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## **Long Term Trend Analysis in the Capital Market – The Case of Serbia**

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**Abstract:** The paper explores the possibility of making investment decisions in emerging markets by using the trend analysis method on a particular example of the capital market in Serbia. The authors, starting from the common features of technical analysis, have analysed the common share index value in the capital market in Serbia, in the Belgrade Stock Exchange – Belexline from 1 March 2006 to 31 March 2009, by the usage of two moving averages method - Moving Average Convergence Divergence (MACD): an intermediate term of 50 days and a long-term one of 100 days. The above mentioned moving averages identify the establishment of a trend, the cessation of the existing one, a change and an establishment of the new one.

The capital market in Serbia had two distinctive long-term trends within the above mentioned observed period of time. The method of two moving averages in combination with the MACD indicator analysis gave quite reliable signals of weakening and change of the long-term trend direction. Analysis of the long-term trend has not been considered for the period from 2009 to date because the market during this period was illiquid with little trading volume, while some stocks that are entered in the Belexline are not more subject of trade.

**Keywords:** capital market, common index of the Belgrade Stock Exchange - Belexline, trend, moving averages, MACD.

**JEL classification codes:** C22, C52, G10, P20

## 1. Technical analysis

Technical analysis studies the movement of share prices, market index (or some other financial instrument) in the past for the projections of the price movement in the future. A term “price movement” is often used instead of a term “market movement” to indicate that despite the prices, the trading volume and interests as an integral part of market analysis are also analysed. Technical analysis is based on the assumption that the price movements in the past can serve for drawing conclusions on the price movement in the future.

Charles Dow is considered to be the founder of the technical analysis. Towards the end of the 19<sup>th</sup> century he established the basic assumptions which the technical analysis is based upon. His company Dow Jones was the first one to follow the price movement systematically. Although Charles Dow never authored a book about his theory, the series of his editorial articles that were published in the Wall Street Journal laid the foundation for a contemporary technical analysis at the dawn of the 20<sup>th</sup> century. The above mentioned foundation has not lost its significance even today despite the appearance of a modern computer technology with numerous new and even more complex technical indicators. There are three basic assumptions which the technical analysis is based upon (Bishop & Dixon, 1992, p. 88-89):

- market trends are taking into account all available information
- prices move in trends
- the past is repeating itself

The basis of technical analysis lies in the assumption that *the market takes into account all the information available and evaluates all events that are relevant*, as well. It means, that all the factors that influence the prices (macroeconomic, political, fundamental ones, investors' expectations, etc.) have already been included in it. From all the above mentioned it can be concluded that for the future price movement it is sufficient to study the price movement that occurred in the past and not the reasons why the prices fall or rise. It is believed that the price movement is the result of changes in supply and demand. If demand is greater than supply, the prices go up, and if supply is greater than demand then the prices go down. The reasons why a change in supply and demand occurs are not of any significance to technical analysis, however, a graphical representation of the price changes in the past and their proper interpretation in the present are of great importance to it. On the basis of the price graphic representation analysis and other technical indexes (indicators), it can be concluded and anticipated in which direction the prices will move in the future (Reilly & Brown, 2003, p. 630).

Technical analysis assumes that the stock prices, index values or financial instrument move in trends and not incidentally. The basis of this assumption is that prices follow certain rules that repeat themselves in cycles. *Prices move in a direction of an established trend until the trend changes* (Lofthouse, 2002, p. 266). Once established, the trend will probably continue its movement before it comes to its change again. In fact, this is the first of Sir Isaac Newton's laws of motion adapted to the market. It means that the stock prices movement continue in the same direction until the trend changes.

The basic assumption is that many patterns that appeared in the price graphic representations in the past will repeat themselves in the future as well, i.e. *the future is a repetition of the past*. During the past one hundred years, numerous patterns that constantly repeat themselves have been established and classified by the pattern analysis of the price graphic representations. The patterns reveal the market psychology that can be based on optimism, i.e. price growth expectation, or pessimism, i.e. price decrease expectation. The patterns are a reflection of psychological behaviour in the markets that do not have a tendency to change. It is considered that the patterns will function in the future in the same way they did in the past.

