Summa Management LLC

Financial Returns versus Predictability

ABSTRACT

In this paper we will analyze the returns that could have been achieved if one had a crystal ball that indicated whether the price of an equity was going to rise or fall over the next trading day, as a function of the accuracy of those predictions. The analysis covers 12 years, and 2 economic cycles. Two stocks (a large cap and a small cap) and two stock indices were analyzed. With predictions of direction that are correct 70% of the time, compound annual growth rates (CAGR) ranged from 40% to 330%, versus -29% to +7.5% for the stocks themselves and the indices over the same period.

PROCEDURE

A 12 year period, from 7/2/1998 to 7/2/2010, was selected for analysis. Over this period, markets (as measured by the S&P 500) fell 11%. The period contains 2 economic cycles, with markets rising by 33% over 21 months from the start of the study period to 3/20/2000, then falling 49% over 30 months from 3/24/2000 to 10/9/2002, then rising by 101% over 60 months from 10/9/2002 to 10/9/2007, then falling 35% over 33 months from 10/9/2007 until the end of the study period.

Two stocks that reasonably represent boundary cases on all US stocks were selected for analysis: a stable blue-chip large-cap (symbol IBM on NYSE; International Business Machines Corporation), and a volatile small-cap (symbol VTSS on NASDAQ; Vitesse Semiconductor Corporation). Likewise two indices were chosen to reasonably represent boundary cases on US stock indices: the S&P 500 (large caps, relatively low volatility) and the NASDAQ Composite index (smaller stocks in general, with higher volatility).

The first part of the analysis only considers long transactions (no shorting of stocks, using inverse index products, or derivatives). Thus the trading capital on any given day was either fully invested (in the market) or earning nominal interest (2%/year) as cash (out of the market). Each trading day, at the open, we could either buy (if we had been out of the market), sell (if we had been in the market), or hold (whether we were in or out of the market). If we bought or sold we incurred a commission cost (0.1%).

A Monte-Carlo analysis was performed to see the relationship between returns and the accuracy of market-direction predictions. The decision to be in or out of the market on any given day (and thus whether to buy, sell, or hold) was computed from our a priori knowledge of what the market was going to do from that open until the next open (we know this since we are working with historical data), combined with a random corruption of this decision to yield an overall decision accuracy per our test parameters. The decision accuracy test parameter was swept from 0 to 100% in 10% steps. Thus we always performed the wrong action (were out of the market when we should have been in, and vice-versa) if the decision accuracy was 0%, and the right action (always in the market when it went up and out when it went down) when the decision accuracy was 100%. CAGR was computed across the analysis period. Ten iterations were run on each of the 11 possible decision accuracies for each security. Each iteration used a different random number generator seed, so the dates where the decisions were correct and incorrect varied from run to run (except for the 0% and 100% decision accuracy cases). Means and standard deviations were then computed on the CAGRs across the ten iterations.

RESULTS

Table 1 shows the CAGR for each of the 4 financial instruments tested, averaged over 10 test runs.

	Decision Accuracy										
Equity Instrument	**0%**	**10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**90%**	**100%**
S&P 500	-73%	-65%	-56%	-44%	-30%	-12%	11%	41%	76%	123%	178%
NASDAQ Composite	-80%	-73%	-64%	-51%	-34%	-10%	20%	60%	118%	194%	298%
IBM	-78%	-71%	-61%	-49%	-31%	-10%	21%	64%	118%	187%	280%
VTSS	-99%	-98%	-95%	-87%	-69%	-26%	73%	326%	940%	2547%	6070%

Table 1: Mean CAGR from 10 Runs over 12 Years of Data

Table 2 shows the amount of variation in the annual return (CAGR) as one randomizes where the decision errors are inserted into the sequence of trades.

	Decision Accuracy										
Equity Instrument	**0%**	**10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**90%**	**100%**
S&P 500	0%	1%	1%	1%	3%	3%	3%	3%	3%	6%	0%
NASDAQ Composite	0%	1%	2%	3%	2%	3%	5%	7%	8%	8%	0%
IBM	0%	0%	1%	2%	3%	2%	7%	7%	6%	6%	0%
VTSS	0%	0%	0%	1%	4%	11%	26%	60%	126%	149%	0%

Table 2: Standard Deviation of Mean CAGR from 10 Runs over 12 Years of Data

The data in Table 1 is shown graphically in Figure 1.

