

# A Five Line Stave Model for Constructing a Big Trend Decision Support System for ETF Mutual Fund Investment

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## Abstract

Stock investment is an easy and direct way for investors, but the literature shows that almost 80% of professional investment institutions (institutional investors) cannot beat the global market when tracking their performances for more than 20 years. To provide more direct and convenient investing channels, some professional investment institutions eager to issue Exchange-Traded Funds (ETF) for their clients. In this paper, we will propose a five line stave decision model, named 5LSDM, based on tracking the trend line as the center line, then respectively add one and two standard deviations to form the upper and top lines, and finally subtract one and two standard deviations to form the lower and bottom lines, respectively. Then, we construct a decision support system by regarding the top and upper lines as reference signals of selling, and by considering the bottom and lower lines as reference signals of buying. Meanwhile, in order to avoid grasping a falling knife in bear market, and releasing the target in bull market when the prices are sharply falling or soaring, respectively, we have extended the model by adding a big trend operating condition as a trading basis. An experimental study has also been conducted by selecting five cases of transactions, including Vanguard Total Stock Market ETF (VTI), iShares MSCI ACWI (ACWI), iShares MSCI Russia Capped (ERUS), iShares MSCI Brazil Capped (EWZ), and Yuanta/P-shares Taiwan Top 50 ETF (0050.TW) by collecting data from 2016/01/01 to 2016/07/08. The derived average ROI is nearly 26.75%, which is higher than the 4.46% performance of S&P 500 based on the same experimental period.

**Keywords:** Five Line Stave Decision Model (5LSDM), Big Trend, Exchange Traded Funds (ETF).

## 1. Introduction

### 1.1. Background and Motivation

Stock investment is an easy way for investors to enjoy the fruitful growth of the target company. Ellis (2013) pointed out that the annualized ROI (Return on Investment) of stock investment is about 9.7% when counting the years from 1926 to 2012. However, during the same period with an average 3.0% inflation rate, the

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annualized ROIs for bonds and treasuries are only 5.4% and 3.9%, respectively. That makes stock investment become a popular tool for pursuing a high return.

However, as professional investors and institutions strive to conduct the stock analysis in real time, there is no trivial task to beat these rivals and overcome the global market. Roughly speaking, there are only 20% of the mutual funds with active investment strategy can beat the market. That means investors should focus on pursuing the same ROI of the global market rate. Exchange Traded Fund (ETF) is such a popular tool with low cost to help investors obtain nearly the same rate of the market in these years. Therefore, in this paper, we choose ETF as our target for study.

Nevertheless, as some irrational crash of stock markets, like the years of 1987, 2001, and 2007, may occasionally frustrate investors, we also need strategies for the decision regarding buying low and selling high. In this paper, we propose a five line stave model (namely, 5LSM) by extending the linear regression line designed by Chan (2011). Chan's model is based on tracking the trend line as the center line, then respectively add one and two standard deviations to form the upper and top lines, and finally subtract one and two standard deviations to form the lower and bottom lines, respectively. We found that it can effectively help investors capture the buy-low-sell-high points in most of the markets, except for the Shanghai Stock Exchange (SSE) Composite Index counting from February, 2015 to June, 2015, and the iShare MSCI Russia Capped Index calculating from November, 2014 to December, 2014. The vibration amplitudes of both emerging markets exceed more than three standard derivations during the period (as depicted in Figure 1). Therefore, we need to revise the decision strategies of Chan's model to obtain more profits for stock investments.



Figure 1. Five Line Stave of SSE

## 2. Literature Review

### 2.1. Exchange Traded Funds (ETF)

Based on the definition of investopedia.com, we realized:

“An ETF, or exchange traded fund, is a marketable security that tracks an index, a commodity, bonds, or a basket of assets like an

index fund. Unlike mutual funds, an ETF trades like a common stock on a stock exchange. ETFs experience price changes throughout the day as they are bought and sold. ETFs typically have higher daily liquidity and lower fees than mutual fund shares, making them an attractive alternative for individual investors.”

The advantage of owning an ETF is that investors can get the diversification of an index fund as well as the ability to sell short, buy on margin and purchase as little as one share. Besides, the expense ratios for most ETFs are lower than those of the average mutual fund.

For most of the cases, beating the market is usually an important goal for institutional investors. However, based on the performance measurement pointed out by Ellis (2013), almost 60% mutual funds cannot achieve this goal in one year, nearly 70% cannot reach the objective when the duration is extended to 10 years, and 80% of that are beaten by the market when the duration stretches to 20 years. Because professional managers are paying more time in the investment research, investment-related information will be more easily achieved, resulting in most of the investment target prices already reflect all information at that time, and therefore more difficult to beat the market. Since it is hard to beat the market, investors now are keen to choose ETFs as tools to pursue a higher rate of return for a long time investment.

## 2.2. A Decision Support System Based on the Five Line Stave Model

The Five Line Stave Model (5LSM) is based on the Chan’s Conduit (Chan, 2011) model, which is a logarithmic linear regression method by tracking the index for 20 years, and above and below the regression line there are respectively added with one parallel lines by separately adding or subtracting two standard deviations for drawing. Chan (2011) found that Hong Kong's Hang Seng Index always fall between the top and bottom lines. To facilitate the operations, Chan suggest adding a 75% parallel line in the middle of each space constructed by the center line and the derived lines, with a total of five lines to judge the relative high and low price, respectively. In summary, the 5LSM modifies Chan’s Conduit as follows:

1. We adopt the duration by 3 to 3.5 years instead of 20 years based on the result found by Balvers *et al.* (2000), which suggests such short period to fit a more sensitive situation for more signals of operations.
2. As the period adopted is shorter, we use linear instead of logarithmic linear regression method.
3. Instead of adding or subtracting 75%, the second (and fourth) lines are drawn by adding (subtracting) one standard deviations on the center line, respectively. The reason is the probability of adding or subtracting one standard deviation is about 66%, which is prone to raise a trading signal when compared with that of 75%.
4. Differing with the momentum investing strategy of Chan’s Conduit, we use contrary investment strategy as a basis, such that it raises a buying signal whenever the price is under the two lower lines, and a selling signal whenever the price is above the two upper lines.