The technical analysis value is in its applicability today. It is applied in different markets for different financial instruments and in different periods of time. The principles of technical analysis do not depend on the market, field, company or time horizon of an analysis. The basic starting point in the technical analysis is a trend analysis and that is why this paper starts its analysis from the Belgrade stock market common share index trending, the BELEXline.

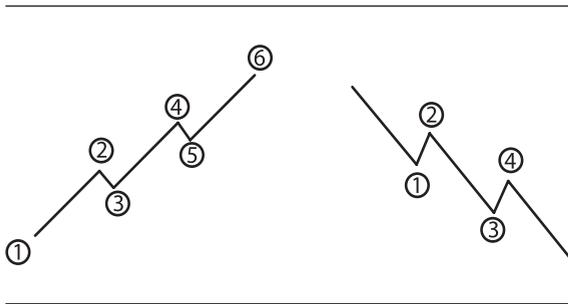
## 2. A Trend Concept

A trend concept is one of the most important principles in technical analysis. *A trend is a direction in which the share price or index value moves*. That motion is not in a straight line but it is characterized by consecutive up and down (zigzag) movements during which the peaks and bottoms are being formed. The direction of those peaks and nadirs makes the trend. Depending on whether the above mentioned peaks or nadirs move upward or downward, a movement direction is spotted. An upward trend is characterized by a series of peaks and nadirs that have consecutive greater values. A downward trend has a range of peaks and nadirs with lower values, which is shown in Figure 1. A period without a trend or a non-trend is a period (also called a horizontal trend) in which the peaks and nadirs are parallel to the horizon or to a baseline and within a limited range.

Irrespective of the direction of a trend in the market, Dow distinguishes three types of trends:

- primary (long-term)
- secondary (intermediate one)
- minor (insignificant or short-term one).

**Figure 1: Ascending and descending trend**



Source: Investopedia

The primary trend is compared with high and ebb-tide of the sea, a secondary one with the waves of the one and a minor one with a ripple of the sea. The primary trend shows the main motion that usually takes a year or more. During the primary trend certain price corrections occur that are opposite to the primary (main) trend movement. The above men-

tioned movement is called a secondary or intermediate trend and it lasts from several weeks to several months. After the above mentioned correction, the market continues its movement in the main trend direction. The least oscillations that represent daily price fluctuations and the secondary trend correction are called minor trends or changes of the day and they can move in the same or opposite direction to the primary trend.

Depending on the primary trend direction of movement on ascending (*bull*) or descending (*bear*) trend is defined. The technical analysis recommends different strategies depending on the current trend. The main assumption of the technical analysis is that when an ascending trend occurs, buying or “long position” taking is recommended, but when the opposite descending trend occurs, selling or “short position” taking is recommended.

According to the Dow’s theory, a long-term ascending (primary) trend consists of three phases:

- accumulation phase
- public participation phase and
- distribution phase.

The first phase of an ascending trend is called the *accumulation phase* during which informed investors enter the market and begin with gradual purchases. This phase is preceded by a descending trend during which everything seems pessimistic and most of the participants withdraw from the market, expecting further drop in the prices. Values are underestimated in the market, negative news included in the price, pessimism present in the one as well as the aversion to the risk which represents a favourable opportunity for the purchase. It is usually said that “the intelligent money is the first one to enter the market” at this phase.

After the first phase, accumulation, during which the informed investors have positioned themselves in accordance with their expectations, the second one begins - the *public participation phase*. In this phase, pessimism dissipates due to positive announcements (revenue growth, profit, etc.). At this stage, a large number of participants in the market notice that the descending trend has finished to be replaced by a period of price growth instead. So, as a result of the above mentioned, more and more participants make their investments in the market causing further growth in prices. The above mentioned phase is generally the longest one and leads to the largest growth in prices.

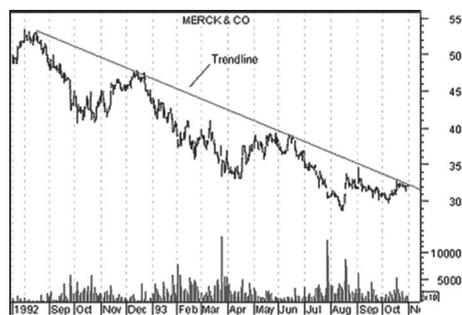
The *distribution phase* means that the market is experiencing an extremely strong trend, the business climate and consumer confidence substantially improve, companies have achieved significantly better financial results, and “an illusion upon an endless trend” has taken over in the market. “The intelligent money” withdraws from the market at this phase, while the beginners with the least experience and knowledge are just entering it, hoping to realize the bearings as they used to be in the past. Only the best news are represented in the public that thus strongly encourage a desire for quick and easy profit with the participants that trade in the market for the first time. Therefore, the steepest price increase usually occurs at this phase, exactly.

