THE SIGNALING ROLE O F FINANCIAL MARKETS IN TRANSITIONAL ECONOMIES: THE CASE OF UKRAINE

by

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A thesis submitted in partial fulfilment of
the requirements for the degree of

Master of Arts

National University Kyiv-Mohyla
Academy

2001

Approved by _____
Chairperson of Supervisory Committee

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Program Authorized
to Offer Degree _____

Date _____

National University Kyiv-Mohyla

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Abstract

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This paper provides an empirical study of the usefulness of financial asset prices in signalling future economic activity in Ukraine. Four econometric analyses, suggested by Cristoffersen and Slok (2000), are applied to check whether changes in short-term interest rates, stock prices, and exchange rate contain information about future movements in industrial production, wages, and unemployment.

Granger causality tests show that returns to money and stock markets signal future growth in industrial production; foreign exchange return, as well as money market return, is statistically significant indicator of future real wage dynamics. Financial asset prices provide no signals about registered unemployment rate. As the data is contaminated by outliers, the robust causality estimation method is applied, which shows a significant predictive ability of foreign exchange return regarding industrial production. A composite financial leading indicator index is constructed using the optimal weighting of the three asset returns.

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ACKNOWLEDGMENTS

I wish to thank Professor Michael Hemesath for the important comments on the drafts of this paper and for the valuable guidance in choosing the main directions of the research, and Professor Iryna Lukyanenko for helpful advice on the empirical part of the work. I am also especially grateful to Professors Charles Steele and Roy Gardner for their feedback and advice on further improvement of the final version of this work. I would like to thank Professor James Dean for his comments that helped in my understanding of the issues and Professor Stephen Lutz for the valuable in-class discussions and advice. Special thanks are provided to second year students Maxym Kryshko and Olexandr Zholood for their advice and willingness to help.

The highest gratefulness is directed to my family for the support and love that is given to me.

GLOSSARY

Akaike information criterion. Criterion, one of the roles of which is to help in determination of the lag length of variables in regressions. The specification with a certain lag length, which is characterized by the lowest value of Akaike information criterion, is chosen.

Currency Corridor. Fixed exchange rate with bands.

Leading Indicator Index. A composition of economic and non-economic variables used to predict future economic activity.

Outlier. An observation that differs largely from the rest of the sample.

Random Walk. Equivalent to non-stationarity or unit root problem. Mean and variance of time series vary over time.

Real Rate of Return. Rate of return to asset in terms of basket of goods.

Robust Estimator. An estimator, obtained without violations of assumptions, but the properties of which are not quite best.

Stationarity of time series. Mean and variance of time series are constant over time.

Schwarz information criterion. It is used in a way similar to Akaike criterion, but it provides larger penalty for extra coefficients.

UEPLAC. An abbreviation to the Ukrainian-European Policy and Legal Advise Center.

Chapter 1

INTRODUCTION

Any country in transition from planned to market economy considers financial development and economic stabilization among the key priorities of its policy. A healthy financial system is one of the main prerequisites for the achievement of macroeconomic stability, which is the eventual goal of any transition process towards the market-oriented economy. This fact, together with the expansion of financial markets and some economic progress in transition countries determines the importance of studying financial markets per se, and their performance in particular. Thus, the main task of this paper is to check whether economic and financial development in Ukraine has reached the point at which information available in the markets is exploited by the economy and incorporated into financial data. If it is actually the case, policymakers can elicit this information from past data values to predict future economic movements. We try to determine what sectors of financial markets are the most significant predictors of economic activity and what sectors are the least significant predictors in this respect. Thus, our task is to check whether the financial markets in Ukraine can effectively play one of their main roles, namely gathering the relevant information and incorporating it perfectly into asset prices (in this way providing signals to the economy).

This work focuses on the issue of the information content of the prices in its broader or aggregate form. We do not make attempts to discover what kind of information is represented through securities prices. It may even not be a testable issue to study at this stage of financial markets development in Ukraine. What we think is the interesting and actual problem to study for Ukraine now is whether

financial markets really gather and incorporate a considerable portion of any relevant information available in the economy. In checking this, we test whether financial prices predict future economic activity in Ukraine. If there is evidence in favour of predictable feature of asset prices, we conclude that they do incorporate the relevant information about the future economic movements in the country. And the stronger the evidence, the more efficient markets appear to be in our view.

We suggest that the development of the economy and financial markets in particular has reached the level at which somewhat meaningful results can be obtained. Our argument is based on the following facts, observed in Ukraine: over the last two years interest rates fell largely; financing became cheaper and expanded for the real sector of the economy (UEPLAC, December 2000); the foreign exchange rate was finally liberalized in March 1999 and followed quite stable trends since that time; trade volumes at stock exchanges were rising starting from 1997; and finally by 2000 Ukraine overcame the shock from the Russian crisis.

Additional motivation for this study has its origins in the results of various empirical studies of the developed countries made at different periods of time that demonstrate the existence of signals in asset prices about future real economic activity. The common feature of these studies is that they all cover the investigation of one particular sector of financial markets, say bond or stock markets, for the case of developed countries. The question arises whether the financial markets are efficient in transition countries. Considerable efforts on this issue are made by Christoffersen and Slok (2000) in their study of informational ability of asset prices for six transition countries, namely Poland, Russia, Hungary, Slovakia, Slovenia and Czech Republic. For those countries and Ukraine, the starting time for transition was approximately the same. Despite this, financial

markets have been developing in somewhat different ways, thus, leading to different current situations, with Ukraine facing a delay in progress as compared to other transition countries in the sample studied. Christoffersen and Slok's finding strongly supported the general view of predictive ability of asset prices for transition countries with the longest history of financial sector existence.

In our research, we attempt to study the informative efficiency issue for the Ukrainian financial assets using the same technique applied by Christoffersen and Slok (2000). The traditional theory of finance suggests informational advantages of banks comparing to other financial markets at the early periods of financial development. But, as suggested by Roe et al. (1997), the transition period is a unique one in that it presumes no such significant advantage of information gathered by banks due to poorly established ways of gathering it. Thus, according to the theory, some traditional approaches to analyzing financial markets may not be very plausible in the case of transition economies. We analyze three types of financial markets: the markets for shares, loans and foreign exchange. Our main question is whether asset prices contain information about future movements in real economic activity in Ukraine.

The analysis proceeds as follows. In Chapter 2 we make a broad overview of the theory on efficiency of financial markets. Chapter 3 covers the overview of the background of and different approaches to testing the efficient markets hypothesis. In Chapter 4 we reveal some important stages of development of Ukrainian financial markets. Following this we describe our data (Chapter 5) and then start our empirical investigation in Chapter 6. As a first step of our empirical analysis, we check the predictive ability of asset prices regarding future movements in real industrial production, real wages and unemployment using Granger causality test. The problem of large outliers in data forces us to check our results using another, robust, causality test. As the final step of this work, a

composite financial leading indicator index is constructed which may help to predict economic events in the country and to explain future movements in economic activity of Ukraine. The purpose of this leading indicator is to show the future movements of real economy activity predicted by financial markets using the information available. We test the sensitivity of our results to the choice of sample period. We conclude our analysis by summarizing the results, suggesting some policy implications and recommendations for further studies.

Chapter 2

EFFICIENT MARKETS THEORY

2.1. DEFINING FINANCIAL MARKETS EFFICIENCY

The theory of market efficiency states that at any given time prices of financial assets (i.e. securities) perfectly and immediately incorporate all the information available at that time (which covers old and new information, and expectations formed on their basis)[1]. Such efficient prices would be perfect signals of resource reallocation to investors (Fama, 1970, p.383). The theory presumes that prices of financial assets are completely flexible and reflect conditional expectations of the players (Sheffrin, 1996, p.99). This does not mean that the current guess of the future value of an asset indicates exactly the ultimate future value, which is possible only in the case of full availability of any even slightly relevant piece of information that may affect the ultimate value of the asset (Brealey and Myers, 1996, pp.327-328).

Mishkin (2000, p.696) emphasizes that in financial markets the incentives to form optimal expectations are particularly strong, owing to the high possibility to get rich by making better forecasts. Thus, the theory of rational behaviour developed a new, "financial" branch called "the efficient markets theory".

[1] The Efficient Market Theory (otherwise called "Efficient Market Hypothesis" or EMH) is based on the rational expectations theory, developed by John Muth together with other monetary economists, which says that expectations, which incorporate all available information, are the best forecasts of the future values (see Muth (1961) as an example).

2.2. THE RANDOM WALK BEHAVIOUR OF ASSET PRICES

The theory uses the concept of random walk to characterize the behaviour of asset prices as random. This is derived from the fact that asset prices already incorporate all the available information (predictable changes), and can be changed only if something unpredicted happens (new information becomes available). As unpredicted events are random in nature, asset prices vary randomly (Brealey and Myers, 1996, p.328).

When new information becomes available in the market, none of the agents knows what his or her future earnings are going to be. The market players will make their own judgements and the market will show the average of these estimates. But it should be noted that good news (i.e. news related to possible increase in earnings) imply the ups as well as downs in asset prices dynamics. If the estimates of agents appear to be too high, the price of an asset will initially rise, adjusting to their expectations but will fall eventually, when the event will take place. Hence, securities cannot be over- or underpriced for a sufficiently long period of time (Alchelis, 2001). The conclusion of the theory is that an agent can expect only normal gain from operating with securities at efficient financial markets and abnormal profits are the issues of chance rather than skills. Despite this, the successful performance of some agents still enhances people to continuously study the market in an attempt to outperform it.

Two types of asset prices analysis support randomness of their fluctuations, as pointed out in Brealey and Myers (1996, pp.328-329). The analysis, accomplished by "technical analysts" (otherwise called "chartist analysts"), is aimed to study all the information about past price movements. A crucial assumption here is that prices move according to some patterns (called "technical anomalies"), which tend to recur in the future (Investor Home, 2001). Despite the existence of price dependency it may be possible to outperform the market using this type of

analysis. Suppose that there is a pattern found in financial market, which may help to predict that prices will move to a certain direction (say, they will rise) in a week[2]. In competitive environment among chartists, informed people immediately try to exploit this technical anomaly, which causes its evaporation (prices change immediately and not in a week). Despite its relative easiness, this type of analysis is quite unrealistic one and is rarely applied in practice.

