“Influence of monetary information signals of the USA on the Ukrainian stock market”

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ARTICLE INFO	Roman Pavlov, Tetiana Grynko, Tetiana Pavlova, Oksana Levkovich and Dariusz Pawliszczy (2020). Influence of monetary information signals of the USA on the Ukrainian stock market. *Investment Management and Financial Innovations*, *17*(4), 327-340. doi:10.21511/imfi.17(4).2020.28
DOI	http://dx.doi.org/10.21511/imfi.17(4).2020.28
RELEASED ON	Monday, 14 December 2020
RECEIVED ON	Friday, 18 September 2020
ACCEPTED ON	Monday, 07 December 2020
LICENSE	This work is licensed under a Creative Commons Attribution 4.0 International License
JOURNAL	"Investment Management and Financial Innovations"
ISSN PRINT	1810-4967
ISSN ONLINE	1812-9358
PUBLISHER	LLC “Consulting Publishing Company “Business Perspectives”
FOUNDER	LLC “Consulting Publishing Company “Business Perspectives”

NUMBER OF REFERENCES	NUMBER OF FIGURES	NUMBER OF TABLES
44	1	0

BUSINESS PERSPECTIVES

LLC "CPC "Business Perspectives"
Hryhorii Skovoroda lane, 10,
Sumy, 40022, Ukraine
www.businessperspectives.org

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INFLUENCE OF MONETARY INFORMATION SIGNALS OF THE USA ON THE UKRAINIAN STOCK MARKET

Abstract

The stronger the level of economic integration between countries, the greater the need to study the formation patterns of the stock market reaction to the financial information signals. This concerns the Ukrainian stock market, which is now in its infancy, and which reaction to financial information signals is sometimes ambiguous. The research aims to identify the formation patterns of return and volatility indicators of the Ukrainian stock market reaction to the US financial information signals. To assess the direct nature of US financial information signals effect on the PFTS stock index, the GARCH econometric modeling toolkit was applied. The research information base is the PFTS stock index and the Federal Reserve System financial information signals at the discount rate for 2000–2019. The fetch is divided into intervals corresponded to the ascent and decline phases of the financial cycle. It was found that an unforeseen increase in the discount rate at the financial cycle decline phase by 25 basis points decreases the PFTS stock index return, on average by 2.9%. Besides, the hypothesis about the general change stabilizing effect in the discount rate on the Ukrainian stock market volatility at the financial cycle growth phase was confirmed. Nevertheless, for investors, the most essential is the regulator's monetary signals in the discount rate at the financial cycle decline phases rather than at the ascent phases because there is a more significant increase in the volatility level.

Received on: 18th of September, 2020
Accepted on: 7th of December, 2020
Published on: 14th of December, 2020

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Conflict of interest statement:
Author(s) reported no conflict of interest

Keywords monetary policy, reaction, stock market, stock index, volatility, return, cyclicality, GARCH

JEL Classification E58, G14, G17

INTRODUCTION

Among the stock market's essential functioning aspects, one can single out the specific features of its reaction to financial information signals negatively affecting the stock indices dynamics. Understanding such reaction formation patterns allows financial regulators to assess in advance the potential scale of negative consequences for the stock market development and make informed preventive management decisions.

The relationship between monetary policy and stock markets is viewed along with two different directions. The first (e.g., Rigobon & Sack, 2003; Bjørnland & Jacobsen, 2013) examines the effect of the stock price dynamics on the banking regulators' decisions regarding the parameters of the monetary policy. The second direction (e.g., Rigobon & Sack, 2004; Bernanke & Kuttner, 2005; Hau & Lai, 2016), to which this paper can also be attributed, examines the effect of the monetary decisions of central banks on stock markets.

To analyze the relationship between monetary policy and stock performance, it is necessary to identify the economic transmission channels (e.g., Kozmenko et al., 2016; Albagli et al., 2019; Shkolnyk et al., 2019), where banking regulators decisions on crucial interest rates affect stock markets. According to Sharpe (1964), a risky asset's return is equal to a risk-free financial asset's interest rate to which the risk premium is added. Thus, when acquiring a risky financial asset (e.g., a stock or the portfolio of stocks), an investor expects excess return compared to a risk-free financial asset, i.e., the risk premium (e.g., Prat, 2013; DaSilva et al., 2019; Bamata et al., 2019; Petru et al., 2019).

Thus, the monetary policy effect on the stock market's return occurs through the effect on the interest rate (risk-free) and/or risk premium (Ozdagli & Velikov, 2020). At the same time, the risk premium can be divided into several components, and the study can be performed to determine the channels that make monetary policy information signals have the most significant effect on the stock market return. Therefore, it is crucial to assess the average reaction of the representative Ukrainian stock market PFTS index return and volatility indicators to the US financial information signals.

1. LITERATURE REVIEW

Many researchers (e.g., Goodhart & Smith, 1985; Patelis, 1997; Bernanke & Kuttner, 2005; Bredin et al., 2009) reviewed the financial information signals effect of banking regulators on the stock market performance. However, most of the research data is concentrated in the US and the EU stock markets. Simultaneously, there are almost no case studies on emerging countries' stock markets, in particular Ukraine. The return of the national stock markets is usually significant and negative to the positive "surprises" of the banking regulators' monetary decisions regarding the discount rate, and vice versa (e.g., Alessi & Kerssenfischer, 2019; Jarociński & Karadi, 2020).

