FORECASTING FINANCIAL INDEXES WITH MODEL OF COMPOSITE EVENTS INFLUENCE

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Abstract
In this article we propose the model for the forecast of various financial indexes: stock markets indexes; currency exchange rates; crediting rates. Behaviour of financial indexes depends on psychological sentiments of players (investors, traders) and their inclination to buy or sell financial tools. We have made the supposition that political, economical, financial and other events are preconditions for formation of the future psychological sentiments of players. Therefore, for forecasting financial indexes we estimate influence of all topical events on the future inclination of players to buy or sell. The proposed model calculates the composite influence of events on the basis of estimations of influence direction, influence force, influence time, events importance and confidence to the information about events. The model fulfills the calculations with help of fuzzy integral Sugeno (1972). We have used this model for forecasting indexes of various economical natures: Ukrainian stock index (PFTS); exchange rate EUR/USD; crediting rate KievPrime 1M and quotations of Eurobonds Ukraine 2015. We also have estimated errors and horizons of forecasts.

Keywords: forecasting model; financial index; events influence; fuzzy integral; fuzzy measure

JEL Classification: C63, C65, D81, G11, G14

1. Introduction
The forecasting problem of financial indexes is topical both from the view-point of practice, and from the view-point of the economic theory. On practice the accurate forecast allows to correctly define opening and closing values at trading. The accurate forecast also is the main condition of high profit for investors which invest in securities and the commodities. From the view-point of an economic science, financial indexes are situation indicators in countries economy, internal and external markets. For example, stock indexes reflect investment appeal of the big enterprises and the companies. The indexes behaviour shows health and problems of economy. The prices of commodity markets reflect balance of supply and demand - the main indicator of market economy. As shows Neziri (2009), the credit default swaps can predict financial crises. The accurate forecast of financial indexes is also necessary condition for adequate government decisions concerning effective budgetary planning, production stimulation and determination of rational structure of the state purchases.

In article we accent attention on forecast accuracy and on forecast horizon. Some researchers consider other parameters. For example, they consider operations profitability on the stock exchange which depends also from of some external conditions, regulatory rules and norms. Use of profitability parameter is justified: in some cases even the accurate forecast does not provide operations profitability on the market. However the accurate forecast always is necessary profitability condition.

In article the concept „the financial index” we consider in a broad sense. The behaviour of financial index reflects the situation in complete economic system. In other words, the financial index we consider as one-dimensional projection of this system. For example, such system is the world market of production and consumption of grain. In this case, the wheat price can be considered as financial index. Indexes of stock exchanges, exchange rates, the prices of black and precious metals also can be considered as financial indexes.

The publications analysis in this area has shown that the forecasting problem of financial indexes also is topical in modern researches. Researchers use various methods for the decision of this problem.

Neural networks. Many researchers use neural networks. For example, the research [Lin Chin-Shien, Khan Haider Ali, Huang Chi-Chung, (2002)] analyse the using effectiveness of neural network for prediction of trend direction of stock index. It is shown that the neural network predicts the trend direction in 58 % of cases with forecast horizon „the next day”. The network was tested on 13 well-known indexes. Lawrence Ramon (1997) proposes using the neural network for forecasting the stock prices in the market depending on variables set (fundamental, technical, macroeconomic indicators.
which are grouped in 7 classes). He declares that the neural network provides accuracy of 92 % concerning prediction of movement direction of the price with forecast horizon „on the next day”. Paper [Liu Yong, Yao Xin, (2001)] demonstrates the forecasting results of Hang Seng index by means of an evolutionary neural network. Research [Chen Yuehui, Yang Bo, Ajith Abraham, (2006)] analyses the using of neural trees ensemble with genetic algorithm for the forecast of indexes NASDAQ and S&P. The forecast error with horizon „the next day” averages up to 1 %. Olson Dennis, Mossmanb Charles, 2003 describe the forecast method of Canadian stock return also with using of neural network. Research shows that neural networks win against techniques of logistic regression (logit).


**Artificial intelligence.** Researchers also use the newest techniques of artificial intelligence. Wuthrich B., Cho V., Leung S., Premunetilleke D., Sankaran K., J. Zhang, W. Lam (2007) describe use of technique „data mining” for the forecasting the main stock indexes of Asia, the Europe and America. The technique provides the accumulation and the analysis of texts with experts forecasts in influential financial mass-media. This work declares that forecast accuracy of indexes movement direction with horizon “the next day” amounts from 40 % up to 45 %. We explain the low forecast accuracy by low accuracy of primary forecasts which are used as entrance data. Premunetilleke Desh and Wong Raymond K. (2007) use the technique „data mining” for the forecasting the exchange rates with forecast horizon 2-3 hours.

