaseValue() / SecondaryPhaseValue();` (with an 'Edit...' button)
- Display:**
 - Primary Phase value
 - Secondary Phase value
 - Tandem Study name
 - Phase value location: In the middle of Phase, At the end of Phase
 - Mark Tandem Study as: Rectangle
 - Suffix of Tandem Study's result: (empty)
 - Color: Green
 - Precision: 3
 - Style: (empty)
 - Font: (with 'Select..' and 'Sample' buttons)

At the bottom right are 'Insert' and 'Close' buttons.

Tradecision's Phase Rover

Importance of Phase Analysis

Tandem study is based on the premise that for medium-term analysis of a stock or commodity in the present-day, fast-changing and interdependent markets, the most important are the two most recent market phases and later history plays a relatively unimportant part in many cases. Given this, the attempts to trace the more complicated structure of the market (price movement pattern) by using such approaches as, for example, the Elliott Waves, are becoming less and less efficient. Due to the psychological aspects and time limits for the arrival and processing of new information, the previous phase of the market is the most important for the current moment. The phase that immediately precedes the previous one also has a considerable influence.

Certainly, the overall state of the market and industry on the whole is extremely important, just like inter-market analysis. However, for the analysis of a specific security the most important is the analysis of the phase the security is in. This kind of analysis we call Phase Prospecting consists of the following components or stages:

- Determining the likelihood of different lengths, stability and force for the current phase;
- Determining the likelihood that a phase will change for several scenarios;
- Determining the likelihood of making a profit and evaluating the related risk for the more feasible scenarios.

It is only after this phase-prospecting analysis that the entry point can be determined and the conditions for profitable and unprofitable exit and position size can be defined (including the money management strategy to be applied).

All the existing indicators, chart patterns and studies are intended to serve the traditional, standardized approach to trading. They are often understood and interpreted the same way in different market phases. We deem this approach to be wrong. For example, candlestick patterns should be interpreted differently in the different market phases. At first, one should determine the phase the market is currently in, and only then make the relevant indicator-based calculations, for example, those of the negative and positive volumes.

The same goes for the use of the trend indicators: the applied indicators should be interpreted differently for sideways moves, sharp uptrends and trends that move with the minimum momentum. This kind of approach will

not only help increase the precision of the analysis, but it will also help divide the applied trading approaches according to certain areas of the market. The latter will enable the trader to identify phases with a higher or lower precision of the market analysis. In addition, it will be possible to identify those market phases, for which certain indicators work better.

Tandem study as a formalized part of Phase Prospecting is a new addition to Technical Analysis that, when properly combined with the classical TA methods, can significantly increase its precision.

Characteristics

Longer-Term Approach

The Tandem study method is used to analyze large “lumps” of the market. In this kind of analysis, the key role is played by an extensive duration of the analyzed market phase and the clarity of the market developments within it. The method will yield **much better results when applied to long, pronounced, “exhausting” phases**, whose influence on the current psychological state of the traders involved can be easily evaluated, rather than to quick phases with strong trends. This happens because “exhausting” phases reflect the whole panoply of feelings of a great majority of the traders, thus showing how prepared these traders are for taking part in the future market developments. Initially, the Phase Prospecting method is intended for medium- and longer-term traders who don't intend to profit from small market moves.

Versatility of the Combined Calculations

Unlike usual indicators, Tandem study enables the trader to **combine different types of calculations**, such as, for example, those for a sideways move and an uptrend. In the first case, the oscillator method can be used, whereas the uptrend part can be calculated using trend indicators. The results can then be compared to make a conclusion about the possible correction or, once the correction has begun, to define the price target range. We believe that the above method is a lot more precise in predicting the target price range and future market behavior than, for example, the Fibonacci studies or the various popular indicators, since the latter don't take into account the peculiarities of different market phases. Thus, the Phase Prospecting method allows identifying the more predictable situations.

