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A Review of Literature and Application of Efficient Market Hypothesis in Horse Betting

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Although a large volume of literature is available on efficient market hypothesis, the topic is still under development and offers potential opportunities for further research and applications. This paper reviews the literature on Efficient Market Hypothesis and applications on horse race betting and identifies the gap between theory and practice and future research directions. A comprehensive list of references is presented. The findings of this research will provide useful insights into the anatomy of EMH literature and be a good source for anyone who is interested in EMH application in horse race betting. This paper also provides some future directions for research.

Field of Research: Efficient Market Hypothesis, horse betting, financial market

1. Introduction

Fama (1940) had initially set up the idea for what is an efficient market. It was defined that if the information was widely available to the participants and the ascertainable information concerned was reflected to the prices, such market would be considered as efficient. Generally speaking, studies on market efficiency had examined financial securities or commodities markets. However, there were recent researchers considering if the Efficient Market Hypothesis (EMH) of Fama or others could apply in different markets, such as racetrack wagering (refer to Snyder 1978; Tuckwell 1983; Asch, Malkiel, and Quandt 1984; Crafts 1985).

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2. Forms of EMH

Briefly speaking, EMH comes in three general forms: -

(a) Strong form efficiency

Under this form of efficiency, there would not be excessive return in the long run. Following the normal distribution of return, the stock value at any given time should reflect the true position namely all necessary information required to determine the value of the stock, which would generate nil excessive gain for investors, provided that the flow, disclosure and assessment of information are not legally prohibited.

(b) Semi-strong form efficiency

In between, this form of efficiency will adjust the uncertain information by way of rationalization and consistency on real time basis, which reflects as the name suggests there has been somehow different interpretation on the information, in other words share values may therefore be slightly adjusted by investors' bias within a small range and in random manners. It follows that there will also not be excessive gain so generated as may be found under the fundamental analysis.

(c) Weak form efficiency

Finally, this form of efficiency is founded on the basis through the use of fundamental analysis, stock values that may either be undervalued or overvalued could be sorted out and thus it allows and agrees that there could be excessive return generated from this fundamental analytical exercise, which is objective, as opposed to use of historical share values, financial ratios or statistical trends under the so called traditional investment strategies.

EMH emphasize that overall speaking, the outcome of the stock market results is always accurate in the context of normal distribution pattern, as some investors might over-react while some might not at any particular time frame or with respect to the same piece of information, which follows that it is not supposed to have generated abnormal gain or loss [per Shin (1992)].

3. Development of EMH

Fama (1970) demonstrated the efficient markets model. After it has been tested and found support by wider variety markets, it becomes widely accepted by academic financial economists and applied in economics and finance communities.The weak form test is strongly supported by evidence. The result is consistent and follows the random walk model. Though fundamental analysis has been tested statistically significant in affecting prices and returns and consistent with the ‘fair game’ efficient market model, it is still insufficient to prove the market is inefficient. Further, technical analysis such as chart reading involves high transaction cost which is hard to make profit. In fact, there is no real value to stock market investors. But, these may not crucial enough to reject the EMH. However, it is difficult to find evident that opposed to prices or returns change in a long period or even for a single day. There is only evident that provide insights to stock market but irrelevant to model testing.

The strong form test is strongly supported by the EMH. Fama, Fisher, Jensen and Roll (1969) found that real time information such as at the time of stock split, the information of future dividend payments is fully reflected on the price. Further, Ball and Brown (1968) and Scholes also showed that the annual earning announcements by firms and large block secondary issues of common stock are totally reflected in prices. Since strong form of EMH assumes all available information must be reflected in price, it is rather difficult to observe precise result on that. Niederhoffer and Osborn (1966) believed that specialists on major security exchanges can generate trading profit by access to monopolistic information. Scholes (1969) also found that corporate insiders access to monopolistic information of the firm to generate profit in trade.