**Classical techniques of forecasting.** Marshall Ben R., Cahan Rochester H. (2005) investigate the using of popular rules of the technical analysis for forecasting the returns of trading operations on the New Zealand stock market. According to this article, the technical analysis not provides returns in the long horizon.

We can expand the techniques list which are used for the forecasting the financial indexes. However collecting the full techniques list is not the purpose of this research. We wished to pay attention to one common attribute of techniques of forecasting. All these methods use the statistical values of financial indexes and other connected parameters out of the past. The main idea of these methods is the decision of following problem: on the basis of values processing out of the past it is necessary to make the index behaviour forecast in the future. We assume that such problem is not completely correct from the view-point of philosophy of forecasting and behaviour of complex economical systems.

Values of financial index depend on direction and force of many factors (variables) which act at the current time-moment $t$ (see figure 1). These factors determine psychological sentiments and expectations of sellers and buyers on the market. They reflect the objective economic data, political situation and situation in corporative sector. For example, the message about rise of budget deficit causes activity of currency sellers on the market. In other words, the aggregate of factors out of past and present which act at the current time-moment $t$, completely determines value of financial index in this time-moment. Hammoudeh Shawkat, Choi Kyongwook (2005) and Rapach David E., Wohar Mark E., Rangvid Jesper (2004) have investigated the most obvious dependences of financial indexes from these factors. Values of many factors cannot appreciably change at short time interval. Therefore the forecast on the basis of statistical values not very deviates from the real values of index, if only suddenly not appears the new critical factor. However, with time the changes arise in factors aggregate. New factors appear and old factors end the influence (the market forgets the old events). Real trend of index greatly deviate from forecast trend. Consequently we can reduce an error and increase forecast horizon if we shall estimate influences of the past and current factors in the future.
Acknowledgement of this conclusion is the short horizon of the forecast in used techniques though these methods use various mathematical approaches and paradigms for data processing. The short horizon can be sufficient for speculators, but it is insufficient for long-term investments. The reason of short horizon of the forecast consists in fast growth of differences between situations in complex economic system at the time-moment \( t \) and \( t+N \) with increase \( N \). In modern economic systems and in conditions of the global information environment these differences become essential already in 1-2 days. Therefore, use of the statistical information for the accurate forecast with sufficient horizon is inefficient. Only information processing about the influence of forecast factors in the future can provide high accuracy and long horizon of forecast.

2. Idea of the model

Financial and economic mass-media publishes the information messages about events which can influence players' sentiments and financial indexes. These events reflect values of various forecast factors. For example, events is: the publication of macroeconomic indicators, experts opinions or officials opinions, declarations of political and economic intentions, the states actions, using of economic sanctions, news of large corporations and the companies. Following parameters describe events influence on financial indexes.

**Influence direction.** Event can increase or decrease values of financial index. For example, growth of industrial production causes growth of stock indexes and on the contrary. The influence direction answers the question: where the index will move after event publication? In different situations the same event influences differently. For example, the rise of oil-prices produces to quotations fall on the Japanese stock market (growth of export price). But the rise of oil-prices produces to quotations growth on USA stock market (growth of oil-companies incomes).

**Influence force.** Influence force of event reflects influence amplitude. For example, event „Decrease of funds target rate on 0.25 %” has smaller influence, than event „Decrease of funds target rate on 1 %”. Influence force answers the question: how strongly the index will change after event publication? Influence force of event can be measured in discrete scale. For example: „small force”, „greater force”, „very much greater force” and so on.

**Influence time.** Event influence is changeable. Figure 2 demonstrates four time-moments which describe event life cycle.
The form of event life cycle depends from event nature. For example, event which describes publication expectation of the macroeconomic indicator has gradual influence increase in beginning and has quick influence decrease in the publication moment. Event which corresponds to the publication of the macroeconomic indicator has quick influence growth, time interval of influence with full force and gradual influence decrease. Gradual influence increase formalizes process of gradual familiarization with the information about event. Gradual influence decrease formalizes event topicality decrease and decrease of market participants' attention to event. Event can influence financial index right away after publication and also can influence with delay. For example, expectation of the macroeconomic indicator starts to influence 1-2 days before the publication of real value of indicator.