According to Fama (1965), stock quotes must immediately and adequately adapt to emerging information (events), including forecasts. Thus, the shift in the exchange rate at the time of information signals announcement should occur only due to the deviation of their information content, i.e., between the actual (announced) value and the corresponding forecast. In this case, the surprise effect was in question, which is significant for the stock quotes and encourages market participants to revise their investment strategies. Hence, it is necessary to distinguish between the expected and the surprise component of the information content's monetary signals.

Obtaining results that can be correctly compared with the other scientists' conclusions demands choosing a unified approach to determining the surprise component of the monetary signal information content. Krueger and Kuttner (1996) substantiated that "30 days federal funds futures" is an effective tool for measuring market expectations regarding changes in the Federal Reserve System discount rate. Bernanke and Kuttner (2005) can use an adaptation of this approach to determine the surprise component of monetary decisions at the Federal Reserve System's discount rate.

Unlike many studies of the European stock markets (e.g., Bredin et al., 2009; Hau & Lai, 2016; Fiordelisi & Galloppo, 2018; Chebbi, 2018), the research will not focus on assessing the effect of the monetary signals of the European Central Bank, rather than determining the decisions' effect on the monetary policy of the Federal Reserve System on the Ukrainian stock market. Considering the Federal Reserve System monetary decisions, in many studies, the idea is promoted that investors in the European stock markets consider the regulator's financial information signals as the most crucial source of financial information. For instance, Bernanke and Kuttner (2005) note the decisions about the Federal Reserve System's monetary policy as risk factors. Furthermore, Jain and Sehgal (2018) and Pavlov et al. (2019) note that unexpected shocks in the US stock market are transmitted to other relevant global markets.

There are practically no papers devoted to studying the US financial information signals' effect on the emerging countries' stock markets, particularly Ukraine, considering their cyclical development nature. It should encourage cyclical development that individual decisions of regulators' monetary policy, especially during financial crises (e.g., Kuznetsova et al., 2017; Plastun et al., 2018; Kuznichenko et al., 2018; Abdulsalam & Bouresli, 2019), are part of the

http://dx.doi.org/10.21511/imfi.17(4).2020.28

logic for stabilizing the stock market. However, at the same time, monetary decisions during regular periods (e.g., Melnyk et al., 2017; Oliinyk & Kozmenko, 2019) consider inflation risk management as the primary goal. Thus, there should be emphasized the importance of determining the US financial information signals' effect on the Ukrainian stock market depending on the financial cycle phase.

2. HYPOTHESES DEVELOPMENT

This study performs tests to identify the effect features of the Federal Reserve System's monetary decisions on the discount rate on the Ukrainian stock market return and volatility with and without highlighting the cyclical fluctuations phases.

First of all, it is necessary to establish whether the discount rate's overall change on the part of the Federal Reserve System increases (decreases) the PFTS stock index return and volatility. For that, it is required to find out whether:

- hypothesis H_0^{ρ} (neutral effect on return) can be discarded in favor of hypothesis H_1^{ρ} (positive effect on return) or hypothesis H_2^{ρ} (negative effect on return);
- hypothesis $H_0^{\rho_{1\Delta i}}$ (neutral effect on volatility) can be discarded in favor of hypothesis $H_1^{\rho_{1\Delta i}}$ (destabilizing effect on volatility) or hypothesis $H_2^{\rho_{1\Delta i}}$ (stabilizing effect on volatility).

Identifying the effect features of the expected and the surprise components of the Federal Reserve System's monetary information signals on the PFTS stock index return requires testing whether:

- hypothesis $H_0^{\rho e}$ (neutral effect of the expected component) can be discarded in favor of hypothesis $H_1^{\rho e}$ (positive effect of the expected component) or hypothesis $H_2^{\rho e}$ (negative effect of the expected component);
- hypothesis $H_0^{\rho u}$ (neutral effect of the surprise component) can be discarded in favor of hypothesis $H_1^{\rho u}$ (positive effect of the surprise component) or hypothesis $H_2^{\rho u}$ (negative effect of the surprise component).

To determine the influence parameters of the expected and the surprise components of the Federal Reserve System monetary signals on the PFTS stock index return (at the ascent/decline phase), it is necessary to check whether:

- hypothesis $H_0^{\rho eExpansion}$ (neutral effect of the expected component at the ascent phase) can be discarded in favor of hypothesis $H_1^{\rho eExpansion}$ (positive effect of the expected component at the ascent phase) or hypothesis $H_2^{\rho eExpansion}$ (negative effect of the expected component at the ascent phase);
- hypothesis $H_0^{\rho eRecession}$ (neutral effect of the expected component at the decline phase) can be discarded in favor of hypothesis $H_1^{\rho eRecession}$ (positive influence of the expected component at the decline phase) or hypothesis $H_2^{\rho eRecession}$ (negative effect of the expected component at the decline phase);
- hypothesis $H_0^{\rho uExpansion}$ (neutral effect of the surprise component at the ascent phase) can be discarded in favor of hypothesis $H_1^{\rho uExpansion}$ (positive effect of the surprise component at the ascent phase) or hypothesis $H_2^{\rho uExpansion}$ (negative effect of the surprise component at the ascent phase);
- hypothesis $H_0^{\rho uRecession}$ (neutral effect of the surprise component in the decline phase) can be discarded in favor of hypothesis $H_1^{\rho uRecession}$ (positive effect of the surprise component at the decline phase) or hypothesis $H_2^{\rho uRecession}$ (negative effect of the surprise component at the decline phase).

