

# Translating Two Confirmation Tools (TMAC) Translated Moving Average Crossover (TRSI) Translated Relative Strength Indicator

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One of the most enduring complaints of trending methods such as the Moving Average Crossover is their propensity to trigger frequent signals at less than opportune times. Optimization of such systems has tended to be a tradeoff between filters that are too restrictive or too broad. By integrating a component of cycle analysis, trending methods may be made more effective.

Systems in nature and the properties of gravity as expressed by Isaac Newton<sup>1</sup> go to laying the foundation for why cycle translation should be considered during the creation and use of a robust trending method. This paper will illustrate a means of reducing the occurrence of whipsaws by adjusting for translation bias, as well as provide performance data to support the benefits of translating confirmation tools.

## Systems in Nature

Much of the complex systems in use today have at their roots, fundamental building blocks borrowed from nature. Our understanding of nature and its systems is reinforced by our increasing reliance on the power and the efficiency of evolutionary change. Systems in nature are not only found to be efficient and streamlined, but bear little evidence of over-optimization.

In nature, successful species seem able to adapt to gradual changes in their surroundings i.e., food source, proximity to population etc., while unsuccessful species are found to be less robust and unable to cope with change. Many non-adaptable species share a list of similar traits. The state of Utah's Natural Resources Department recently released a "sensitive species" list of over 50 species on the verge of being extinct if present conditions persist.

The "sensitive species" list is compiled by evaluating four broad categories. Of interest to this paper is the first of the four criteria entitled, "Biology/ Life History." Under this first criteria there are three sub-headings; the second, "Genetic uniqueness," suggests that excessive optimization contributes to a species extinction.

If extinction is the result of over-optimization, and trending methods are a trade-off between too broad and too restrictive filter parameters, (i.e., under or over-optimization), it may prove beneficial to select filter parameters based on the frictional bias within a market cycle.

## Elements of Translation Bias

Many trending systems pay particular attention to Nature's physical laws. Newton's first law of motion has long been used to illustrate why trending methods in technical analysis have validity. As Newton<sup>2</sup> imparted, "an object in motion continues in motion until an equal or greater force acts upon it." Dow's theory<sup>3</sup> asserts that, "a trend is assumed to be in effect until it gives definite signals that it has reversed."

Newton's influence is also present in William P. Hamilton's<sup>4</sup> interpretation of Dow's work. Hamilton notes that Dow's three movements, primary trend, secondary reaction and daily fluctuations, resemble tides, waves and ripples. The investment community often refers to Hamilton's analogy when characterizing money flow in securities markets. On the surface, the analogy seems straightforward, investment capital ebbs and flows as market participants attempt to realize value. On a closer view, Hamilton's tides and waves description supports the existence of bias in market cycles.

A closer look at Newton, Dow, and Hamilton reveals the unifying element of

friction. At low tide (Dow's accumulation phase) inflows of water and/or capital are slower because of friction. As the inflows overlap velocity increases and friction dissipates. The friction at the root of bias in securities markets comes from one source, investor expectation. It is exacerbated by the use of differing valuation metrics and the ceaseless requirement to remeasure based on new inputs. Price friction can take many forms: behavioral, (as in investor fear of loss or greed) - qualitative, quantitative and technical. Adding to Hamilton's analogy, the shallow water effects of a tidal bore exemplify the hydrological parallel to the market-pricing struggle.

A tidal bore created by inbound tidal flows, requires a large rise of tide (inflows) at the mouth of a river. A sandbar or other frictional elements at the entrance impede the initial advance of the tide. As inflows occur, the water is unable to spread uniformly over the vast shallow interior area fast enough to match the rapid rise at the entrance. While friction is prevalent at the base of the advancing front, the resistance from the last ebb flow still draining into the basin compounds it. The combination of these competing elements causes the top of the advance to tumble forward revealing bias.