Simplicity of Use

Tandem study doesn't need to be optimized. Moreover, the length of the required calculations doesn't need to be selected. Unlike any classical technical indicators, Tandem study doesn't calculate values for a strictly predefined number of bars back, as is done, for example, by RSI(14), which is calculated using the price values of the 14 preceding bars. The market itself shows the necessary length of the calculations with its rises and falls. Also, with Tandem study, you don't need to adjust the length of the calculations to the changing market conditions, as needs to be done for the Adaptive Moving Average.

Narrow Focus and High Customizability

Each Tandem study is created for some specific type of contiguous phases. The division into phases can be different depending on the trader's goals and the trading methods he/she applies. The next chapter contains a table with phases and recommended value combinations for the more frequently occurring situations. Tandem Study can be used to analyze the likelihood of a trend's continuation after a strong trend. That is why it may not be expedient to use a weak, simple correction in the Tandem study that is used to analyze market situations with protracted, deep and ambiguous corrections (complicated strong corrections). In fact, each Tandem study presupposes that it should be used to analyze a certain pair of neighboring market phases. Using Tandem study in a different combination makes no sense and may even be detrimental to the decision-making process.

A Trading System, Based on a Tandem Study

Study Idea and Purpose

The article describes the stages of creating a trading strategy based on the tandem study AccumulatedRangeRatioBull, included in the TradeDecision package.

The beginning of any trading strategy is an idea. We strongly recommend that you refrain from creating trading strategies by simply combining different indicators with the help of math.

One of the tasks a trader is faced with is determining the likelihood of a trend's continuation after a correction. The answer to this question is needed by many – a trader who was late for the beginning of the trend and who has been waiting for the correction needs this answer to enter correctly, a trader who has been holding a correct position needs the answer to decide whether he should take the whole of the profit or only some part of it, a trader, holding the incorrect position needs it to choose the most suitable moment for cutting his losses.

To make it all simpler, let's imagine that we are developing a tandem study for bullish trends only. As is mentioned above, Tandem Studies are based on the important role turning points play both psychologically and technically. We also need to take into consideration how the price of the security passed in between the turning points. Thus, we have three important points – the starting point of the bullish trend, the starting point of the correction, and the ending point of the correction (possibly, an assumed one).



Figure 1. Two types of trend development.

The two charts in Fig. 1 show trends and corrections that are similar as far as the range is concerned, but different in how they moved. In the first case, we see a drastic upward breakthrough and a long, dwindling movement up to the peak, with a “straight” correction whose ending is already confirmed by the last two bars. In the second case, we see a sluggish uptrend that ends into a drastic upward move with a similar “straight” correction. Obviously, in both cases the traders have approached the point where the assumed correction will be replaced by a continuation of the trend that will provoke different expectations and sentiments.

Study Formulas

How can one take into consideration the different types of trends to be able to tell apart the different scenarios using just one figure?

On each day of a continuing trend, the traders subconsciously compare the current state of the security with the low of the current trend (i.e. with the trend's starting point). For some traders it's the max efficient profit, for others – the max possible loss. Some enter the trend later and look at how late they are, others, who entered earlier, calculate their profits. With every passing day, the situation is getting all the more tense and we evaluate the part of it that is reflected by the difference between the current high and lowest low of the current trend. A total of these ranges will become a measure of the existing tension and describe the form of the trend in just one figure.

The calculation can result in equal figures if the trend has a strong momentum and doesn't last long, or if the trend is flat and extended. This is a side effect that can also be used to advantage, as the tension is roughly the same, but in the first case it's caused by the speed of the price movement and in the second one by the traders' expectations. Therefore, if we total up the ranges for all the days, the market situation in Fig. 1.a will result in a much higher figure than the trend in Fig. 1.b.

Next, in a similar manner, we'll evaluate the form and route of the correction, but this time we'll calculate the range toward the highest high using the low of each next bar for the calculation. Now, for each pair of the trend-correction, we have two figures using which we can calculate the ratio between these pairs. To obtain a value within the range from 0 to 1, one needs to divide the accumulated range, calculated for the correction by the accumulated range, calculated for the trend. The formulas for the calculation of the Tandem Study, written in the Improvian Language, are quoted below.