Another type of analysis called "fundamental analysis" is more commonly conducted. The fundamental approach assumes that "at any point in time an individual security has an intrinsic value", i.e. its equilibrium value, "which depends on the earning potential of the security." To check for the beneficial deviations from the equilibrium values, fundamental analysts study the company's business performance. If the competition among fundamental analysts is sufficiently large, the prices will incorporate all the important information and there will only be unpredictable price changes (Brealey and Myers, 1996, p.328).

In the real world the random walk theory faces some challenges, which make this theory less compelling. The problem is that the vast majority of people usually evaluate common stock using their expectations based on yesterday's prices of comparable securities and adjusting it for the currently available information. Since investors' expectations determine demand on assets and, thus, asset prices, it appears that past prices do have a significant influence on future prices (Alchelis, 2001). The longer information is not subject to large spikes, the more confident the market players are in the correctness of today's prices. However, when the market players are disappointed in the prices, the chaotic transactions and price volatility take place until the market is again "confident" (Brealey and Myers, 1996, p.333).

[2] The example is based on the similar one described in Brealey and Myers (1996, p.328).

2.3. THREE FORMS OF EFFICIENT MARKET HYPOTHESIS

The efficient markets hypothesis is quite a broad issue; to increase its testability Harry Roberts distinguishes between efficient market hypotheses of different strength and proposes three forms of the Efficient Market Theory[3]:

I. The **"Weak" form** – all the information from past prices is fully incorporated into securities prices. The weak efficiency theory, thus, suggests that the market is "at least" efficient and technical analysis is useless (Investor Home, 2001).
II. The **"Semi-strong" form** – all publicly available information is entirely embodied in securities prices. That is to say, fundamental analysis is useless.
III. The **"Strong" form** – all information is fully reflected in securities prices. That is, insider information is of no use.

The division into three forms specifies more precisely a shortcoming of the efficient markets theory, which is most easily identified in the "strong" version of markets' efficiency. The shortcoming lies in the almost complete impossibility of testing the strong form of EMH, because of lack of non-price methods for evaluating the intrinsic value of assets (Brealey and Myers, 1996, p.333). This may explain small amount of evidence supporting this form of the EMH.

2.4. FINANCIAL MARKET INEFFICIENCY

Investor Home (2001) points to the paradox of efficient market theory, which lies in the fact that if each player believed in the market efficiency, no analysis would be made and no trading operations would be conducted. The market may simply disappear or become strongly inefficient. Consequently, the efficiency of the

[3] See Brealey and Myers (1996, p.329) for the reference to Harry Roberts' unpublished paper "Statistical versus Clinical Prediction of the Stock Market", presented to The Seminar on the Analysis of Security Prices, University of Chicago, May 1967.

market is based on its players who believe that the market is sufficiently inefficient for them to try to outperform it by trading various securities. And in markets with some degree of inefficiency it is expected that more informed players make attempts to outperform the less informed ones (Investor Home, 2001).

Fama(1970, p.387) defines three sufficient conditions for financial markets to be efficient:

1) no transaction costs in trading financial assets in the market;
2) all available information can be accessed at no cost;
3) no disagreement in the implications of the available information for prices of securities.

The existence of a market satisfying all three conditions is definitely an unrealistic. As Fama notes himself, these conditions are not necessary for any market to be efficient (see pp.387-388). For example, even in the presence of large transaction costs (i.e. the violation of the first condition), the market may still be efficient if agents take into account all available information. With this awareness about the available information, those transactions that are not hindered by large costs of their accomplishment, affect prices so that they reflect all available information. The existence of a "sufficiently large" number of investors with access to all available information is quite enough for market to be efficient as long as their bargaining leads to "efficient prices". And finally, unless there are some agents that continuously outperform the market, the disagreement among agents about the implications of available information to the prices is not a factor of inefficiency. However, Fama indicates that these conditions, not being "necessarily sources of market inefficiency, ...are potential sources" (Fama, 1970, p.388).

Grossman and Stiglitz (1980) go further and define the costless information as the necessary condition for efficient capital markets to exist. But this becomes an absurd because competitive markets matter only when there are some informational costs. In the case of freely available information there will be no competitive equilibrium. The market will exist only if there are some differences in beliefs of agents (induced by costly information). It is also shown that when the information is costly and the market is efficient (i.e. prices already reflect all available information), informed market players see no reason in paying for information as long as they earn the same profit as uninformed agents. Thus, there is no equilibrium with some players being informed, but also no equilibrium exists where all the players are uninformed, because they will feel they could earn more by using information. Hence, equilibrium exists when information is almost costlessly available to all market participants, or when informed agents are very well informed. In this case prices reflet almost all available information (Grossman and Stiglitz, 1980, pp.403-405).

As examples of extremely efficient markets Investor Home (2001) proposes the government bond market and markets for stocks of large capitalization. This may be the case for developed countries, but it is not valid for bond markets in Ukraine, which is represented by government bonds with a low level of public confidence in the market. Markets for international stocks, stocks with small capitalization, real estate and venture capital markets are likely to be markets of moderate efficiency. In markets of this kind information is spread unequally, and there are possibilities to outperform the market, especially for those people who have access to inside information of the companies. In most markets there are few institutions that can gather most of the relevant information on the aggregate, market level.

Chapter 3

LITERATURE REVIEW

The issue of market efficiency is an enormously broad one, and therefore it induced a great deal of research in quite different fields of economics. We can roughly divide these researches into the following groups by the questions they address:

1. To what extent do securities prices reflect the relevant information?
2. Do asset prices follow a random walk or patterns?
3. Is it possible to continuously beat the market (i.e. to earn above normal profits)?

The incipience of the idea of markets efficiency was quite an extraordinary one, beginning with the empirical puzzles that initially fitted no existing theory. Hence, we present the review of the researches made on market efficiency in the following order. Firstly, we talk about earliest works, which served as a stimulus for developing an appropriate theory. Then we provide a very brief insight into different approaches to test for markets efficiency and the evidence for and against the efficiency issue. And finally, we provide an in-depth overview of the researches done on the informative ability of financial asset prices.

3.1. PREDECESSORS TO THE THEORY

The main impetus for the development of efficient markets hypothesis lays in the middle century's researches that found the evidence of random walk behaviour for securities prices. The father of this view, French mathematician Louis Bachelier in his Ph.D. dissertation titled "The Theory of Speculation" (1900)

came to the conclusion that "the mathematical expectation" of the speculator's profits is zero[4].

In 1934 Holbrook Working observed a somewhat independent behaviour of commodity prices and outlined the possibility that stock prices are much more random in their nature. A later follower of Bachelier's paper was the powerful work by Maurice Kendall (1953), in which the author argued against a cyclical behaviour of stock and commodity prices. Harry Roberts (1959) found that plotting prices against time could only show different levels of prices over time, but not patterns. He suggested that it is worthwhile looking at the changes of prices over time in order to check for patterns.

Generally, the works done by Working, Kendall and Roberts were based on the analysis of time series and could be hardly explained properly at that time.

Thus, the beginning of the "theoretical" evolution of the Efficient Markets Theory dated back to 1963, when Eugene Fama Ph. D. wrote his dissertation on the efficiency of financial markets and random walk behaviour of stock prices. In his work Fama states the following:

«An 'efficient' market is defined as a market where there is a large number of rational profit-maximizers actively competing, with each trying to predict future market values of individual securities, and where important current information is almost freely available to all participants. In an efficient market, competition among the many intelligent participants leads to a situation where, at any point in time, actual prices of individual securities already reflect the effects of information based both on events that has already occurred and on events which, as of now, the market expects to take place in the future. In other words, in an efficient market at any point of time the actual price of a security will be a good estimate of its intrinsic value[5]» (see Fama, 1995, p.76).

4 The citation of Bachelier's dissertation is taken from Investor Home (2001).

5 In Fama(1995) part of Fama's dissertation was published.

3.2. APPROACHES TO TEST THE EFFICIENT MARKET HYPOTHESIS[6]

The evidence that supported market efficiency was mainly observed in the period before the 1980s and can be roughly divided as follows:

1. The evidence on random walk behaviour of securities prices and three forms of the EMH, which are well studied in the work of Fama (1970) as well as in the studies mentioned in the previous section;

2. The impossibility of continuously outperforming the market by, e.g., learning its patterns of movements is broadly examined for the case of mutual funds and stock markets in developed countries (Jensen (1968), Grimblatt and Titman (1989), and Ippolito (1989)).

The evidence against the EMH was quite rare up to 1980s, but eventually there emerged a sudden cluster of contrary findings:

1. Small firms appear to earn above normal profits for long time periods (Ritter (1988) is quite useful regarding this issue);

2. Markets overreaction, excessive volatility and relative rigidity of securities prices in slowing down previously impulsive behavior are observed by Shiller (1981), De Bondt and Thaler (1987). The abnormal jumps in prices in the period of December-January, called the "January effect", are also observed largely for shares of small companies (see Huberman and Kandel (1990) for details).

[6] This section is based on the well outlined survey of empirical evidence in Mishkin(2000, pp.700-706).

3.3. EVIDENCE ON INFORMATIONAL PROPERTIES OF ASSET RETURNS

Various researches incorporate an attempt to describe future economic activity by examining current changes in financial returns and spreads (i.e. changes in returns on different securities). Most of them find positive evidence on the informative ability of "predictors" chosen. We outline here the works which seem to be well reasoned to us and are based on considerable portion of empirical evidence. The works are remarkable to the extent that they make attempts to study various aspects of informative issue. Most works investigate the informative property of one chosen group of financial assets, without considering all of them simultaneously. To present as an example, Estrella and Hardouvelis (1991) find positive relation between cumulative or marginal future real GNP growth rates and the today's slope of the yield curve measured as a spread between short-term interest rates and long-term interest rates (that is between the 3-month Treasury bill rate and the 10-year Treasury bond rate). They also consider growth rates of different components of GNP separately to check for an "individual" predictability. The results show that predictive power stands for up to 4 years ahead as for cumulative changes and up to 7 months regarding marginal growth rates of real output growth. The results are similar for the components of real GNP, namely for consumption, investment and consumer durables. The same qualitative conclusions Campbell (1998) makes in his work on stock and bond markets, consumption and the business cycle, where he finds a strong forecasting ability of bond market towards output growth and less remarkable predictive ability towards consumption growth for different countries.

