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LOGIC OF THE INFLUENCE OF NON-MONETARY INFORMATION SIGNALS OF THE USA ON THE EXCESS RETURN OF UKRAINIAN STOCK MARKET

Abstract. The research was conducted to assess the changes in the excess return of Ukrainian stock market (using the example of the representative stock index PFTS) on the informational content of such major non-monetary signals of the USA as "Consumer Price Index", "Personal Spending", "Unemployment Rate", "Gross Domestic Product", "Industrial Production", "Consumer Confidence" and "Housing Starts" on the basis of daily data for 2000—2017 (number of observations — 4436). We used the toolkit of vector autoregressive modelling to determine the sources of Ukrainian stock index PFTS response to the US non-monetary information signals, which is based on the decomposition of changes in stock market excess return through the channels of economic transmission ("expected future dividends", "real interest rate" and "risk premium") and takes into account the unexpected values of the informational context of selected non-monetary signals. Target time series are stationary according to the KPSS and ADF criteria. The results show that four of the six selected non-monetary information signals of the USA do not have a significant effect on the response of endogenous variables of econometric model. The existence of significant direct influence of US non-monetary informational signals "Personal Spending" and "Consumer Confidence" on the response of the excess return of Ukrainian stock index PFTS has been established. It is substantiated that the actual and forecast state of the USA national economy is considered by the participants of the local stock markets, in particular in Ukraine, as one of the most important sources of macroeconomic information while making strategic and tactical investment decisions. Thus, the increasing importance of the component of "surprise" of such non-monetary information signals of the USA is considered as "positive" news for the domestic stock market by investors, which increases the excess return of the stock index PFTS.

Keywords: stock market, stock index, excess return, component of "surprise", autoregressive model.

JEL Classification E44, G12, G14.

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ЛОГІКА ВПЛИВУ НЕМОНЕТАРНИХ ІНФОРМАЦІЙНИХ СИГНАЛІВ США НА НАДЛИШКОВУ ДОХІДНІСТЬ РИНКУ АКЦІЙ УКРАЇНИ

Анотація. Проведено дослідження щодо оцінювання змін надлишкової доходності українського ринку акцій (на прикладі репрезентативного фондового індексу PFTS) на інформаційний зміст таких основних немонетарних сигналів США, як «Consumer Price Index», «Personal Spending», «Unemployment Rate», «Gross Domestic Product», «Industrial Production», «Consumer Confidence» та «Housing Starts» на основі щоденних даних за 2000— 2017 рр. (кількість спостережень — 4 436). Використано інструментарій векторного авторегресійного моделювання для визначення джерел реакції українського фондового індексу PFTS на немонетарні інформаційні сигнали США, що ґрунтується на декомпозиції змін надлишкової доходності ринку акцій через канали економічної трансмісії («очікувані майбутні дивіденди», «реальна відсоткова ставка» і «премія за ризик») та враховує неочікувані значення інформаційного контексту відібраних немонетарних сигналів. Цільові часові ряди є стаціонарними відповідно до критеріїв KPSS та ADF. Отримані результати свідчать, що чотири із шести відібраних немонетарних інформаційних сигналів США не мають суттєвого впливу на реакцію ендогенних змінних економетричної моделі. Установлено наявність значного прямого впливу немонетарних інформаційних сигналів США «Personal Spending» і «Consumer Confidence» на реакцію надлишкової доходності українського фондового індексу PFTS. Обґрунтовано, що фактичний і прогнозний стани національної економіки США розглядається учасниками локальних ринків акцій, зокрема України, як одне з найважливіших джерел макроекономічної інформації при ухваленні стратегічних і тактичних інвестиційних рішень. Таким чином, зростання значення компоненти «несподіванки» за такими немонетарними інформаційними сигналами США розглядається інвесторами як «позитивна» новина для вітчизняного ринку акцій, яка збільшує надлишкову доходність фондового індексу PFTS.

Ключові слова: ринок акцій, фондовий індекс, надлишкова доходність, компонента «несподіванки», авторегресійна модель.