To determine whether the overall change in the discount rate of the Federal Reserve System increases (decreases) the PFTS stock index volatility (at the ascent/decline phase), it is necessary to check whether:

- hypothesis $H_0^{\rho\Delta iExpansion}$ (neutral effect at the ascent phase) can be discarded in favor of hypothesis $H_1^{\rho\Delta iExpansion}$ (destabilizing effect at the ascent phase) or hypothesis $H_2^{\rho\Delta iExpansion}$ (stabilizing effect at the ascent phase);
- hypothesis $H_0^{\rho\Delta iRecession}$ (neutral effect at the decline phase of financial cycle) can be dis-

carded in favor of hypothesis $H_1^{\rho\Delta iRecession}$ (destabilizing effect at the decline phase of financial cycle) or hypothesis $H_2^{\rho\Delta iRecession}$ (stabilizing effect at the decline phase).

3. DATA AND METHODS

Daily quotes during 2000–2019 taken from the Datastream database and used to compute the exchange rate of the PFTS stock index return in the trading day format (excluding dividends reinvestment):

$$R_t = \ln \frac{P_t}{P_{t-1}}, \quad (1)$$

where R_t is the return on the stock index on the trading day t, P_t is the stock index value on the trading day t, P_{t-1} is the stock index value on the trading day $t-1$.

For informational signals of monetary policy, the Federal Reserve System's decisions are selected depending on the discount rate for the same period. That is caused by the fact that the US economy is the largest, and the Federal Reserve System's monetary policy significantly affects the economic development of other countries and their national stock markets.

After determining computing specifics of the expected and the surprise components of the monetary signal information content on the Federal Reserve System (Bernanke & Kuttner, 2005) discount rate, it is essential to test whether the information in the bank regulators' information signals affects the PFTS stock index return and volatility. A methodological approach can be applied, which is usually used in modern scientific literature on the influence of financial information signals on stock markets. Specifically, Flannery and Protopapadakis (2002) apply an econometric model described as follows:

$$R_t = \alpha + \beta R_{t-1} + \rho \Delta i_t + \varepsilon_t, \quad (2)$$

where R_t is the PFTS stock index return at time t (daily format); α is a constant; β is the autoregression coefficient; ρ is the direct effect weight coefficient of the Federal Reserve System's monetary information signal on the return of Ukrainian stock market; Δi_t is the time series of financial time series, which values correspond to changes in the discount rate by the Federal Reserve System on the day the monetary information signal is announced or equal to zero on days when there is no announcement of the corresponding monetary information signals; ε_t is an error, which conditional variance is heteroscedastic and follows the GARCH (ρ, q) process of the form:

$$\sigma_t^2 = \alpha_0 + \sum_{i=1}^{q} \alpha_i \varepsilon_{t-i}^2 + \sum_{j=1}^{p} \beta_j \sigma_{t-j}^2 + \rho_1^{\Delta i} D_t, \quad (3)$$

where D_t is a dummy variable that equals one on day t of the Federal Reserve System financial information signal announcement and zero otherwise. It is introduced into the dispersion equation to check whether the information signals influence of the regulator's monetary policy on the Ukrainian stock market is stabilizing or destabilizing; α_0 is a constant; α_i, β_j, are autoregressive coefficients; $\rho_1^{\Delta i}$ is the direct effect weighting coefficient of the Federal Reserve System's monetary information signal on the volatility of Ukrainian stock market; ρ, q are lagged orders $(p = 1,\ q = 2)$, selected following the Akaike (AIC) and Schwarz (SIC) information criteria.

Further study of the information signals influence of monetary policy on the Ukrainian stock market return and volatility requires an assessment based on equations (2) and (3), dividing the change in the discount rate Δi (Bernanke & Kuttner, 2005) into the expected component Δi^e and the surprise component Δi^u.

The model for assessing the effect on return (2) gets transformation as follows:

$$R_t = \alpha + \beta R_{t-1} + \rho_e \Delta i_t^e + \rho_u \Delta i_t^u + \varepsilon_t, \quad (4)$$

where ρ_e is the direct effect weighting coefficient of the expected component Δi^e of the Federal Reserve System financial information signal on the Ukrainian stock market return; ρ_u is the direct effect weighting coefficient of the surprise component Δi^u of the Federal Reserve System's monetary information signal on the Ukrainian stock market return.

http://dx.doi.org/10.21511/imfi.17(4).2020.28

The research sample can be divided into sub-periods that correspond to the ascent or decline phases of the financial cycle to check the Ukrainian stock market's reaction to monetary policy information signals, depending on the financial cycle phase. The financial cycle is considered on the example of cyclical fluctuations of the Ukrainian representative PFTS stock index.

The model for assessing the effect on return (4) gets the following transformation:

$$R_t = \alpha + \beta R_{t-1} + \sum\nolimits_{i=Expansion,\mathrm{Recession}} \rho_i^e \Delta i_{i,t}^e + \\ + \sum\nolimits_{i=Expansion,\mathrm{Recession}} \rho_i^u \Delta i_{i,t}^u + \varepsilon_t, \quad (5)$$

where $Expansion$ is the financial cycle ascent phase; $Recession$ is the financial cycle decline phase; $\Delta i_{i,t}^e$ is the expected component of the information signal on the discount rate of the Federal Reserve System at the financial cycle ascent phase $(i = Expansion)$ or the financial cycle decline phase $(i = Recession)$, ρ_i^e is the direct effect weighting coefficient of the expected component of the Federal Reserve System's monetary information signal on the Ukrainian stock market return at the financial cycle ascent phase $(i = Expansion)$ or the financial cycle decline phase $(i = Recession)$, $\Delta i_{i,t}^u$ information signal surprise component on the discount rate of the Federal Reserve System at the financial cycle ascent phase $(i = Expansion)$ or the financial cycle decline phase $(i = Recession)$, ρ_i^u is the direct effect weighting coefficient of the surprise component of the Federal Reserve System's monetary information signal on the Ukrainian stock market return at the financial cycle ascent phase $(i = Expansion)$ or the financial cycle decline phase $(i = Recession)$.

