Shirly Siew-Ling WONG, Postgraduate student
E-mail: shirlywong87@hotmail.com
Chin-Hong PUAH, PhD
E-mail:chpuah@feb.unimas.my
Professor Shazali Abu MANSOR, PhD
E-mail:mshazali@feb.unimas.my
Department of Economics
Faculty of Economics and Business,
University Malaysia Sarawak,
Malaysia

SURVEY EVIDENCE ON THE RATIONALITY OF BUSINESS EXPECTATIONS: IMPLICATIONS FROM THE MALAYSIAN AGRICULTURAL SECTOR

Abstract. *The rational expectations hypothesis (REH) serves as an appealing mechanism in forming expectations compared to that of extrapolative or adaptive frameworks because of its consistency with the basic principles of maximizing behavior. This argument is particularly true as the basic idea of REH maintains that expectations in an uncertain world are formed under assumptions where no systematic errors and information are fully utilized. However, empirical findings from the present study showed diverse evidence of rationality in business operational forecasts formed by Malaysian agriculture firms, as capital expenditure expectations were found to be irrational but gross revenue expectations were supportive of the REH proposition. This implies that the survey of business forecasts may not work well in reflecting the true business outlook, specifically in value-related operational forecasts, which in turn would directly influence investment decisions as well as the capital budgeting process.*

Keywords: *Rational Expectations Hypothesis, Unbiasedness Test, Non-serial Correlation Test, Weak-form Efficiency Test*

JEL Classification: C12, C22, C83, D84, L81

Introduction

Decision making and future planning are crucial parts of business and economics, and expectations play a prominent role in generating informed presumptions for future outlooks. In an increasingly dynamic business climate surrounded by economic risk, uncertainty, and imperfect information, it is certainly less than sensible to expect firms to generate precisely correct business expectations. Instead, at the least, business forecasts must reflect the profit maximizing behavior of

typical business players under a well-defined economic system with information incorporated efficiently. Under such circumstances, the hypothesis of rationality is theoretically more appealing since the microeconomics assumptions of profit and utility maximizing behaviors are consistent with the basic principles of rational conduct in which people efficiently engage in their economic self-interest by acting rationally in predicting future economic variables. Such assertions are upheld by the notion advocated by neoclassical economists, which maintains that economic agents are assumed to behave akin to rational optimizers, and this behavior is compatible with the concept of rational expectations that embraces the optimizing framework to describe the way agents generate future forecasts (Levine, 1993). Consequently, firms should be rational optimizers and business expectations should also fall under the doctrine of rationality.

Theoretically, even though the rational expectations hypothesis (REH) has been clearly established, empirical support is still subject to strong debate given that the validity of REH has not been empirically verified. Most of the earlier works on REH testing employed indirect tests based on constructed measures of expectations as proposed by Muth (1961). However, under a joint testing procedure, the validity of REH was not clear, as uncertainty existed regarding whether a rejection of the joint hypothesis was due to the rejection of REH or the other hypothesis (Beach et al., 1995). Hence, many of the subsequent advocators of REH claimed that the rejection of REH was caused by use of the indirect method which involved a strong auxiliary hypothesis in measuring expectations. Alternatively, Friedman (1980), Keane and Runkle (1990), Beach et al. (1995), Osterberg (2000), Forsells and Kenny (2002), Nielsen (2003), Mitchell and Pearce (2005), Dais et al. (2008), Gao et al. (2008), and other REH researchers tended to use survey data as a proxy of market expectations to overcome the problems created by joint testing. The rationale was that REH testing based on survey data collected from individual responses can provide empirical support directly without the need to account for additional economic models.