In reality, it seems that market participants and other professionals who are familiar with the reliable trading rules or stratagems have no reason to disclose them to the academic researchers. In addition, there might be an information gap between the academic researchers who only study the markets and the market professionals who actually work with them. Some observers pointed out that apparently inefficient market features could be fully utilized, for instance, the seasonal tendencies and diverging returns to assets with different characteristics. For example, factor analysis and studies on returns of various types of investment strategies discovered that some of the stock types

might have outperformance in the long-term market such as in the United Kingdom (UK), United States of America (USA) and Japan.

When Efficient Market Hypothesis was first introduced but prior to this hypothesis, market was still considered as inefficient. Inefficiency was commonly known to exist in both UK and USA stock markets. Nevertheless, earlier study by Kendall (1953) suggested that changes in UK stock market prices were random. It was further extended by Brealey and Dryden, together with Cunningham that there were no significant dependences in price changes and recommended that the UK stock market was weak-form efficient. Despite this evidence that the UK stock market was weak form efficient, other studies of capital markets had stated that it should be semi strong-form efficient. Studies by Firth (1976, 1979 and 1980) in the UK had compared the share prices existing after a takeover announcement with the bid offer. Firth found that the share prices were fully and immediately altered to their correct levels, thus concluding that the UK stock market was semi strong-form efficient. The market's ability to efficiently respond to a short term and widely publicized event e.g. a takeover announcement cannot necessarily be taken as an indicator of a market efficient at pricing in regard to the longer term and amorphous factors.

However, there were observers disagreed with the idea of EMH that market behaviour was consistent, in particular in the stronger forms. Some of the economists, mathematicians and market practitioners do not trust that synthetic markets are strong-form efficient as there were preliminary evidence on inefficiency like the slow dissemination of information, the respective strong power from particular market participants such as financial institutions and the obvious influence from the complicated professional investors. The way how the markets reacted to unexpected astonishment might be the most visible defect in the EMH. Take for an example, new incident like unexpected interest rate changed from local banks were not immediate expeditiously specified on the stock prices, however, it caused continuous movement of prices over a period of time from hours to months.

Fama (1991) realized there are problems in the EMH. The joint-hypothesis is one of the problems due to ambiguity in defining information and trading costs. Further, market efficiency must be test jointly with some other equilibrium model such as asset-pricing model. Therefore, there is lacking evidence on

behaviour of returns and there is no clear cut between market efficiency and market equilibrium model. As the result, Fama (1991) altered the categories first proposed by Fama (1970) in order to resolve these problems. He instead of applying the test of weak, semi-strong and strong forms of the EMH, he used return predictability, events studies and private information to test. Among those events studies, daily returns give a clear picture of studies. Thus, there is lot of event-study following in the literature about corporate finance. They showed prices adjust with firm-specific information such as investment decisions, dividend changes, changes in capital structure, and corporate-control transactions.

4. Application of horse betting in EMH

Financial markets efficiency was the primary concern of economists. For example, when maximized value was expected by traders, market efficiency required the expected return on investments should be identical across different assets. There are few asset markets that could offer different form of information efficiencies for testing purposes since in such markets, assets such as securities and in fact most of which were infinitely lived and that the 'true' value underneath thereof did not come to the surface within a specified time frame for comparison to the prices. Hence, economists to test the efficiency had turned to settings which were not only less important in itself, but also more promising for experimental inquiry. Such setting was the market for racetrack betting.

A thousands years ago, horse race betting has been a custom. Horse racing in many countries are highly institutionalized, standardized and regulated by governmental authorities. Bettors place wagers on a closely controlled probabilistic events and the odds are determined by market forces of the competitive betting market. Bettors face both risk and uncertainty. In each race, different horses have different winning probabilities that cannot be known beforehand. A rational bettor will place a bet on a horse that he/she believes will win and the odds is somehow underestimate the willing probability. At the same time, the bettors need to bear risk. They can only make a profit if they make estimation more accurate than the market does. In order to increase the chance of make accurate estimation, they require gathering more information. In more extreme case, the bettors with access to monopolistic information may able to outperform the others.

