

# PREDICTIVE MODELS VERSUS TREND-FOLLOWING TECHNIQUES

by David Sepiashvili

**I**nvestors usually either try to predict stock market behaviour or try to react to market trends, starting to trace them after a significant part of the trend has already developed. While the main principles of trend-following trading systems are well studied and well proven, theoretical concepts of predictive trading models are virgin land, where research is only in its initial stages.

The reasons for the lack of popularity of predictive models in comparison with trend-following systems likely results from a widespread false statement that no predictive model is possible since there is no dependency between adjacent data points, and therefore a trading system must be reactive, not predictive. We strongly believe that there are patterns with predictive value in the market and that we can recognize them based on advanced statistical concepts. Our only concern is defining the areas of their excellence.

The demarcation line between these two groups of trading systems lies in the frequency of the underlying data (intraday, daily, weekly, monthly) and the time horizon being traded (very short, short, minor intermediate, intermediate, and long). As our studies show, predictive models are preferable for trading on intraday data, particularly on high frequency data, and perform satisfactorily on daily data only in the very short term. While trend-following

models are better suited to lower frequencies, namely daily, weekly, or monthly data and are applicable to longer terms. Here we present empirical evidence to support this statement.

## Testing period

To find the right testing period, we must take into consideration the cyclical nature of the stock market. It is important to determine in which phase of the long wave we are currently in and which strategy is most appropriate to use in this phase. During the last 70 years the US stock market has exhibited five distinct trending/non-trending periods: the bearish market over the 20 years from 1929 to about 1949, the subsequent 17-year bull market (from 1949 to about 1966) followed by a 17-year bear market, and finally an 18-year bull market starting in 1982. In 2000 the bull market was over and we are now in a new long wave bear market.

To validate the potential advantages and limitations of the trading systems with respect to their profitability and consistency, we will test them under various types of market conditions. Based on the above we chose for comparative evaluation of predictive and trend-following trading systems the last five years of the preceding bull 18-year period from 1/1/1995 to 1/1/2000, and the starting five years of the current bearish cycle that is the period from 1/1/2000 to 1/1/2005. Demonstrating both 'good' and 'bad' conditions when bull phases interspersed with bearish phases and quiet narrow ranging markets, they are suitable for performance evaluation under

various market environments.

## Trading models

The main difficulty when using a trend-following technique is to determine the appropriate moving average calculation period that will fit the market cycle. A shorter calculation period results in overreacting to minor, temporary fluctuations of price, whereas a longer calculation period may avoid the numerous false signals, but will react more slowly and lag behind the security's actual cycle, thereby missing the major part of the trend. In other words, there is a trade off between sensitivity and reliability. With this in mind we included in the performance evaluation report three different moving average crossover systems: a very short-term system, a short-term system, and an intermediate term system.

Predictive models, instead of reacting to market movements, are trying to forecast their direction ahead of time. Trading rules in our case are based on small-scale predictive patterns that have a high degree of recurrence. One of the simplest predictive patterns of the kind are 'down-down-up' and 'up-up-down', that is buy long after two consecutive down moves, and sell short after two consecutive up moves. This group of trading rules, using price rates of change as predictor variables, forecast with a certain degree of accuracy a target variable - the direction of the price movement, but not its value: price is predicted to go up or to go down. We consider here predictive models of two terms - very short and short.

| Term                          | n   | n(w)/n | NP,%    | NP/n,%  | n(w)/n(l) | W/L  | PF   | EF   |
|-------------------------------|-----|--------|---------|---------|-----------|------|------|------|
| 1/1/1995 – 1/1/2000           |     |        |         |         |           |      |      |      |
| <b>Predictive models</b>      |     |        |         |         |           |      |      |      |
| very short                    | 139 | 0.73   | 32.6    | 0.23    | 2.76      | 0.44 | 1.21 | 0.17 |
| short                         | 56  | 0.71   | (-5.3)  | (-0.09) | 2.50      | 0.40 | 1.00 | 0    |
| <b>Trend-following models</b> |     |        |         |         |           |      |      |      |
| very short                    | 121 | 0.27   | 52.4    | 0.43    | 0.38      | 3.32 | 1.26 | 0.21 |
| short                         | 39  | 0.36   | 116.2   | 2.98    | 0.56      | 3.59 | 2.01 | 0.50 |
| intermediate                  | 29  | 0.38   | 128.1   | 4.42    | 0.61      | 3.70 | 2.26 | 0.56 |
| long                          | 1   |        | 831.6   |         |           |      |      |      |
| B & H                         |     |        | 831.6   |         |           |      |      |      |
| 1/1/2000 - 1/1/2005           |     |        |         |         |           |      |      |      |
| <b>Predictive models</b>      |     |        |         |         |           |      |      |      |
| very short                    | 132 | 0.82   | 245.0   | 1.86    | 4.50      | 0.94 | 4.23 | 0.76 |
| short                         | 57  | 0.68   | 50.9    | 0.89    | 2.17      | 0.69 | 1.50 | 0.33 |
| <b>Trend-following models</b> |     |        |         |         |           |      |      |      |
| very short                    | 120 | 0.35   | 14.4    | 0.12    | 0.54      | 1.96 | 1.06 | 0.06 |
| short                         | 37  | 0.35   | 92.9    | 2.51    | 0.54      | 3.68 | 1.99 | 0.50 |
| intermediate                  | 21  | 0.38   | 48.8    | 2.32    | 0.62      | 2.30 | 1.43 | 0.30 |
| long                          | 3   | 0.50   | 6.1     | 2.03    | 2.00      | 0.69 | 1.37 | 0.27 |
| B & H                         |     |        | (-57.2) |         |           |      |      |      |