Despite various studies on the survey measure of expectations, it is still doubtful whether survey data can work as an empirically sound representation of market expectations in REH testing given that previous empirical results provided by direct testing are clearly mixed. Thus, the ability of survey materials to reflect the economic agent's true expectations is ambiguous. Implicitly, survey materials, which serve as a platform for most publicly accessed resources of future economic outlooks and thus are key ingredients in decision making, may induce significant interruption to policy establishment that relies on surveys of market expectations if the potential effects of irrationality are not clearly identified and adjusted for during survey application. Therefore, examination of the evidence of rationality through survey material in business operational forecasting is undoubtedly welcomed to verify empirically the mechanism of expectation formation among the surveyed economic agents.

Given that the empirical testing of survey rationality from the Malaysian business perspective is still an open issue, following the scant literature contributed by Habibullah (1994, 1996, 2001), the present study sought to add to the empirical support of forecast rationality in the context of survey-based business expectations, particularly in agriculture-based entities in Malaysia. This paper is organized into sections, as follows. The next section discusses the assumptions underlying the framework of REH and is followed by a brief description of the data. The subsequent section goes into methodological aspects of the study as well as presentation of empirical findings and interpretations. The final section contains the conclusion.

The Concept and Classical Properties of Rationality

In economic theory, the mechanism of expectations formation has long been seen as a crucial aspect in understanding how the economy works. The framework of rational expectations put forward by Muth (1961) has been the prevailing assumption about expectations within economics for years (Levine, 1993). Muth's REH assumes that people generally do not waste information, as rational behavior eventually drives them to use all publicly available and cost-free information in an efficient manner. Ultimately, the expectations are virtually identical to the true values. Hence, the framework of REH explicitly implies that economic agents forecast in such a way as to minimize forecast errors based on all publicly available information under a setting where perfect foresight is not possible. Anchored in Muth (1961), forecast rationality emerges when the expectation is identical to the conditional expectation regarding the set of relevant information available for forecasting. The associated forecast errors or random errors are attributable to non-systematic or random influences that do not exhibit a definite pattern. Under this condition, the concept of REH can be expressed as follows:

$$\Pi_t^* = \mathrm{E}\left(\Pi_t \middle| \Omega_{t-1}\right) + \eta_t \qquad (1)$$

where Ω_{t-1} is a subset of the full information set and η_t designates the random error term. Rearranging Equation (2), we obtain:

$$\eta_t = \Pi_t^* - \mathrm{E}\left(\Pi_t \middle| \Omega_{t-1}\right) \qquad (2)$$

A forecast is said to be rational if the non-systematic or random errors due to an imperfect information set and economic uncertainty can be captured in the error term. For forecasting to work under the framework of REH, or in the sense of an optimal forecast, three classic assumptions of rationality ought to be empirically satisfied. First, the past forecast errors cannot be serially correlated with the current forecast errors. This is a condition in which the property of lack of serial correlation manifests. This characteristic also signifies that the error term should be free of autocorrelation by which there must be no interdependence relationship between the present forecast errors and the past forecast errors. If this is not the

case, then the property of lack of serial correlation is being violated, and this is a sign of biased forecasts. The concept of lack of serial correlation in the context of REH can be depicted as follows:

$$\mathrm{E}(\eta_t \eta_{t-1}) = 0, \quad \forall_i \neq 0 \tag{3}$$

Second, the unbiasedness property entails that the unconditional expected value of the forecast error has a zero mean. To meet this assumption, the random error term η_t must be uncorrelated with the expected value Π_t^* and also must not exhibit significant serial correlation (Muth, 1961). In other words, violating the property of lack of serial correlation also results in the rejection of the unbiasedness property. The principle of unbiasedness implicitly indicates that economic agents will not assemble systematic forecast errors over time because continuous learning processes will eliminate any regularity in the expectations formation process. At the end, the true values, on average, are equivalent to the expected values. If this property is being violated, then economic agents would systematically over- or underestimate the realized value (Nielsen, 2003, pp. 2). The unbiasedness property can be written as follows:

$$\mathrm{E}(\eta_t) = 0 \tag{4}$$

Finally, the forecast error, conditional on the current and past values of the predicted variable, should have a mean of zero. This is the so-called efficiency property, which requires that economic agents efficiently incorporate and use all available information from the past when forming future expectations. The principle of efficiency can be expressed as follows:

$$\mathrm{E}(\eta_t | \Pi_{t-1}, \Pi_{t-2}, ...) = 0 \tag{5}$$

In brief, Muth's idea explicitly implies that economic agents forecast in such a way as to minimize forecast errors based on present and publicly available information but subject to a certain degree of restriction such as uncertainty. After all, the forecast error is in fact unbiased and efficient in statistical explanation if rationality applies. To draw on the evidence of rationality in REH testing, it is fairly common to conduct a set of three rationality tests to validate each of the classic properties underlying REH, namely, tests of unbiasedness, lack of serial correlation, and efficiency.

Data Description

This study utilized a set of bi-annual, time series survey-based expectational data with the respective actual realized series on gross revenue and capital expenditure compiled from various issues of the Business Expectations Survey of Limited

Companies (BESLC).[1] To the best of our knowledge, the BESLC survey data published by the Department of Statistics Malaysia (DOSM) are the only readily and publicly available long-span survey materials that enable us to provide additional insight into the understanding of expectations formation for business operational forecasts in the Malaysian agricultural sector from January 1978 through July 2009.

Empirical Results and Discussion

In the investigation of REH, most prior studies have employed regression analysis without considering the stationarity or stability of the survey data (Aggarwal et al., 1995). However, using time series data which are non-stationary or unstable will lead to erroneous conclusions, as the inferences drawn from the regression estimations are based on spurious regression results (Engle & Granger, 1987). Thus, incorporating a set of survey data which follow a unit root process into the ordinary least squares (OLS) estimation will result in misleading inferences regarding the validity of REH. Indeed, the undesirability of using non-stationary survey data in rationality testing has been addressed by Dominguez (1986), Dwyer et al. (1989), and subsequent researchers. Following the recent work by Aggarwal et al. (1995), Habibullah (2001), Nielsen (2003), and others, this study used the Augmented Dickey-Fuller (ADF) unit root test developed by Dickey and Fuller (1979, 1981) to detect the existence of unit root in the survey data as well as to distinguish the order of integration.

The results of ADF unit root testing for both actual and expected values of gross revenue and capital expenditure are presented in Table 1. The findings suggest that the actual and expected series of gross revenue and capital expenditures are unable to achieve stationarity at level because the null hypothesis of unit root cannot be rejected, as the absolute values of computed *t*-statistics are smaller than the critical values proposed by MacKinnon (1996). However, they are stationary at the significant level of 1% after differencing once. This outcome indicates that all the involved series are stationary at their first difference and integrated to the order of one, or possessing $I(1)$ stochastic process.

[1]As documented in BESLC, 270 survey respondents that included both large public and private limited companies were selected through a three-stage sample design. In the first stage, the respective sectors' contribution to gross revenue, employment, and net value of the fixed assets in the overall business segment was evaluated to allocate the 270 companies among the sectors. Next, the representation of industry within each sector was derived from the industries' contribution to gross revenue in the sector. Finally, the individual company's contribution to gross revenue was calculated and used to select companies within each industry.

Table 1: ADF Unit Root Test Results

Variables	Level		Variables	First Difference	
	Constant No Trend	Constant Trend		Constant No Trend	Constant Trend
LAGR	-0.908	-2.923	ΔLAGR	-5.938***	-4.271***
LEGR	-1.073	-3.070	ΔLEGR	-4.393***	-4.180***
LACE	-2.097	-2.037	ΔLACE	-4.111***	-4.410***
LECE	-1.378	-1.935	ΔLECE	-5.800***	-5.100***

Notes: Asterisks (***) indicate statistically significant at the 1% level. Lag lengths for ADF test have been chosen on the basis of Akaike Information Criterion (AIC). LAGR, LACE, LEGR and LECE denote natural logarithms of actual gross revenue, actual capital expenditure, expected gross revenue, and expected capital expenditure, respectively.