Strategy Filtering - Trends

Another important aspect is the problem of the preliminary filtering, i.e. determining the pairs of trend corrections for which this trading system can and should be applied. Obviously, we need two filters: the first one for the determination of the trends that can be traded using this system and the second one for the determination of the corrections that fit this system. To create the filters, one needs to visually analyze the results of the Tandem Study's performance and get rid of those cases that don't fit our idea or produce statistically negative results by using the classical technical analysis techniques.

Therefore, after the analysis, we receive the rule of the first filter – the trend must be dominant, i.e. our "working trend" cannot be a continuation of another, stronger trend or part of the sideways movement. This limitation is imposed by the very idea the Tandem Studies are based on and is confirmed statistically. If the trend isn't dominant and it's a continuation of the previous trend, the traders' mood is determined by the dominant trend and in this case one should use another Tandem Study we will tell you about in our next article.



Figure 2. Trend filtering: incorrect and correct strategy usage.

Strategy Filtering - Corrections

Obviously, we have to filter out the corrections that are too small or too big. The too small corrections create major noise and don't matter for a large number of traders. The too big corrections, i.e. very deep corrections or very long corrections, turn into quite a different phenomenon than a mere correction in the eye of the traders.

A too big correction is a correction greatly exceeds the main trend in terms of depth or time. How can the main trend be determined? One of the answers is by using a MA, but what length should be used for this MA?

The filtering out of corrections can be done using one of the advantages of the Tandem Studies. When the parameters of the technical indicators that play a role in a Tandem Study-based trading strategy are selected, there is often no need to use optimization or rely on the commonly accepted expert values, as the basis period for the indicators is determined by the market itself (the duration of a stage). This period proves efficient in many cases as it gives a logically coherent picture when different TA tools are used in a combination.

In this case, the main trend will be determined by a MA whose length equals the number of the bars in the Primary Phase (trend phase) multiplied by 1.5.

Therefore, if the price goes below the long MA, with length equal to the number of bars in the trend phase, the correction is too extended. From the psychological point of view, we can say that the correction is so deep and long that the traders are wholly enthusiastic about it and the previous trend plays a lot more modest role now than is required for our idea to work out and bring us a profit.

Note: Tradecision provides a special feature for determining the length of a phase – `CurrentPhaseBarsNumber()`.

For the filtering out of the too small corrections, we can use the universally known rule using a difference between the MAs. If the difference isn't negative, i.e. if the short MA isn't smaller than the long one, the correction is considered to be noise.

Note: To improve the trading system's performance, one can increase or decrease the commonly accepted zero threshold.

We recommend using 3 as the minimum value for the short MA, as a smaller length doesn't allow the MA to perform its function of noise removal, and 5

as the maximum value, as with greater values the MA starts reflecting the short-term trend instead of filtering out the noise.

According to experiments the long MA length should be equal to the number of bars in the Primary Phase multiplied by 0.5.





Figure 3. Correction filtering: incorrect and correct strategy usage.

Subjective Filtering for More Discretionary Traders

Some traders prefer a more discretionary and easier approach for filtering one can also name expert matrix. With this approach, instead of using technical indicators to filter those market situations that are suitable for a Tandem Study, one can use the table of phase combinations that contains information on the relative probability of success or suitability of a developed tandem study for each of the combinations.

For our AccumulatedRangeRatioBull Tandem Study, the table below shows which of the combinations provides a higher degree of precision of the market analysis. Of course, although the terms Strong/Weak Trend or Simple/Complex Correction are understood by all traders roughly well enough, they are still subjective in nature.

