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A Review on Efficient Market Hypothesis and Algorithmic Complexity Theory: A Study of Review of Literature

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Abstract - Equity markets are very complex and hard to predict. The study of equity market efficiency has been the objective of many researchers across the globe. To understand equity markets, it is important to understand efficient markets. An equity market is said to be efficient if it fully and correctly reflects all relevant information in determining security prices. The results of Efficient Market Hypothesis studies are mixed. Some studies conclude that the equity markets are efficient, whereas others do not. Measurements of the deviation from randomness provide a tool to verify the validity and limitations of the efficient market hypothesis. One way of interpreting market efficiency is by Algorithmic complexity theory. This paper depicts algorithmic complexity and conclude that better and efficient algorithms need to be developed to understand equity markets.

Keywords - *Efficient Market Hypothesis (EMH), Weak Form, Semi-strong Form, Strong Form, Algorithmic Complexity Theory.*

1. Introduction

1.1 Efficient Market Hypothesis

E. Fama [1] confirmed the randomness of stock prices and defined the efficient market concept. Three forms of market efficiency were identified by Fama: weak form, semi-strong form and strong form. A market is in weak form efficiency if it is impossible to make abnormal profits by using past prices and patterns to make decisions about when to buy and sell securities. The weak form efficiency rules out profit making by technical analysis. Market is in semi strong efficiency when the current price reflects all past prices and public information. If any new publicly available information is made, it instantaneously reflects in prices in in semi strong form and investors will not be able to identify undervalued stocks. If all types of information, public and private information are reflected in the prices then it is strong form efficiency. In an efficient market investors should be able to make only normal profits and earn a normal rate of return.

1.2 EMH and Algorithmic Complexity Theory

Algorithmic complexity theory was developed independently by Kolmogorov and Chaitin (1960) [2]. The complexity of a given object coded in an n-digit binary sequence is given by the bit length K(n) of the shortest computer program that can print the given symbolic sequence. An algorithm asymptotically optimal exists shown by Kolmogorov. A series of symbols is considered unpredictable if the information in it cannot be compressed to a more compact form. With algorithmic complexity theory, a series of symbols is considered unpredictable if the information embodied in it cannot be ‘compressed’ or reduced to a more compact form. A time series that has dense amount of non-redundant economic information exhibits statistical features that are almost indistinguishable from those observed in a time series that is random. Measurements of the deviation from

randomness provide a tool to verify the validity and limitations of the efficient market hypothesis. From the point of view of algorithmic complexity theory, it is impossible to distinguish between noise and information based trading. There is no difference between a time series carrying a large amount of non-redundant economic information and a pure random process.

2. Review of Literature

Fama (1965) claimed that the evidence on the EMH was so strong that it could only be neglected by large-scale empirical studies. S. Grossman and J. Stiglitz (1980) claimed that markets could not be efficient as there exists cost of information. R. Shiller opposed the EMH with the concept of excess volatility. He concluded that the actual volatility of stock prices had been higher than that calculated from fundamental information. De Bondt and Thaler (1985) reconfirmed Shiller's hypothesis of excess volatility. De Bondt and Thaler (1985) first noticed that in January stock returns were generally higher than in other months, which could not be explained by fundamental information only. B. Lehmann and N. Jegadeesh (1990) rejected the EMH. K. Chan (1997) concluded that global stock markets were weak-form efficient. In 1998, Fama argued that an overreaction in stock markets was as common as underestimation which therefore did not lead to inefficiency. Ojah and Karemera (1999) concluded that four Latin American emerging markets are weak-form efficient. In the Indian market, Sharma and Kennedy (1977), Barua (1980, 1987), Sharma (1983), Ramachandran (1985), Gupta (1985), Srinivasan (1988), Vaidyanathan and Gali (1994) support weak form efficiency.

Darrat and Zhong (2000) examined whether or not the Chinese markets follow a random walk. The daily data of the A-share closing index prices of the Shanghai exchange from December 20, 1991 to October 19, 1998 and the Shenzhen exchange from April 4, 1991 to October 19, 1998 was used for the study. The results show indices on both Chinese stock markets do not follow a random walk. The results also showed that prices of A share indices exhibit positive autocorrelation implying predictability. The study further suggested that the inefficiency probably arise from thin trading, inadequate information, legal environment and lack of transparency as the explanation for inefficiency in the Chinese stock markets. Thomas and Shah (2002) analysed the Indian stock market index from April 1979 to June 2001 by using 26 budget dates. The study found that in some years, post-budget returns are positive, in other years' post-budget returns are negative; on an average, there is no clear pattern about and concluded that market is semi strong efficient. Gupta and Kundu (2006) examined the effects of union budgets on BSE Sensex stocks from 1991 to 2005. The study found that investors can earn abnormal profits during the short-term, medium-term periods around the budget (up to 15 days). Mishra (2011) concluded lack of evidence of weak form of efficiency in select emerging (India, China, Brazil, South Korea, Russia) and developed capital markets (Germany, US and UK) with help of unit root test and GARCH (1,1) model. Nageshwari and Selvam (2012) investigated whether Friday effect exist in Bombay stock. The analysis revealed that there is no significant Friday effect exists in Indian stock market during the period 1 April 2002 to 31 March 2010.