After identifying the time series properties of the data, we proceeded to the cointegration test. The cointegration test has significant implications for survey-based studies; Granger (1986) contended that the "optimal forecast" and the actual value of the series being predicted must be cointegrated under a relatively general condition, or else the two series do not even own similar long-term properties.[2] Recent studies that involve rationality testing have advocated the use of cointegration testing in addition to pre-testing the stationary properties of the data series. Aggarwal et al. (1995) argued that, in validating the unbiasedness property of the expectational series, the stationary forecast is a necessary requirement for a series to be unbiased. Aggarwal et al. (1995) suggested the use of cointegration testing if the realized series and the respective forecasted series are non-stationary following a unit root process.

In this study, we utilized the Johansen and Juselius (1990) cointegration test to examine whether a group of non-stationary series is cointegrated, and the findings are depicted in Table 2. In all cases, both Trace and Maximum-Eigen statistics are statistically significant at the 5% level, signifying that the null hypothesis of non-cointegration can be firmly rejected. This finding shows the existence of a long-term relationship between the expected series and the actual series with the cointegrating vector of one. Thus, the actual series and its respective forecast series are said to be sharing a common stochastic trend and able to converge to a similar equilibrium path in the long run. The existence of such co-movement would ensure that, at least in the long-term, any modestly acceptable forecast series must not deviate far from the actual realized series.

[2] For an expectational series to be regarded as a rational forecast of its actual series, the survey-based forecast series Π_t^* must be integrated in the $I(1)$ process, Π_t and Π_t^* must be cointegrated, and the cointegrating vector must be 1 (Fischer, 1989).

Table 2: Johansen and Juselius Cointegration Test Results

Variables	H_0	H_1	λ-trace	H_0	H_1	λ-max
LAGR, LEGR	$r = 0$	$r \geq 1$	26.516**	$r = 0$	$r \geq 1$	24.582**
	$r \leq 1$	$r \geq 2$	1.934	$r \leq 1$	$r \geq 2$	1.934
LACE, LECE	$r = 0$	$r \geq 1$	28.672**	$r = 0$	$r \geq 1$	25.455**
	$r \leq 1$	$r \geq 2$	3.218	$r \leq 1$	$r \geq 2$	3.218

Notes: Asterisks (**) denote significant at the 5% level, r is the number of cointegration vector(s). The critical values for λ-trace are 15.495 and 3.841 for H_0: $r = 0$ and $r \leq 1$. Alternatively, the critical values for λ-max are 14.265 and 3.841 for H_0: $r = 0$ and H_0: $r \leq 1$, respectively.

In the attempt to test the unbiased nature of the forecast series, we performed a conventional unbiasedness test based on the realization-forecast regression (RFR) proposed by Theil (1966). The RFR unbiasedness test was performed by regressing the survey expectational series on its respective realized series. The corresponding findings for each of the investigated operational variables are reported collectively in Table 3. The results reveal that the slope coefficient is significantly positive at the 1% level in both cases, implying that, on average, business firms in the agriculture sector are able to predict the direction of future changes correctly. However, in the case of expectations on capital expenditures, the joint hypothesis of α=0, β=1 is firmly rejected at the 1% level, suggesting that businesses in the investigated sector tend to be biased in the prediction of capital expenditures and the biased forecasts tend to overestimate the actual value of gross revenue, as the slope coefficient is significantly less than 1.

Table 3: Results of Unbiasedness Test

	Gross Revenue	Capital Expenditure
Constant (α)	0.022	0.183
Slope (β)	0.996***	0.927***
R-squared	0.944	0.896
Hypothesis Testing		
F-statistic (α=0, β=1)	0.038	15.366***
LM χ^2 (1)	1.146	0.305
LM χ^2 (2)	1.150	0.665

Note: Asterisk (***) denotes statistically significant at the 1% level.