In the analysis of a trend the trend lines that point out the existence, direction and strength of a trend are used. An ascending trend line is drawn to join the two adjacent bottoms. According to the ascending trend definition, subsequent bottoms and prices are above the trend line. A descend-

Figure 2: An ascending trend line



Source: Achelis, 2000, p. 23

**Figure 3: A descending trend line**

Source: Achelis, 2000, p. 24

scending trend when the price rebounds from a descending trend line (a rebound is a “sell” signal). In both cases, a price movement in the primary trend direction is expected after the price rebounds from the resistance line.

A trend line has a stronger significance if it retains its direction for a longer period of time. In addition, when a price “rebounds” from the trend line several times, its significance becomes greater. Each “breakthrough” of a trend line is the first signal of a trend weakening and also a warning that the current trend is nearing its end. If a breakthrough occurs more often, the signal becomes more significant.

### 3. Moving averages method

The moving averages method is one of the methods used in the technical analysis and it is included in the methods that follow the trend. The objective of this method is to perceive the main course of the phenomenon and enable the price direction trend review, according to which the current rapid price fluctuations are “conformed”. Moving average (MA) is calculated as a price average at a certain period (for a certain number of days) defined in advance. The term “moving” is used because the last unknown quantity of a price -  $x$ , within certain period of time is taken for each calculation (Radovic, 2009, p. 183). For example, a simple fifty-day long moving average (MA 50) is calculated in the following way: all prices realized within the last fifty days are added and the total is divided by 50 (a number of days within the period). The calculation is repeated for each day so the last price is added to the above mentioned total and the one of 51 days ago is

ing trend line is drawn in a descending trend by joining the first two peaks in a row. The prices in the descending trend are moving below the descending trend line.

The descending trend line represents a “resistance” since the selling line overcomes the purchase one at that level and the price decreases, i.e. “rebounds” from the trend line. Purchase is usually recommended in a descending trend when the price rebounds from the ascending trend line (a rebound is a “buy” signal), i.e. the sale in a de-

subtracted from it. The moving average calculated in this way is called the simple one because each price within the observed period is given an equal significance in the process of calculation. Apart from the simple one, weighted and exponential moving averages that place more weight on recent prices are applied as well.

The length of a period for which the moving average is calculated depends on the time period of investment. A short-term period is the one that lasts for 10 or 20 days, an intermediate one is the one that most often lasts for 50 days and a long-term period lasts for 100 or 200 days. Shorter moving averages are usually more sensitive and provide early signals, due to which they are applied to a shorter period of investment. Longer moving averages are less sensitive to short-term price changes, due to which they are applied to long-term analysis. The authors use a daily moving averages analysis here due to the Belgrade stock market trading data availability.

Moving averages are applied to identify a signal of a trend ending or the beginning of another trend establishment. Moving averages do not predict a trend but only confirm the market direction.

There are three ways of a trend direction determination. *The first way* is to determine a trend based upon the moving average direction. If the moving average increases the trend is considered to be an ascending one. If the moving average decreases, the trend is considered to be a descending one. *The second way* is based upon the mutual price in relation to the moving average. In an ascending trend a price is above the moving average while in a descending one a price is below the moving average. *The third way* uses the ratio of a short and long moving average. If the short moving average is above the longer one, the trend is considered to be an ascending one, and if it is below the one, the trend is considered to be a descending one.

Moving averages provide signals for investment decisions. They represent the levels of resistance or support depending on whether the market trend is an ascending or a descending one. A moving average price crossover i.e. breaking through the resistance or support is considered to be the signal for buying or selling. A crossover of the two moving averages at different time periods provides rather strong signals for an investment. When a short moving average crosses over a longer one in an upward direction, the buy signal arises. In the case of a short moving average crossing over of the longer one, in a downward direction, the sell signal arises. A change of a moving average direction indicates the qualitative changes in an investor's mood (Dugalic, 2001, p. 87).