**Table 1.** Nasdaq 100. (n = total number of trades; n(w) = win probability (number of winning trades to total number of trades); n(w)/n(l) = win probability to loss probability ratio; W/L = average win per winning trade to average loss per losing trade ratio; NP = total net profit (gross profit less gross loss); PF = profit factor (gross profit to gross loss ratio); EF = efficiency factor (net profit to gross profit ratio); NP/n = net profit per trade (allows assessment relative to trade costs))

## Performance

The results in Table 1 illustrate the performance of the mechanical trading rules on the Nasdaq 100 index. For completeness, we also present results for popular long-term investment trading strategies, comprising the 50-day and 200-day moving average crossover system (long positions only) and a buy & hold strategy.

It's worth noting that the hypothetical performance of such trading does not represent actual trading results because it makes no allowance for trading expenses and because, in reality, it is impossible to execute a trade at the closing price. Nevertheless, the two approaches are evaluated in identical terms and the analysis lays an objective basis for comparison.

## Comparative analysis

**Nasdaq 100 index.** As we can see from Table I, predictive models perform on daily data satisfactorily only in the very short term, while trend-following models are preferable for longer terms (short, intermediate, and long).

In 2000-2005 the very short-term predictive model outperforms the short-term predictive model and all trend-following models by a wide margin, featuring an exceptionally high net profit, profit factor, and efficiency factor. Net profit per trade is sufficient to exceed all execution costs even in the case of retail trading. During the preceding five-year span the model returns meager gains.

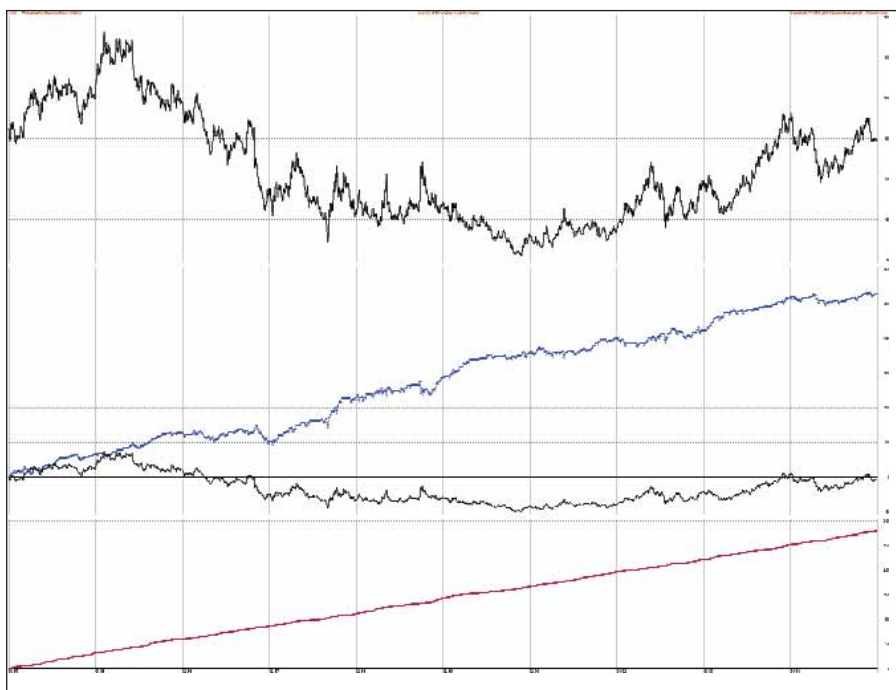
The trend-following strategy demonstrates a sufficient level of returns during the strongly-trending market of

1995-2000. All the models yield good results, the long-term strategies topping among them. The existence of long waves explains why long-term strategies deliver the best results during 1995-2000, while the results in the bear market of 2000-2005 are disappointing. The recent years of the downswing of the stock market long wave has proven that simple long-term investment strategies, being efficient in strongly-trending markets, fail when the market moves down or sideways. The fact demands a revision of investment policy. In this deflationary phase of the economic long wave, which will probably last until around 2012-2016, it is a good time to start using more flexible trading strategies.