Estrella and Handouvelis (1991) also consider the quality of information (i.e. its usefulness) incorporated into asset prices. The main question here is whether the predictive ability of securities prises will last in the future? To find explanation Estrella and Hardouvelis use IS-LM framework. There can hardly be found a

definite answer to this question, but the general recommendation for policymakers and forecasters is to examine the impact of the sample period chosen on the correlation results. Estrella and Hardouvelis consider also the relation between the current yield curve and future monetary policy actions checking whether other influences are also reflected into asset prices or the informative property is limited to future monetary policy changes alone. The issue still appears to be doubtful and may be subject of further research. The authors find that indicators of macroeconomic activity (lagged variables of output growth, inflation, the leading indicators index consisting of twelve widely accepted indicators) are generally much weaker predictors than the yield spread, with forecasting ability of no more than three quarters.

The simultaneous study by Nai-Fu Chen (1991) comes to the similar conclusion that short-term interest rates, the yield spread, and past growth of industrial production are good forecasters of future movements in real GNP and consumption. The predictive power of a spread appears to last for 5 quarters and the variable is only slightly correlated with the lagged GNP growth rates.

Quite a different study is conducted by Dow and Gorton (1997) in which the authors make an attempt to examine the quality of information reflected in stock prices. They examine the impact of stock market efficiency on the welfare of the economy by trying to find a link between stock market efficiency and allocative efficiency. The authors claim that the financial markets efficiency do not necessarily imply the efficient economy. They come to the conclusion that efficient markets can enhance the efficiency of the economy in two ways, the backward-looking and forward-looking ones, but are not sufficient for economic efficiency to exist. The role of financial markets efficiency in allocation of capital is considered as an indirect and a slight one. Despite the fact that stock prices do not reflect the costs of investments, market players use them for obtaining

information about investment decisions. This is economically efficient role of informatively efficient asset prices. But Dow and Gorton define another possibility in which the equilibrium is not efficient in terms of allocation of investment resources. This is the case when stock prices do not reflect the relevant information. Then, if and only if the average investment opportunity has negative net present value, the manager may never invest. If there are no investments, they do not affect future profitability of assets and the securities traders can't exploit any profit through revealing information. Thus, stock prices will remain "uninformative". But these prices will stay efficient because they are the result of supply-demand forces in the economy. Additionally Dow and Gorton find that efficient stock markets are not the necessary condition for efficient investment decisions because banks may substitute them quite well.

The evidence of informative feature of stock returns is found in the paper by Cochrane (1991) where he tests for the equality of stock returns forecasts of future economic activity and forecasts, which come from investment returns. The author uses production–based asset pricing model to show that stock returns of the previous three quarters are individually significant predictors of GNP value in a subsequent quarter. The most significant forecasting abilities are found in the nearest returns and no considerable difference is observed in forecasting properties of investment returns and stock returns.

The earlier work of Barro (1990) witnesses a considerable explanatory power going from lagged real stock market price movements in USA towards the investment growth rate for the period of 1891-1921. The author observes the increased significance of results when the sample period is expanded. The puzzling result is found regarding the greater predictive ability of US stock market regarding Canadian investment movements than the predictive power of Canadian stock market itself. Some possible explanations to this finding, among

them using of Toronto stock index, which is the inefficient measure of Canadian stock value, and the fact that many US firms are the considerable sources of investments in Canada, are still not satisfactorily strong.

The recent work by Christoffersen and Slok (2000) is the only one known to us study of efficient market hypothesis in its informative context made for transition countries[7]. And this is a study that uses the main parameters of financial markets together to test for the informative aspect of efficiency markets hypothesis. The study covers financial markets of Czech Republic, Poland, Russia, Hungary, Slovakia and Slovenia in the period of 1994-1999. The authors make an in-depth analysis of the financial variables-economic variables linkages. The commonly used for studying financial markets Granger causality test is applied to test for existence of any causal relationship between financial series of interest rates, stock returns and foreign exchange returns and economic series, represented by real variables of industrial output growth rate, wage and unemployment rate. The significant relationship is shown for future movements of industrial production. The authors point out to the great volatility of series and to the existence of large outliers, which may spoil the importance of the results obtained. Thus, quite a different, robust approach is applied which shows the significant results in favour of labour market, but does not prove the previously obtained results on causality. Christoffersen and Slok construct a composite leading indicator index[8] out of the three financial variables and lagged industrial variable that is useful for policymakers in predicting real economic activity. The general important conclusion of the work is the evidence of great effectiveness of financial markets in progressive transitional economies.

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[7] Another research on efficient market hypothesis for transition countries was the simultaneous work by Dedov (2000), in which the random walk behavior of asset prices and the weak form of markets efficiency are not supported by the evidence for the case of Ukrainian over-the-counter stock market.

[8] More information on composite leading indicator indexes, their construction and predictive ability can be obtained from Auerbach (1982), Diebold and Rudebusch (1989).

Chapter 4

THE DEVELOPMENT OF FINANCIAL MARKETS IN UKRAINE

The purpose of this section is to provide a broad overview into the financial markets in Ukraine, outlying basic stages of their evolution. The goal here is to show the progress of the transition of Ukrainian economy towards the market system. Each financial market in Ukraine is characterised by its own unique path of development and it is helpful to consider the banking, foreign currency and stock markets separately.

4.1. THE BANKING SECTOR

The national banking system emerged in March 1991 after the Ukrainian Parliament issued the Law of Ukraine "On Banks and Banking Activity". The growth of the banking sector followed in two directions. The first was the establishment and development of the National Bank of Ukraine (the NBU) as the central bank of the country. The second one covered different types of commercial banks.

According to the report of the National Bank of Ukraine (2001), commercial banks are either joint stock companies or the companies involving both physical and legal entities. In 1990 the Association of Ukrainian Banks was established to protect the interests of banks in the economy (Consulate General of Ukraine in Chicago, 2000a). The central bank played a primary role in regulating banks' activity through implementing controlling procedures for statutory capital formation of banks and quality of services, standards of liquidity, solvency, reserve requirements, specifying the maximum amount of credit per loan, defining rules for conducting open market operations (covering collateral

crediting and operations on the stock market) and establishing procedures for issuing and withdrawal of credit funds.

In 1998 the NBU issued the last version of the set of rules and procedures of regulating establishment, registering and licensing of commercial banks that have some share of foreign capital. According to the Consulate General of Ukraine in Chicago (2000b) the establishment of bank (with its foreign capital being anything up to 100%) requires the minimum amount of capital of 10 m Euro and the share of each shareholder being no more than 35%.

All these regulative measures of the National Bank of Ukraine are crucial for many banks to stay in financial business. Starting from 1994 the NBU provided direct crediting of banks on production programs and put to force credit auctions in Ukraine. In that period, banks started to issue loans against a collateral of highly liquid securities (see Consulate General of Ukraine in Chicago, 2000b). In 1996 the National Bank approved the system of licensing of activities for commercial banks and in January 1998 the Ukrainian banks adopted international accounting and statistics standards (National Bank of Ukraine, 2001). The latter step was aimed at improving the disclosure of information about banks and at further facilitating the relationships of Ukrainian banks with foreign ones. Among the innovations covered by adoption of International Accounting Standards were:

1) clear determination of banks' profits on the basis of its activity;
2) accrual principle for all transactions that were recorded in balance sheet;
3) taxation accounting was separated from the financial one;
4) banks were required to disclose information to their clients;
5) creation of the base for internal bank audit and better management inside the bank.

The survival of banks in the transition period was also greatly dependent on the confidence of society in the baking sector. To increase public confidence, the insurance fund for bank deposits was created in September 1998 (Consulate General of Ukraine in Chicago, 2000a).

According to the Consulate General of Ukraine in Chicago (2000a), 227 banks were registered in the National Book for Registration of Banks in 1998. Among them there were two state-owned banks (OshchadBank and Ukreximbank) and 17 commercial banks with foreign capital. In June 1999 among a reduced number of 210 banks registered there were 28 commercial banks with foreign capital, out of which 9 were 100% foreign-owned (Consulate General of Ukraine in Chicago, 2000b). Hence, the share of total foreign capital in the banking sector of Ukraine amounted to 15%. By February 2001, a further reduction in the number of banks showed 195 commercial banks registered. Out of these, 31 banks incorporate some share of foreign capital including 7 joint stock banks with this share being 100% (National Bank of Ukraine, 2001).

Regarding the recent trends in the banking sector we can outline the following major directions (UEPLAC, December 2000):

1) The National Bank of Ukraine reduced credit rates to real sector of the economy. According to UEPLAC, the NBU lowered its discount rate from 45% in January 2000 to 27% in October of that year. This stimulated banks to pay greater attention to financing the real sector. Despite this, the share of loans for financing investment decisions as a proportion of total number of bank loans actually diminished from 8.9% in 2000 to 5.6% as for the beginning of 2001
2) The reserve requirements were reduces. This means that the excessive liquidity (i.e. the large increase in the amount of reserves at the NBU as of

2000 with no significant improvements in loan issuing) of commercial banks diminished;

3) Generally public confidence in Ukrainian banks improved, which can be seen from the increase in the amount of individual deposits by 2.3 bn UAH in 2000, which is equivalent to a 54% increase;

4) The decreasing gap between profitability of the economy and interest rates signifies better access to financing for enterprises;

5) The constraints are imposed on barter transactions, which resulted in accumulation of cash at banks' accounts.

Despite some evident improvements of the banking sector, the total amount of financing exceeds slightly 10% of GDP (UEPLAC, December 2000). Finding solutions to the still existing problems of information disclosure, solvency, internal management, public confidence and many others are essential for the existence of a healthy banking system.

4.2. THE MARKET FOR FOREIGN CURRENCY

The US dollar is the most traded currency at the Ukrainian foreign exchange market. Thus, our discussion about foreign exchange mainly concerns this currency and its price in hryvnyas.

In October 1994 prices, including foreign currency prices, were officially liberalized (UEPLAC, April 1998). The first response to this planned economic shock was a considerable real depreciation of exchange rate, which gradually recovered later. Despite that, foreign exchange market stayed under the tough control of the National Bank of Ukraine. The subsequent period of 1995-1997 was the time of currency markets' expansion (UEPLAC, December 2000, p.85). The stability of the national currency exchange rate in that period signalled the

increased confidence of the society in the domestic monetary unit. In September 1996 hryvnya was introduced into the economy (UEPLAC, April 1998).