The model for assessing the effect on volatility (3) gets transformation as follows:

$$\sigma_t^2 = \alpha_0 + \sum_{i=1}^{q} \alpha_i \varepsilon_{t-i}^2 + \sum_{j=1}^{p} \beta_j \sigma_{t-j}^2 + \\ + \sum\nolimits_{i=Expansion,\mathrm{Recession}} \rho_i^{\Delta i} D_{i,t}, \quad (6)$$

where $\rho_i^{\Delta i}$ is the direct effect weighting coefficient of the Federal Reserve System's monetary information signal on the Ukrainian stock market volatility at the financial cycle ascent phase $(i = Expansion)$ or the financial cycle decline phase $(i = Recession)$, $D_{i,t}$ is a dummy variable, which is equal to one on day t of the announcement of the Federal Reserve System's monetary information signal at the financial cycle ascent phase $(i = Expansion)$ or the financial cycle decline phase $(i = Recession)$ and zero in other cases.

4. EMPIRICAL RESULTS

Table 1 represents the evaluating equations (2) and (3) results concerning the Federal Reserve System's monetary decisions.

Table 1. Preliminary analysis of the influence of the Federal Reserve System monetary signals on the discount rate on the PFTS stock index return and volatility

Source: Compiled and calculated by the authors.

Coefficient	Value	Standard deviation
α	0.0081**	0.0022
β	–0.2494***	0.0531
ρ	0.0293	0.0323
α_0	0.0081***	0.0012
α_1	0.0984***	0,0214
α_2	0.1242	0.0285
β_1	0.7164*	0.0451
$\rho_1^{\Delta i}$	–0.0091	0.0087
R^2	0.0265	
DW	2.13	
LB (4)	0.767	
LB (12)	0.512	

Notes: Statistical significance levels: 1% (***); 5% (**); 10% (*). DW is Durbin-Watson statistics. LB (4) is the *p*-value of the Ljung-Box statistical test for the autocorrelation absence of the 4th order. LB (12) is the *p*-value Ljung-Box statistical test for the autocorrelation absence of 12th order.

As for equation (2), the PFTS stock index's response to financial information signals regarding the Federal Reserve System discount rate is negligible and statistically insignificant. This is evidenced by the value of the direct influence weighting coefficient of the Federal Reserve System's monetary information signal on the Ukrainian stock market return (Table 1).

The results of testing the advanced hypotheses (Table 2) confirm hypothesis H_o^{ρ} about the general change neutral effect in the discount rate Δi of the Federal Reserve System on the Ukrainian stock market return.

The neutral nature of the Federal Reserve System's monetary decisions effect on the general change in the discount rate on Ukrainian stock market return can be partially explained by the fact that the model does not consider behavioral factors (e.g., O. Velychko & L. Velychko, 2017; Dzhusov & Rubtsova, 2017; Krupskyi & Grynko, 2018; Pavlova et al., 2019) in their effect on investment decisions. It is advisable to consider the surprise and the "price overreactions" effects of the information signal (e.g., Caporale et al., 2017; Caporale et al., 2018).

Table 2. The testing results for advanced hypotheses H_0^{ρ}, H_1^{ρ}, H_2^{ρ} about the nature of the general change effect in the discount rate Δi of the Federal Reserve System on the PFTS stock index return

Source: Compiled and calculated by the authors.

Federal Reserve System monetary information signal	H_0^{ρ} Neutral effect	H_1^{ρ} Positive effect	H_2^{ρ} Negative effect
General change in discount rate Δi	Accepted	Rejected	Rejected

As for the volatility equation (3), the Ukrainian stock PFTS index volatility response to financial information signals at the Federal Reserve System rate is negligible and statistically insignificant. That is evidenced by the direct effect weighting coefficient value of the Federal Reserve System financial information signal $\rho_1^{\Delta i}$ on the Ukrainian stock market volatility (Table 1).

The results of testing the advanced hypotheses (Table 3) confirm hypothesis $H_0^{\rho_{1\Delta i}}$ about the general change neutral effect in the discount rate Δi on the Federal Reserve System on Ukrainian stock market volatility.

The neutral nature of the Federal Reserve System's monetary decisions' effect on the general change in the discount rate on Ukrainian stock market volatility can be partially explained by the fact that the research sample does not separately consider the financial cycle phases.

Table 3. Testing results for advanced hypotheses $H_0^{\rho_{1\Delta i}}$, $H_1^{\rho_{1\Delta i}}$, $H_2^{\rho_{1\Delta i}}$ about the general change effect nature in the discount rate Δi on the part of the Federal Reserve System on the PFTS stock index volatility

Source: Compiled and calculated by the authors.

Federal Reserve System monetary information signal	$H_0^{\rho_{1\Delta i}}$ Neutral effect	$H_1^{\rho_{1\Delta i}}$ Destabilizing effect	$H_2^{\rho_{1\Delta i}}$ Stabilizing effect
General change in discount rate Δi	Accepted	Rejected	Rejected

Table 4 depicts the evaluating equations (4) and (3) results based on the reaction of Ukrainian stock market return and volatility to the information context components of the Federal Reserve System's monetary information signals on the discount rate in the general case.