**Confidence to the information about event.** This parameter reflects information properties of event. Mass-media publishes the information about event in messages. Each message has the author and source of the information. The confidence to mass-media, the author and source of the information characterizes confidence to the information about event. The confidence formalizes the certainty level concerning estimation of influence force of event (estimation accuracy of influence force). For example, influence force of event on index can be characterized as „very much greater force”. However the source of the information does not deserve full confidence. It means that the real estimation of influence force of event can differ from the specified. In other words, the estimation of influence force becomes more uncertain.

**Event importance.** Event importance reflects an event influence degree on financial index. In other words, it is dependence force of event and financial index. For example, event „Decrease of funds target rate” practically unambiguously raises stock indexes and, therefore, has high importance. Event „Trade balance level” has smaller influence on stock indexes.

The quantity of information messages about events during one day can amount to five hundred and more. About fifty messages are the most informative. These events directly influence financial indexes. Figure 3 demonstrates events aggregate which influence financial index.

**Figure 2.** Formalization of event life cycle
Thus, the estimation of events aggregate influence on financial index during each time-moment is the forecast of index change force. Forecast basis is the processing of the current information about events which will influence financial index in the future. Here we have the following problem: it is necessary to receive the generalized estimation of joint influence of all events with taking into account of the specified parameters.

3. Mathematical model

We shall designate set of events as: $E = \{e_i, i = 1, \ldots, I\}$. We describe each event by parameters sequence $e_i = \{d_i, a_i, T_i, c_i, p_i\}$, where:

- $d_i$ - is event influence direction, $d_i = \{1, -1\}$, $d_i = 1$ - the increase of index value, $d_i = -1$ - the decrease of index value;
- $a_i$ - is influence force of event, $a_i \in \{1, 2, 3, \ldots, 10\}$, $a_i = 1$ - very small influence force, $a_i = 10$ - large influence force;
- $T_i$ - is event life cycle, $T_i = \{T_1, T_2, T_3, T_4\}$ - according to figure 2;
- $c_i$ - is confidence to information about event, $c_i \in [0; 1]$, $c_i << 1$ - minimal confidence, $c_i = 1$ - maximal confidence;
- $p_i$ - is event importance, $p_i \in [0; 1]$, $p_i << 1$ - minimal importance, $p_i = 1$ - maximal importance.

Expert determines the initial events estimations in terms of this sequence. Model performs two calculations steps for each time-moment. On first step the model calculates the resultant influence force of each event. The model uses for this:

- direction and influence force;
- confidence to information about event;
- position of current time-moment in event life cycle.

On second step the model calculates the composite influence force of all events according to their importance. As result the model calculates the possibility distribution in the kind of membership on influence force axis. This axis also is axis of index change force.

**Step 1.** Calculation of resultant influence force of each event.
Let's define the linguistic variable “influence force” as memberships aggregate on force gradation set:

\[ F = \left\{ \left( f_j, \mu_j(x) \right), j = \{1, 2, 3, \ldots, 21\}, X = \left\{ x_j \right\} \right\}, \]

where \( f_j \) is name of force gradation \( x_j \);
\( \mu_j(x) \) is membership which describes influence force according to \( f_j \);
\( X \) is the set of influence force gradations.

Linguistic variable “influence force” is shown on Figure 4.

![Figure 4. Linguistic variable “influence force”](image)

The step 1 consists of several substeps.

**Step 1.1.** Selection of membership which describes the influence force of event.

We select the pair \( \langle f_j, \mu_j(x) \rangle \) from \( F \) according to direction \( d_i \) and the influence force \( a_i \) of event on financial index:

\[
\forall d_i > 0 : \left( f_j, \mu_j(x) \right), \quad j = a_i
\]
\[
\forall d_i < 0 : \left( f_j, \mu_j(x) \right), \quad j = -a_i
\]

As the result we have the membership which corresponds to estimations of direction and the influence force of event.

**Step 1.2.** Correction of influence force of event for taking into account confidence to the information about event.

The confidence to the information about event determines the certainty level concerning estimation of influence force of event. The low confidence to the information means “uncertainty”, “ambiguity” of force estimation. In case of low confidence the real influence force of event can have other values. The high confidence to the information about event, on the contrary, means unambiguity of force estimation. Exponentiation operation of membership which we have selected on step 1.1 formalizes this reasoning:
\[ \sigma_i(x_j) = \mu_i(x_j) \forall j = \overline{1,J}. \] (3)

**Step 1.3.** Taking into account of event life cycle.

The model takes into account the event life cycle as change of influence force of event during time (TF - temporal force):

\[ TF_i = \begin{cases} \frac{t-T^1_i}{T^2_i-T^1_i} & \forall \ t \in [T^1_i;T^2_i] \\ \frac{T^4_i-t}{T^4_i-T^3_i} & \forall \ t \in [T^3_i;T^4_i] \\ 0 & \forall \ t \notin [T^3_i;T^4_i] \end{cases} \] (4)

where \( t \) - current time-moment of modelling; 
\( T^1_i - T^4_i \) - according to figure 2.