Comforting in some sense was the finding that these betting markets showed a relatively high degree of efficiency. Market odds were good predictors of winning chances. Nevertheless, there was one vigorous finding which was contradictory to market efficiency: the favorite-longshot bias (for a brief illustration, refer to Thaler and Ziemba, 1988). The winning opportunities of horses with a high winning probability are often undermined by the implied winning probabilities of the market odds and vice versa for those with a low winning probability. It could be said there are actually too few bets placed on the favorites and too many on the long shots. The expected return per dollar bet was not equal across bets in the aftermath.

From Dowie (1976)'s research paper concerning betting market efficiency and equity, he suggested three kinds of market efficiency tests differentiated by definition of using 'available information'. He had used the approach to test weak efficiency correlated to available information with historical prices and returns. Regarding the tests of semistrong efficiency, public announcements was added to the set of available information and focused on whether the prices being fully reflected as soon as they were made. The third type of test, which was related to strong efficiency, it had studied the occurrence of specific subsets of market participants possessing monopolistic access to or control over specific information. Owing to the differentiation in information accessibility, when referring to this last set of test, Dowie chose to refer to equity: 'In other words, we will talk of a market as efficient to the extent that it passes the weak and semi-strong tests and equitable to the extent that it passes the strong test'.Similarly, researchers studying horserace betting markets might focus on information contained in past odds/prices (i.e. weak-form EMH), information provided by 'experts' (i.e. semistrong-form EMH), and information held privately by "insiders" (i.e. strong-form EMH). Oppositions exist upon whether the betting markets were efficient in these three forms. Weak-form EMH stated that technical analysis of past/historical prices was worthless; semi-strong-form EMH stated that fundamental analysis of publicly available information was worthless; strong-form EMH suggested that all information including private information was worthless. Most studies done previously agreed on overall weak-form and semistrong-form market efficiency, however, the strong-from market efficiency was in doubt.

To evaluate weak-form efficiency, they used specified movements in the ‘sum to one’ probabilities of winning to conduct filters. In that research, horse’s ‘sum to one’ probability of winning was derived from implied probability, which was in turn derived from odds. For instance, odds of 4/1 for a horse imply a 20% chance of winning in a race. To acquire ‘sum to one’ probability for that horse, this implied probability needed to be divided by the sum of the implied probabilities for all horses in that race. Bird & McCrae (1986) carried out the research in Australian horserace-betting market, suggested the weak- and semi-strong-form market efficiency. It is proven to be nearly negative rates of return, under the strategy of placing a $1 bet on a horse when it first satisfied a specific filter. The paper revealed that ‘experts’ selections did have some prophetic power, while track odds discounted almost all of such predictions from professional handicappers. However, in the paper mentioned that betting through the Off Track Betting did not seem to discount the information fully. With the paper, a control group and two various staking systems were used to test whether past movements in odds were able to use to form a beneficial gambling strategy. Past odds movements could not be used to get the positive gains which the results were coherent with the previous one.

According to Bird (1986), ‘experts’ information led to negative returns, and thus, suggesting semi-strong form efficiency. For estimating the market reaction to expert information, he classified the horses in each race according to an ‘experts’ poll, and then calculated the rates of returns for a betting strategy of placing a $1 bet on all horses with the same tipsters ranking. Figlewski (1979) also did analytical testing semi-strong form market efficiency. He distinguished on-track bettors from OTB (off-track betting system) bettors, and then conducted an analysis using a multinomial logit probability model to evaluate the information content of the predictions. Asch, Malkiel, and Quandt (1986) used a similar logit model and developed different gambling strategies based on odds information established by experts and by gamblers to measure whether expert information was included in prices. Both shown that there are no positive return, despite the gambling strategies developed proved superior to a random betting strategy.