Table 4. The expected and the surprise components effects of the Federal Reserve System monetary signals on the discount rate on the PFTS stock index return and volatility: a general case

Source: Compiled and calculated by the authors.

Coefficient	Value	Standard deviation
α	0.0084^{**}	0.0025
β	-0.2492^{***}	0.0531
ρ_e	0.0513	0.0469
ρ_u	-0.0971^{***}	0.0314
α_0	0.0082^{***}	0.0011
α_1	0.1014^{***}	0,0212
α_2	0.1295	0.0286
β_1	0.7021^{*}	0.0454
$\rho_1^{\Delta i}$	-0.0134	0.0162
R^2	0.028	
DW	2.13	
LB (4)	0.792	
LB (12)	0.631	

Notes: Statistical significance levels: 1% (***); 5% (**); 10% (*). DW is Durbin-Watson statistics. LB (4) is the *p*-value of the Ljung-Box statistical test for the autocorrelation absence of the 4th order. LB (12) is the *p*-value of the Ljung-Box statistical test for the autocorrelation absence of 12th order.

The PFTS stock index return reaction to the Δi^e Federal Reserve System's monetary information signals expected component relative to the discount rate is negligible and statistically insignificant, as evidenced by the weighting coefficient direct effect value ρ_e (Table 4).

http://dx.doi.org/10.21511/imfi.17(4).2020.28

The results of testing the advanced hypotheses (Table 5) confirm the hypothesis $H_0^{\rho e}$ about the neutral effect of the expected component Δi^e of the Federal Reserve System monetary signals on the discount rate on the Ukrainian stock market return.

Table 5. Testing results for advanced hypotheses $H_0^{\rho e}$, $H_1^{\rho e}$, $H_2^{\rho e}$ about the effect nature of the expected component Δi^e of Federal Reserve System monetary signals on the PFTS stock index return

Source: Compiled and calculated by the authors.

Federal Reserve System monetary information signal	$H_0^{\rho e}$ Neutral effect	$H_1^{\rho e}$ Positive effect	$H_2^{\rho e}$ Negative effect
Expected component Δi^e of the total change in the discount rate Δi	Accepted	Rejected	Rejected

The neutral nature of the expected component effect of the Federal Reserve System's monetary information signals on the discount rate on the Ukrainian stock market return can be explained by the fact that, according to Fama (1965), the available information is already reflected in the asset price and, therefore, should not affect quotes.

An unforeseen increase in the Federal Reserve System discount rate negatively affects the PFTS stock index return, as evidenced by the value of the direct effect weighting coefficient ρ_u of the surprise component Δi^u. A positive surprise around 25 basis points leads to a decrease in the PFTS stock index return by an average of 2.4% (Table 4).

The results of testing the advanced hypotheses (Table 6) confirm the hypothesis $H_2^{\rho u}$ about the negative effect of the surprise component Δi^u of the Federal Reserve System monetary signals at the discount rate on the Ukrainian stock market return.

Table 6. Testing results for advanced hypotheses $H_0^{\rho u}$, $H_1^{\rho u}$, $H_2^{\rho u}$ about the nature of the surprise component effect Δi^u of Federal Reserve System monetary signals on the PFTS stock index return

Source: Compiled and calculated by the authors.

Federal Reserve System monetary information signal	$H_0^{\rho u}$ Neutral effect	$H_1^{\rho u}$ Positive effect	$H_2^{\rho u}$ Negative effect
Surprise component ρ_u of the total change in the discount rate Δi	Accepted	Rejected	Accepted

Source: Elaborated by the authors.