Patel, Radadia and Dhawan (2012) examined the day of the week effect in four selected stock markets of Asian countries namely India (BSE), Hong Kong (Hong Kong Stock Exchange) Japan (Tokyo Stock Exchange) and China (Shanghai Stock Exchange) the maximum average return is on Wednesday with maximum volatility on Monday. All the Asian markets under study had maximum volatility on Monday. There is no evidence in favour of the day of the week effect and also provide evidence that investor cannot predict market behaviour and may not have opportunities to improve their returns by timing their investments. It was also suggested that the markets understudy is efficient.

Haritika Arora (2013) [5] tested for weak form efficiency using daily data for S&P CNX Nifty for the period January 2000 to 31 December 2011. Results exhibited that returns series are characterised by linear as well as nonlinear dependences and a high persistence of volatility clusters over the sample period. Linear Dependences was confirmed by Ljung-Box Q statistics, serial correlation LM test and autoregressive model. BDS test was applied on the residuals series generated by ARMA model indicated n o n l i n e a r d e p e n d e n c e s. The results provide absence of weak form of efficiency and random walk hypothesis. Vikram Bisen (2015) [3] examined efficient market hypothesis in the current Indian stock market. Two case studies where the stock price impact of announcement with respect to Infosys and SEBI noncompliance order was studied and concludes that a definitive conclusion cannot be arrived at in supporting or rejecting the EMH hypothesis and questions the validity of EMH in today's market scenario. Sandeep (2016) [4] reviewed EMH and found that Indian stock market follows three form of market efficiency that is weak, semi strong and strong forms and there are enough gaps in the study regarding test of randomness in equity market indices.

Ricardo Giglio et al. (2008) [6] resort to the efficiency interpretation provided by algorithmic complexity theory and used the approach to rank 36 stock exchanges, 37 individual company stocks and 19 US dollar exchange

rates. O Brandouy et al. (2012) [8] made a survey of the main applications of algorithmic complexity to price dynamics and put forward a general algorithmic framework for financial data analysis. They concluded that algorithmic tools constitute an alternative to stochastic model. Amaresh Das (2014) [7] reviews the algorithmic complexity theory and concludes that most empirical evidence about market behaviour can be explained by algorithmic complexity theory which is generalized by Shannon entropy theory of information.

3. Review Table

The study of Efficient Market Hypothesis as shown below in the table 1.

Table 1 : Review Table

S.No	Efficient Market Hypothesis	Study
1.	Supportive to various form of Efficient Market Hypothesis	Sharma & Kennedy (1977)
		Barua (1980)
		Sharma (1983)
		Ramachandran (1985)
		Gupta (1985)
		Srinivasan (1988)
		Vaidyanathan & Gali (1994)
		Thomas & Shah (2002)
		Mishra (2011)
		Nageswari Selvam (2012)
		Patel, Radadia, Dhawan (2012)
		Sandeep (2016)
2.	Rejection to Efficient Market Hypothesis	Darrat and Zhang (2000)
		Gupta and Kundu (2006)
		Haritika Arora (2013)
		Vikram Bisen (2015)
3.	Efficiency Interpretation by Algorithmic Complexity Theory	Ricardo Giglio et al. (2008)
		Brandouy et al. (2012)
		Amaresh Das (2014)

4. Conclusion

From the study of review of literature, it is very clear that there is no conclusive evidence for the efficient market hypothesis and a clearer explanation of randomness in the market can be given by algorithmic complexity theory. It is also clear that an efficient algorithm which helps to understand better, the behaviour of financial time series is required. It is a new area which requires more research.

References

[1] Eugene F Fama, Efficient Capital Markets A review of Theory and empirical work, Journal of Finance Volume 25, Issue 2. 1969.

[2] Rosario N Mantegna, H Eugene Stanley, An introduction to Econophysics Correlations and Complexity in finance, 2000.

[3] Dr.Vikram Bisen, Madulika Pandey,Testing efficient market hypothesis in Current Indian Stock Market, International Journal of Applied Research, Volume 5 March 2015.

[4] Dr.Sandeep ,EMH A study of Review of Literature, International Journal of Computing & Corporate research Volume 6 Issue 2 March, 2016.

[5] Haritika Arora Testing weak form of efficiency of Indian stock market Pacific Business Review International Volume 5 Issue 12 June, 2013.

[6] Ricardo Giglio, Raul Matsushita, Annibal Figueiredo, Irlam Gleria, Sergio Desilva, Munich Personal RePE Archive, 2008.

[7] Amaresh Das, Martingales, Efficient Market Hypothesis and Kolmogorov's complexity theory, Information Management and Business Review, Vol 2, No.6, pp 252-258, 2013.

[8] Olivier Brandouy, Jean Paul Delahaye, Lin Ma, Hector Zenil, Algorithmic Complexity of financial motions, Research in International Business and Finane 30 (2014) 336-347, 2012.