In response to the crisis in Russia in August 1998 the official planned foreign exchange band for that year of 1.85-2.25 UAH/USD was upgraded to the level of 2.50-3.50 UAH/USD. Hryvnya showed the rapid depreciation in September with the overall devaluation for that period of 36% (UEPLAC, November 1998). Generally, for the period to the end of that year foreign exchange was under the tight control of the National Bank. The control over the currency market covered the following aspects:

1) Foreign exchange transactions were centrally controlled through Kyiv. Inter-bank transactions were banned in order to reduce the speculative actions in the market;
2) Narrow 5% margins around official exchange rate were imposed on the bid/ask prices of foreign currency;
3) Foreign currency was provided only for the predetermined 'crucial' import transactions;
4) A surrender rate of 50% was imposed on the foreign currency earnings of exporters.

Thus, it was not a surprise that the 'black market' in September expanded quickly with the unofficial exchange rate exceeding by a large margin the NBU's.

The six month-currency controls appeared to be very helpful in successful stabilization of the currency market. After the overshooting period of September – October 1998, the market exchange rate returned to the normal fluctuations inside the corridor (UEPLAC, November 1998).

Inasmuch as the foreign exchange market reached a considerable level of stabilization, in March 1999 the NBU decided to liberalize the foreign exchange rate. By the end of that year the bid/ask margins on the dollar exchange rate were cancelled. The year 1999 brought the appreciation of hryvnya/dollar exchange rate of 31% (UEPLAC, December 2000, p.85). The subsequent year showed further strengthening of the national currency. There were no official controls by the National Bank, although foreign currency was still under its careful surveillance. In 2000 the foreign currency market was remarkably stable. The dollar exchange rate devalued by 4.2% in nominal terms and revalued by 17.2% in real terms.

4.3. STOCK MARKET DEVELOPMENT

There are three stages in the evolution of capital market in Ukraine, as suggested by Ignatov (2000):

The market of issuers (1991-1994). The activity in the market was minimal, with main players being issuers itself, buying and selling securities.

Initial stage (1995-1997). The Securities Stock & Exchange Commission was created with the purpose of tracking securities. The infrastructure for securities trading was poorly provided and didn't stimulate the expansion of stock market considerably.

These first two periods were characterized by massive bankruptcy of joint stock companies established in the early 90s and loss of the money invested in public venture firms. These forced small & middle size investors to leave the market.

Regulated market (1997-2000). The State Securities & Stock Exchange Commission increased regulation of transactions and completed legislative base.

But the regulation appeared not to be strong enough to make securities markets more transparent.

As the secondary market for securities reached some meaningful level of development only in late 90s, we concentrate mainly on this period of the stock markets evolution in Ukraine.

In 1996 PFTS - the largest marketplace for securities (mainly shares) - was established in the form of an over-the-counter stock market (PFTS, 2000). PFTS regulates trading operations, settlement of disputes and provides protection to its members and investors. PFTS has its own listing requirements, divided into 3 groups (levels), which differ in extend of information disclosure, re-registration conditions and level of investors' interest in the securities. Initially PFTS main activity included secondary market services and State Property Fund actions.

We provide a descriptive statistic of the stock market in general and of the largest trading place for the period 1997-2000 in Table 1. It can be noticed that over the last four years the stock market has been expanding largely. One of the main reasons of such a considerable increase in trading volumes was the recent successful privatization (the case of 1999 and 2000 years).

The year 1998 was not favorable year for stock market in Ukraine in general. The Russian crisis of August 1998 harmed financial markets largely. The number of stock market players dropped considerably and non-residents lost interest to the "expected to recover" securities markets. The stock market faced a downturn in trading activity. Trading at PFTS was represented by 12 industries. The most active trades were accumulated around power generating and supplying companies (more than a half of all shares trading volumes), metallurgy, oil, gas, and chemistry industries. These industries covered 89.5% of cumulative share trading at PFTS of UAH 206.9 mln (see PFTS, 1998).

For the first time, in August 1999, PFTS granted temporary access to the trading system to 40 companies.

Table 1. The descriptive data on stock market development for 1997-2000.

	1997	*1998*	*1999*	*2000*
PFTS daily trading volume (mln. UAH)	NA	1.34	4.03	5.80
PFTS average daily amount of trades	15	13	31	101
PFTS total trading volume (mln. UAH)	321.60	338.54	988.44	1463.03
Total trading volume of Ukrainian Regulated Market (mln. UAH)	761.95	522.92	1899.10	2820.50
PFTS share of total trade volume in Ukraine	42%	64%	52%	52%
PFTS share of secondary stock market circulation	NA	99%	99%	99%
The capitalization of shares traded at the PFTS trading system at the end of the year (UAH bn)	NA	4.94	11.70	12.02
Structure of trade:				
Shares	NA	61	62	90
Bills of exchange	NA	NA	32	3
Bonds	NA	35	6	0
Listing of companies:	131	186	432	249
The 1st level	6	9	9	9
The 2nd level	77	116	152	165
The 3rd level	48	61	271	75
No. of investment companies, brokerage firms, and banks in the PFTS Association at the end of the year	>190	294	150	197

Source: The data for Table 1 is taken from the annual reports of PFTS (see PFTS 1998, 1999 and 2000).

The period of 1999-2000 was characterized by a considerable expansion of the stock market in Ukraine (Table 1). In 2000 the interest of domestic investors to shares of Ukrainian companies increased, although there was no improvements in attracting attention of non-residents to Ukrainian stock market. The latter might be explained partially by harmful political situation in the country over the last half of 2000 and by low development of international cooperation between investors (PFTS, 2000).

The year 2000 was notable in the sense of the recovery of activity in secondary and especially in primary stock markets. In January – June 2000 the privatisation process was very favourable for Ukrainian stock market. In 2000 PFTS expanded its activity by adding primary market services. The amount of oil and gas companies as well as banks increased largely at PFTS. Still the shares of power enterprises were the most tradable securities, accounting for more than 40% of trades (PFTS, 2000). Total trade volumes at PFTS comprised 70% of the trade volumes in the whole secondary market (in 1999 it was equal 65%). It remains the largest trading place for securities in Ukraine now (see Table 1).

Despite a notable progress in the development of stock markets in Ukraine, it is still low compared to the other countries of former socialist regime, partially due to the low speed and poor success of privatisation programs implemented in Ukraine. In 2001 Ukrainian market of securities still faces the problems of liquidity, fluctuations in trade volumes (no consistency in the demand for shares), the transparency in securities' transactions, lack of enforcement of laws (although the infrastructure was elaborated quite well) and small volumes of trade.

Chapter 5

DATA DESCRIPTION

The main purpose of the analysis is to test whether financial markets incorporate relevant information about the economic activity of Ukraine into asset prices[9].

We choose the following three real economic variables as proxies to the movements in economic activity: real industrial production, unemployment and real wage. The reason of choosing industrial production and not GDP as an indicator of economic activity is that the latter includes the agricultural sector, which has no strong relations with financial markets in Ukraine yet. We apply the following financial return series: real money market interest rate, real stock prices and real exchange rate as the main financial indicators for Ukraine. All data series are seasonally adjusted.

Our choice of sample period is limited by the series of stock indices available. Different organizations simultaneously have started to calculate stock indices only several years ago. Thus, we have chosen the sample period from January 1997[10] to September 2000.

Real Industrial Production (IP).

We take the Index of Real Industrial Production (official, 1990=100) calculated by Derzhkomstat and UEPLAC and published monthly in *Ukrainian Economic*

9 Our empirical analysis uses the methodology offered in the recent work of Cristoffersen and Slok (2000), which investigates whether such signals are valid for the sample of transition countries, namely Poland, Russia, Slovakia, Slovenia, Hungary and Czech Republic.

10 This is the earliest date when stock indices calculations were made in Ukraine.

Trends by UEPLAC (December 1998, 1999, and 2000)[11]. The data are seasonally adjusted. Industrial production is composed using the data from 9800 medium and large Ukrainian enterprises. The index is constructed as a combination of chain index (defined as a percentage ratio between industrial production in one month and the previous month) and industrial production index of the previous month.

It should be noted that a part of industrial production couldn't be observed and registered by Derzhkomstat. Thus, the data is biased downward – the official statistics is likely to underestimate the performance of the economy.

Unemployment (U).

Total Unemployment Registered as a percentage of labor force. The data is available at OECD (2000). The data on the registered unemployment should be accepted with a grain of salt, as they don't perfectly reflect the actual state of labor market, where the real unemployment is much higher, but where the incentives to register in employment centers are very weak and many actually unemployed people can hardly meet the requirements to be recognized as "unemployed" officially.

Real Wage (W).

The data for Total Real Monthly Wage (1990=100) is elicited from the database published in *Ukrainian Economic Trends* by UEPLAC. The reported data covers both private and state enterprises, and generally understates the factual data. The data is calculated on the basis of "accounted" wages that might not be actually paid. Real wage is obtained by deflating nominal wages by CPI.

[11] As almost all of our data are taken from *Ukrainian Economic Trends* by UEPLAC, this source is indicated as simply "UEPLAC" in the text and implicitly means UEPLAC (December 1998, 1999, and 2000). But this

Stock Index (S).

We use the data for ProU-50 Index, which has the longest history in Ukraine. The company *"Prospect Investments"* has been calculating it since January 1, 1997. A detailed description of index is taken to Appendix 1.

Real Money Market Interest Rate (I).

The data of Monthly Real Interest Rate on Credits (lending rate) (weighted average) is collected from *Ukrainian Economic Trends* (UEPLAC). Traditionally in Ukraine interest rates are not compounded. Real data is obtained by deflating the weighted average interest rates on credits by CPI.

Real Exchange Rate (E).

Real cash exchange rate for US dollar (index June '92=100) is taken from *Ukrainian Economic Trends* (UEPLAC). For its calculation the product of the nominal average exchange rate for cash in Kyiv is multiplied by the U.S. price level and then divided by the price level (CPI) in Ukraine. The US dollar is chosen because this currency is most commonly used in transactions.

Consumer Price Index (CPI).

Monthly data for CPI is taken from *Ukrainian Economic Trends* (UEPLAC).

All the financial and real economic series are presented in first differences in logs times 100. The exception is unemployment variable, the data for which is in first differences in levels. The volatility and trends observed in the data for financial and real economic variables are shown in Figure 1 and Figure 2 respectively. The main common feature of our series is the presence of outliers (especially in the case with financial markets series). To examine this deeper, we provide the descriptive statistics of the series and its analysis in Appendix 2.