This expression allows calculating influence force of event according to its life cycle which is formalized by trapeze.

**Step 1.4.** Calculation of resultant influence force of event.

The model calculates the implication of the corrected influence force of event (Step 1.2) and of temporal influence force of event (Step 1.3):

\[ \eta_i(x_j) = \frac{2 \sigma_i(x_j) \cdot TF_i}{\sigma_i(x_j) + TF_i} \forall \ TF_i \neq 0, \quad \forall \ j = \overline{1,J}. \] (5)

As result the model calculates the new membership which formalizes resultant influence force of event (according to its parameters) in current time-moment.

**Step 2.** Calculation of composite influence force of all events.

The model uses fuzzy integral Sugeno (1972) for calculation of composite influence force of all events on financial index:

\[ \nu(x_j) = \frac{1}{Y} \alpha_j(y) \cdot \beta(y) \quad \forall \ j = \overline{1,J}, \] (6)

where \( \frac{1}{Y} \) - is symbol of fuzzy integral Sugeno;
\( Y = \{ e_i, \quad i = \overline{1,I} | TF_i \neq 0 \} \) - is the events set which influence in current time-moment;
\( \alpha_j(y) = \frac{1}{Y} \eta_j(x_j), \quad e_i \in Y \} \) - is membership out of membership densities of events from \( Y \) for gradation from \( x_j \); 
\( \beta(y) = 2^y \rightarrow [0,1], \quad \beta(y) = \{ p_i | e_i \in Y \} \) - is fuzzy measure of the importance out of importance estimations of events from \( Y \).

As result the model calculates the membership \( \nu(x): X \rightarrow [0,1] \). This membership formalizes composite influence force of all events on financial index in current time-moment.

To use the received membership to calculation of forecast values of index it is necessary to execute defuzzification. In other words, it is necessary to execute transformation of possibility
distribution to single value of composite influence force of events. Figure 5 demonstrates the defuzzification.

![Figure 5. Defuzzification]

Membership has four parameters which are most often used for defuzzification (parameters numbers correspond to numbers on figure 5):

1. Force value which corresponds to maximum of membership
2. Force value which corresponds to the gravity centre of membership
3. Force value which corresponds to minimum on force axis for fixed level of possibility
4. Force value which corresponds to maximum on force axis for fixed level of possibility

If to connect values of these parameters for all time-moments, we shall receive four trends which reflect the forecast of composite influence force of events on financial index. In calculations the model uses arithmetic-mean of values of all these parameters.

Described model allows determining the composite influence force of events, but not the absolute value of index. Influence force is similar to derivative of financial index. Composite force determines change speed of financial index. The model calculates the absolute value of index according to expression:

\[
J_{F, t+1} = JF_t + k * F_{t+1}, \quad JF_0 = J_0, \tag{7}
\]

where \(JF_t\) - is absolute value of financial index;
\(J_0\) - is real value of financial index at time-moment \(t = 0\);
\(F_t\) - is composite influence force of events (arithmetic-mean of values of defuzzification parameters);
\(k\) - is coefficient which transforms scale \(X\) to changes range of financial index.

Thus, the model calculates the absolute forecast values of financial index which can be used for decision-making. We have incarnated the model in software „Expert Professional Master Forecast”. We have used this model for forecasting indexes of various economical natures:

- Ukrainian stock index (PFTS);
- exchange rate EUR/USD (Forex market);
- credit rate KievPrime 1M;
- quotations of Eurobonds Ukraine 2015.

For forecasting these indexes we have analysed only public information sources, mainly electronic mass-media from America, Europe, Russia, and Ukraine which publish economic and financial news, news of governments and banks. We have not used any internal information. We have
classified events majority for simplification of estimations. In table 1 we demonstrate this events classification for Ukrainian stock index PFTS. For other indexes the events classification differ from this.