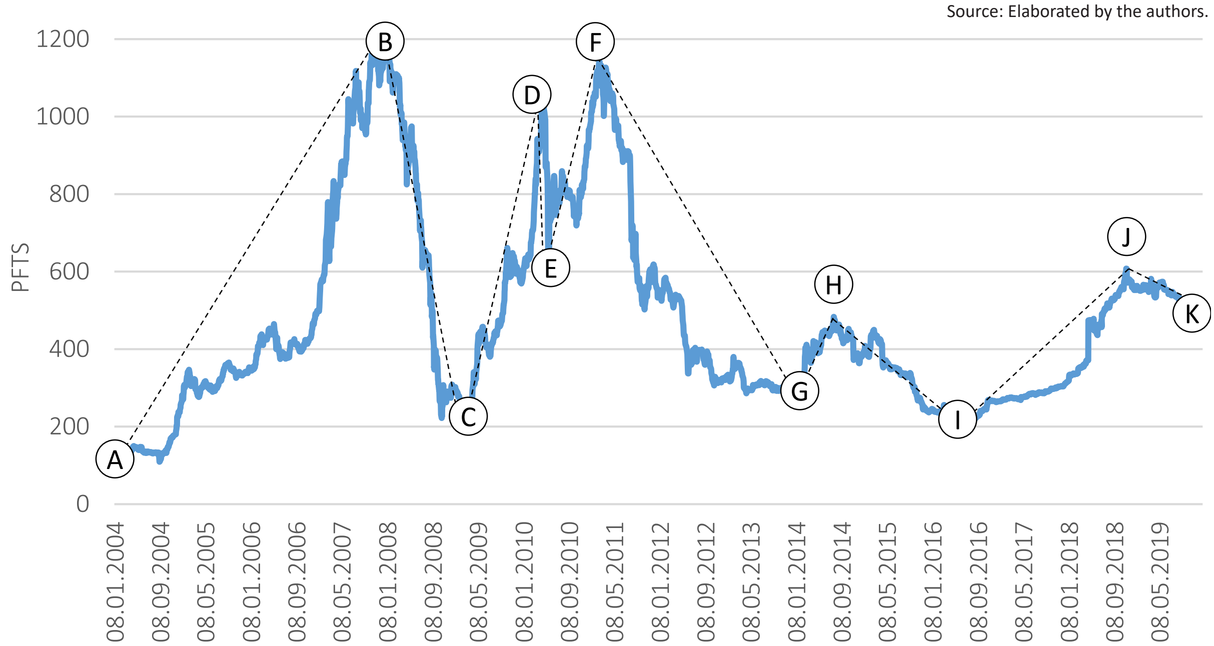

Figure 1. The cyclical fluctuations phases on the Ukrainian stock market (based on the PFTS stock index) from January 8, 2004 to December 27, 2019

The negative effect of the surprise component of the Federal Reserve System's monetary information signals on the discount rate on Ukrainian stock market return is caused by the fact that participants in the Ukrainian stock market perceive Federal Reserve System monetary signals as an essential source of financial information when making their investment decisions (e.g., Frolov et al., 2017; Khmarskyi & Pavlov, 2017; Ponomarenko et al., 2017).

Based on the volatility equation (3) assessment, it is noteworthy that the PFTS stock index volatility reaction to financial information signals at the Federal Reserve System discount rate is negligible and statistically insignificant. That is evidenced by the corresponding direct influence weighting coefficient value of the regulator's monetary information signals $\rho^{\Delta i}$ on Ukrainian stock market volatility (Table 4).

This research relates to the entire research sample and does not consider the Ukrainian stock market's cyclical fluctuations phases (financial cycle).

The financial cycle phases are identified based on the local minimum and maximum values of the daily values time series of the PFTS stock index (Figure 1).

This series choice is advisable since it reflects the ascent or decline trends of such a vital component of the Ukrainian financial market as the stock market.

The sample is divided into ten intervals: five ascent phases and five decline phases (Figure 1):

1. The first ascent phase (the conditional name of the "AB" interval) of the PFTS stock index: sub-period from January 8, 2004 to January 15, 2008.
2. The first decline phase (the conditional name of the "BC" interval) of the PFTS stock index: sub-period from January 16, 2008, to March 6, 2009.
3. The second ascent phase (the conditional name of the "CD" interval) of the PFTS stock index: sub-period from March 10, 2009 to April 27, 2010.
4. The second decline phase (the conditional name of the "DE" interval) of the PFTS stock index: sub-period from April 28, 2010 to May 25, 2010.
5. The third ascent phase (the conditional name of the "EF" interval) of the PFTS stock index: sub-period from May 26, 2009 to February 21, 2011.
6. The third decline phase (conditional name of the "FG" interval) of the PFTS stock index: sub-period from February 22, 2011 to January 9, 2014.
7. The fourth ascent phase (the conditional name of the "GH" interval) of the PFTS stock index: sub-period from January 10, 2014 to July 29, 2014
8. The fourth decline phase (the conditional name of the "HI" interval) of the PFTS stock index: sub-period from July 30, 2014 to May 26, 2016.
9. The fifth ascent phase (the conditional name of the "IJ" interval) of the PFTS stock index: sub-period from May 27, 2016 to November 13, 2018.
10. The fifth decline phase (the conditional name of the "JK" interval) of the PFTS stock index: sub-period from November 14, 2018 to December 27, 2019.

Table 7 represents the evaluating equations (5) and (6) results by the reaction of Ukrainian stock market return and volatility to the Federal Reserve System financial information signals' information context components on the discount rate depending on the financial cycle phase.

The PFTS stock index return response to the $\Delta i^{e}_{Expansion}$ Federal Reserve System's monetary information signals expected component relative to the discount rate in the ascent phase is negligible and statistically insignificant, as evidenced by the direct effect weighting coefficient value $\rho^{e}_{Expansion}$ (Table 7).

http://dx.doi.org/10.21511/imfi.17(4).2020.28

Table 7. Influence of the expected and the surprise components of the Federal Reserve System monetary signals at the discount rate on the PFTS stock index return and volatility depending on the financial cycle phase

Source: Compiled and calculated by the authors.

Coefficient	Value	Standard deviation
α	0.0056^{**}	0.0023
β	-0.2154^{***}	0.0487
$\rho^{e}_{Expansion}$	0.0179	0.0203
$\rho^{e}_{Recession}$	-0.0028	0.0165
$\rho^{u}_{Expansion}$	0.0394	0.0482
$\rho^{u}_{Recession}$	-0.1147^{***}	0.0298
α_0	0.0082^{***}	0.0012
α_1	0.0943^{***}	0,0211
α_2	0.1139	0.0285
β_1	0.7306^{*}	0.0454
$\rho^{\Delta i}_{Expansion}$	-0.0185^{**}	0.0043
$\rho^{\Delta i}_{Recession}$	0.0471^{***}	0.0098
R^2	0.031	
DW	2.13	
LB (4)	0.756	
LB (12)	0.512	

Notes: Statistical significance levels: 1% (***); 5% (**); 10% (*). DW is Durbin-Watson statistics. LB (4) is the *p*-value of the Ljung-Box statistical test for the autocorrelation absence of the 4th order. LB (12) is the *p*-value of the Ljung-Box statistical test for the autocorrelation absence of 12th order.