## 2.3. Big Trend Acceleration Bands

Big Trend’s Acceleration Bands is an index chart, like Bollinger Bands or moving average envelopes, proposed by Headley (2002). It has more adaptive than moving

average envelopes, and has less fluctuation than Bollinger Bands. It is composed of three lines, the first line is a simple moving average (middle line), and the second and third lines are the upper and lower band respectively derived by the following formulae:

$$\text{Upper band} = (\text{High} * (1 + 2 * (((\text{High} - \text{Low}) / ((\text{High} + \text{Low}) / 2)) * 1000) * 0.001)))$$

$$\text{Lower band} = (\text{Low} * (1 - 2 * (((\text{High} - \text{Low}) / ((\text{High} + \text{Low}) / 2)) * 1000) * 0.001)))$$

Big Trend's Acceleration Bands can be used for doing long or short. For doing long, it suggests buying when breaking through the upper band, and suggests selling when backing to the normal band. When doing short, conduct the opposite actions accordingly. Note that when breaking through the upper or lower bands, it may stand for oversold or overbought conditions, respectively. Figure 2 depicts the Big Trend Acceleration Bands, where the blue line keep breaking through the upper line in Figure 2 during the period of 2015/02/25 to 2015/06/25, which indicates to keep calm even the five line stave (in Figure 1) already breaks through the upper line. We sell the target when the blue line in Big Trend (Figure 2) falling back into the upper channel, and make more 28.75% profits (1011 points).

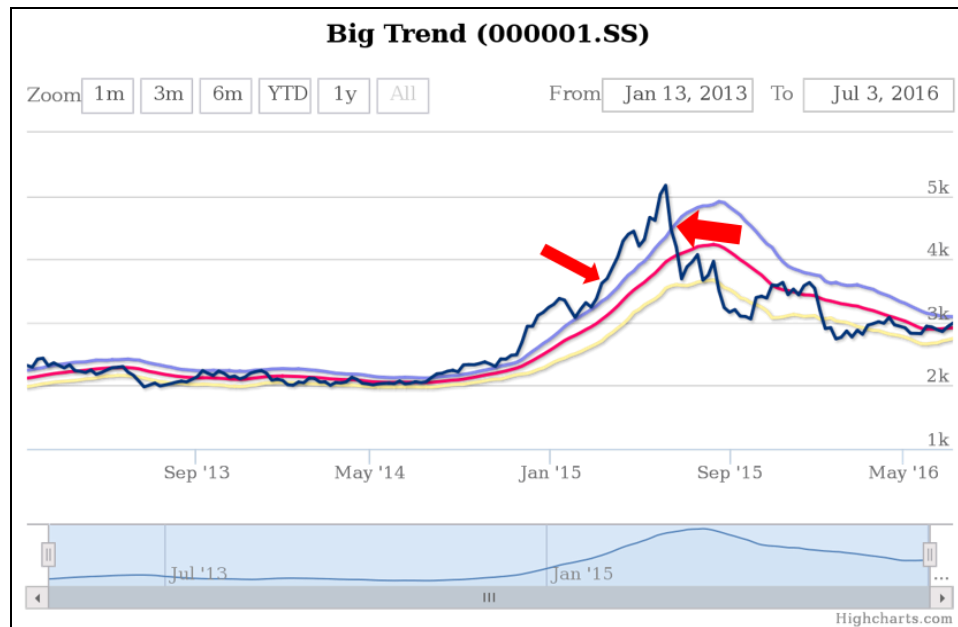


Figure 2. Big Trend of SSE

Conversely, although Figure 3 shows that the five line stave diagram of ERUS already breaks through the lower line on 2014/11/17, we still keep calm with no buying as the Big Trend diagram (in Figure 4) is still under the lower line. We buy the target when the blue line in Big Trend is raising up to step into the lower channel, and save about 18% loss.

### 3. The System Architecture and Implementation

We have constructed a decision support using PHP, together with Highcharts, an interactive JavaScript chart (<http://www.highcharts.com/>). All the historical data are crawled from <http://finance.yahoo.com> by our backend service. The objective of our frontend system (can be reached by <http://invest.wessorfinance.com/notation.html:en>) is to establish a decision support platform by offering responsive and friendly user interface for any devices, including personal computers, tablet PCs, or even smart phones.



Figure 3. Five Line Stave of ERUS

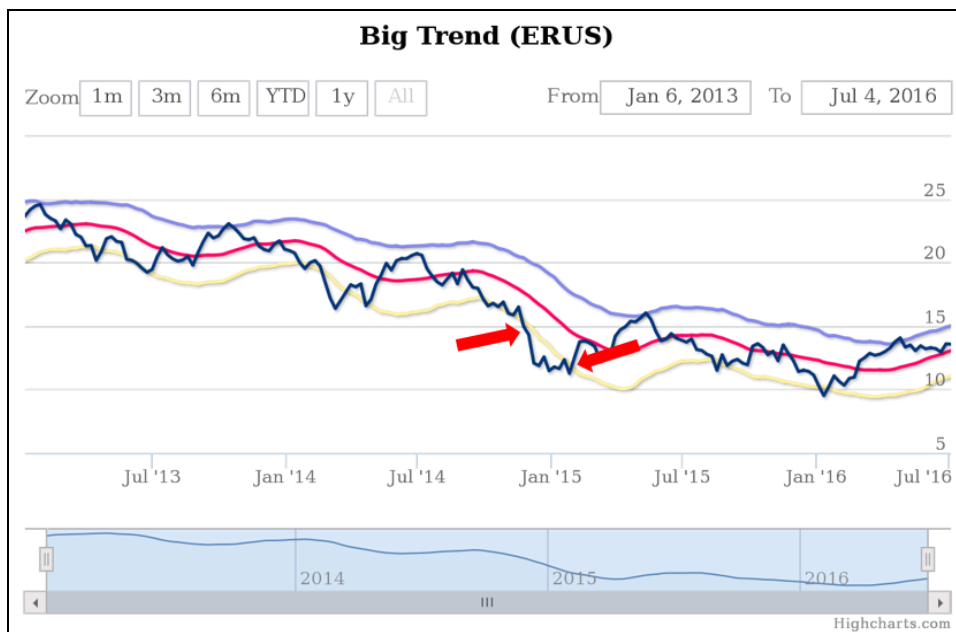


Figure 4. Big Trend of ERUS

#### 4. Empirical Experiments

We implement the 5LSM model in our system, the five lines are called extremely-optimistic, over-optimistic, neutral, over-pessimistic, and extremely-pessimistic lines from top to bottom. The buying signals can be set at the over-pessimistic or extremely-pessimistic lines, and the selling signals can be set at the over-optimistic or extremely-optimistic lines.

By taking Big Trend's Acceleration Bands into account, investors can take profit when it pullbacks after breaking through the upper band, or stop loss when it re-bounces after breaking through the lower band.

We have conducted an empirical study by collecting data from 2016/01/01 to 2016/07/08 on five cases of transactions, including Vanguard Total Stock Market ETF

(VTI), iShares MSCI ACWI (ACWI), iShares MSCI Russia Capped (ERUS), iShares MSCI Brazil Capped (EWZ), and Yuanta/P-shares Taiwan Top 50 ETF (0050.TW). The derived average ROI is nearly 26.75%, which is higher than the 4.46% performance of S&P 500.

The performance calculations for these tests are listed in Table 1. Some examples with critical points are listed in Figures 5 to 24 to illustrate our strategy. Each two figures show a five line stave models accompanied with the Big Trend illustrations in these markets.