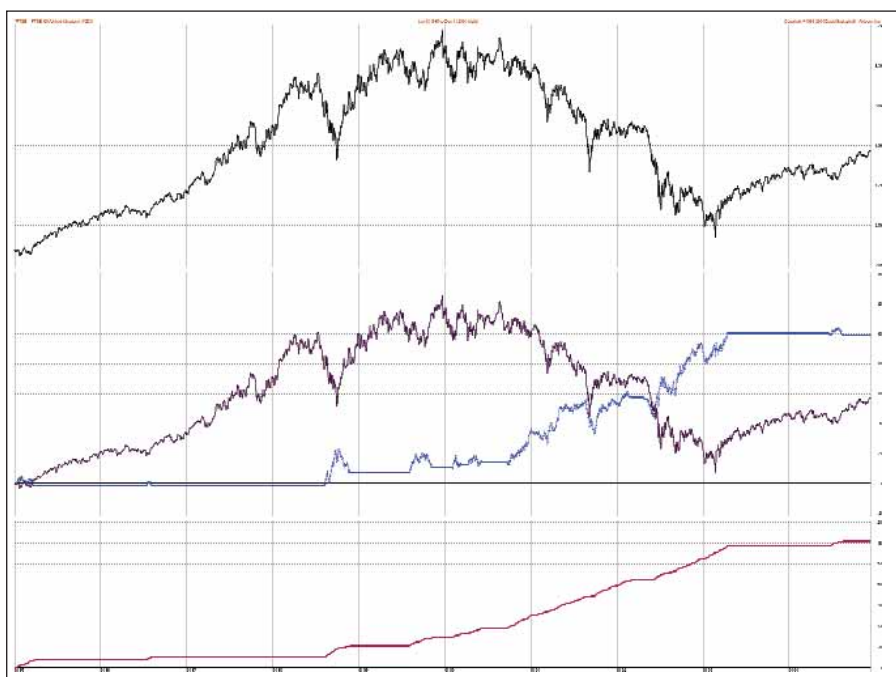
**FTSE 100 index.** We can observe an analogous situation in other world stock markets. The FTSE 100 index, as an example, is chosen. Figure 1 shows its absolute values over 1995-2005 with percentage values marked in black and total net profit obtained by using a very short-term predictive model and calculated without reinvestment and allowance for trading costs. We can clearly distinguish phases efficient for a long-term trend following strategy and for predictive models. This brings us to an essential point that we would have made much more headway with combining these two strategies giving preference to one of them depending on market current conditions.

**Philadelphia gold & silver index.** Let's consider an example of Philadelphia Gold & Silver index since gold is generally recognized as a global hedging tool. The common sense underlying the statement is that investment in gold provides an efficient hedge when confidence is lost in the stock market, as the price of gold varies inversely to the stock market. Figure 2 shows absolute values of the index over 1995-2005 with percentage values marked in black and total net profit obtained by using a very short-term predictive model and calculated without reinvestment and allowance for trading costs. As we →

## “IN THIS DEFLATIONARY PHASE OF THE ECONOMIC LONG WAVE...IT IS A GOOD TIME TO START USING MORE FLEXIBLE TRADING STRATEGIES.”



**Figure 1.** Combining two techniques for profits in different market environments: here you can see how we can get high profits by combining long-term investment during upward trending periods and swing trading based on the predictive model during downward and sideways phases of price movement.



**Figure 2.** Gold vehicle: here you see how it's possible to benefit from trading gold's regular short-term cycles, while long-term investment is a failure.

can see, the percentage chart looks like investing in the gold has not been a good investment during the first six years of the past decade. The last two years of a bullish four-year period, when price of gold moves in tandem with stock market, are an exception from the empirical rule. But as we continue to move through the deflationary phase of the economic long wave, gold value, unlike the stock market, is likely to go on rising, diverging again from the stock market.

Using the very short term predictive model as an alternative investment strategy we could have obtained encouraging results: total net profit of 317.2% with 282 trades, and average net profit per trade of 1.12%. The trading model demonstrates high profit factor (2.36) and efficiency factor (0.58) with a stable growth of returns (Figure 2).

### Performance characteristics

Predictive models allow investors and traders to forecast the direction of price movement with a high degree of accuracy, providing an extremely high win probability (around 0.7). Compare it to the win probability values of (0.35 - 0.45), which are considered satisfactory for trend-following models. But a more accurate prediction of reversal points is accompanied here by significantly lower win-loss ratios than in trend-following models: compare  $W/L < 1$  for predictive models with  $W/L > 2$  for trend-following models. Such asymmetric performance is an important aspect of predictive models that requires further attention.

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