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THEORY OF RATIONAL EXPECTATIONS HYPOTHESIS: BANKS AND OTHER FINANCIAL INSTITUTIONS IN MALAYSIA

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ABSTRACT

The Rational Expectations Hypothesis (REH) states that the actual outcome will be identical to the optimal forecast when all obtainable information had been utilized in forming the expectations. This study intends to empirically examine the existence of rational behavior in the banks and other financial institutions in Malaysia from the perspective of how the decision-makers formed their gross revenue (GR) and capital expenditure (CE) forecasts. Survey data provided by the *Business Expectations Survey of Limited Companies* was utilized to conduct a series of rationality tests including unbiasedness, non-serially correlated and efficiency tests. Empirical evidence shows that GR is unbiased, serially uncorrelated and efficient, nevertheless, CE fails to pass any of the tests. Therefore, GR is deemed as a rational predictor to the actual value but not in the case of CE.

KEYWORDS: Rational Expectations, Financial Sector, Gross Revenue, Capital Expenditure

1. INTRODUCTION

Rational expectations utilize all the available information and experimental data to predict the variables in a future market. As noted by Pesaran and Weale (2006), rational expectations are the composition of an economy structure and model through the economic theories determined by effects of expected future events on current behavior. In other words, an economy model can only be tested if the expectations data is rational. In a different way, Muth (1961) and Lucas (1972) suggested that the existence of rational expectations is valid with the condition that the expectations are formed when the market is under unique equilibrium. Besides, rational expectations play an important role in microeconomics and macroeconomics helping policies makers evade from persuading ineffective policies. The successful and efficiency decisions that avoid the uncertainty of the economy environment could be obtained merely through the rational expectations. Effective business management with full allocation of resources will subsequently maximize the business outcomes by adjusting the economic planning and policies.

The financial sector is one of the top contributors in the services sector that drastically affects the nation's GDP. In Malaysia, financial systems are broadly divided into banking and non-bank financial institutions that account for approximately 70 percent and 30 percent, respectively (Sufian, 2006). The banking system is further divided into three main groups: commercial banks, finance companies and merchant banks. The non-bank financial institutions are partitioned into two major clusters: finance companies and merchant banks. An efficient financial sector can help to open up the country to a global market and enhance financial market liberalization. Moreover, it boosts the economy's growth and development in the long-run. Nevertheless, the inefficiency in this sector in turn will be harmful to the economy. Therefore, this study attempts to investigate whether the predictions of decision-makers in Malaysian banks and other financial institutions are aligned with the rational expectations hypothesis (REH).

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2. BRIEF REVIEW OF LITERATURE

Generally, REH can be tested by using direct tests and indirect tests of the survey data. Direct tests are the non-parametric tests that do not require prior models while the indirect tests are the joint tests that may be rejected due to incorrect model specification. In this study, the Malaysian quantitative survey-based expectations are utilized to determine the type of expectations formed in the banks and other financial institutions through the direct tests. This section comprises a brief discussion of the empirical works that employ different estimation techniques in testing REH. We noted that much effort has been devoted in testing REH, but there is only fair evidence that is in favor of it.

In the past few decades, interest in studying the rational behavior of economic agents has greatly increased. By and large, traditional regression had been employed by using the OLS estimator to examine the rationality. In particular, the unbiasedness test, non-serial correlation test, efficiency test and orthogonality test have been widely utilized in this matter. Razzak (1997) claimed that the survey data that passed the unbiasedness, efficiency and orthogonality tests showed weakly rational, followed by the sufficiently rational that is obtained after passing the ARIMA models, and strictly rational after passing tests for strong rationality. On the other hand, some literatures started to test the REH by using the quantitative expectations converted from qualitative expectations. A further condition is for the forward looking and backward looking expectations to be addressed since they can change the expectations formation process. Recently, researchers tend to employ time series analyses which include stationarity and cointegration tests together with other diagnostic tests in studying the REH. In addition, there is also consideration of using panel data analysis to observe the realization and prediction effects in the REH studies.

The findings of expectations based on macroeconomics variables such as inflation overwhelmingly imply that REH is well applied. Other than inflation, REH also have been tested for income, price level, production growth rate, unemployment rate, wage rate, company profit, interest rate and commodity price. The empirical findings from the REH tests, however, have mixed results. For instance, the studies by Habibullah (1994a, 1997), Razzak (1997), Heinemann and Ullrich (2006), Mestre (2007), as well as Henzel and Wollmershäuser (2008) found evidence in support of REH. In contrast, the works by Gerberding (2001), Ashiya (2003), Lehmann (2009) and Puah, Chong and Jais (2011) had rejected the REH.