In contrast, surveyed manufacturers do not exhibit biased predictions in their gross revenue given that the joint hypothesis of α=0, β=1 cannot be rejected. Hence, gross revenue forecasts were found to be consistent with the property of unbiasedness. On the whole, the results of diagnostic testing reported in Table 3 confirmed that the estimated residual of the RFR equation is consistent with the requirement of forecast rationality, as the findings from the Lagrange multiplier (LM) tests showed no evidence of serial correlation in all cases, indicating that the disturbance terms under study are white noise (Habibullah, 2001).

Then, we examined if the survey data incorporate past information through non-serial correlation and efficiency tests following the Evans and Gulamani (1984) and Mullineaux (1978) frameworks, respectively. The former test aims to detect the existence of series correlation between the current forecast error and its past forecast error. If the null hypothesis of non-serial correlation cannot be rejected, then the survey forecast is said to be excused from potential effects of unsystematic forecast errors, implying that forecasters learned from past mistakes and sufficiently corrected based on past mistakes. The latter test investigates whether forecasters efficiently incorporate all past available information into their forecasting process. The findings for both tests are presented collectively in Table 4.

Table 4: Results of Non-Serial Correlation and Weak-Form Efficiency Tests

Lag Length	Non-Serial Correlation Test:		Weak-Form Efficiency Test:	
	Gross Revenue	Capital Expenditure	Gross Revenue	Capital Expenditure
F-statistic with respect to lag length:				
1	0.541	12.662***	1.811	12.602***
2	0.692	8.446***	1.252	8.695***
3	1.400	6.580***	0.961	6.527***
4	1.189	5.240***	0.745	5.389***

Note: Asterisk (***) denotes statistically significant at the 1% level.

The results of non-serial correlation testing under the basis of *F*-statistic suggest that the null hypothesis of non-serial correlation can be firmly rejected at the 1% level for capital expenditure prediction, implying that the present forecast errors are serially correlated with the past forecast errors up to a lagged four forecast error value. Alternatively, forecast errors for gross revenue prediction do not exhibit any significant serial correlation with past forecast errors. This evidence verified that respondents from the agriculture sector utilized past forecast errors as part of the available information set and incorporated that information sufficiently while forming expectations on gross revenue but not capital expenditures. Interestingly, the results of weak-form efficiency testing reinforced the findings on non-serial correlation testing. Therefore, we could conclude that firms in the agriculture sector tend to be inefficient in predicting capital expenditures but not gross revenue. Based on the evidence suggested by the rationality tests above, the researchers concluded that business decision makers in the Malaysian agriculture sector are rational in predicting gross revenue, but appear to be irrational when dealing with capital expenditure forecasts.

Conclusion

To date, the widespread use of REH in the economic context has provided a means for further expansion in rationality testing as the validity of REH in real-world settings is crucial in that the implications of REH on policy establishment and

decision making are indeed substantial. The fairly limited empirical support for rationality testing in developing countries in general, and Malaysia in particular, has explicitly strengthened the need for further cultivation of this research topic. Fortunately, the availability of survey expectational data as documented in the BESLC published by the DOSM enables us to shed light on the applicability of the REH framework in the Malaysian business domain through survey-based expectations, specifically on the business operational forecasts formed by business firms in the agriculture sector. Hence, this study may serve to reinforce or supplement the findings offered by previous studies or provide additional insight into understanding of the expectations formation mechanism in Malaysian business firms. In addition, the empirical findings could implicitly demonstrate the extent to which the publicly accessible survey material is consistent with the doctrine of rationality and thus imply whether the existing business survey material can work well in reflecting optimal forecasts or true expectations of a typical profit-maximization firm.