Table 1. Events classification which influence on stock index PFTS

<table>
<thead>
<tr>
<th>Events class</th>
<th>Average estimation of life cycle</th>
<th>Average estimation of influence force</th>
</tr>
</thead>
<tbody>
<tr>
<td>Results of stock markets of the USA, EU, Russia, Japan, Asia</td>
<td>0-24 hour</td>
<td>2-3</td>
</tr>
<tr>
<td>Expectations publication of macroeconomic indicators of the USA, EU, Russia, Japan, Asia</td>
<td>0-24 hour</td>
<td>3-4</td>
</tr>
<tr>
<td>Values publication of macroeconomic indicators of the USA, EU, Russia, Japan, Asia</td>
<td>7-30 days</td>
<td>3-4</td>
</tr>
<tr>
<td>The prices-changes on the world commodity markets</td>
<td>0-15 hour</td>
<td>1-2</td>
</tr>
<tr>
<td>The prices-changes on the world markets of precious metals</td>
<td>0-15 hour</td>
<td>1-2</td>
</tr>
<tr>
<td>The prices-changes on the world oil-markets</td>
<td>0-15 hour</td>
<td>2-3</td>
</tr>
<tr>
<td>Domestic political events</td>
<td>15-40 days</td>
<td>2-4</td>
</tr>
<tr>
<td>Events of fund of the state property, events of establishments of state regulation, events of National bank of Ukraine</td>
<td>5-10 days</td>
<td>2-5</td>
</tr>
<tr>
<td>Foreign policy and external economic events, agreements, declarations</td>
<td>1-1.5 months</td>
<td>3-4</td>
</tr>
<tr>
<td>Values publication of macroeconomic indicators of Ukraine</td>
<td>5-10 days</td>
<td>2-3</td>
</tr>
<tr>
<td>Values publication of industries indicators of Ukraine</td>
<td>10-20 days</td>
<td>1-2</td>
</tr>
</tbody>
</table>

We have used following parameters for analysis of forecasts errors:
- prediction accuracy of index movement direction at next day;
- absolute percentage error of forecast (further - percentage error);
- admissible forecast horizon.

We have used standard dependences for calculation of prediction accuracy of index movement direction and percentage error of forecast.

We have determined the admissible forecast horizon in conformity with following reasoning. In fixed time-moment we have ended input of events estimations into model. But we continued supervision of percentage error of the forecast. In some time-moment the percentage error has exceeded some threshold value. We define the difference of these time-moments as admissible forecast horizon. We have chosen threshold value of percentage error according to the criteria which have been described in http://www.e-mastertrade.com/en/main/technical_analysis/about_forecasting.asp:
- the forecast with error of 0 % - 23 % - is the forecast of the first-rate quality;
- the forecast with error of 24 % - 33 % - is the forecast of high quality.

Moreover, we have used additional parameter for analysis of forecast error of Ukrainian stock index. It is dependence of percentage error from events estimation quality. We in series have changed estimations of influence direction of last events to opposite estimations until percentage error has not increased twice. Estimations change is equivalent to the blunders of expert concerning estimation of events influence. This parameter allows determining the stability (robustness) of model.

4. Investigation of the forecast of Ukrainian stock market index PFTS

Ukrainian stock market calculates the index PFTS along 18 corporations. Market capitalization on September 01st 2008 amounts to $75 000 000 000. We have collected and analysed messages about events from January, 01st till July, 01st 2008. Figure 6 demonstrates the forecast results of index PFTS.
As have shown calculations, prediction accuracy of index movement direction at next day is very low (44.3 %). Therefore the considered model is inexpedient to using for daily speculations. Probably, estimations errors of events life cycle have predetermined the low prediction accuracy. These errors can cause shift of forecast trend concerning real trend of index. Determination discreteness of time parameters of events also can decrease the prediction accuracy, because these parameters for events majority we have determined with precision „up to one day”. However prediction accuracy of index movement direction on next week amount 69.4 %. According to classification of forecasts quality it is the forecast of high quality.

Figure 7 shows percentage error of the forecast. Percentage error of the forecast does not exceed 11 % during from January, 01st till July, 01st, 2008. The maximal errors have appeared in the moments of quick index changes (on January, 20th, on April, 24th and on June, 20th). Such changes of error we consider as separate fluctuations. We also have smoothed the error's graph with help of polynom. In this case the smoothed error's value does not exceed 5% and also increases at greater fluctuations of stock index.
For estimation of forecast horizon we have analysed events and have introduced their estimations into model till July, 01st, 2008. After that we have observed index PFTS and have estimated the forecast error. The error has exceeded threshold of 23 % on July, 15th. However, in this time-moment the index greatly has fallen. Therefore we consider the quick increase of error as fluctuation and use the smoothed graph for the error's analysis. In this case the maximal error does not exceed 15 %. It is the confirmation of high forecast quality. Therefore the forecast horizon exceed one month with observance of admissible error. The forecast horizon directly depends on duration of life cycle of events which we use at forecasting.