3. THEORETICAL FRAMEWORK

The REH is dictated by the mathematical expectations (predictions) to be the same as the subjective expectations (actualizations) as demonstrated by Muth (1961) and expressed below:

$$\forall_t = E\{{}_{t-1}e_t \mid \Omega_t\} \tag{1}$$

where E is the proxy of the mathematical predictions operator, ${}_{t-1}e_t$ is the predictions for observed value $\forall_t$ on time t that constituted at time t-1, and Ω_t represents the information set at the time forecasts made.

As the economic agents tend to utilize all the available information without dissipation, the model is rewritten as:

$$E\{ \forall_t - {}_{t-1}e_t \mid \Omega_t \} = 0 \quad (2)$$

Subsequently, it can be reconstructed by treating $\hbar_t$ as forecast errors $\forall_t - {}_{t-1}e_t$:

$$E\{ \hbar_t \mid \Omega_t \} = 0 \quad (3)$$

The forecasting errors $\hbar_t$ are assumed to be free from measurement errors due to the fact that economic agents will redress the past forecast errors during the anticipations assembly at time t-1. Additionally, $\hbar_t$ shall not correlate with any variables inside the information set as well. On the other hand, REH postulates that forecasting is required to be unbiased, non-serial correlated and efficient. Consequently, the REH is violated if any of the above properties are unable to be fulfilled.

4. EMPIRICAL RESULTS

In this study, the realized and anticipated values of the operational variables in the banks and other financial institutions have been collected from various issues of the *Business Expectations Survey of Limited Companies* published by the Department of Statistics Malaysia. These operational variables include gross revenue (GR) and capital expenditure (CE) of the firms in the industry. The sample period spans from June 1991 to June 2006 with survey data on bi-annually basis.

Clayton (1997) and Lim and McKenzie (1998) pointed out that non-stationary data tends to cause rejection of REH and lead to spurious results for rationality tests. Thus, the stationarity properties of the time series need to be ascertained beforehand through unit root testing. In Table 1, the Augmented Dickey-Fuller (ADF) unit root test results indicated that both realized and anticipated values of GR and CE are non-stationary at level, but they appeared to be stationary after the first order differencing. Thus, the time series for GR and CE are said to be integrated of order one, or $I(1)$. This indicates that the data under study is appropriate for rationality tests.

Table 1: Augmented Dickey-Fuller Unit Root Test Results

	Realized Variables	Anticipated Variables
	Level	
GR	-2.326 (0)	-2.396(0)
CE	-3.462(3)	-3.344(3)
	First Difference	
ΔGR	-8.674(0)***	-8.364(0)***
ΔCE	-4.678(3)***	-4.420(3)***

Notes: The model allows a trend and intercept for level while intercepting for first difference. Asterisk (***) indicates statistically significant at 1% level. Figures in parentheses are the lag lengths. The ADF test examines the null hypothesis of a unit root against the stationary alternative. Critical values for ADF test are obtained from MacKinnon (1996) as follow: (1%) -4.30 and (5%) -3.57.

REH requires subjective expectations to be identical to the corresponding mathematical expectations (Friedman, 1980). Accordingly, the realizations are regressed by survey expectations via the unbiasedness test shown as:

$$\forall_t = \alpha + \beta_{t-1} e_t + \varepsilon_t \quad (4)$$

where ε_t is a zero mean finite-variance disturbance term that is uncorrelated with $_{t-1}e_t$. The rejection of the null hypothesis, H_0: α=0, β=1 implies that anticipations are the biased predictor of the actual outcomes. Instead, the cointegration test has some meaningful implications in testing REH, particularly on establishing the long-run relationship between the realized and anticipated series. It is used to further evaluate the unbiasedness after the unit root test (Schirm, 2003). If the series are cointegrated, forecast errors had not followed the random walk and fit the judgment of rationality. Therefore, the study proceeds with the unbiasedness test, Engle-Granger cointegration test, and LM test after verifying that all variables are integrated with the same order.