Empirical findings offered by the three reported rationality tests enable us to conclude that Malaysian agriculture-based companies are rational in revealing gross revenue predictions, but go against rationality when dealing with capital expenditure predictions. The evidence of irrationality again suggests that businesses in this particular sector tend to be optimistic in expectations regarding their capital expenditures, as the unbiasedness test results showed significant overestimation in this operational variable. In addition, non-serial correlation and weak-form efficiency tests imply that capital expenditure forecasts are not being formed under optimally sufficient information. In this circumstance, forecast accuracy could be further enhanced by incorporating more past errors and relevant information into the forecasting process. Proper assimilation of information by business forecasters is crucial, as information is a necessary ingredient for the generation of rational forecasts.

Again, the present study suggests that a survey of business forecasts may not work well in reflecting the true business outlook specifically in value-related operational forecasts, which in turn would directly influence investment decisions as well as the capital budgeting process. However, it is less surprising to obtain an irrational business expectations survey with value-related variables, as certain firms may act in an optimistic manner in revealing information on value-related variables with the aim of making the business outlook more attractive to potential investors as well boosting business confidence in their business unit. This is particularly true in the case of capital expenditure expectations, which could serve as a reflection of the firm's future investment capacity, financial health, and liquidity. Moreover, it is interesting to note that the Malaysian agriculture sector, which has been rather labor intensive over the past few decades, possesses business players that have a relatively optimistic outlook on capital expenditure prediction. This may suggest that public limited companies within the Malaysian agriculture domain are looking forward to increasingly capital-intensive business exploration and development.

As the existing survey of business forecasts is still less promising to be characterized as a good representation of a typical rational optimizer, survey users need to account for the potential effect of irrationality, and any decision making should come with relevant adjustments, but not based solely on the inferences drawn from the available survey materials. All in all, accuracy in economic and business forecasting is particularly important to the general development of the economy. The success of any development plan, along with government policy, depends on the ability of economic agents to generate realistic future forecasts and the predictive power of existing expectational materials that serve as the dominant input in most decision making in the economy. Thus, business entities are encouraged to contribute more reliable and truthful future forecasts that reflect the real business outlook in the economy to survey institutions that offer survey materials to public and private users.

Acknowledgment

The authors acknowledge the financial support of the University Malaysia Sarawak and Fundamental Research Grant No. FRGS/05(27)781/2010(62). Any flaws are the responsibility of the authors.

REFERENCES

[1] **Aggarwal, R., Mohanty, S., Song, F. (1995),** ***Are Survey Forecasts of Macroeconomic Variables Rational?.*** *Journal of Business*, 68(1), 99-119;

[2] **Beach, E.D., Fernandez-Cornejo, J., Uri, N.D. (1995),** ***Testing the Rational Expectations Hypothesis Using Survey Data from Vegetable Growers in the USA.*** *Journal of Economic Studies*, 22(6), 46-59;

[3] **Department of Statistics Malaysia.** ***Business Expectations Survey of Limited Company, various issues.*** Putrajaya: Department of Statistics Malaysia;

[4] **Dias, F., Duarte, C., Rua, A. (2008),** ***Inflation Expectations in the Euro Area: Are consumer Rational?.*** Banco de Portugal, Working Paper 23-2008;

[5] **Dickey, D., Fuller, W. (1979),** ***Distribution of the Estimators for Autoregressive Times Series with a Unit Root.*** *Journal of the American Statistical Association*, 74*(*366), 427-431;

[6] **Dickey, D., Fuller, W. (1981),** ***Likelihood Ratio Statistic for Autoregressive Times Series with a Unit Root.*** *Econometrica*, 49(4), 1057-1072;

[7] **Dominguez, K. (1986),** ***Are Foreign Exchange Forecasts Rational? New Evidence from Survey Data.*** *Economic Letters*, 21(3), 277-282;

[8] **Dwyer, G.P.Jr., William, A.W., Battaliio, R.C., Mason, T.I. (1989),** ***Tests of Rational Expectations in a Stark Setting*****.** The Federal Reserve Bank of St Louis, Research Paper, No. 89-001;

[9] **Engle, R.F., Granger, C.W.J. (1987),** ***Cointegration and Error Correction, Estimation and Testing.*** *Econometrica*, 55(2), 251-276;