#### 4. BELEXline moving average index analysis

The common share index of the Belgrade stock market, BELEXline, is the main benchmark index of the Belgrade stock market (BSM). It was established with an objective to represent the movement of share prices, traded in the BSM in the most real and precise way. The BELEXline has been turned into account since 30<sup>th</sup> September, 2004 with a base index value of 1000. Originally, the methodology of index calculation was based upon the total market capitalization, and then the index calculation has been improved by the weighted market capitalization of the shares that are in free circulation (free float). In that way the accuracy of market processes description, the quality of an index itself, as well as the availability of the information to the public investors has been improved. The BELEXline index is designed in a way that describes the overall market movements in the most faithful way that can also be the basis for the structural products and their derivatives creation in a domestic as well as foreign market. The structure of an index basket includes the shares of 100 companies that are traded with at the Belgrade stock market.

**Table 1: BELEXline index values**

Date	Belexline	index change	% of a change
01.03.2006.	2062,59		
03.05.2007.	5007,34	+ 2944,75	+ 142,8
31.03.2009.	844,36	- 4162,99	- 83,3

Source: Belgrade stock market

The BELEXline index value amounted to 2062,59 on 1 March 2006 and 844,36 on 31 March 2009. The maximum index value of 5007,34 was reached on 3 May 2007 which indicates that the observed period was extremely volatile at the time.

A diagram of BELEXline index value and simple moving averages of BELEXline index for an intermediate period of 50 days (MA 50) and a long-term period of 100 days (MA 100) in the period from 1 March 2006 to 31 March 2009 are shown in Figure 4. It is noticed that in the first period until 3 May 2007 the market was in a strong ascending trend when the index value reached the maximum value of 5007,34 points on 3 May 2007. Until 16 August 2007, during the above mentioned period, the index value was above its MA 100, which means that the market was in its long-term ascending trend. Starting from 20 July 2006 to 4 June 2007, the index value was above its intermediate moving average period of 50 days.

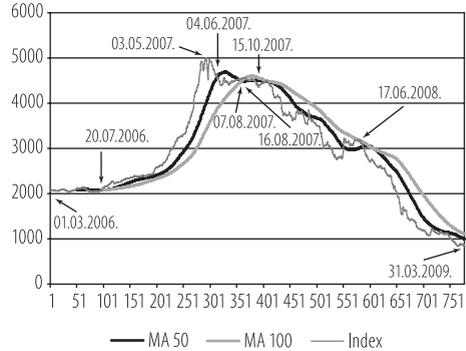
Since the beginning of December 2006, a sudden and rather significant increase of both moving averages MA 50 and MA 100 slopes can be noticed, which is typical for an ascending trend's final phase during which an excessive optimism dominates the market.

The first index crossover with its MA 50 occurred on 4 June 2007 and it amounted to 4569 at the BELEXline index value. The crossover occurred under an acute angle which pointed to the first cessation of the past long-term ascending trend and then even indicated a possible change of a long term trend. After that, the index approached its MA 50 and started oscillating around it. The above mentioned oscillation is also typical for the periods after the maximum index value is reached in the market. On 7 August 2007, a moving average MA 50 cut across the moving average MA 100 which can be explained by the change and a descending trend establishment that followed.

A long-term trend is established on the basis of the index value mutual position in relation to its long-term moving average. The establishment of a new descending long-term trend is the crossover of the BELEXline index value with its moving average MA 100 which amounted to 4543 at the BELEXline index value on 16 August 2007. The above mentioned crossover lasted for 7 days only after the crossover of the two moving averages MA 50 and MA 100. The crossovers in the short period of time indicated the long-term descending trend establishment.

From 16 August 2007 to 31 March 2009, as of the crossover of a long-term MA 100 line, the BELEXline index was below the long-term trend line. It means that within that period, the market was in the long-term descending trend all the time. However, during that same period, certain intermediate corrections also occurred, i.e. the periodical recovery and the index increase. The first correction occurred already on 15 October 2007 when the index "rebounded" from its MA 100 again, which was also typical and which represented the "testing" of the resistance line after which a long-term and sharp fall followed. The next testing

**Figure 4: BELEXline MA 50 and MA 100, 1 March 2006 - 31 March 2009**



Source: The authors' calculations made on the basis of the BELEXline index value taken over from the Belgrade stock market website.

and rebounding from the MA 100 trend line, which represented a resistance, occurred on 17 June 2008. After that, a further index fall came again.