Concerning strong-form information efficiency, Bird (1986) discovered that bettors did earn positive returns with access to nonpublic information. They used the same filter tests as mentioned aforesaid in their weak-form efficiency

test to detect if a prior knowledge of odds changes could enhance positive gains. Bettors also adopted a strategy to place bets on race horses filtered out by specific criteria before changes to the odds. The results showed that knowledge obtained in advance could bring significant positive rates of return. Per Shin (1991) found the existence of significant positive returns when shortening odds were accompanied by a rise measure in his model. Shin actually developed a model testing favorite-longshot bias and odds divergence caused by occurrence of insider trading. He deduced a necessary and sufficient condition for the bias which, if satisfied, would give rise to the existence of bias as well as insider trading. He also advised that insider dealing was more evident when a long shot was tipped to win. Similarly, per Law and Peel (2002) were revealed that a pronounced shortening of odds in horseracing betting markets indicated the existence of insider dealings.

Apart from the point of whether the market was at all efficient or not, argumentations existed upon the existence of favorite-longshot bias. If informed bettors betted on their favoured horses too soon, the fall in odds provided a signal to other uninformed punters (per Asch (1982)). To prevent early leakage of valuable information into the market, and to prevent others from knowing and using the information to increase their own profits at the informed bettors' expense, the informed bettor would then put off trades. Provided a much better indication of outcomes than those placed in the first half of betting, encouraging overall late-betting behaviour, Asch *et al*. also discovered that the bets placed in the second half of betting. Besides, Gandar, Zuber and Johnson (2001) studied the New Zealand pari-mutuel betting market. They tested correlation between returns and odds using regression, and then examined odds changes between the opening and close of on-track betting. They concluded that both on- and off-track late bettors in this market were better-informed "smart bettors" who were able to exclude much of the early off-track bettors' bias at the end of betting. According to Swidler and Shaw (1995)'s study on a small Texas track, there was found high correlation between the winning frequency and winning probability implied by the odds, suggesting no favorite-longshot bias. Furthermore, Asch (1982) also measured and compared the biased probabilities and objective probabilities. They gave a deduction that the subjective odds were a good predictor overall of the true objective probabilities of winning, with however, a clear tendency that favourites tended to be underbet and longshots overbet.

Other than that, Snyder (1978) in the betting market in the United States agreed that the market was efficient in its weak, semi-strong, and strong form, while the research showed that the bettors did exhibit bias in their horse selections, which, however, were not significantly adequate to permit positive gains especially when these profits were adversely affected by the take of the track. He criticized that the relationship between risk and gain in horserace-betting market was negative since bettors generally chose low probability-high prize rather than high probability-low prize horses in a sense that the prime return of horse betting came from the excitement of successfully choosing a moderately long-odds winner and thus outperforming the others.

There were various explanations for this abnormality. Some argued that betters were locally risk seeking, as a result which the usual preference over the return's variance was reversed (Quandt, 1986). There was submitted that people tended to overweigh small probabilities when calculating expected utility, which concur with the explanation in the prospect theory (per Kahneman and Tversky, 1979). In an attempt to retrieve these losses they would take more risks by betting on the long shot, thereby driving up its price. Whereas Thaler and Ziemba (1988) proposed another explanation towards the lines of prospect theory, the majority of bettors even evaluated bets in terms of gains and losses over the day and risk adverse in the domain of gains and risk would be at a loss due to the transaction costs during the course of the day. It was adequate to say that the issue was far from settled.

5. Conclusion

On the whole, Fama’s researches focused on the predictability of stock returns from past returns and other variables by EMH. For the following researchers, they further work on the predictability of daily and weekly returns from past returns, but they come to similar conclusion as Fama. The others such as the result of predictability of long-horizon stock returns from past returns have been inconsistent. In latest development, researchers test on other variables such as D/P, E/P and term structure then give a more reliable result in predictability of returns.

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