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ЛОГИКА ВЛИЯНИЯ НЕМОНЕТАРНЫХ ИНФОРМАЦИОННЫХ СИГНАЛОВ США НА ИЗБЫТОЧНУЮ ДОХОДНОСТЬ РЫНКА АКЦИЙ УКРАИНЫ

Аннотация. Проведено исследование по оценке изменений избыточной доходности украинского рынка акций (на примере репрезентативного фондового индекса PFTS) на информационное содержание немонетарных сигналов США на основе ежедневных данных за 2000—2017 гг. Использован инструментарий векторного авторегрессионного моделирования для определения источников реакции фондового индекса PFTS, основанный на декомпозиции изменений избыточной доходности рынка акций. Установлено наличие значительного прямого влияния немонетарных информационных сигналов США «Personal Spending» и «Consumer Confidence» на реакцию избыточной доходности фондового индекса PFTS. Таким образом, рост значения компоненты «неожиданность» по таким немонетарным информационным сигналам США рассматривается инвесторами как «позитивная» новость, которая увеличивает избыточную доходность фондового индекса PFTS.

Ключевые слова: рынок акций, фондовый индекс, избыточная доходность, компонента «неожиданность», авторегрессионная модель.

Формул: 2; рис.: 0; табл.: 2; библ.: 15.

Introduction. The connection between non-monetary information signals and the stock market response is based on the hypothesis of an efficient market, according to which the share price should consider all available information [1], in particular about the economic situation of the country. Many scientific studies indicate that non-monetary information signals of the USA have a greater impact on the profitability of local stock markets than the corresponding national non-monetary information signals [2; 3; 4; 5]. At the same time, it was alleged [3] that stock markets react to less than half of the selected macroeconomic information signals of the USA, and the authors [4] have not revealed a single American non-monetary information signal out of nine selected that have a potential impact on local stock markets profitability, even despite the use of high-frequency data.

Thus, in the case of Ukrainian stock market, it is necessary to investigate more thoroughly not only the reasons related to the methodological basis and the format of data frequency, but also "economic" and "behavioral" reasons [6; 7; 8; 9; 10], which would make it possible to explain the rather limited influence of individual non-monetary information signals on the excess return of stock indices.

Literature review and the problem statement. Fundamental financial theory, which determines the stock price as the sum of discounted future dividends (for example, J. Campbell and R. Shiller [11]), is used in the scientific literature to explain the response (or its lack) of the stock market to a large number of non-monetary information signals by mutual compensatory opposite effects. However, only G. McQueen and V. Roley [12] attempted to verify this assumption

empirically for the first time. Despite the fact that their research is a significant contribution to science, there are several important observations. In particular, the methodological basis used by these scientists does not take into account the interactions that may exist between dividends and interest rate, and also does not make it possible to demonstrate whether non-monetary information signals of the USA are considered as a risk factor by market participants. Also, the approaches used in the study [13] do not allow determining the component of "surprise" by dividends or interest rate and verify whether such a component can explain (at least partially) the "surprise" according to non-monetary information signals.

Research results. B. Bernanke and K. Kuttner in their work [13] proposed to calculate the effect of monetary information signals on the stock market return through dividends, interest rate and risk premium. In our opinion, such a distinction in determining the effect of influence allows us to identify, from a fundamental point of view, the sources of response (or its lack) of Ukrainian stock market on the component of "surprise" of not only monetary, but also non-monetary information signals of the United States.

On the basis of a certain modification of the methodological approach [13] for information signals on inflation and the general state of the economy with the relevant definition of "surprise effects", we will test in this context whether non-monetary information signals of the United States are considered to be risk factors by the participants of Ukrainian stock market. Also, we will try to identify whether the component of "surprise" of non-monetary information signals of the USA affects the excess return of the domestic stock market through the channels of risk premium, dividends or interest rate.

The expression of unexpected excess return according to J. Campbell and J. Ammer [14] is as follows:

$$e_{t+1}^{y} = \tilde{e}_{t+1}^{d} - \tilde{e}_{t+1}^{y} - \tilde{e}_{t+1}^{i} \, , \qquad (1)$$

where e_{t+1}^{y} – unexpected excess return;

$\tilde{e}_{t+1}^{d}$ – «news about future dividends»;

$\tilde{e}_{t+1}^{y}$ – «news about future excess returns», that is risk premium;

$\tilde{e}_{t+1}^{i}$ – «news about future real interest rate».