On 31 March, 2009 a relative BELEXline index value position of 844,36, in relation to its intermediate moving average MA 50 of 994 and a long-term moving average MA 100 of 1100, indicated that the market was still in a descending long-term trend.

## 5. Trend following indicator - Moving Average Convergence Divergence – MACD

The Moving Average Convergence and Divergence (MACD), represents a trend following indicator. It is calculated as the difference between the shorter and longer exponential moving averages of 12 and 26 days, respectively.

The MACD is shown in a separate graph that is being analysed together with another graph in which the basic value (an index value in our case) with its moving averages is being presented. The MACD values oscillate around the “zero” line which gives them the features of an oscillator. When the shorter moving average of 12 days is above the longer one of 26 days, the MACD has positive values i.e. it is above the “zero” line. On the other hand, when the shorter moving average is below the longer one i.e. when it is below the “zero” line, the MACD has negative values. A mutual ratio of the shorter and longer moving average indicates the trend direction of movement which is an ascending one if the MACD is positive i.e. a descending one if the MACD is negative. The MACD measures the moving averages speed of change due to which it has the characteristics of a momentum indicator.

The MACD graph shows the moving average of 9 days as well. It is a signal line that is used as a “trigger” line. The crossing of the MACD line with the “trigger” line denotes the purchase (“buy”) or selling (“sell”) signal. The “buy” signal has a stronger significance if the MACD line cuts through the signal line in an upward direction, while both lines are far away, below the “zero” line. The “sell” signal has a stronger significance if the MACD line cuts through the signal line in a downward direction while both lines are way above the “zero” line.

Divergence is a phenomenon where the two curve lines represented in the graph move in the opposite directions. The above mentioned phenomenon of divergence represents a very important signal in the technical analysis. It is observed between the graphic representation of the price (index) and some of the indica-

tors, the MACD line, in this case. It can be positive or negative one. For instance, if the MACD line starts to rise while the prices are still declining then it is the positive divergence and the fall of the prices is expected to end soon. A negative divergence occurs when the MACD line begins to decline while the price still increases. Then a growth in the prices is expected to end soon. The appearance of divergence phenomenon is not so common, however, it is considered to be one of the most reliable signals in the technical analysis that precede the higher growth or decline of the prices.

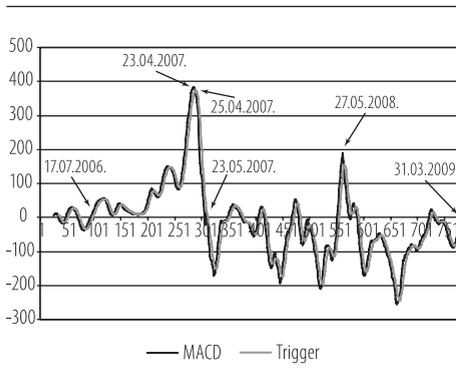
## 6. The MACD Belexline analysis from 1 March 2006 - 31 March 2009

The MACD values have been calculated on the basis of the Belexline index value from 1<sup>st</sup> March, 2006 to 31<sup>st</sup> March, 2009 (Belgrade stock market), and its moving averages of 12 and 26 days. The MACD analysis has been complementary to the two moving averages one. The MACD oscillation in the current trend, at the time, indicated the slowing down i.e. weakening of the trend or its acceleration and strengthening of the one, even. Its signals represent the first signals and warnings that were yet to be confirmed by the trend signals which are considered to be more important ones. The MACD and signal (trigger) lines diagram is represented in Figure 5.

From 17 July 2006 to 23 May 2007, the MACD had a positive value which confirms that the market was in an ascending trend. In Figure 6, it can be noticed that the MACD line reached its extreme value, realized on 23 April 2007, when the Belexline index had a value of 4812,9. The extreme value of the MACD indicated that the market was overheated, i.e. that the optimism reached its peak after which the trend stagnation followed. The crossing of the MACD line with the signal line with its index volume of 4714,09 that occurred on 25 April 2007, represented a serious signal of the growth cessation. It is known that the MACD signal is more significant if it is further away from the "zero" line. The second signal is the crossing of the MACD and the "zero" line that occurred on 23 May 2007, when the index value was 4761,81. It is the moment that indicates the occurrence of the 12- and 26-day moving average lines cross-section and the change of their relative positions after that.