Table 1: An empirical study by collecting data from 2016/01/01 to 2016/07/08 on five cases of transactions. The derived average ROI is nearly 26.75%, which is higher than the 4.46% performance of S&P 500.

Stock Symbol	Index name	Buy Date	Buying Price	Sell Date	Selling Price	ROI
VTI	Vanguard Total Stock Market ETF	2016/1/22	94.8	2016/7/8	108.8	14.77%
ACWI	iShares MSCI ACWI Index Fund	2016/1/22	53.3	2016/7/8	56.5	10.15%
ERUS	iShares MSCI Russia Capped Index	2016/1/26	10	2016/4/21	13.7	37%
EWZ	iShares MSCI Brazil Capped Index	2016/1/27	18	2016/5/6	28	55.56%
0050.TW	Taiwan Top 50 ETF	2016/1/22	56.5	2016/7/7	65.7	16.28%
Avg.						26.75%
S&P 500	S&P 500	2016/1/4	2038	2016/7/8	2129	4.46%
Excess Return						22.29%

## 5. Conclusion

As indicated by Ellis (2013), it is not an easy task to beat the market. Therefore, professional investors now tend to adjust their performance along the market through various ETFs. However, the timing of buying and selling is also important to gain reasonable profit. Bernstein (2000) suggests conducting buying or selling in relative low or high price, respectively. Therefore, we have proposed a five line stave model and use it to construct a decision support system to help investors make critical decision on buying or selling.

By combining Big Trend's Acceleration Bands with 5LSM, investors can take profit when it pullbacks after breaking through the upper band, or stop loss when it re-bounces after breaking through the lower band.

To verify the performance, we have conducted an empirical study by collecting data from 2016/01/01 to 2016/07/08 on five cases of transactions, including Vanguard Total Stock Market ETF (VTI), iShares MSCI ACWI (ACWI), iShares MSCI Russia Capped (ERUS), iShares MSCI Brazil Capped (EWZ), and Yuanta/P-shares Taiwan Top 50 ETF (0050.TW). The derived average ROI is nearly 26.75%, which is higher than the 4.46% performance of S&P 500.

In the future, we will conduct more experiments on different kind of markets, including emerging and mature markets, and compare their differences, which can hopefully help investors to conduct their decisions more precisely and obtain more expected profits.

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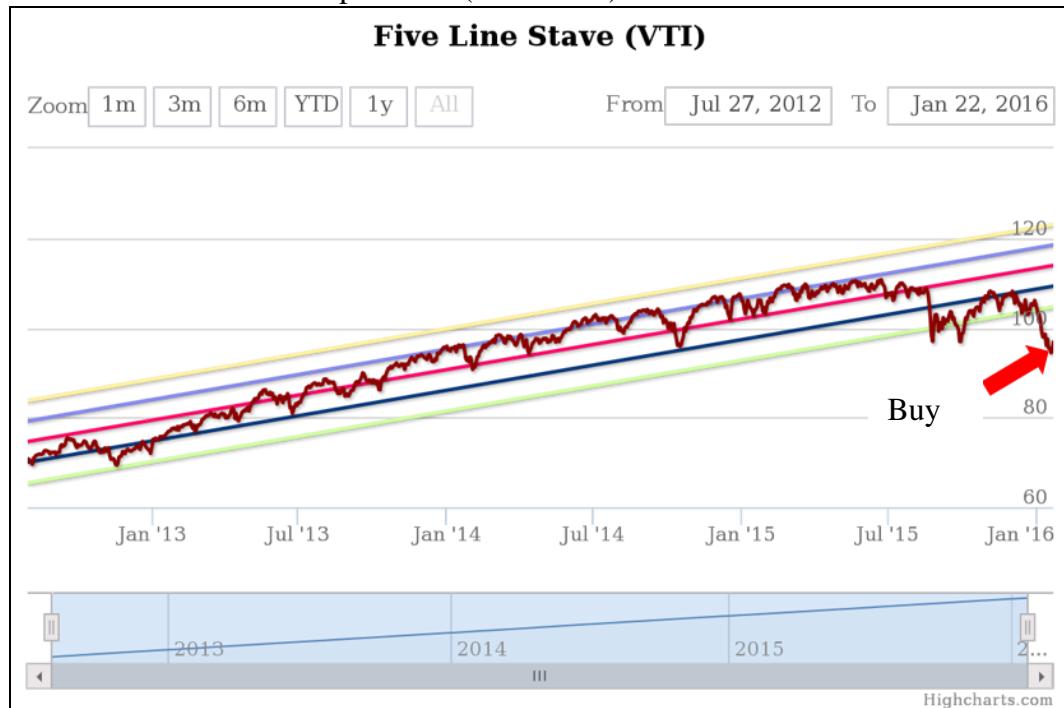