What is evident in the physical characteristics of a tidal bore is the similarity in which capital market inflows behave - investor uncertainty and subsequent selling clash against the weight of buying inflows. The struggle to confirm direction is a major contributor to trending system whipsaws. The competing forces of a tidal bore illustrates why it is difficult to determine price direction. They also suggest a means of improving trend methods by accounting for translation bias.

In environments (a breaking wave and/or financial markets), the formation and degradation of their respective cycles illustrate the presence of friction, a change in velocity due friction and the subsequent translation bias that results.

To illustrate translation bias in real market terms, the S&P 500 is used as the representation of "the Market." The Dimensional Fund<sup>5</sup> data, shown in Chart 1, illustrates the duration of Expansion and Contraction Phases of the S&P 500 over the past 77 years, January 1926 to September 2002.

The market duration data suggests that over the last seventy-seven years, the typical expansion phase or "up market" has taken 3 times longer to complete than its contraction counterpart, 31 months versus 10 months.

Given the bias in the data, it would seem beneficial to incorporate a change of filter sensitivity to address the durational differences of the two market phases (expansion/contraction). First, we must have a basic tool to help us determine phase.

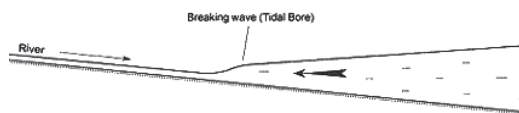


Figure 1: Example of a tidal bore

"Up Markets" Expansion Phase			"Down Markets" Contraction Phase		
Dates	No. of Months	S&P 500	Dates	No. of Months	S&P 500
Jan. 1926–Aug. 1929	44 mons.	193%	Sept. 1929–Nov. 1929	3 mons.	-33%
Dec. 1929–Mar. 1930	4 mons.	21%	Apr. 1930–Jun. 1932	27 mons.	-80%
Jul. 1932–Aug. 1932	2 mons.	92%	Sept. 1932–Feb. 1933	6 mons.	-30%
Mar. 1933–Jan. 1934	11 mons.	105%	Feb. 1934–Jul. 1934	6 mons.	-21%
Aug. 1934–Feb. 1937	31 mons.	135%	Mar. 1937–Mar. 1938	13 mons.	-50%
Apr. 1939–Dec. 1938	9 mons.	61%	Jan. 1939–Apr. 1939	4 mons.	-16%
May 1939–Sept. 1939	5 mons.	22%	Oct. 1939–May 1940	8 mons.	-26%
Jun. 1940–Oct. 1940	5 mons.	22%	Nov. 1940–Apr. 1941	6 mons.	-13%
May 1941–Aug. 1941	4 mons.	14%	Sept. 1941–Apr. 1942	8 mons.	-22%
May 1942–May 1946	49 mons.	49%	Jun. 1946–Apr. 1947	11 mons.	21%
May 1947–Oct. 1948	18 mons.	23%	Nov. 1948–June 1949	8 mons.	-10%
Jul. 1949–Jul. 1957	97 mons.	429%	Aug. 1957–Dec. 1957	5 mons.	-15%
Jan. 1958–Dec. 1961	48 mons.	105%	Jan. 1962–Jun. 1962	6 mons.	-22%
Jul. 1962–Jan. 1966	43 mons.	90%	Feb. 1966–Sept. 1966	8 mons.	-16%
Oct. 1966–Nov. 1968	26 mons.	52%	Dec. 1968–Jun. 1970	19 mons.	-29%
Jul. 1970–Dec. 1972	30 mons.	76%	Jan. 1973–Sept. 1974	21 mons.	-43%
Oct. 1974–Dec. 1976	27 mons.	86%	Jan. 1977–Feb. 1978	14 mons.	-14%
Mar. 1978–Nov. 1980	33 mons.	86%	Dec. 1980–Jul. 1982	20 mons.	-17%
Aug. 1982–Aug. 1987	61 mons.	282%	Sept. 1987–Nov. 1987	3 mons.	-30%
Dec. 1987–May 1990	30 mons.	71%	Jun. 1990–Oct. 1990	5 mons.	-15%
Nov. 1990–Apr. 1988	90 mons.	345%	May 1998–Aug. 1998	4 mons.	-13%
Sept. 1998–Aug. 2000	24 mons.	63%	Sept. 2000–Sept. 2002	25 mons.	-45%
Expansion Phase Averages			Contraction Phase Averages		
22 "Up Markets" 1926–2000 Average length 31 months Average 117% gain per cycle			22 "Down Markets" 1929–2002 Average length 10 months. Average 26 % loss per cycle		
<small>"Up Markets" defined as lowest open up month to highest closing up month.  "Down Markets" defined as highest open down month to lowest closing down month.</small>					