After 23 May 2007, the MACD had dominantly negative values which indicated a descending, downward trend. As the time passed, it was also noticed that its bottoms had more and more negative values which gave basic grounds for the assumption of the established downward trend continuation. Occasional MACD positive values that were occurring in much shorter periods of time, pointed out

**Figure 5. The MACD and its trigger from 1 March 2006 to 31 March 2009**



Source: The authors' representation created on the basis of the calculated MACD index value.

A negative MACD value that occurred on 31 March 2009 pointed out that the market was still in a decline and its positive slope indicated that the descending trend would come to its slowing down.

## 7. Research results

By the analysis of the *BELEXline*, the Belgrade stock market common share index trend, its intermediate MA 50 and a long-term MA 100 moving averages and MACD indicator, the signals of the long-term trend weakening and its change have been noticed. The characteristic signals given by MACD in Table 2, index value and moving averages cross-sections, as well as the cross-sections of MA 50 and MA 100 lines are presented in the chronological order of their appearance. In the above mentioned graph, a date of each signal origin is listed along, then the number of day delays in relation to the previous signal, then the *BELEXline* index value on the day of the signal occurrence. The *BELEXline* index decline dynamics is expressed by the absolute index change (*BELEXline* difference) between the current and the previous index value. A corresponding proportional index value reduction is expressed in regard to the corresponding previous signal index value. It is noticed that the MACD signals preceded the signals that were crossing over the trend lines. It is also noticed that the fall index percentage is significantly higher in the first signals in relation to the fall index percentage of the subsequent signals.

shorter periods of consolidation within the downward trend. The MACD signals preceded the signals based upon the crossing over of the trend line. For instance, on 27 May 2008, the MACD reached its maximum value after which it changed its direction sharply, i.e. moving in a downward direction. The change of the MACD direction of movement pointed out the correction weakening and indicated that the MA 100 long-term trend line would represent a strong resistance line. A rebound of the index from his MA 100 followed on 17 June 2008 after which the downward trend continued.

**Table 2: A chronological display of the signal weakening and trend changes and their delay with the corresponding Belexline index values**

	MACD and trigger cross-section	Max. index value	MACD and "zero" cross-section	Index and MA50 cross-section	MA50 and MA100 cross-section	Index and MA 100 cross-section
Date	25.04.07	3.05.07	23.05.07	4.06.07	7.08.07	16.08.07.
Difference of the day		6	15	9	47	7
Index	4714,09	5000,34	4761,82	4569,34	4551,35	4543,04
BELEXlin difference			238,52	192,48	17,99	8,31
% differ.			4,8	4,0	0,4	0,2

Source: The authors' preview according to data from the Belgrade stock market

## 8. Conclusion

The paper analysed the capital market trend in Serbia from 2006 to 2009 confirmed the possibility of the moving averages method applicability during the period as it uses rather simple and homogeneous rules that are easily applied in the conditions of an existing trend. The trend analysis enables investors to succeed in accumulating profit during the ascending trend and sell shares when the stoppage or change of the trend occurs. A prompt identification of early weakening signals, as well as the ones that confirm the change of a trend, enables the investors to be quite successful while making decisions upon their investments. When a market is not in a trend, i.e. when it is in a horizontal one, the above mentioned moving averages method is not possible to apply.

The trend concept analysis and the BELEXline common share index of the two moving averages method from 1 March 2006 to 31 March 2009 pointed out that the stock market in Serbia had two quite distinctive and strong long-term trends within the observed period of time. An ascending trend that existed until the first half of 2007 after which, in a similar way, a strong descending trend of the market supervened. In the first three months of 2009, the BELEXline index kept moving downward in a long-term, descending trend. The paper has confirmed that the signals of the moving averages method are late, which has been a common feature of the trend based methods. This research confirms that the MACD analysis coupled with the moving averages gives a reliable evaluation of a market trending. It has been confirmed that the MACD signals preceded the ones crossing over the trend lines. It has also been noticed that the fall index percentage was significantly higher in the first signals in relation to the one of the subsequent signals.

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