Figure 5. Five Line Stave of Vanguard Total Stock Market ETF from 2016/1/22

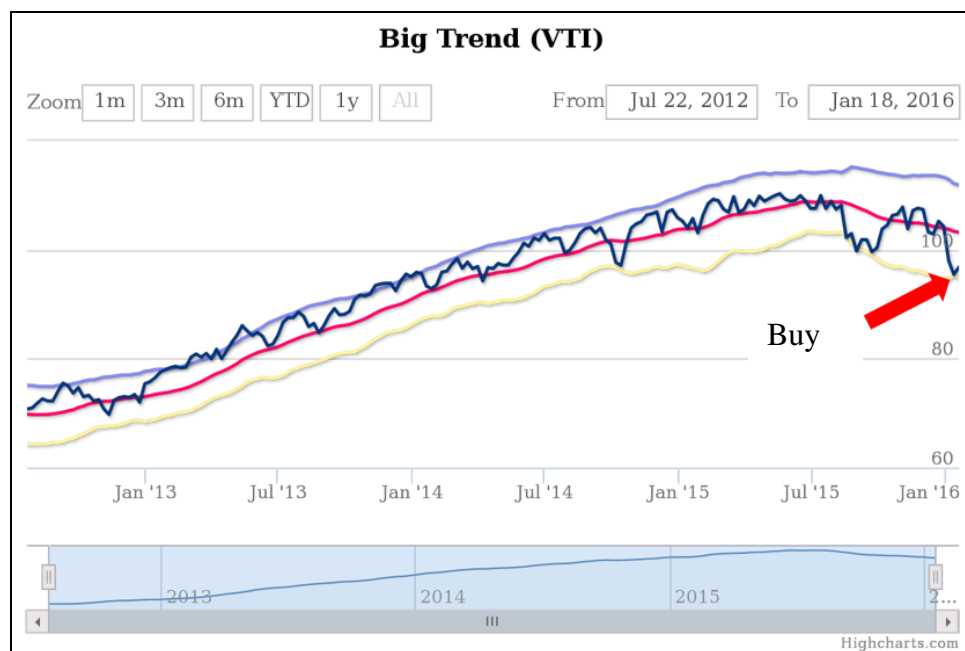


Figure 6. Big Trend of Vanguard Total Stock Market ETF from 2016/1/18

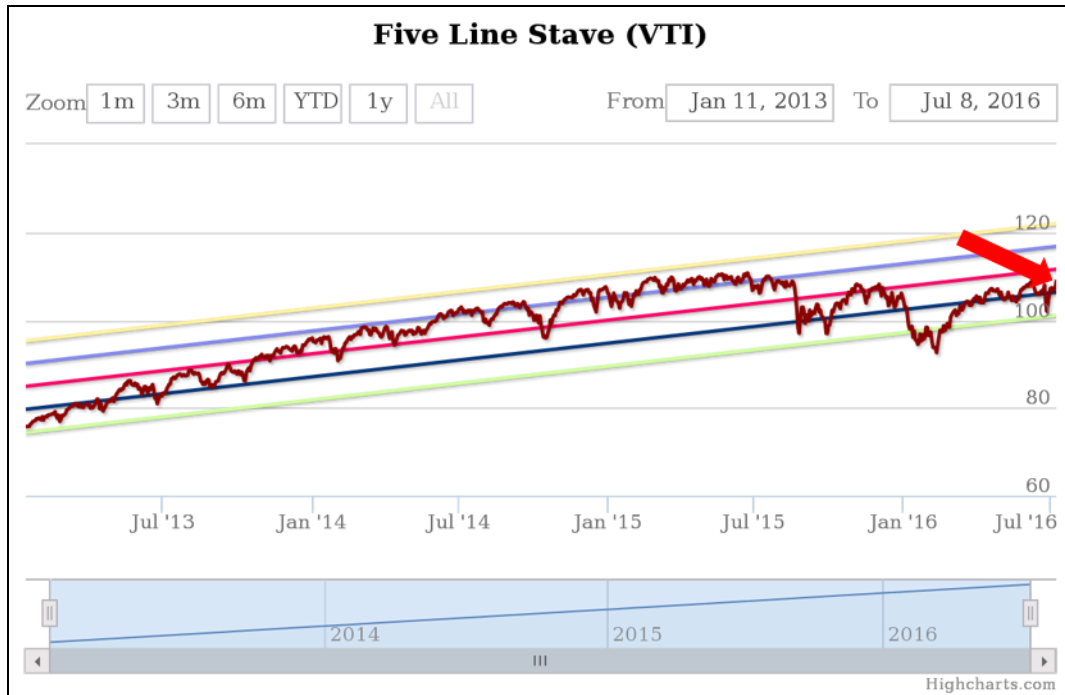


Figure 7. Five Line Stave of Vanguard Total Stock Market ETF from 2016/7/8

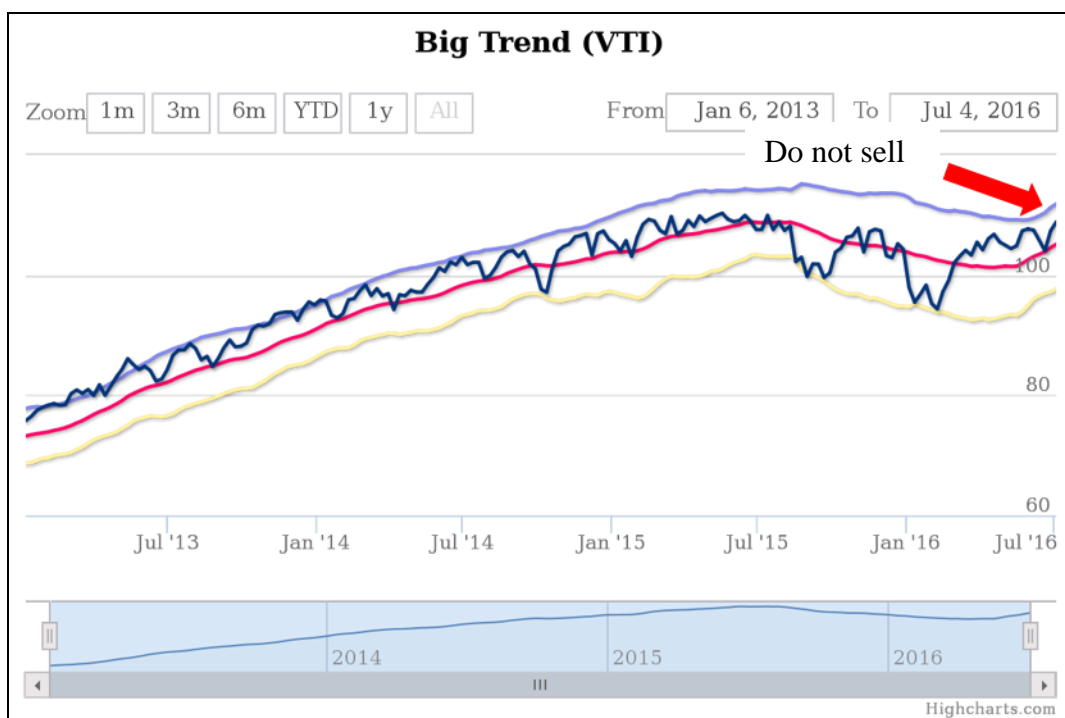


Figure 8. Big Trend of Vanguard Total Stock Market ETF from 2016/7/4