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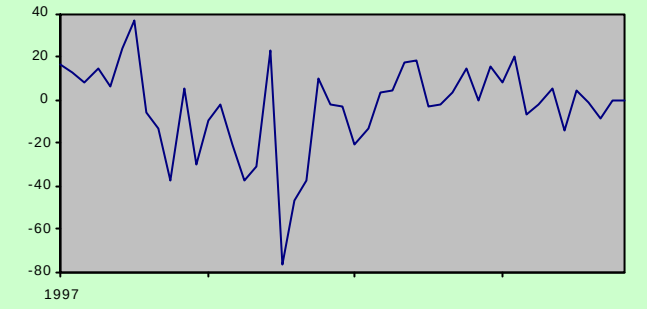
notation is applied only to the Data section.

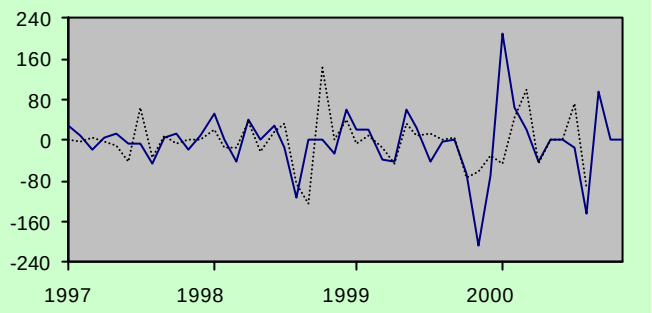
Figure 1. Monthly Real Rates of Return to the Financial Assets[12]

Real Stock Market Return



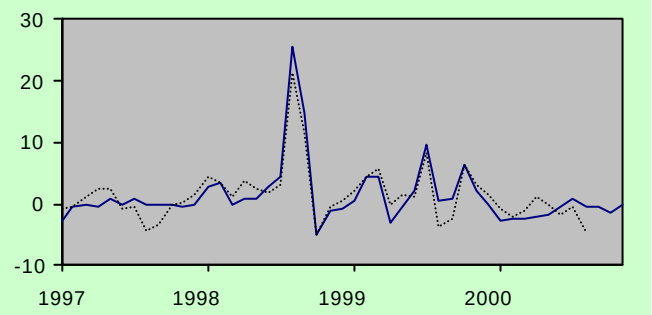
Source: The data on stock index is provided by "*Prospect Investments*".

Real Money Market Return



Source: *Ukrainian Economic Trends* (UEPLAC, December 1998-2000).

Real Foreign Exchange Return

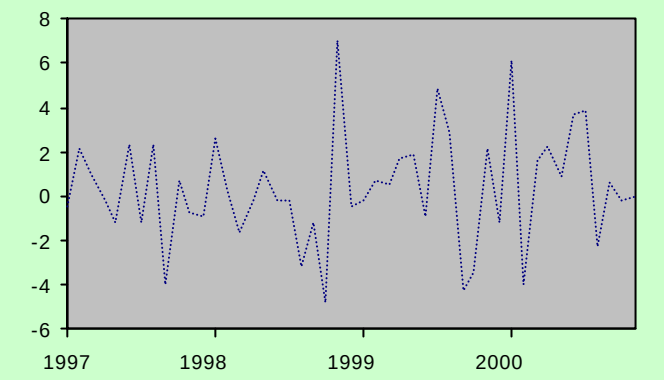


Source: *Ukrainian Economic Trends* (UEPLAC, December 1998-2000).

[12] For construction of dashed graphs in Figure 1 and Figure 2 we use seasonally adjusted data. Solid kinked curves represent actual data for each variable. For some variables we have only one graph, based either on seasonally adjusted data (industrial production variable) or on a sample of non-adjusted data, which is too small for reducing seasonality (as for stock index variable).

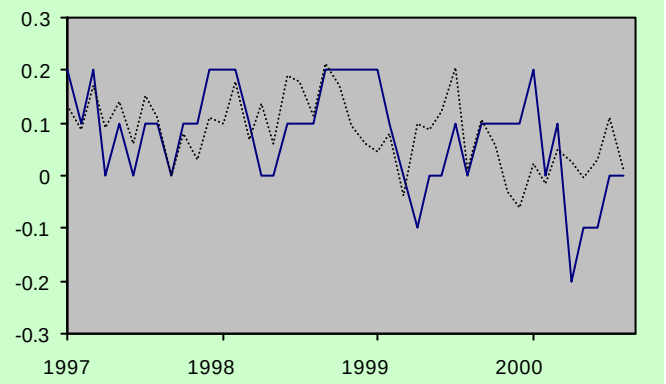
Figure 2. Monthly Real Economic Growth Rates

Real Industrial Production



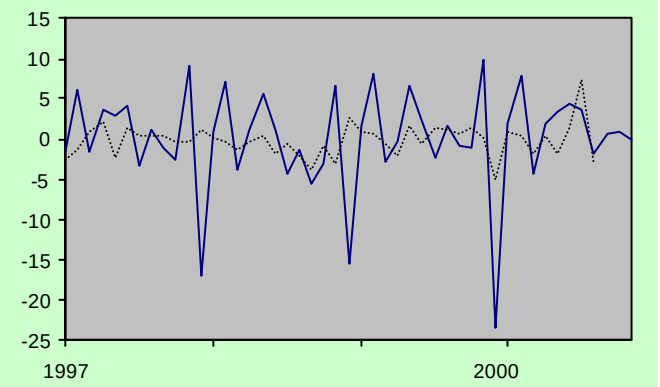
Source: *Ukrainian Economic Trends* (UEPLAC, December 1998-2000).

Unemployment



Source: OECD (2000) database.

Real Wage



Source: *Ukrainian Economic Trends* (UEPLAC, December 1998-2000).

Chapter 6

METHODOLOGY AND EMPIRICAL ANALYSIS

In this chapter we test whether financial markets incorporate relevant information about the economy and its future movements into asset prices. Our empirical analysis is based on the assumption that asset prices change when financial market players take into account new relevant information. With the help of this assumption our analysis takes the form of verification whether certain movements in asset returns signal future changes in real economic activity, which is presented by three economic time series here: real industrial production, registered unemployment rate and real wage.

Our empirical analysis consists of four steps. In the first two steps we check whether there is a causal relationship between any of the financial variables and real economic variables using the Granger causality test and test that is robust to the existence of large outliers in our time series respectively. As a third step we construct a composite leading financial indicator, which will help to predict and explain future movements in real economy of the country. The need for the fourth step, in which we check for the sensitivity of our results to the period of time chosen as well as to the choice of financial variables, appears due to the relatively recent establishment of financial markets in Ukraine and to large changes in government policy over that period.

6.1. STEP 1: Test on Leading Indicator Properties.

In the beginning of our analysis we check whether a certain financial asset return signals movements in the real economic activity variables. For this purposes we construct the following Granger-causality regression:

$$Y_t = \alpha + \sum_{i=1}^{I} \beta_i X_{t-i} + \sum_{i=1}^{I} \lambda_i Y_{t-i} + \varepsilon_t \quad (1.1)$$

Here Y denotes the growth rate of a certain real economic variable and X denotes lagged rate of return for a certain financial asset variable.

The reverse causality issue is checked on the basis of the following regression:

$$X_t = \phi + \sum_{i=1}^{I} \gamma_i Y_{t-i} + \sum_{i=1}^{I} \delta_i X_{t-i} + \eta_t \quad (1.2)$$

It should be noted that the causation issue is quite different from that of the ordinary regression. As stated in Gujarati (1995), the fact that one variable is statistically dependent on another variable does not necessarily indicates causal relationship between the two variables. The causation should be tested on the basis of some theoretical analysis.

The regressions are run for the number of lags (I) of 1, 3 and 6[13]. The Granger Causality Test is applied to check for the presence of causal relationship for each of the pairs of variables. The null hypothesis is that financial variable does not cause the real economic variable (i.e. all betas are jointly zero). The results of the test are reported in Table 2.

The results show the evidence of the existence of causal relationships of the following kind:

Industrial production changes are statistically significantly caused by changes in return to the money market (for the lags of one and three months). A less remarkable causal relationship is observed with stock returns. This relationship is

[13] We run these regressions for all the lags in the range from 1 to 6, but these three lags that are chosen for the report are quite representative.

statistically significant only for the one-month lag. There is no evidence of the existence of such a relationship with the foreign exchange variable.

Table 2. Granger Causality Tests

H_0: X does not Granger Cause Y

	# of Lags		*Ind. Production*	*Unemployment*	*Wage*
Stock Return	1	F	4.533*	0.13	0.973
		p-value	***0.039***	*0.721*	*0.330*
	3	F	1.606	2.194	1.860
		p-value	*0.206*	*0.107*	*0.155*
	6	F	1.183	1.243	0.817
		p-value	*0.347*	*0.319*	*0.567*
Money Return	1	F	7.319*	0.452	0.229
		p-value	***0.010***	*0.505*	*0.635*
	3	F	3.917*	0.053	2.671*
		p-value	***0.018***	*0.984*	***0.063***
	6	F	1.601	0.184	2.033*
		p-value	*0.194*	*0.979*	***0.094***
FOREX Return	1	F	0.861	1.093	5.208*
		p-value	*0.359*	*0.302*	***0.028***
	3	F	1.230	0.480	3.245*
		p-value	*0.313*	*0.698*	***0.032***
	6	F	0.760	0.607	2.015*
		p-value	*0.608*	*0.723*	***0.093***

**Statistically significant at less than 10% significance level*

Unemployment rate changes can't be explained by the changes in any of the financial variables (a statistically insignificant relationship is observed).

Real wage growth rate changes are significantly caused (or predicted) by the returns to the foreign exchange and money markets (for all the lags and for the

lags of 3 and 6 months respectively). Stock market returns have not shown any statistically significant predictive ability regarding the real wage movements.

The existence of causality for some choices of number of lags and non-existence of it for the other can be explained by the high sensitivity of Granger Causality test to the number of lags taken. More lags are preferred in this test. From this we may conclude that the results of the test should not be taken with too high a level of confidence.