Primary phase/ secondary phase	Strong Simple Correction	Weak Simple Correction	Sideway move	Strong Complex Correction	Weak Complex Correction
Strong Bull Trend	High	High	x	Medium	Medium
Weak Bull Trend	Medium	High	x	Low	Low
Sideway move	x	x	n/a	x	x
Weak Bearish Trend	Medium	High	x	Low	Low
Strong Bearish Trend	High	High	x	Medium	Medium

The table provides a total of 24 options, 6 of which have great prognostic ability, 6 – medium, 4 – small, and 8 options are not considered. A more detailed description of the table is beyond the framework of this document, but it's worth a mention that such tables are at first built using the expert method, and then its recommended to test them on historical data (sometimes its better to create separate tables for different markets). The discrepancies between the expert opinion and the historical data value are thoroughly checked into to find out the reasons. A solely expert or solely statistical approach can be erroneous.

Ratio Threshold for Entry Signal

Next, using historical data for the last several years, it is possible to statistically determine the threshold value. If the ratio is below the determined threshold value, the trend will continue as the investors' mood wasn't affected by the correction. To calculate the threshold value correctly, one should test the system on different instruments and data for different periods of time using walk-forward verification and cross verification.

After the different complex kinds of testing with different source data and sensitivity were conducted, the resulting threshold value most often fluctuated within the range from 0.36 to 0.38 with a certain frequency shift toward the top value. Taking into consideration that 0.382 is a Fibonacci number, we decided to use this very number in the final version of the trading system, as we view it as an additional confirmation of the global laws of nature.

As a result of the experiments, it has been established that the dependence of the likelihood of a trend's continuation on the AccumulatedRangeRatioBull value isn't distributed in a non-linear, undulating manner with shifts and outliers. That is why an even more precise solution will be dividing the range of the possible relations between the two accumulated ranges into sub-ranges and calculating the statistical probability of a trend continuation for each of the sub-ranges. As experiments of this kind and their interpretations are more complicated, we will not describe them in this article.

Summary - Strategy Development Process

Therefore, in brief, the process of creating a trading strategy that is based on a Tandem Study consists of the following stages:

1. Coding of an idea using the Phase Rover and special features of the Improvian language;
2. Expert visual validation of how the idea works;
3. Creation of a filter for the first phase (the expert and statistical approach);
4. Creation of a filter for the second phase (the expert and statistical approach);
5. Statistical determination of the threshold or any other trigger values for the stage as a whole. Importantly, this stage can be included only in those situations, when the filtering is already done.

Of course, for the creation of a full-value strategy, one should use money management and correctly incorporate the new system into the current set of trading systems to ensure the required level of diversification between them.

Formulas

The quoted formulas can be used for the calculation of the parameter value for the Primary Phase (the trend), Secondary Phase (the correction) and resulting ratio. The formulas are written in the Improvian Language. They can be used directly in Tradecision's Phase Rover or adapted for use in some other software.

PrimaryPhaseValue calculation:

```
var
    firstBarLow:=0;
    sum:=0;
end_var

firstBarLow:=firstBarLow\1\;
if CurrentTStudyBar() = 1 then
begin
    firstBarLow:=Low;
    sum:=High - firstBarLow;
end;
else
    sum:=sum\1\ + (High - firstBarLow);

return sum;
```

SecondaryPhaseValue calculation:

```
var
    firstBarHigh:=0;
    sum:=0;
end_var

firstBarHigh:=firstBarHigh\1\;
if CurrentTStudyBar() = 1 then
begin
    firstBarHigh:=High;
    sum:=firstBarHigh - Low;
end;
else
    sum:=sum\1\ + (firstBarHigh - Low);

return sum;
```

AccumulatedRangeRatioBull formula:

AccumulatedRangeRatioBull = SecondaryPhaseValue / PrimaryPhaseValue.

Note: The above formulas are intended only for working with bullish trends and presuppose the correct selection of the turning points. Formulas that contain security against imprudent actions and work in both directions are very complicated and they are not quoted herein as they can preclude a clear understanding of the idea the technique is based on.