Thus, the revaluation of excess return in the stock market occurs by calculating either the expected future dividends, or the expected real interest rate, or risk premium. The above-stated decomposition of unexpected return makes it possible to determine that the effect of the informational "surprise" (shock) of a non-monetary signal, which leads to unexpected changes in excess return, happens:

1) or through the channel of expectations regarding future dividends;

2) or through the channel of real interest rate;

3) or through the channel of risk premium (if it is a risk factor).

Many scientific studies (in particular, [2; 14]) use the VAR model, which includes, in addition to the time series of excess return of the stock index (in our case PFTS) in relation to EUR / USD exchange rate changes (e_t), also other variables that may be useful in predicting the future dynamics of the main characteristics of Ukrainian stock market.

Thus, it leads to the necessity of introducing the real interest rate i_t (similarly as in [2]) to this econometric model, which is calculated as the difference between the monthly EUR / USD rate (change in the currency pair exchange rate per month) and the monthly inflation rate.

Similarly as in work [2], the change in the monthly EUR / USD rate is denoted as $\Delta y_{1,t}$, and the change in premium for default risk is − Δp_t, which is defined as the difference between the risk premium value of the bond with Baa credit rating and the corresponding premium value for risk of the bond with a credit rating of Aaa (based on the ratings of Moody's). We will denote the changes in dividend return on the stock index (in our case PFTS) as Δdy_t (likewise in work [2]).

Table 1 shows the main characteristics of the target time series, which are stationary in accordance with the criteria of KPSS and ADF. The values for the considered time series are taken and calculated on the basis of daily data for 2000-2017 from the Datastream database. VAR (3) model was selected according to AIC and SIC information criteria.

Table 1.

Descriptive statistics of VAR model variables

Indicator	e_t	i_t	$\Delta y_{1,t}$	Δp_t	Δdy_t
Mean	0,00033	0,0009	0,00014	0,00039	0,00016
Maximum	0,064	0,0068	0,195	0,457	0,189
Minimum	-0,093	-0,0039	-0,168	-0,142	-0,337
Standard deviation	0,0132	0,00198	0,0153	0,0186	0,0161
Skewness	-0,022	0,074	1,263	4,298	-1,041
Kurtosis	5,82	2,61	36,85	109,17	59,45
Jarque-Bera	1449,4[*]	33,6[*]	212340,3[*]	2094365,2[*]	588748,6[*]
Observations	4436	4436	4436	4436	4436

Source: compiled and calculated by the authors on the basis of preliminary data processing from the Data stream database (PFTS stock index values; EUR / USD quotation values; inflation rate), and Moody's credit rating agency data (premium for default risk on bonds). The level of statistical significance: 10% (*).

The average values for the selected variables are positive. The highest values are observed in the Δp_t, variable, that is, changes in the default risk premium are mainly directed towards the growth concerning the basis of default risk level on the credit rating Aaa. The negative asymmetry is observed for the variables e_t and Δdy_t, it means that the probability of obtaining negative values for the corresponding variables is higher than the probability of obtaining the positive ones. There is a positive asymmetry for the variables i_t, $\Delta y_{1,t}$ and Δp_t, so the probability of obtaining positive values for the corresponding variables is higher than the probability of obtaining negative values. The rate of kurtosis in the selected variables is higher than in the normal distribution, that is, there is a high probability of obtaining the values of the corresponding variables at a level close to the average.

We use A. Belgacem's [2] proposed econometric model to assess the impact of non-monetary information signals of the USA "Consumer Price Index", "Personal Spending", "Unemployment Rate", "Industrial Production", "Consumer Confidence", "Housing Starts" on the response of the selected five variables:

$$z_{t+1} = \sum_{i=1}^{3} A_i z_{t+1-i} + \sum_{j=1}^{6} \emptyset_j S_{j,t+1} + \omega_{t+1}^{\perp} , \qquad (2)$$

where z_t – the vector of five considered variables;

$S_{j,t}$ – the standardized component of "surprise" for a non-monetary information signal j at time t as the difference between the actual value and the consensus forecast, normalized by the standard deviation;

$A, \emptyset$ – regression coefficients;

$\omega_{t+1}^{\perp}$ – a mistake expression, which represents unpredictable factors that are different from the standardized component of "surprise" $S_{j,t}$, on selected non-monetary information signals of the United States.