The results of testing the advanced hypotheses (Table 8) confirm hypothesis $H_0^{\rho eExpansion}$ about the neutral effect of the expected component $\Delta i^{e}_{Expansion}$ of the Federal Reserve System monetary signals on the discount rate (at the ascent phase) on the Ukrainian stock market return.

Table 8. Testing results for hypotheses $H_0^{\rho eExpansion}$, $H_1^{\rho eExpansion}$, $H_2^{\rho eExpansion}$ about the effect nature of the expected component $\Delta i^{e}_{Expansion}$ of Federal Reserve System monetary signals (at the ascent phase) on PFTS stock index return

Source: Compiled and calculated by the authors.

Federal Reserve System monetary information signal	$H_0^{\rho eExpansion}$ Neutral effect	$H_1^{\rho eExpansion}$ Positive effect	$H_2^{\rho eExpansion}$ Negative effect
Expected component $\Delta i^{e}_{Expansion}$	Accepted	Rejected	Rejected

The neutral nature of the expected component effect of the Federal Reserve System's monetary information signals on the discount rate on Ukrainian stock market return at the financial cycle ascent phase can be partially explained by the fact that the forecast regarding the change in the discount rate is already reflected in the current price and, according to Fama (1965), should influence quotes.

The PFTS stock index return reaction to the $\Delta i^{e}_{Recession}$ Federal Reserve System's monetary information signals expected component relative to the discount rate at the decline phase is negligible and statistically insignificant, as evidenced by the direct effect weighting coefficient value $\rho^{e}_{Recession}$ (Table 7).

The results of testing the advanced hypotheses (Table 9) confirm hypothesis $H_0^{\rho eRecession}$ about the neutral effect of the expected component $\Delta i^{e}_{Recession}$ of the Federal Reserve System monetary signals at the discount rate (at the decline phase) on the Ukrainian stock market return.

Table 9. Testing results for advanced hypotheses $H_0^{\rho eRecession}$, $H_1^{\rho eRecession}$, $H_2^{\rho eRecession}$ about the effect nature of the expected component $\Delta i^{e}_{Recession}$ of Federal Reserve System monetary signals (at the decline phase) PFTS stock index return

Source: Compiled and calculated by the authors.

Federal Reserve System monetary information signal	$H_0^{\rho eRecession}$ Neutral effect	$H_1^{\rho eRecession}$ Positive effect	$H_2^{\rho eRecession}$ Negative effect
Expected component $\Delta i^{e}_{Recession}$	Accepted	Rejected	Rejected

The effect neutral nature of the expected component of the Federal Reserve System's financial information signals on the discount rate on Ukrainian stock market return at the financial cycle decline phase can, as in the case of the ascent phase, be partially explained by the fact that the forecast regarding the change in the discount rate is already reflected in the current price and, according to Fama (1965), should not influence quotes. Thus, there is a forecasting and predictable reaction of the Ukrainian stock market return to monetary signals.

The PFTS stock index response to the surprise component $\Delta i^{u}_{Expansion}$ of the Federal Reserve System's monetary information signal relative to the discount rate in the ascent phase is negligible and statistically insignificant, as evidenced by the direct effect weighting coefficient value $\rho^{u}_{Expansion}$ (Table 7).

The results of testing the advanced hypotheses (Table 10) confirm hypothesis $H_0^{\rho uExpansion}$ about the neutral effect of the surprise component $\Delta i^{u}_{Expansion}$ of the Federal Reserve System monetary signals at the discount rate (at the ascent phase) on the Ukrainian stock market return.

Table 10. Testing results for advanced hypotheses $H_0^{\rho uExpansion}$, $H_1^{\rho uExpansion}$, $H_2^{\rho uExpansion}$ about the effect nature of the surprise component $\Delta i^{u}_{Expansion}$ of monetary signals of the Federal Reserve System (in the ascent phase) on PFTS stock index return

Source: Compiled and calculated by the authors.

Federal Reserve System monetary information signal	$H_0^{\rho uExpansion}$ Neutral effect	$H_1^{\rho uExpansion}$ Positive effect	$H_2^{\rho uExpansion}$ Negative effect
Surprise component $\Delta i^{u}_{Expansion}$	Accepted	Rejected	Rejected

The neutral nature of the surprise component effect of the Federal Reserve System's financial information signals on the discount rate on the Ukrainian stock market return at the financial cycle ascent phase can be partially explained by the fact that monetary policy announcements are not limited to the days when information signals at the discount rate are announced (e.g., Neuhierl & Weber, 2019). Investors also closely follow the reports of the US Federal Open Market Committee (FOMC) and the speeches of the head of the Federal Reserve System, with analyzes of the current economic conditions and reports on own expectations for the future development of the economy.

The evaluation results (Table 7) indicate that the Ukrainian stock market return reacts to the regulator's monetary signals (considering a temporary gap in the operation of the US and the Ukrainian stock markets, the reaction occurs when trading opens the next business day after the financial decision announcement on the accounting rate of the Federal Reserve System) at the discount rate during the decline financial cycle phase of the PFTS stock index.

A significant adverse reaction to the return on the Ukrainian PFTS stock market index is observed after an unexpected increase in the Federal Reserve System's discount rate at the decline phase. An unforeseen increase in the discount rate at the financial cycle decile phase harms the PFTS stock index return, as evidenced by the direct effect weighting coefficient value $\rho^{u}_{Recession}$ of the surprise component Δi^{u}. A positive surprise component of about 25 basis points leads to a return decrease on the PFTS stock index by an average of 2.9% (Table 7).