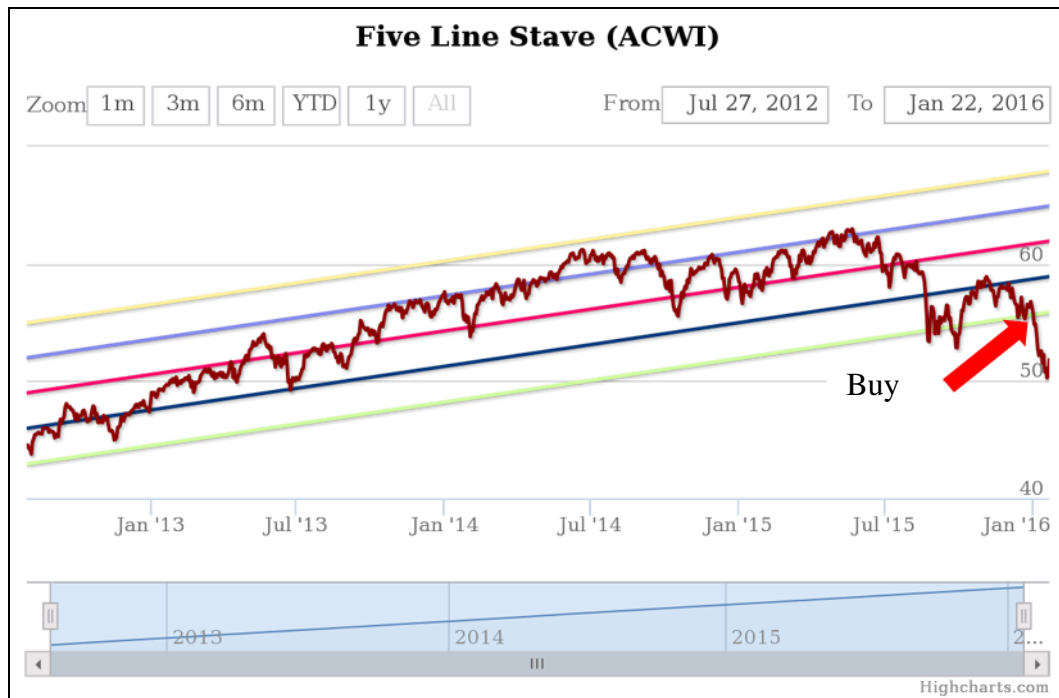


Figure 9. Five Line Stave of iShares MSCI ACWI Index from 2016/1/22

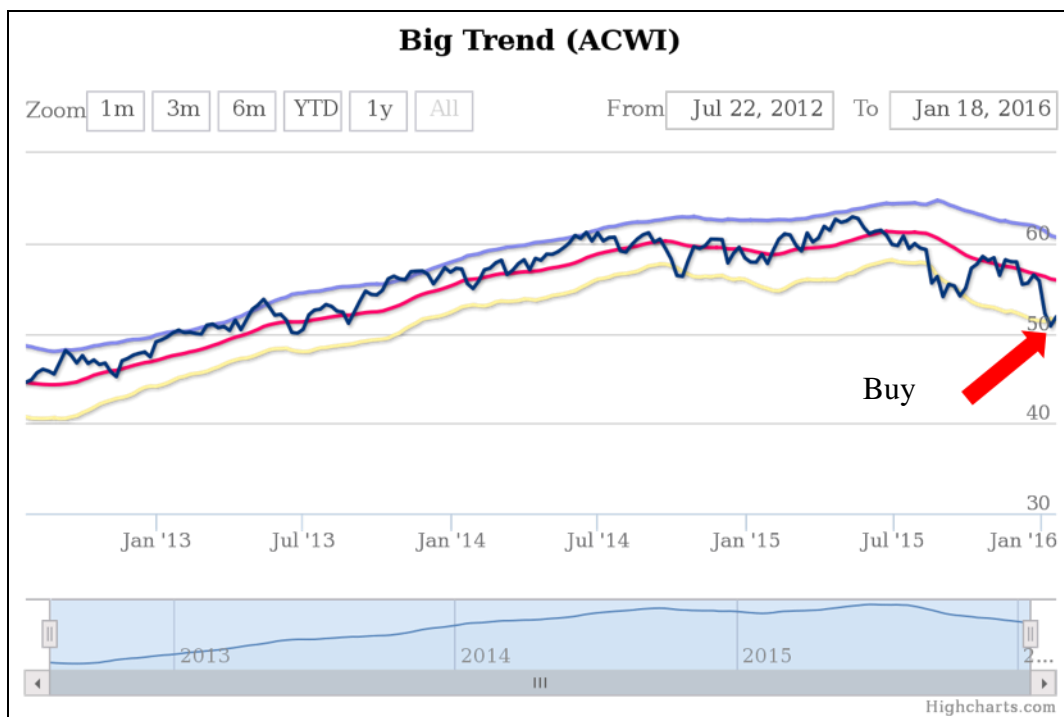


Figure 10. Big Trend of iShares MSCI ACWI Index from 2016/1/18



Figure 11. Five Line Stave of iShares MSCI ACWI Index from 2016/7/8

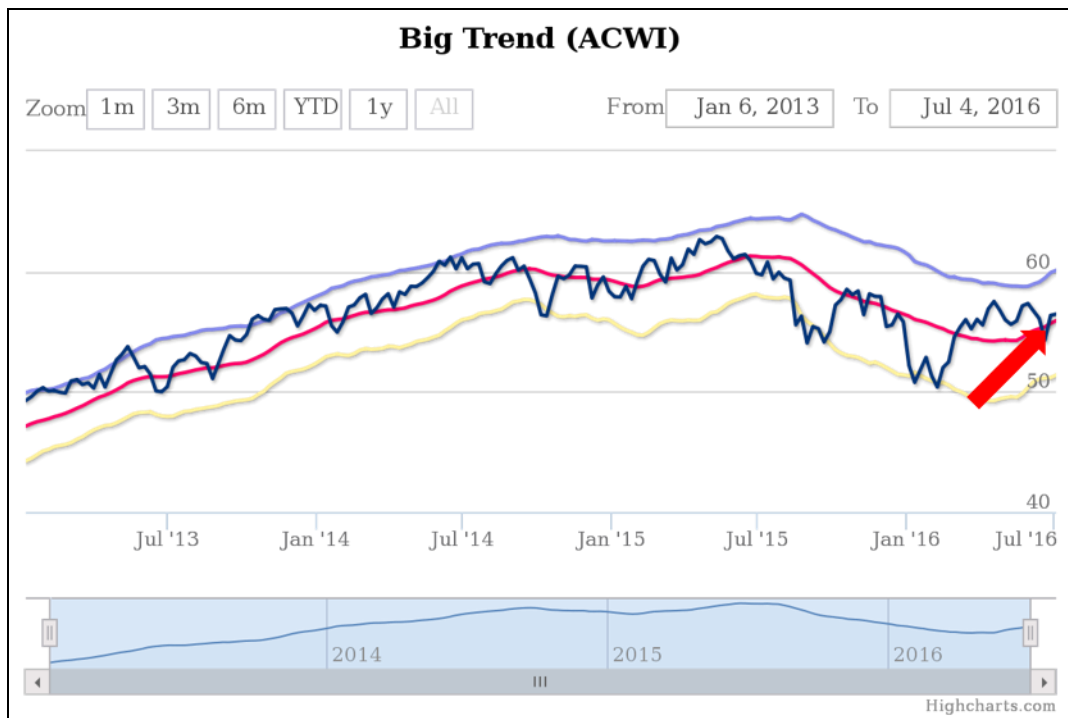


Figure 12. Big Trend of iShares MSCI ACWI Index from 2016/7/8