We also have estimated the dependence of percentage error from events estimation quality. Calculations show that deliberate change of influence direction of last 28 events (4.7 % from the general number of events) increases the percentage error of the forecast in 2 times. We emphasize, that the error at estimation of event influence direction is very blunder. Therefore it is possible to suppose, that the considered model is steady enough to quality of entrance data.

5. Investigation of the forecast of exchange rate EUR/USD on Forex

We have collected and analysed messages about events from January, 01st till February, 09st 2009. Figure 8 demonstrates the forecast results of exchange rate EUR/USD. Figure 9 demonstrates the forecast error of exchange rate EUR/USD. On figures 8, 9 the vertical line shows time-moment when we have ended data input into model.
As have shown calculations, prediction accuracy of trend movement direction at next day has amounted 65%. It is not high accuracy. As shows the analysis of error's graph, the percentage error not exceeds 5% on horizon 40 days. It is very important that the forecast trend displays the turning point on horizon 15-20 days. We regard this forecast as the forecast of the first-rate quality.

6. Investigation of the forecast of crediting rate KievPrime 1M

The Ukrainian banks use the crediting rate KievPrime as the cost indicator of credit resources on the interbanking market of Ukraine. Reuters calculates KievPrime daily according to technique which is similar to technique for calculation of crediting rate LIBOR. Rates of eight Ukrainian banks participate in calculation KievPrime. This market has very small volume: capitalization amounts approximately $30 000 000 000. Forecasting of indexes in the small markets causes the heightened interest from the view-point of checking of appropriateness and adequacy of forecast model in extreme conditions. We have collected and analysed messages about topical events from September, 01st till October, 16st 2008. It is period of financial crisis aggravation in Ukraine. Figure 10 demonstrates the forecast results and the forecast error.
As have shown calculations, prediction accuracy of trend movement direction at next day has amounted 83%. The average weighted error has amounted 4.26%. From this view-point we classify the forecast as the forecast of the first-rate quality.

For an estimation of forecast horizon we have purposely created conditions of the maximum uncertainty. We have inputted estimations of events into model only for the first day of forecasting: on September, 01st, 2008. Figure 11 shows forecast results. Analysis of error's rise shows that the forecast horizon amounts „More than one week”. Forecast trend also displays the turning point that also testifies to forecast high quality.

**Figure 10.** Forecast of crediting rate KievPrime 1M

**Figure 11.** Forecast of crediting rate KievPrime 1M in conditions of the maximum uncertainty

### 7. Investigation of the forecast of quotations of Eurobonds Ukraine 2015

Quotations of Eurobonds are confidence indicators to economy of Ukraine. We have collected and analysed messages about topical events from September, 01st till October, 10st 2008 (financial crisis aggravation in Ukraine). Figure 12 shows the forecast results; figure 13 shows the forecast error.
As have shown calculations, prediction accuracy of trend movement direction at next day has amounted 84%. The average weighted error has amounted 2.08%. We also classify this forecast as the forecast of the first-rate quality.

For an estimation of forecast horizon we also have inputted estimations of events into model only for the first day of forecasting. Figure 14 shows forecast results. Analysis of error's rise shows that the forecast horizon amounts „More than one week”. Forecast trend also displays the turning point that also testifies to forecast high quality.
5. Conclusions

1. The offered model provides high accuracy of forecasts of financial indexes which have the different economic nature. The forecast error amounts 11 % for Ukrainian stock market index PFTS. For other indexes the error does not exceed 5 % on admissible horizon of the forecast.

2. The forecast horizon greatly depends on market volume. For the small markets the forecast horizon exceeds one week. For the markets with high capitalisation the forecast horizon amounts more than 40 days. Moreover, the forecast horizon directly depends on duration of life cycle of events which have used in forecast. We assume that the model can provide the essentially larger forecast horizon if we shall use the events as tendencies with long life cycle. Then the forecast accuracy will depend on events set integrity and accuracy of their estimations.

3. The proposed model demonstrates not high accuracy of prediction of index movement direction at next day because of low discreteness of time-estimations of events influence.

4. The model has high stability to blunders of the expert at estimation of events influence.

6. References