Chart 1: Market Cycles defined by the S&P 500 | Total Returns (%)

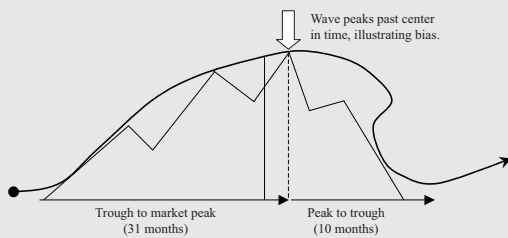


Figure 2: Market Defined by S&P 500 Jan. 1926 to September 2002

## Translated Moving Average Crossover (TMAC)

If confirmation indicators are not adjusted to account for bias, the trending method being used may be out of phase with the market. The result of this is an unnecessary number of false signals, and a subsequent increase in friction costs and investment risk.

### Basic construction and rationale

In translating a confirmation tool, it is necessary first to determine the trend and timing cycles to be used. The timing cycle (trading cycle) should be one half to one-third the duration of the trend cycle. The rationale for the trend and trading cycle length is the principle of harmonics in cyclic analysis. Harmonics<sup>6</sup> suggests that each cycle is related to its neighboring cycle (longer or shorter by 2) for instance  $40 \text{ week ma}/2 = 20/2 = 10$ .

The rationale for the specific use of a 10-week timing cycle and 40-week trend cycle is their effectiveness in smoothing out and uncovering the overall trend and secondary counter-trend. The preference of a weekly moving average over a daily moving average is further to reduce price volatility. Weekly closing price is considered to hold greater significance, as investors must hold their positions over the weekend.

### The Role of the Averages

The aim of the moving averages in the TMAC is to signal either an expansion or a contraction phase as they cross. As the 10-week moving average breaks above the 40 an "expansion" phase is considered in place. This signals the use of specific buy and sell rules.

The "expansion" phase buy and sell rules are unique in their right to account for bias. The inherent bias during this phase suggests a greater sensitivity to purchase and a reduced sensitivity to sell. This is to account for both Newton's and Dow's related theory that a trend is considered to be in place until it gives definite signs of change.

The "contraction" phase is signaled by the 10-week moving average falling below the 40-week. The contraction phases triggers its set of buy and sell criteria. The bias being translated during the contraction part of the cycle is for the tendency of accelerated price declines. As such, sell filters are more sensitive, while buy confirmations take longer.

The benefits of the TMAC are simplicity and objectivity. It provides a concise indication of the particular phase, as well as which buy/sell filters to use.

## TRSI (Translated Relative Strength Indicator)

Welles Wilder Jr's counter-trend indicator<sup>7</sup> is a tool for confirming the alert signals given by the translated MA Crossover.

The construction goals of the TMAC (Translated Moving Average Crossover) are similar to those of the TRSI (Translated Relative Strength Indicator). Both indicators must be set to account for the fact that markets take longer to form and complete their expansion phase than they do their contraction phase.