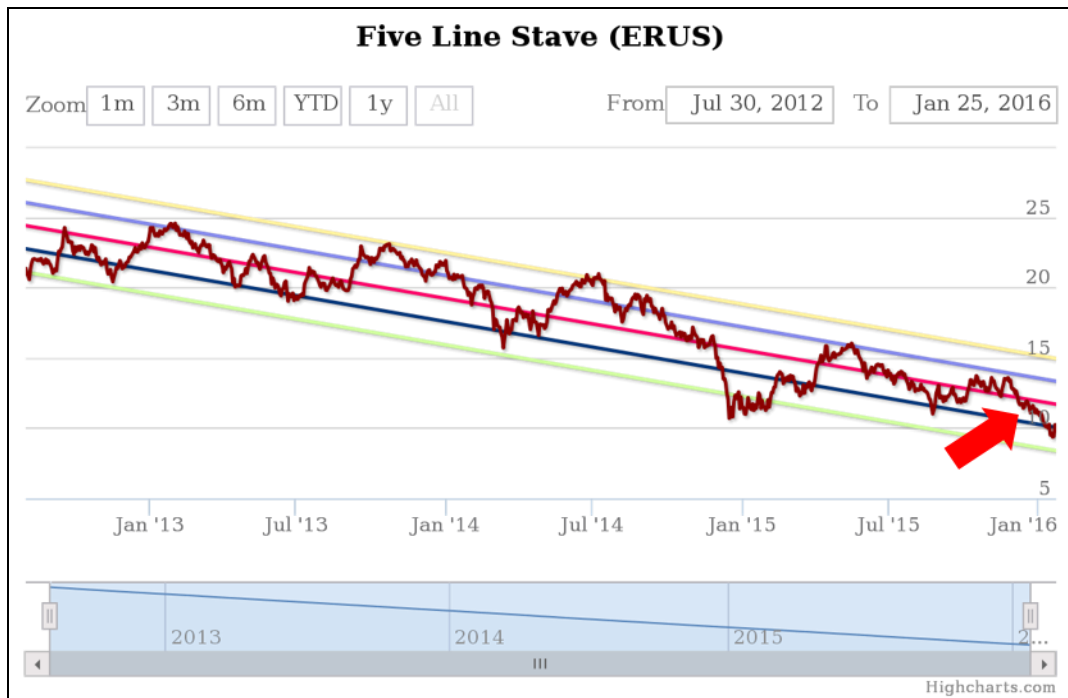


Figure 13. Five Line Stave of iShares MSCI Russia Capped Index from 2016/1/25

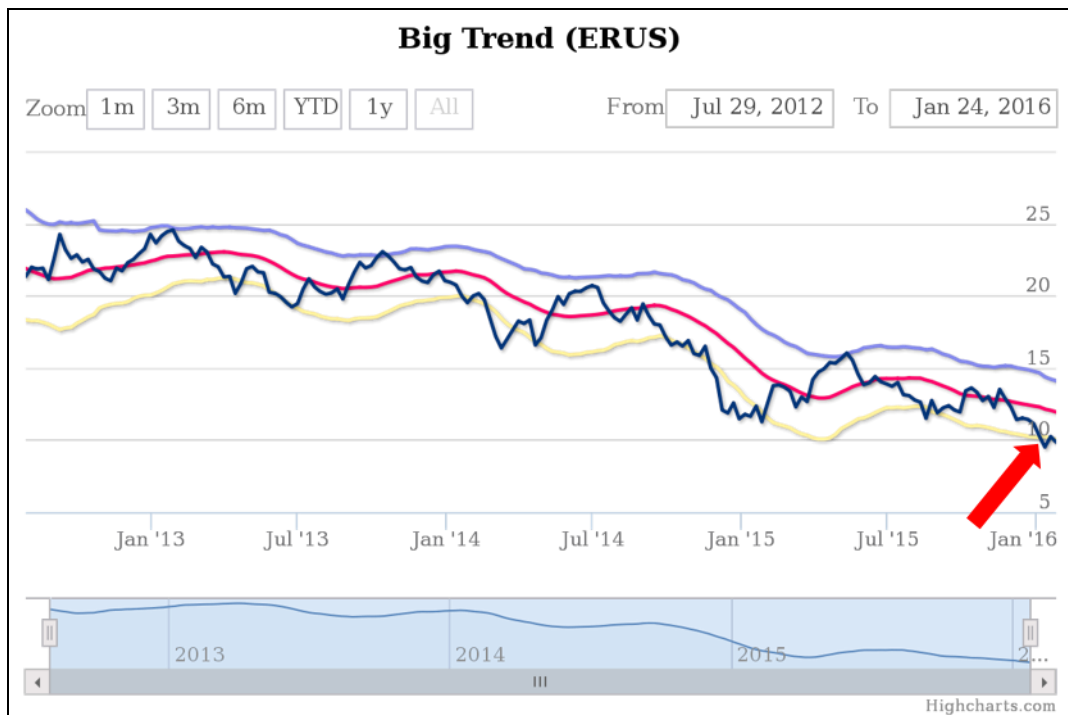


Figure 14. Big Trend of iShares MSCI Russia Capped Index from 2016/1/24

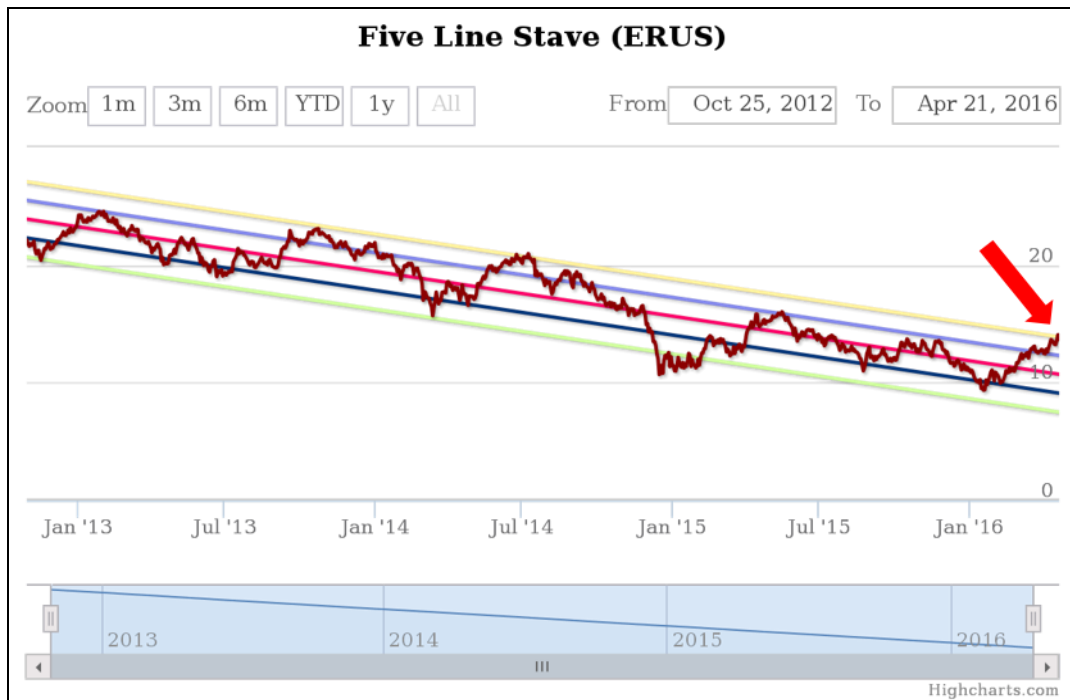


Figure 15. Five Line Stave of iShares MSCI Russia Capped Index from 2016/4/21

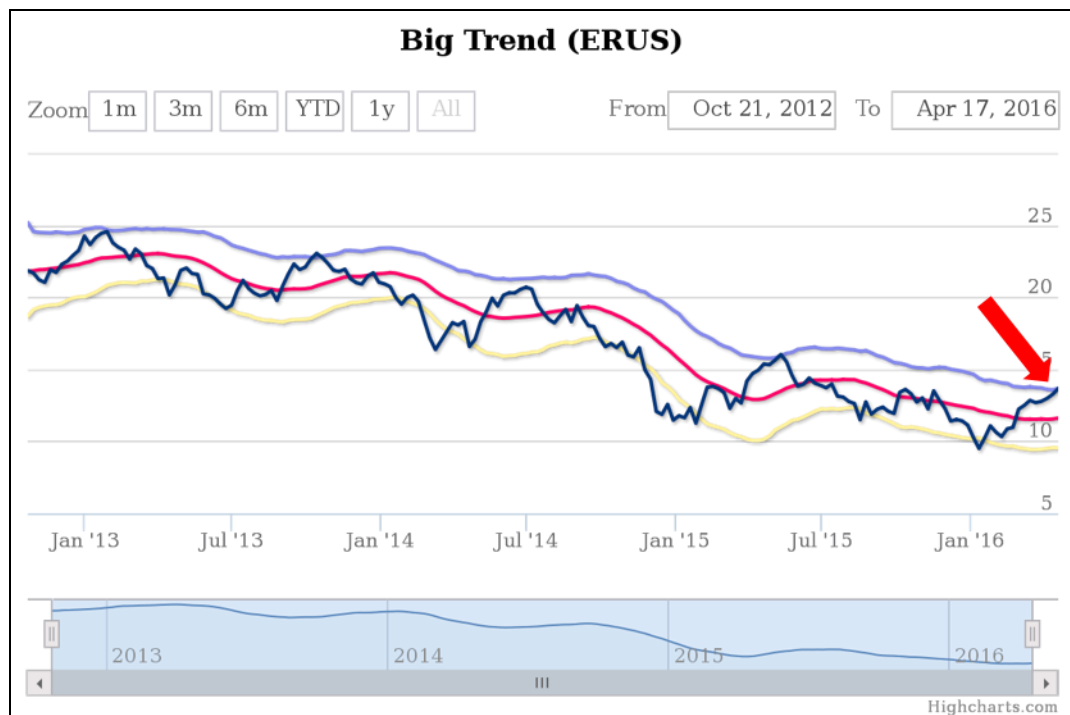