The results of the reverse hypothesis test, that the growth rate of any economic variable doesn't cause the rate of return on a certain financial asset, are reported in Appendix 3. The assumption following this twofold causality analysis is that the error terms from both types of causality regressions are uncorrelated. The reverse direction causality seems not to be obvious from these results – there are only very weak signs of such possibility regarding industrial production, stock return and foreign exchange return at one lag. For all the other lags the p-value for these pair-causality increases largely with the number of lags included indicating strong statistical insignificance of such causal relationship.

The general econometric analysis of the regressions (1.1) is described in Appendix 4.

6.2. STEP 2: Leading Indicator Properties - Assessing Dependence in Tails

From the Appendix 2 as well as Figure 1 and Figure 2 we can see that the series include large outliers. On the one hand some characteristics of the data make our analysis easier, i.e. the unit root test is rejected for most of the series at the critical value of 1%. It is shown in Appendix 2 that the only time series variable, which shows non-stationarity, is unemployment rate. On the other hand, the Jarque-Bera test of normality is rejected for half of the series. Thus, it becomes clear that the data for financial and economic variables are very volatile. The existence of

extremes distorts the quality of estimation and may lead to misleading interpretation. To cope with this problem we use the different approach to check for the pair-causality between financial and economic variables. This approach is not sensitive to the existence of large outliers in time series.

We use the same denotations for economic and financial variables as in the previous section of analysis. The new variables are introduced, as follows: TY(p) is a threshold for the economic variable Y. It implicitly refers to a certain percentage value, p, in the unconditional distribution of Y; TX(q) is a threshold for the financial variable X, implicitly corresponding to a certain percentage value, q, in the unconditional distribution of X.

The scoring variable for the real economic variable, $SY(p,t)$ is defined in the following way:

$$SY(p,t) = \begin{cases} +1, if Y(t) > TY(1-p) \\ 0, otherwise \\ -1, if Y(t) < TY(p) \end{cases}$$

In the same way, we define the scoring variable for the financial return indicator, $SX(q,t-1)$:

$$SX(q,t-1) = \begin{cases} +1, if X(t-1) > TY(1-q) \\ 0, otherwise \\ -1, if X(t-1) < TY(q) \end{cases}$$

We define the dependence-scoring variable by multiplying the two scoring variables, i.e.

$$SD(p,q,t) = SY(p,t) * SX(q,t-1)$$

These variables are defined in a way similar to the cross product inside the measurement of covariance, where the deviations are substituted by the discrete values 0, -1 and +1 (Cristoffersen and Slok, 2000, p.14). From the definition it follows that the dependence-scoring variable, SD, is i.d.d. trinomial with distribution[14], as shown below.

$$SD(p,q,t) = \begin{cases} +1, \text{ with Prob}=2pq \\ 0, \text{ with Prob}=1\text{-}4pq \\ -1, \text{ with Prob}=2pq \end{cases}$$

Asymptotically, the approximate distribution of the sample average of SD is $\overline{SD}$, a standard normal variate when the sample size, n, is large. The tail test statistic (*TT*) is

$$TT = \sqrt{n} * \overline{SD} / \sqrt{4pq} \sim N(0,1)$$

Our null hypothesis is the same as in Step 1, i.e. that there is no causal relationship between financial return and economic activity series. In order to calculate the tail test statistic particular values of p and q are chosen and then the null hypothesis is tested on the basis of the well-known t test. The results are reported in Table 3 below.

Now our results show the existence of a strong causal relationship between return to foreign exchange and real industrial production (which has not appeared in the previous analysis). This robust method also confirms our previous results,

[14] The mean for SD variable is derived to be
$E(SD)=1 * 2pq+0 * (1-4pq)+(-1) * 2pq=0$
The calculation of the variance is conducted in the following way:
$Var(SD) = E(SD^2) - E^2(SD) = 1^2 * 2pq + (0)^2 * (1-4pq) + (-1)^2 * 2pq - 0 = 4pq$

that is the strong causality is observed between foreign exchange return and real wage rate dynamics; a weak causality can be inferred for changes in stock and money market returns and movements in industrial production and a slight causal relationship may be concluded from the results on money market return and real wage series.

Table 3. Tail Test of Causality

H_0: X does not Granger Cause Y

(p,q)	Ind. Production			Unemployment			Wage		
	Stock	Money	FOREX	Stock	Money	FOREX	Stock	Money	FOREX
(0.25, 0.25)	**1.52***	1.23	-0.30	-0.30	0.31	0.90	0.61	-0.31	-1.21
(0.25, 0.5)	1.29	**1.31***	**-1.49***	-0.22	-0.65	1.28	0.65	**1.31***	-0.85
(0.5, 0.25)	1.08	1.09	-0.64	0.22	0.65	0.21	1.08	-0.65	**-1.71****
(0.5, 0.5)	0.76	1.23	**-2.26*****	0.76	0.62	0.75	1.07	0.31	**-2.11*****
# of obs.	43	42	44	43	42	44	43	42	44

* *20% significance level*

** *10% significance level*

*** *5% significance level l*

We should note that our results for unemployment series are not surprising as long as we use official registered unemployment rate in the country, the highly understated value of real unemployment. The real rate is expected to be much higher, but the data for this type of series is not available to us. Thus, our real movements in unemployment are not reflected in registered unemployment rate and consequently they may not help checking for the informative ability of financial asset prices.

6.3. STEP 3: Construction of Financial Leading Indicator Index

As our results above show a stronger predictive ability of financial asset prices concerning the movements in real industrial production than any other economic

variable that was tested, we concentrate on this parameter of real economic activity in this part of our analysis.

The leading indicator index for industrial production movements is based on the three financial variables chosen above, with each having its own weight in the index. We construct the leading indicator index in the following way:

$$IndexIP_t = \hat{b}_1 S_{t-1} + \hat{b}_2 I_{t-1} + \hat{b}_3 E_{t-1} \qquad (3.1)$$

The weights $\hat{b}_1, \hat{b}_2, \hat{b}_3$ are the OLS estimates of coefficients from the regression where industrial production is regressed on the lagged financial series and on lagged values of itself:

$$IP_t = a + b_1 S_{t-1} + b_2 I_{t-1} + b_3 E_{t-1} + \sum_{j=1}^{3} g_j IP_{t-j} + e_t \qquad (3.2)$$

As coefficients near greater lags of financial variables appeared not to be statistically significant, we use only first lags for each of financial return variables[15]. A number of regressions are run for different lags of dependent variable on the right-hand side of the regression. We repeat calculations for the regressions omitting foreign exchange return variable, which is the least significant regressor among financial time variables. The results are reported in Table 4 below.

As noted in Christoffersen and Slok (2000), the specifications 4 and 8 that include only financial variables, can be considered as pure financial leading indicator regressions, while the financial parts of the other specifications in Table 3 can be called "news" parts of regressions. This "news" property follows from the fact

that lagged industrial production variables serve as proxies for peoples' expectations about future movements in industrial production. Therefore, the financial variables in regressions are "in charge of" the news portion of future growth of industrial production. We might suggest also that the intercept in our regressions signifies something like a "medium-run" trend in industrial production (in long-run the value of intercept may change) and that lagged industrial production variables represent a "short-run" trend in dependent variable. But it appears that the intercept is statistically insignificant for most specifications.

Table 4. Regression of Industrial Production variable on financial variables

Regression #		1	2	3	4	5	6	7	8
S(-1)	*Coef.*	0.048	0.051	0.043	0.043	0.040	0.042	0.033	0.030
	p value	*0.009*	*0.005*	*0.019*	*0.024*	*0.021*	*0.013*	*0.055*	*0.090*
I(-1)	*Coef.*	0.028	0.026	0.024	0.026	0.022	0.020	0.017	0.019
	p value	*0.003*	*0.003*	*0.011*	*0.005*	*0.006*	*0.010*	*0.036*	*0.026*
E(-1)	*Coef.*	0.135	0.142	0.155	0.184				
	p value	*0.164*	*0.144*	*0.128*	*0.080*				
IP(-1)	*Coef.*	-0.351	-0.339	-0.266		-0.384	-0.371	-0.297	
	p value	*0.013*	*0.015*	*0.057*		*0.007*	*0.009*	*0.036*	
IP(-2)	*Coef.*	-0.370	-0.309			-0.389	-0.322		
	p value	*0.018*	*0.033*			*0.014*	*0.029*		
IP(-3)	*Coef.*	-0.208				-0.219			
	p value	*0.137*				*0.123*			
Intercept	*Coef.*	0.375	0.339	0.201	0.071	0.583	0.546	0.421	0.320
	p value	*0.329*	*0.364*	*0.603*	*0.858*	*0.109*	*0.125*	*0.252*	*0.401*
R squared		0.457	0.427	0.347	0.276	0.424	0.390	0.302	0.213
Adj. R squared		0.358	0.345	0.274	0.218	0.339	0.323	0.246	0.172
Akaike info crit.		4.488	4.475	4.557	4.611	4.498	4.488	4.574	4.646
Schwarz criterion		4.784	4.726	4.766	4.778	4.751	4.697	4.741	4.771
Prob(F-statistic)		0.0016	0.0011	0.0034	0.007	0.0015	0.0011	0.0037	0.0105

[15] Thus, it appears that predictive power of financial asset prices is valid only for one month. The result is not surprising, taking into account quite unstable economic environment in Ukraine. The traditional markets theory states that the more sustainable the economy, the greater predictive power of asset prices.

The figures obtained show the robustness of qualitative results to the number of lagged industrial production variables in regression and to the exclusion of foreign exchange return from regressions. The magnitude of "optimal weights" of financial variables tends to increase as more lagged dependent variables are included. Christoffersen and Slok (2000) suggest that this implies some sign of validity of the "news" property of financial series. The results suggest that increase in the stock return indicates a positive change in growth of industrial production (holding everything else unchanged). Similar positive signals may be inferred for increases in real money market return and real foreign exchange return (an appreciation of US dollar).