The TRSI receives the same count rule as the moving average weekly price breach, and this adjusts the RSI for translation. When RSI 14 period readings are below 30 and above 70, using different period sensitivities refines entry and exit points. The quicker degradation of market peaks is filtered using a smaller period 9 RSI that increases sensitivity to price movements. At market troughs, (i.e., when the 14 period RSI is below a reading of 30), utilizing an RSI 20 period helps to reduce price sensitivity. This allows more time for the trend to continue or reverse.

During the expansion phase (10w above 40w), and the successful upside breach of the RSI 14 period 70 reading, the objective becomes retention of capital gains and risk management, since risk and price rise are commensurate.

### Rule set for TMAC and TRSI Test Period of 20.5 Years Using S&P 500 Weekly

The following rule set is a result of optimization, observation and fitting over a 10-year period from January 1993 to January 2003 with an out of sample test performed from January 1985 to January 1993. The rule set for the 20.5-year period is as follows:

#### Expansion phase = 10-week above 40-week

#### Contraction phase = 10-week below 40-week

- Expansion phase buy signals occur on the second consecutive 1% close above the 10-week moving average confirmed by the second cumulative minimum 2-pt rise in RSI with price above 10-week. (Each increase in RSI must be minimum 1 pt.)
- The count begins with the first up/downside weekly closing 1% price breach of the 10-week average. If the price falls below/above the 10-week moving average by 1% before count is complete, the count begins again.
- Expansion phase sell signals occur on the third consecutive price decline below the 10-week confirmed by three cumulative point declines in RSI w/price below 10w.
- Contraction-phase buy signals occur on the second consecutive rise above the 10-week confirmed by the second cumulative rise in RSI with price minimum 1% above 10w moving average.
- Contraction-phase sell signal occurs on first 1% breach of 10-week moving average.
- All price breaches of moving averages must be minimum 1% +/- on a consecutive count basis.
- All RSI readings must be one full point on a cumulative basis. (The cumulative count helps to reduce noise and permits greater time for trend resumption by creating a support or resistance line depending on signal given.)
- Nine-period RSI default occurs when the 14-period has read 70+ for minimum two periods.

### Phase Specific Rules

- **Expansion Phase only:** RSI nine-period sell signal occurs on the first 1% breach of the 10-week moving average. If the breach of the moving average does not occur by the third cumulative period, default to regular sell rule count. (i.e., third consecutive close below 10w moving average confirmed by the cumulative count in RSI.)
- **Expansion Phase only:** when the third cumulative decline below 70 RSI triggers a sell signal and a 10-week moving average breach does not occur, buy signal is triggered with default buy rules, as price is already above 10-week confirmation for repurchase occurs with 2 cumulative increases in the RSI (ea.min.1pt.)
- **Expansion Phase only:** 40-week moving average support rule: if during a decline below the 10-week moving average, the third price plot is within 1% of the 40-week; omit count and hold until 40-week is breached by 1% or trend reversal occurs.
- **Moving Average intersect rule:** weekly price plots that intersect both moving averages are omitted from count, unless the intersect is a result of severe price decline from over-bought conditions based on RSI 9 period sell criteria. (The intent of the M.A intersect rule is to allow the price trend to reassert.)

### Postscript

The aim of this paper was to revisit the physical characteristics of price change (bias and friction) in an effort to institute a clear and objective set of buy and sell rules for an intermediate-term trending system. The goal at the outset was capital preservation. Implementing the rule set provided a secondary benefit in improved dollar-weighted returns. (See Appendix one for performance data.)

The test period was deliberately long to show the robustness of the methodology. The risk-adjusted performance of a simple trending system has seen additional

benefits in the lower drawdown and significant increase in the Sharpe ratio. The translated version's standard deviation data shows an undesirable 4.2% increase from the non-translated version; however, a closer look at the data shows the increase in standard deviation has a positive skew.