Figure 16. Big Trend of iShares MSCI Russia Capped Index from 2016/4/17



Figure 17. Five Line Stave of iShares MSCI Brazil Capped Index from 2016/1/27



Figure 18. Big Trend of iShares MSCI Brazil Capped Index from 2016/1/24

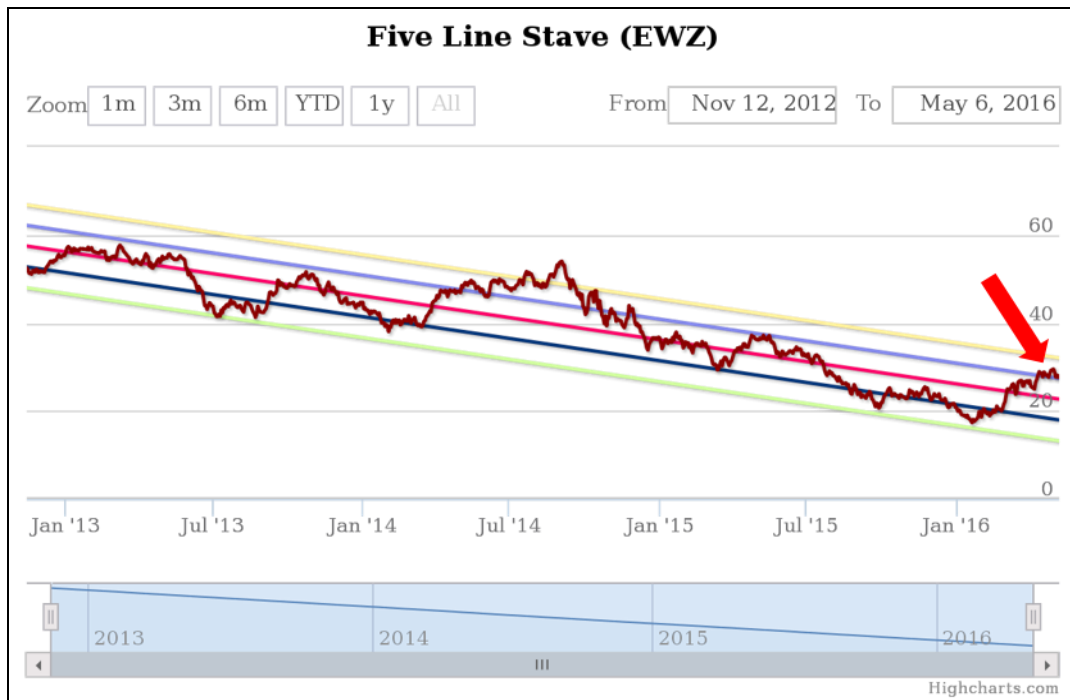


Figure 19. Five Line Stave of iShares MSCI Brazil Capped Index from 2016/5/6

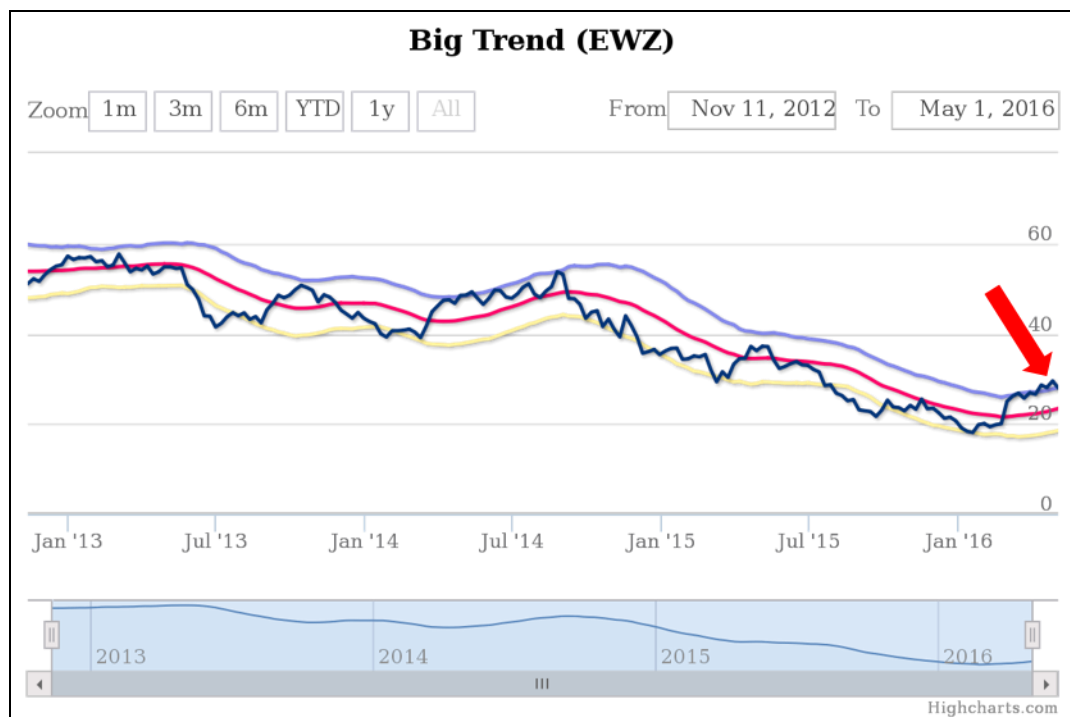