The results of testing the advanced hypotheses (Table 11) confirm the hypothesis $H_2^{\rho uRecession}$ about the negative effect of the surprise component $\Delta i^{u}_{Recession}$ of the Federal Reserve System monetary signals at the discount rate (at the decline phase) on the Ukrainian stock market return.

The volatility reaction of the Ukrainian PFTS stock market index to financial information signals at the Federal Reserve System rate at the financial cycle ascent phase recovery is notional and statistically significant. That is evidenced by the direct effect weighting coefficient value of the monetary information signal $\rho^{\Delta i}_{Expansion}$ on the Ukrainian stock market volatility (Table 7).

Table 11. Testing results for advanced hypotheses $H_0^{\rho uRecession}$, $H_1^{\rho uRecession}$, $H_2^{\rho uRecession}$ about the effect nature of the surprise component $\Delta i^{u}_{Recession}$ of Federal Reserve System monetary signals (at the decline phase) on the PFTS stock index return

Source: Compiled and calculated by the authors.

Federal Reserve System monetary information signal	$H_0^{\rho uRecession}$ Neutral effect	$H_1^{\rho uRecession}$ Positive effect	$H_2^{\rho uRecession}$ Negative effect
Surprise component $\Delta i^{u}_{Recession}$	Rejected	Rejected	Accepted

http://dx.doi.org/10.21511/imfi.17(4).2020.28

The results of testing the advanced hypotheses (Table 12) confirm hypothesis $H_2^{\rho\Delta i Expansion}$ about the stabilizing effect of the general change in the discount rate Δi at the financial cycle ascent phase of the Federal Reserve System on the Ukrainian stock market volatility.

Table 12. Testing results for advanced hypotheses $H_0^{\rho\Delta i Expansion}$, $H_1^{\rho\Delta i Expansion}$, $H_2^{\rho\Delta i Expansion}$ about the effect nature of changes in the discount rate Δi of the Federal Reserve System (at the ascent phase) on the PFTS stock index volatility

Source: Compiled and calculated by the authors.

Federal Reserve System monetary information signal	$H_0^{\rho\Delta i Expansion}$ **Neutral effect**	$H_1^{\rho\Delta i Expansion}$ **Destabilizing effect**	$H_2^{\rho\Delta i Expansion}$ **Stabilizing effect**
General change in discount rate Δi	Rejected	Rejected	Accepted

The volatility reaction of the Ukrainian PFTS stock market index to the financial information signals at the Federal Reserve System's discount rate at the financial cycle decline phase is notional and statistically significant. That is evidenced by the direct effect weighting coefficient value of the monetary information signal $\rho_{Recession}^{\Delta i}$ on the Ukrainian stock market volatility (Table 7).

The results of testing the advanced hypotheses (Table 13) confirm the hypothesis $H_1^{\rho\Delta i Recession}$ about the destabilizing effect of the general change in the discount rate Δi at the financial cycle decline phase of the Federal Reserve System on the volatility of the Ukrainian stock market. That partly can be explained by the dependence of issuing companies, whose shares are included in the PFTS stock index computing, on the world trade situation (e.g., Grynko et al., 2016; Velychko et al., 2019), which is greatly affected by the state of the US economy.

Table 13. Testing results for hypotheses $H_0^{\rho\Delta i Recession}$, $H_1^{\rho\Delta i Recession}$, $H_2^{\rho\Delta i Recession}$ about the effect's nature of changes in the discount rate Δi of the Federal Reserve System (at the decline phase) on the PFTS stock index volatility

Source: Compiled and calculated by the authors.

Federal Reserve System monetary information signal	$H_0^{\rho\Delta i Expansion}$ **Neutral effect**	$H_1^{\rho\Delta i Expansion}$ **Destabilizing effect**	$H_2^{\rho\Delta i Expansion}$ **Stabilizing effect**
General change in discount rate Δi	Rejected	Accepted	Rejected

The increase in volatility at the decline phase and the opposite effect at the ascent phase may mean that unexpected changes in monetary decisions on the Federal Reserve System discount rate at the financial cycle decline phases are perceived by the Ukrainian stock market participants more than at the ascent phases. Thus, for the Ukrainian stock market participants, the most essential is information about monetary decisions at the Federal Reserve System discount rate at the decline phases of the PFTS stock index cyclical fluctuations rather than at the ascent phases, since there is a significant increase in the level of volatility.

CONCLUSION

This study examined the effect of the Federal Reserve System's decisions on the discount rate on such main features of the Ukrainian stock market as return and volatility. The Ukrainian stock market's reaction to announcements on the Federal Reserve System's monetary policy was assessed with and without highlighting the financial cycle phases.

It was established that the Ukrainian stock market return reaction to the Federal Reserve System's monetary signals is quite significant. The effect of monetary decisions on the Federal Reserve System's discount rate (which fits into the logic of risk management) is more expressive at the decline phase than at the ascent phase of the financial cycle.

It is proved that the surprise component of the Federal Reserve System's monetary signal regarding the discount rate at the decline phase (to support the markets) increases the return of the PFTS stock index but destabilizes (increases volatility) of the Ukrainian stock market. Nevertheless, the Federal Reserve System's monetary decisions on the discount rate at the ascent phase in the Ukrainian stock market's cyclical fluctuations stabilize it.

A promising area of further research is to assess the return and volatility effects of the Ukrainian stock market of monetary decisions regarding the discount rate of the National Bank of Ukraine in the expected and the surprise components since there is no unified approach to determining such components of the national banking regulator's financial information signals.

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