Table 2 presents the results of the Engle-Granger cointegration test symbolized by the ADF statistic. The cointegration test result indicated that there is a long running co-movement between the expected and actual values for GR and CE. Moreover, the *F*-statistic of the joint hypothesis that imposed restriction for α=0 and β=1 in the unbiasedness test suggested that the forecast is an unbiased predictor of the actual value for GR, since the null hypothesis cannot be rejected at the 5 percent level. Nonetheless, it can be rejected for the case of CE at the 1 percent level. In other words, predictions based on GE are unbiased, but it is not the same case in CE. Other than that, the significant slope of both GR and CE implies that firms in the financial industry are able to predict the future outcomes well. In addition, the LM test results showed that the disturbance term for GR is white noise.

Table 2: Results of Engle-Granger Cointegration Test, Unbiasedness Test and LM Test

	GR	**CE**
Cointegration Test		
ADF	-5.753***	-3.946***
Unbiasedness Test		
Constant (α)	0.190	0.149
Slope (β)	0.980***	0.917***
F-statistic (α=0, β=1)	0.853	18.922***
LM(2)	1.371	3.203**

Notes: Critical value for ADF is -2.65 (1%), -1.95(5%) and -1.61(10%) (see MacKinnon, 1996). Asterisks (***) and (**) denote statistically significant at 1% and 5% levels, respectively.

The existence of serial correlation between forecast errors and the lag forecast errors is tested by employing the non-serial correlation test as follows:

$$E\{ \hbar_t \mid \hbar_{t-i} \} = 0 \qquad ; i = \{1, 2, 3, ..., n\} \quad (5)$$

The forecast errors $\hbar_t$ will be adjusted from time to time as suggested by REH. Consequently, the past forecast errors $\hbar_{t-1}$ should not exhibit any relationship with $\hbar_t$. Meanwhile, the efficiency test is used to examine if the forecast errors are disjointed with any variables comprised in the information set available during forecasting (Beach, Fernandez-Cornejo and Uri, 1995). The equation is expressed as below:

$$E\{ \hbar_t \mid \Omega_{t-i} \} = 0 \quad (6)$$

In Table 3, the results of non-serial correlation and weak-form efficiency tests on the GR consistently suggest that the hypotheses of serially uncorrelated and efficiency cannot be rejected, however, these outcomes do not apply to CE. Consequently, the forecast on CE is serially correlated and inefficient (see Table 3). This implies that the decision-makers in the financial sector have incorporated all the available information when building expectations on GR, but it was the other way around for CE. All in all, GR is a rational predictor to the actual value.

Table 3: Results of Non-Serial Correlation and Weak-Form Efficiency Tests

Variable	F-statistic with respect to lag length					
	1		2		3	
	NSC	WF	NSC	WF	NSC	WF
GR	1.357	0.529	0.962	0.887	0.405	0.467
CE	18.800***	25.842***	16.514***	16.621***	11.795***	12.257***

Notes: NSC refers to non-serial correlation test while WF refers to weak-form efficiency test. Asterisk (***) denote statistically significant at 1% level.

5. CONCLUSIONS

Business survey expectations entail significant consequences not only for the respondent firms, but also for the individuals and government that are directly affected by the economic environment. In this study, the rationality of Malaysian banks and others financial institutions was examined using the actual and expected operational variables in the industry. Using the techniques of unit root, cointegration, unbiasedness, non-serial correlation as well as efficiency tests, the results demonstrated that firms are rational predictors of future outcomes in the case of GR. However, they do not seem to follow the REH in predicting CE. In another view, survey respondents do not incorporate all the available information in forecasting the CE rather than GR. This finding is consistent with Habibullah (1994b) along with Wong, Puah and Shazali (2011) who found that expectations based on CE are more likely to reject the rationality tests compared to GR.

Furthermore, the estimated coefficient ($\beta<1$) illustrated that the Malaysian banks tend to overestimate when making predictions based on CE (Aggarwal and Mohanty, 2000). Perhaps, this is due to the nature of the industry as the financial sector is one of the most fluctuated industries. Therefore, decision-makers are hardly able to predict the CE rationally. In addition, the predictions of CE in the financial sector are easily affected by the market forces. To summarize, although REH does not hold for the expectations based on CE, it fixed well for the GR predictions in that particular sector. This might imply that Malaysian banks and others financial institutions are alert to the economy changing the GR and they are capable of adjusting their expectations from time to time by avoiding past errors.

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