Table 2 shows the results of assessing the response of each of the endogenous VAR variables to non-monetary information signals.

The obtained results are to some extent consistent with the conclusions of work [2], where the French stock market was studied and it was established that the selected variables do not allow us to predict changes in excess return effectively. Similar results about an Italian stock market were also obtained in work [15], but the results for the UK and the Netherlands stock market indicate a higher degree of predictability of their return. As for the USA stock market, it was noted in work [13] that the obtained results of VAR modelling can explain about 4% of changes in return, and it largely coincides with the results of work [14]. Therefore, the mentioned above studies confirm that the excess return of the stock market is not qualitatively predicted, and the value of the R^2 coefficient is less than 10%.

Regarding the results we obtained, it should be noted that they do not characterize the majority of selected variables (non-monetary information signals of the USA) as those which influence the response of endogenous variables of the econometric model the most. Even the values of statistically significant coefficients are generally very low. Nevertheless, it was established the existence of a significant influence of non-monetary information signals "Personal Spending" and

"Consumer Confidence" on the excess return. It confirms the assumption that the "element of surprise" of a non-monetary US signal may be a risk factor for Ukrainian stock market.

Table 2.

Assessment of non-monetary signals impact on the response of the variables

Informationsignals	Variables				
	e_t	i_t	$\Delta y_{1,t}$	Δp_t	Δdyt
ConsumerPriceIndex	-0,00392 (0,00353)	-0,00023 (0,00036)	0,00148 (0,00125)	-0,00017 (0,00024)	0,00468 (0,00251)
PersonalSpending	0,01921[***] (0,00142)	0,00224 (0,00321)	-0,00411 (0,00201)	0,00298 (0,00362)	-0,00081[*] (0,00035)
UnemploymentRate	-0,00413 (0,00384)	-0,00152[*] (0,00067)	0,0029[**] (0,0009)	-0,00124 (0,00187)	0,00349 (0,00216)
IndustrialProduction	0,00267 (0,00249)	0,00187 (0,00283)	-0,00602 (0,00844)	-0,00483 (0,00539)	-0,00153[**] (0,00461)
ConsumerConfidence	0,03872[***] (0,00138)	0,00145 (0,00332)	-0,00952 (0,00769)	-0,00207 (0,00266)	-0.00257[*] (0,00133)
HousingStarts	-0,00126 (0,00152)	-0,00108 (0,00253)	-0,00822 (0,00938)	0,00115 (0,00133)	-0,01632 (0,01988)
R^2	0,08	0,84	0,19	0,09	0,03

Source: compiled and calculated by the authors on the basis of preliminary data processing from the Datastream database (PFTS stock index values; EUR / USD quotation values; inflation rate), and Moody's credit rating agency data (premium for default risk on bonds). The level of statistical significance: 1% (***); 5% (**); 10% (*).LB(12) – the p-value of Ljung-Box statistical criterion for the absence of 12-order autocorrelation is 0.81. Standard deviation is given in brackets.

Conclusion. Our obtained results confirm the fact that non-monetary information signals of the USA affect the Ukrainian stock market, and its participants consider the US economy as the most important source of economic information. The conclusion that can be made from the data concerns non-monetary information signals "Personal Spending" and "Consumer Confidence" (among the selected 6 signals), which have a very significant effect on the daily excess return of the Ukrainian PFTS stock index. Regarding the influence of the other four non-monetary information signals of the United States on the Ukrainian stock market, we should note its low sensitivity to the component of "surprise" of these information signals. The growing significance of the component of "surprise" of non-monetary information signals "Personal Spending" and "Consumer Confidence" is "positive" news for investors on the Ukrainian stock market and increases the excess return of the PFTS stock index.

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