[10] **Evans, G., Gulamani, R. (1984),** ***Tests for Rationality for the Carlson-Parkin Inflation Expectation Data.*** *Oxford Bulletin of Economics and Statistics,* 46(1), 1-19;

[11] **Fischer, A.M. (1989),** ***Unit Roots and Survey Data. Oxford Bulletin of Economics and Statistics,*** 51(4), 451-463;

[12] **Forsells, M., Kenny, G. (2002),** ***The Rationality of Consumers' Inflation Expectations: Survey-based Evidence for the Euro Area.*** European Central Bank, Working Paper, No. 163;

[13] **Friedman, D. (1980),** ***Survey Evidence on the Rationality of Interest Rate Expectations.*** *Journal of Monetary Economics*, 6(4), 453-465;

[14] **Gao, F., Song, F.M., Wang, J. (2008),** ***Rational or Irrational Expectations? Evidence from China's Stock Market.*** *Journal of Risk Finance*, 9(5), 432-448;

[15] **Granger, C.W.J. (1986),** ***Developments in the Study of Cointegrated Economic Variables.*** *Oxford Bulletin of Economics and Statistics*, 48(3), 213-228;

[16] **Habibullah, M.S. (1994),** ***Do Business Firm in Developing Economy Make Rational Economic Forecast? The Evidence from Malaysia Business Expectations Survey of Limited Companies.*** *Asian Economies*, 23(4), 73-92;

[17] **Habibullah, M.S. (1996),** ***Forecasting Economic Variables in the Agricultural Sector: Testing Rational Expectations Hypothesis on Survey Data.*** *Pakistan Journal of Applied Economics*, 12(2), 171-184;

[18] **Habibullah, M.S. (2001),** ***Rationality of Insurance Firms' Forecasts: Results of Unbiasedness and Efficiency Tests.*** *Malaysia Management Journal*, 5(1&2), 107-117;

[19] **Johansen, S., Juselius, K. (1990),** ***Maximum Likelihood Estimation and Inference on Cointegration with Application to the Demand for Money.*** *Oxford Bulletin of Economics and Statistics*, 52(2), 169-210;

[20] **Keane, M.P., Runkle D.E. (1990),** ***Are Economic Forecasts Rational?.*** *Federal Reserve Bank of Minneapolis Quarterly Review,*13(2), Spring, 26-33;

[21] **Levine, D.I. (1993),** ***Do Corporate Executives Have Rational Expectations?.*** *The Journal of Business*, *66(*2), 271-293;

[22] **Mackinnon, J.G. (1996),** ***Numerical Distribution Functions for Unit Root and Cointegration Tests.*** *Journal of Applied Econometrics,*11(6), 601-618;

[23] **Mitchell, K.; Pearce, D.K. (2005),** ***Professional Forecasts of Interest Rates and Exchange Rates: Evidence from the Wall Street Journal's Panel of Economists*****.** Department of Economics, North Carolina State University, Working Paper, No. 004;

[24] **Mullineaux, D.J. (1978),** ***On Testing for Rationality: Another Look at the Livingston Price Expectations Data.*** *The Journal of Political Economy*, 86(2), 329-336;

[25] **Muth, J.F. (1961),** ***Rational Expectations and the Theory of Price Movements.*** *Econometrica*, 29(3), 315-335;

[26] **Nielsen, H. (2003),** ***Inflation Expectations in the EU Rational?.*** Paper presented at the Eighth Spring Meeting of Young Economists, Catholic University of Leuven, Belgium;

[27] **Osterberg, W.P. (2000),** ***New Results on the Rationality of Survey Measures of Exchange-rate Expectations.*** *Federal Reserve Bank of Cleveland Economic Review*, 36(1), 14-21;

[28] **Theil, H. (1966),** ***Applied Economic Forecasting*****.** North-Holland: Amsterdam.