Figure 20. Big Trend of iShares MSCI Brazil Capped Index from 2016/5/1



Figure 21. Five Line Stave of Taiwan Top 50 ETF from 2016/1/22

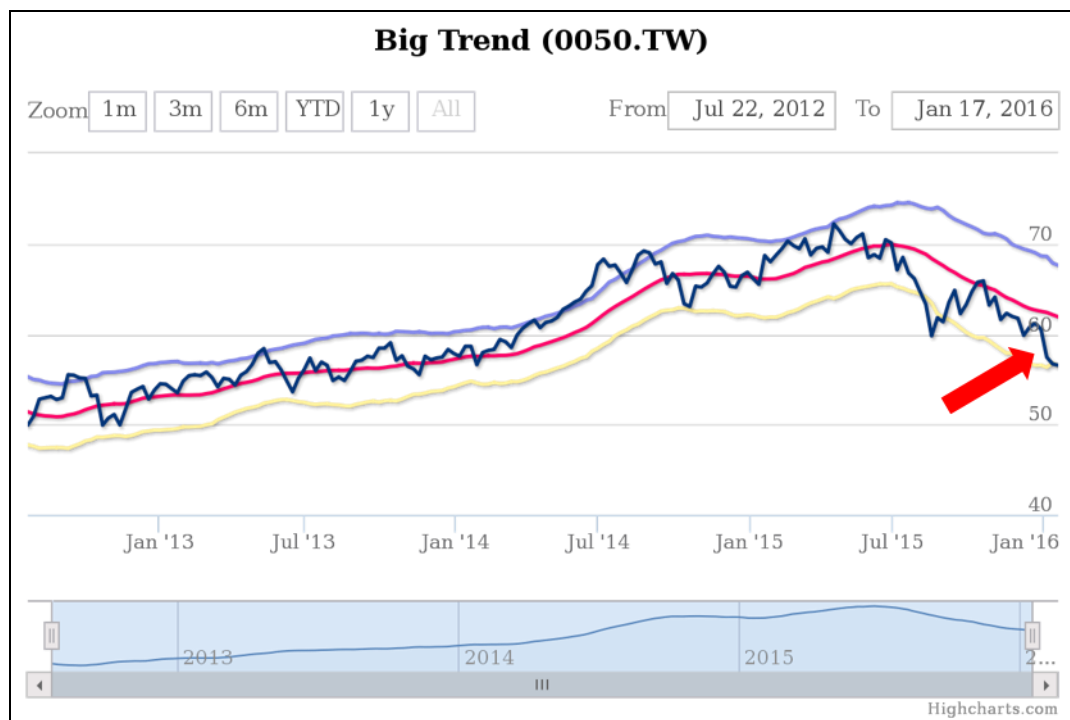


Figure 22. Big Trend of Taiwan Top 50 ETFx from 2016/1/17



Figure 23. Five Line Stave of Taiwan Top 50 ETF from 2016/7/7

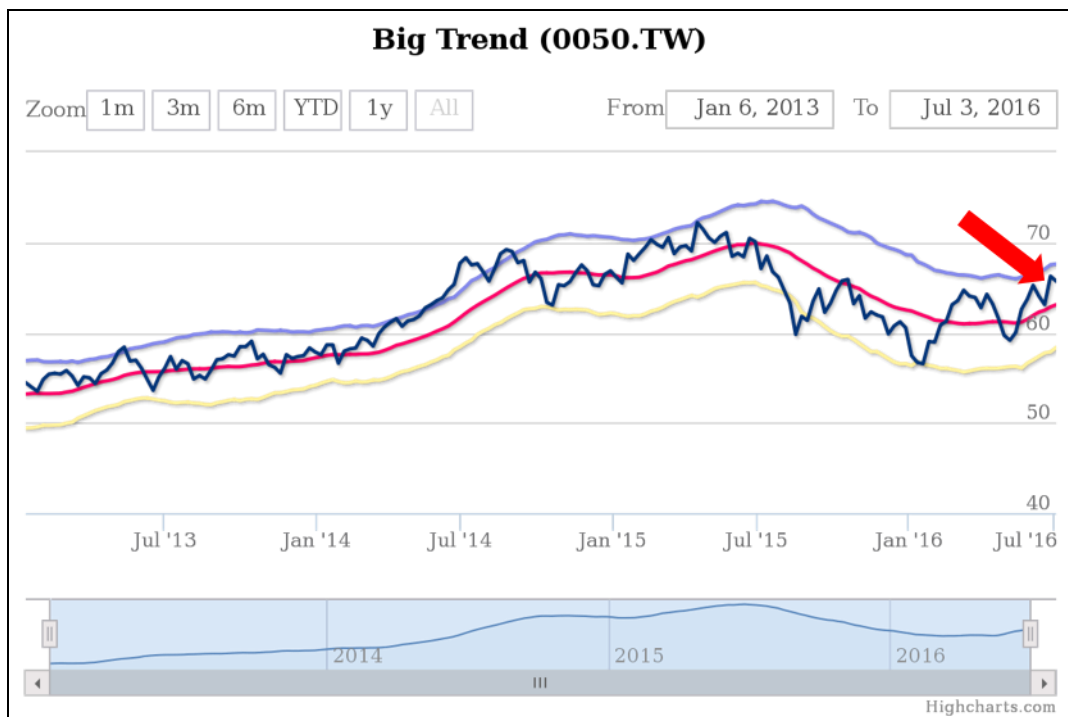


Figure 24. Big Trend of Taiwan Top 50 ETF from 2016/7/3