Over the years many references have been made to filtering for price sensitivity, Gerald Appel<sup>®</sup> has suggested it may prove beneficial to alter the sensitivity of the MACD indicator depending on the reading above or below equilibrium "0." Appel also suggests that penetration filtered systems showed superior results when used in conjunction with an intermediate cycle of 40-50 days. (10 wks.) Although he does not address the overall issue of translation bias, he does hint at the rationale for filtering penetrations of the moving average.

## Appendix 1 - Performance Data & Buy/Sell Chronology

	Non-Translated (E = 2/2 C=2/2)	Translated Version (E= 2/3 C=2/1)		
Annualized Return	8.29%	10.84%		
\$ Weighted Return	7.40%	9.91%		
Standard Deviation	13.57%	14.14%		
Sharpe Ratio	0.3427	0.5064		
Profit Ratios				
Avg. gain per trade	13.39%	18.81%		
Largest % gain	37.35%	67.38%		
Avg. drawdown per trade	-4.35%	-3.62%		
Largest drawdown	-8.05%	5.48%		
% of Trades Prof.	57.14%	60.87%		
% Unprofitable	42.86%	39.13%		
* # of signals per year	2.73	2.24		
* Translation alone does not make for a complete trading system. Other indicators must be utilized to confirm buy and sell signals. (i.e., Volume indicators, etc.) Do not attempt to trade with this system as a stand-alone platform.				
Annual Percentage gain and loss per trade				
	Gain	Loss	Gain	Loss
1	8.63%	-4.07%	9.78%	-4.52%
2	23.39%	-2.03%	49.75%	-5.48%
3	12.56%	-5.10%	4.20%	-2.17%
4	4.41%	-1.09%	3.33%	-3.84%
5	0.36%	-5.66%	22.88%	-4.52%
6	9.13%	-6.56%	20.27%	-2.16%
7	0.14%	-3.58%	8.50%	-3.01%
8	25.23%	-5.16%	67.38%	-3.13%
9	10.01%	-8.05%	8.96%	-3.82%
10	37.35%	-4.98%	12.88%	
11	11.37%	-2.15%	19.74%	
12	28.85%	-3.78%	0.58%	
13	20.82%	27.33%		
14	19.32%	7.83%		
15	1.66%			
16	1.03%			

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## Appendix 2 - Performance Data Comparison

- **Annualized Return Differential:** 10.84% : 30.76% increase in the translated version's annualized return.
- **\$ Weighted Return Differential:** 9.91% : 33.92% increase in translated version's dollar weighted return.
- **Standard Deviation:** "translated" version increased volatility by 4.2% with positive skewness.
- **Sharpe Ratio:** "translated" version saw Sharpe Ratio increase by 47.7%.
- **Average gain per signal:** "translated" version saw profitability per trade increase by 40.48%.
- **Average drawdown:** "translated" version reduced average drawdown 20.17%.
- **Trade count:** translated version reduced trade count 17.81% from 28 trades to 23 trades.
- **End Value differential** of 60.39% @ 20.5 yr. Mark (non-translated value @ \$43,240 vs. translated value at \$6,9351.38).

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## Endnotes

- 1 Isaac Newton, *the Principia*, a New Translation by Bernard I. Cohen and Anne Whitman, pgs. 416-417
- 2 Isaac Newton, *The Principia*, A New Translation and Guide L. Bernard Cohen and Anne Whitman
- 3 John Murphy, *Technical Analysis of Financial Markets*, chap.2, pg.28
- 4 Robert Rhea, *The Dow Theory*, chap. 6, pg. 33
- 5 *Dimensional Matrix Book 2003*, exhibit 4, pg.3
- 6 John Murphy, *Technical Analysis of Financial Markets*, Chap. #9, pg. 212.
- 7 J. Welles Wilder, Jr., *New Concepts in Technical Trading Systems* (Trend Research, Greensboro, NC, 1978).
- 8 Appel & Hirschler, *Stock Market Trading Systems*, Chap.3, pg. 23-24.