Using optimal weights for all three financial indicators from the regression, which includes all three financial variables and two statistically significant lagged dependent variables[16], we construct the following financial leading indicator index:

$$IndexIP_t = 0.051S_{t-1} + 0.026I_{t-1} + 0.142E_{t-1}$$

We can see also that our coefficients (optimal weights) are quite low. The explanation here might go in two ways. Firstly, the data is presented as growth rates. Thus, the growth rate of industrial production should not appear to be greatly volatile. Moreover, the values in stock and money markets time series usually exceed the growth rate of industrial production by more than ten times. Their volatility and sometimes overreaction requires mitigation of such "huge predictions" through small coefficients. As the data for exchange rate is of the same order with production data, the coefficient near foreign currency return is relatively high. Secondly, despite quite a considerable history of developments in stock markets as well as in banking sector, these markets are still underdeveloped

[16] Regression 2 has the lowest Akaike information criterion.

and incorporate only a very low proportion of potential players yet. As long as the active market players are not very strong in interpreting the implications of information for asset prices, the returns to markets would not be good predictors of future economic activity. Thus, these markets face low weights. Regarding the foreign currency market, although the foreign exchange return appears to be the least significant indicator, it has the largest share in the equation for leading indicator index. The explanation of this may be the fact that the foreign exchange market was only liberalized in March 1999. Thus, artificially determined exchange rates were not good indicators of future dynamics of real economic activity. But, after liberalization occurred, it may be suggested that the foreign exchange return becomes a valuable economic indicator, even more valuable than the other financial parameters considered above.

Changing the sample period can easily check the last argument. The results for coefficients for equation number 2 in Table 4 are reported in Table 5 below.

Table 5. Sensitivity of coefficients for financial variables to the choice of sample period.

		1997:01-1999:03	1997:01-2000:09	1998:01-2000:09	1999:01-2000:09
S(-1)	*Coef.*	0.033	0.051	0.057	0.065
	p value	*0.018*	*0.005*	*0.018*	*0.294*
I(-1)	*Coef.*	0.037	0.026	0.025	0.013
	p value	*0.000*	*0.003*	*0.024*	*0.394*
E(-1)	*Coef.*	0.084	0.142	0.124	0.440
	p value	*0.310*	*0.144*	*0.335*	*0.061*

We notice that the coefficient for stock return is not sensitive to the period chosen out of the initially defined time period of 1997:01-2000:09. Roughly the same conclusion can be inferred for money market. In the case when the earlier period is taken (1997:01-1999:03), we observe that the weights of returns to these two sub-sectors of financial markets are approximately the same, taking values of

0.033 and 0.037 respectively. The greater weight for stock market in the case of considering the whole period (1997:01-2000:09) may be explained by the recent stabilization of stock market in the end of 1999 and for the whole 2000 and by increase in trading volumes on Ukrainian stock exchanges. Generally we observe a decreasing weight for banking sector return over time. This may be the consequence of the intervention by the National Bank of Ukraine into the banking sector in 2000.

The most interesting results are obtained for return to foreign exchange: it rises fivefold if we compare the periods of estimation before March 1999 and after January of 1999 (see the first and the last columns in Table 5) appearing to be highly significant in the latter case. Thus, after the Russian crisis in August 1998 and exchange rate liberalization in March 1999, return to foreign exchange (in this case to US dollar) becomes highly significant predictor of real industrial production dynamics.

Here we should note that the purpose of the estimated leading indicator index is only to show the direction of industrial production movements, which may be predicted using information available in the markets (and incorporated into prices). Our analysis does not cover attempts to forecast the value of growth rate for industrial production.

Let's show the predictive ability of the leading indicator index on the graph (Figure 3). We plot the values for leading indicator index calculated for the chosen sample of data against time (a solid kinked curve). Three horizontal dashed lines indicate the one standard deviation bands and the unconditional mean (the middle line) of the leading indicator. To demonstrate the power of our leading indicator we also plot the actual data for industrial production (see dashed kinked curve), which is supposed to show real movements in production observed over time. The interpretation of the graphs goes in the following way.

First of all we suggest that if the returns on assets change largely, it happens because financial markets react to some important news. Sharp changes in asset returns most likely have a considerable effect on the value of financial leading indicator (if the effects of returns on different assets are not offsetting). If the value of the leading indicator index exceeds the upper band (or is less than lower band), we predict that industrial production will go up next period (or will go down respectively). This is mostly observed in the graphs below[17].

Figure 3. Financial Indicator of Industrial Production Growth Rate

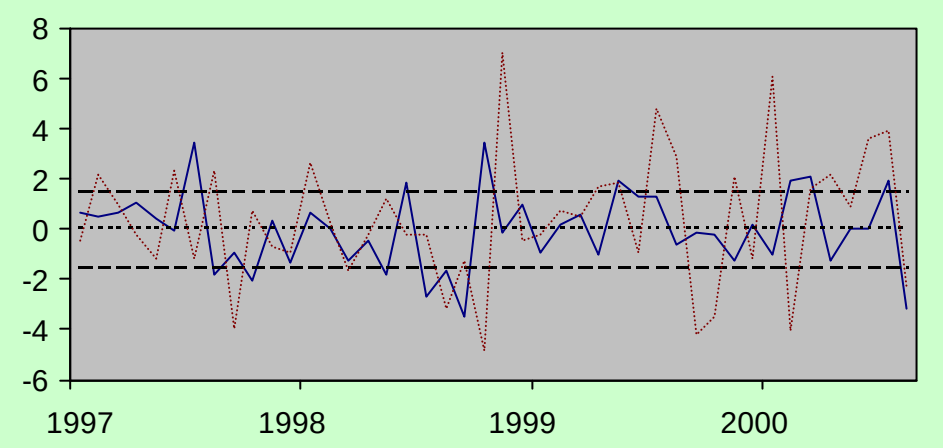


Figure 3 shows that despite the fact that leading financial indicator does not predict the values of future industrial production growth[18], it appears to be quite a significant indicator of considerable future movements in industrial production.

[17] Standard deviations, plotted in Figure 3, are only important for determining whether leading indicator value exceeds the band in absolute terms and should not be used in analysis of the graph for actual industrial production growth.

[18] The leading indicator index does not include all the factors that may determine industrial production growth rate, but is based only on the degree of informative efficiency of financial markets in Ukraine. We examine the predictive ability of the leading indicator in order to find additional evidence on informational content of financial asset prices.

Chapter 7

CONCLUSIONS

In our work we examined whether financial asset prices contain information about future movements in real economic activity in Ukraine. The results allow us to conclude that, although financial markets are still on the stage of earlier development, these markets indicate to some validity of efficient market theory for the case of transition country.

It is shown that financial markets are statistically significant predictors of future industrial production movements. The returns to money market and foreign exchange market significantly cause changes in real wage growth rate. No statistically significant causal relationship is observed between financial asset returns and unemployment rate, which is not a surprise, taking into account unreliability of registered unemployment data.

The estimation of the composite financial leading indicator shows that all the financial series are statistically significant predictors of movements in industrial production with positive weights in leading indicator formula. The positive weight is not what is normally is expected regarding foreign exchange variable for developing countries. This anomaly may be the result of only recent liberalization of foreign exchange rate, which may bring distortions to our results. Initially the foreign exchange return appears to be the least significant indicator, but after being liberalized in March 1999 the foreign exchange return becomes a valuable economic indicator, even more valuable than some other financial parameters considered above.

It is shown that only predictive power of financial variables of the previous month matters. Re-examining the leading indicator results for the sample period

chosen supported the predictive power of the index. The results show that the leading indicator is a useful tool for policymakers in predicting significant deviations of industrial production up to few months ahead. Using the leading indicator may be very helpful in choosing the next-period optimal policy program aimed to support macro- and micro-economic stability in Ukraine.

Having said all that, we should note that our work faces some shortcomings, which may be solved in the future works on the issue of informative efficiency of financial markets. First of all, it is the problem of using the stock index that covers only a limited number of the most popular shares. Secondly, it will be useful to examine the predictive ability of financial asset returns regarding actual unemployment rate as well as actual investments made in the country. The latter proposal stems from the fact that stock market prices may be considered as reflectors of business conditions in Ukraine, incorporating the information valuable to potential investors. And predicting of investment fluctuations is an important issue because of its direct link to economic development.

We should emphasize also that despite the evident predictive power of the calculated indicator index, it is greatly desirable to recalculate the leading indicator index as the time passes. The reason behind this is the possibility of some policy changes, further development of financial markets, or some external shocks to the economy, which may lead to considerable changes in coefficients of financial return variables in the future.

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APPENDIX 1. DESCRIPTION OF "PROU-50"

The stock index "PROU-50" covers the fifty largest privatized companies registered on the largest secondary securities market PFTS in Ukraine. It illustrates the change in the gross capitalization of those companies for a particular point of time relative to the base (1st of January, 1997).

The capitalization (MC) of each issuing company is calculated as a product of market price of its stock on the gross stock of the company on that date. For the market price of company's stock the maximum price of demand on the PFTS is taken. The index then is calculated according to the following formula:

$I_t = I_b * (MC_t / MC_b)$

Where,

I_t, MC_t- the value of the index and gross capitalization of all the companies for a particular point of time respectively;

I_b- shows the base value of the index for the 1st of January 1997 ($I_b = 100$);

MC_b – is gross capitalization of all the companies for the base point of time.

APPENDIX 2. DESCRIPTIVE STATISTICS

Table A1. Descriptive Statistics

	Mean	*Standard Deviation*	*Jarque-Bera*	*Unit Root, statistic*	*Critical Value, 10%*	*5%*	*statistic 1%*	*No. of Observ.*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Ind. Production	0.295	2.636	**0.745**	**-5.392**	-2.603	-2.930	-3.589	45
Unemployment	0.085	0.067	**0.671**	-2.57	-2.601	-2.971	-3.581	45
Wage	-0.171	1.995	0.000	**-5.158**	-2.601	-2.927	-3.581	45
Stock Return	-3.262	21.657	0.001	**-3.137**	-2.604	-2.932	-3.593	44
Money Market Return	-3.950	49.059	**0.195**	**-5.647**	-2.605	-2.934	-3.597	43
FOREX Return	1.342	4.448	0.000	**-4.806**	-2.601	-2.927	-3.581	45

We test for non-stationarity (the presence of a unit root) in time series. The importance of stationarity of time series is straightforward. The ordinarily practiced regression analyses of time series data assume stationarity of the series involved. The violation of this assumption may lay suspicion on the results of hypothesis testing procedures based on *t, F* and similar tests.

Therefore, the Augmented Dickey-Fuller (ADF) test is applied with ô statistic reported in column 5. H_0 hypothesis is that "the chosen time series is non-stationary". The results above indicate the rejection of the stationarity hypothesis if statistic is marked with regular type and bold type for the case when we reject the hypothesis about non-stationarity. All time series with an exception of those for unemployment rate and real stock return appear to be stationary with the significance level of less than 1%. The real stock return series are stationary at 5%. The only case when non-stationarity hypothesis can't be rejected even at the level of significance of 10% relates to unemployment series.