Figure 2 shows the following data for each of the four financial instruments tested:

1. Open, High, Low, and Close prices in a candlestick plot
2. Whether the strategy, with its decision accuracy at the 70% level, says we should be in the market (purple bar) or out of the market (no bar)
3. Trading volume
4. Trailing Twelve Months (TTM) yield using this strategy, with 70% decision accuracy
5. Baseline TTM yield; if one bought 12 month prior and sold on this day

CONCLUSIONS

If one has a mechanism to predict the direction of a stock or stock index price change on a daily basis for the upcoming day, trading on this information can produce returns that are substantially better than the financial instrument itself over the same time period, even if the predictions are accurate only 60% of the time. With 70% prediction accuracy, gains of 40% and 60% per year, averaged over 12 years, were seen on the S&P 500 and NASDAQ composite. On a high volatility stock, this study shows that prediction accuracy of 70% can produce gains of over 300%/year.

FIGURES

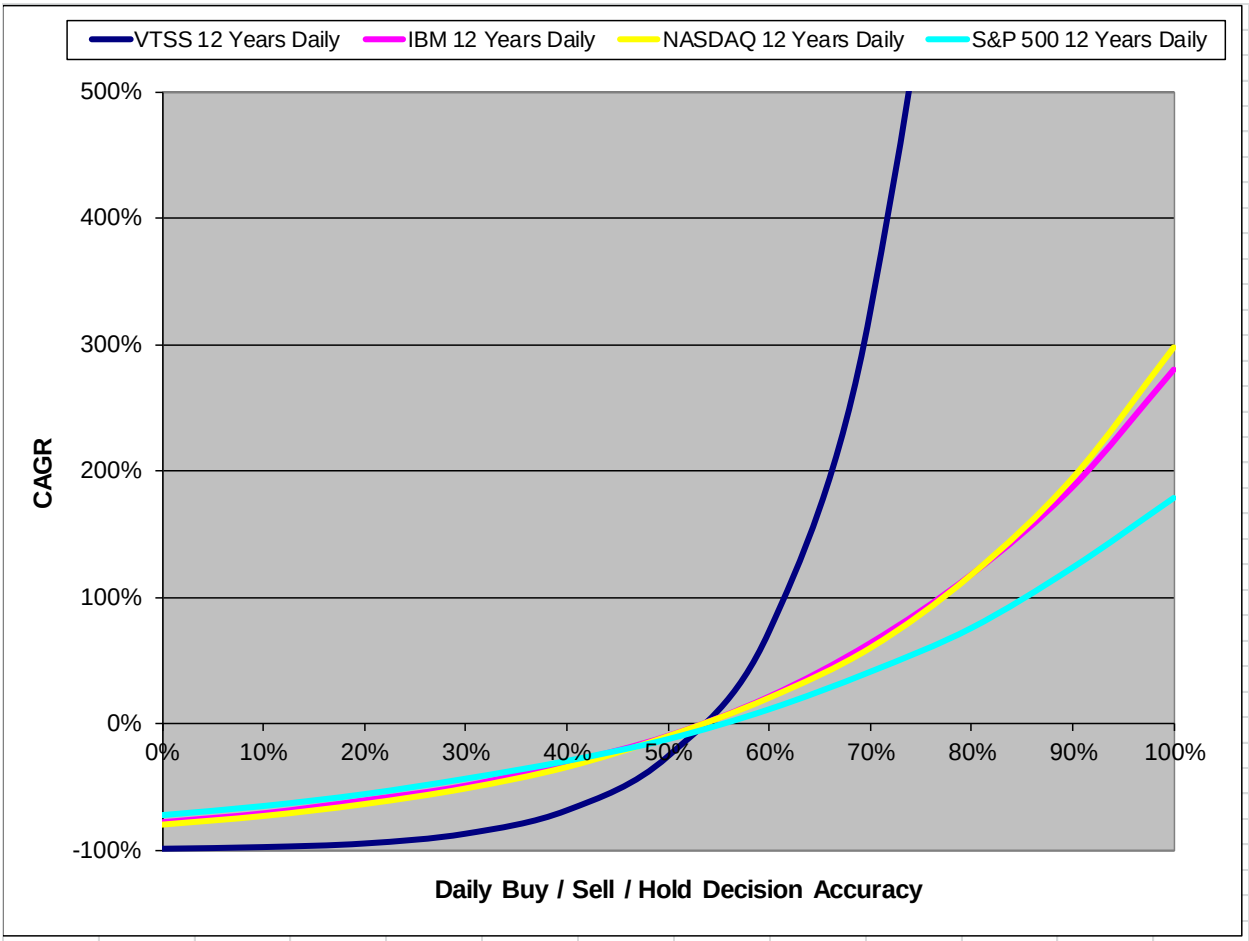

Figure 1: CAGR vs. Decision Accuracy

Figure 2 follows this page

Note: if printed, use 2' x 8' paper

Figure 2 - Price and Return Graphs

S&P 500 12 Years Daily

NASDAQ 12 Years Daily

IBM 12 Years Daily

VTSS 12 Years Daily