APPENDIX 3. THE REVERSE GRANGER CAUSALITY TESTS

Table A2. Granger Causality Tests

H_0: Y does not Granger Cause X

	# of Lags		*Stock return*	*Money Return*	*FOREX Return*
Ind. Production	1	F	3.963*	0.743	2.835*
		p-value	***0.053***	*0.394*	***0.100***
	3	F	1.481	1.660	1.296
		p-value	*0.237*	*0.196*	*0.291*
	6	F	1.121	0.686	0.643
		p-value	*0.379*	*0.663*	*0.695*
Unemployment	1	F	0.986	0.126	0.272
		p-value	*0.327*	*0.725*	*0.605*
	3	F	0.514	0.413	0.576
		p-value	*0.675*	*0.745*	*0.635*
	6	F	1.134	0.339	0.817
		p-value	*0.372*	*0.910*	*0.565*
Wage	1	F	0.188	0.990	0.044
		p-value	*0.667*	*0.326*	*0.834*
	3	F	0.529	2.243	0.104
		p-value	*0.666*	*0.101*	*0.957*
	6	F	0.740	0.889	0.099
		p-value	*0.623*	*0.516*	*0.996*

**statistically significant at more than 90% confidence interval*

APPENDIX 4. ANALYSIS OF GRANGER CAUSALITY REGRESSIONS IN STEP 1.

Autocorrelation Test: Lagrange Multiplier (LM) Test

Table A3. LM Test on Autocorrelation.

		Lags	p=1	p=3	p=6
X squared, 5%			**3.841**	**7.815**	**12.592**
Ind. Production	s	1	1.017	1.686	2.870
		3	0.103	3.555	8.227
		6	2.059	3.883	5.883
	I	1	0.065	2.414	3.777
		3	0.113	0.961	3.556
		6	**5.662**	**8.083**	**16.290**
	e	1	1.372	3.257	4.681
		3	1.032	1.329	2.405
		6	**4.470**	7.659	10.725
Unemployment	s	1	**6.465**	6.882	8.068
		3	0.000	0.729	4.441
		6	0.101	1.103	3.748
	I	1	**5.669**	6.603	9.155
		3	0.594	3.273	5.966
		6	1.885	2.126	2.705
	e	1	**6.717**	7.573	8.031
		3	0.245	2.297	2.990
		6	2.738	3.130	5.284
Wage	s	1	**4.841**	4.956	9.948
		3	1.779	4.355	6.284
		6	3.730	6.344	8.533
	I	1	1.705	2.145	2.819
		3	0.000	3.401	5.195
		6	0.108	4.169	8.988
	e	1	**4.115**	4.602	10.265
		3	0.195	0.502	4.190
		6	0.211	0.523	9.543

The results of the LM test show that the results of Granger causality test should be taken with a reasonable level of suspicion for some regressions. But we can notice that autocorrelation disappears when we increase the order of

autocorrelation to test (say, from p=1 to p=3). The autocorrelation problem still does not affect our final results on the leading indicator and our robust results on second causality test. Thus, we can state that the predictive ability of financial markets is still quite significant.

White Heteroscedasticity Test

Gujarati(1995) points out that the existence of outliers in series may lead to heteroscedasticity problem, which makes application of OLS estimation procedure giving not minimum variance (best) results. To check for this we apply White's general heteroscedasticity test. The advantage of this test against numerous other methods to check heteroscedasticity lies in that it does not require the normality assumption. The table below reports the X^2 statistic and probabilities respectively for each of the pairs of financial and economic variables on the basis of regression (1.1) in Step 1 of empirical part of this work.

The results show that we can accept the null hypothesis that there is no heteroscedasticity problem observed in our regressions with the confidence interval of 95%.

Table A4. Step 1: White heteroscedasticity test.

H_0: no heteroscedasticity

	Lags		Ind. Production	Unempl-t	Wage	df	critical X^2 p=10%	critical X^2 p=5%
Stock Return	1	X^2	5.269	1.626	1.967	5	9.236	11.071
		p-value	*0.384*	*0.898*	*0.854*			
	3	X^2	30.916	20.157	15.781	27	36.741	40.113
		p-value	*0.275*	*0.824*	*0.957*			
	6	X^2	25.942	22.939	12.159	24	33.196	36.415
		p-value	*0.356*	*0.523*	*0.978*			
Money Return	1	X^2	1.226	9.657	6.459	5	9.236	11.071
		p-value	*0.942*	*0.086*	*0.264*			
	3	X^2	32.392	31.774	35.013	27	36.741	40.113
		p-value	*0.218*	*0.241*	*0.139*			
	6	X^2	20.360	26.703	21.222	24	33.196	36.415
		p-value	*0.676*	*0.318*	*0.626*			
FOREX Return	1	X^2	6.441	8.001	1.921	5	9.236	11.071
		p-value	*0.266*	*0.156*	*0.860*			
	3	X^2	28.156	29.090	18.516	27	36.741	40.113
		p-value	*0.403*	*0.357*	*0.887*			
	6	X^2	26.924	24.067	9.056	24	33.196	36.415
		p-value	*0.308*	*0.458*	*0.997*			

Significance of Individual Coefficients.

When testing for the presence of Granger causal relationship between variables we should be aware of a potential problem of existence of a relationship between some or all of the variables in regression (i.e. multicollinearity). To check for the presence of multicollinearity we consider the statistical significance of the coefficients near each of financial variable in the regressions described by the

general regression (1.1) and compare our results with those obtained by testing for causality issue. The p-values of financial coefficients are gathered in Table A5.

Table A5. P-values for coefficients of finanical regressors - regression (1.1)

		Dependent Variable								
	Lags	Ind. Production			Unemployment			Wage		
Stock Return	-1	**0.040**	**0.094**	0.184	0.721	0.542	0.397	0.330	0.629	0.500
	-2	0.566	0.623		**0.025**	**0.034**		**0.057**	0.293	
	-3	0.874	0.382		0.750	0.511		0.904	0.876	
	-4		**0.083**			0.753			0.459	
	-5		0.533			0.798			0.846	
	-6		0.627			0.761			0.586	
Money Return	-1	**0.013**	**0.015**	0.027	0.607	0.774	0.692	0.527	0.270	0.251
	-2	0.810	0.701		0.644	0.536		**0.052**	**0.084**	
	-3	0.299	0.374		0.888	0.869		0.925	0.924	
	-4		0.861			0.570			0.261	
	-5		0.579			0.882			**0.074**	
	-6		0.817			0.880			0.275	
FOREX Return	-1	0.359	0.743	0.914	0.302	0.541	0.435	**0.028**	**0.066**	**0.063**
	-2	0.207	0.110		0.458	0.774		0.111	0.226	
	-3	0.198	0.198		0.857	0.487		0.376	0.227	
	-4		0.447			0.251			0.523	
	-5		0.983			0.640			0.211	
	-6		0.456			0.239			0.121	

When comparing these results with the results of Granger causality F test we see that in any regression where the financial coefficients appear to be jointly statistically significant, the results of the tests for significance of individual coefficients prove that fact – some of the coefficients in such regressions actually are statistically significant.

APENDIX 5. ANALYSIS OF REGRESSIONS IN STEP 3.

Ramsey's RESET Test.

We check for the misspecification of our regressions generally described by regression (3.2). According to our results from Table A6, we cannot reject the hypothesis that the regression model is not misspecified at 1% significance level.

Table A6. Step 3: Ramsey's RESET Test

H_0: The model is not misspecified

Financial regressors	Lags of Ind. Production	F, 1 fitted term	*p-value*	F, 2 fitted terms	*p-value*
Stock, Money, FOREX Return	0	0.166	*0.686*	2.198	*0.126*
	1	0.002	*0.963*	3.84	*0.031*
	2	0.015	*0.904*	1.189	*0.317*
	3	0.177	*0.677*	0.868	*0.430*
Stock, Money Return	0	0.121	*0.730*	2.04	*0.145*
	1	0.000	*0.997*	3.063	*0.059*
	2	0.004	*0.948*	1.471	*0.244*
	3	0.172	*0.681*	0.873	*0.428*

Autocorrelation.

First of all we check for the presence of autocorrelation in our regressions, generally described by the formula (3.2) and the results of which are reported in Table 3. For this purpose we apply Durbin h test, which is designed to test for first-order serial correlation in models with lagged dependent variables and large samples (see Gujarati, 1995, pp.605-606). We calculate h statistic as show in the Table below.

Table A7. Durbin's h statistic for regressions described by (3.2)

H0: no positive or negative first-order autocorrelation

Financial regressors	Lags of Ind. Production	h statistic
Stock, Money, FOREX Return	1	-0.3032365
	2	-0.9618785
	3	-1.360862
Stock, Money Return	1	-0.3304168
	2	-0.705367
	3	-0.9499637

h statistic asymptotically follows normal distribution. Accordingly, for our estimated h values we make decision about acceptance of the null hypothesis with significance level of 95% if the estimated h value lies in the interval (-1.96; 1.96). As we see from results, no one h value satisfies this requirement. Thus, we can't reject the null hypothesis that our regressions are not subject to presence of positive or negative first-order autocorrelation.

Heteroscedasticity.

The table below consolidates the X^2 statistic and probabilities respectively for each regression on the basis of the regression formula (3.2) in Step 3 of empirical part of this work.

The results allow us to accept the null hypothesis about absence of heteroscedasticity problem in our regressions with the confidence interval of 95%.

Table A8. Step 3: White heteroscedasticity test.

H0: no heteroscedasticity

Financial regressors	Lags of Ind. Production	X squared	*p-value*	df	critical X^2 p=10%	critical X^2 p=5%
Stock, Money, FOREX Return	0	4.893	*0.844*	9	14.684	16.919
	1	7.260	*0.924*	14	21.064	23.685
	2	24.124	*0.237*	20	28.412	31.410
	3	28.601	*0.380*	27	36.741	40.113
Stock, Money Return	0	3.461	*0.629*	9	14.684	16.919
	1	4.301	*0.891*	14	21.064	23.685
	2	18.970	*0.166*	20	28.412	31.410
	3	21.892	*0.346*	27	36.741	40.113