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**TESTING FOR EFFICIENCY IN THE NEW ZEALAND
HORSE RACETRACK BETTING MARKET**

A Thesis in partial fulfilment
of the requirements for the degree of
Master of Applied Economics at
Massey University

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Massey University
1998

Abstract

Using a large sample of New Zealand pari-mutuel horse race betting data, this study tests for market efficiency. This involves testing for weak form efficiency and an anomaly known as the favourite longshot bias. Additionally, a test developed by Henery (1985) is used to examine the extent to which bettors discount their losses. Also, two utility estimations are calculated using the first three moments surrounding the distribution. Each test is performed twice, firstly with the odds at the close of the tote and secondly with the odds quoted 30 minutes before the tote closes.

A number of previous studies are reviewed. The data set is discussed along with its limitations. An extensive description of the research methodology is presented, followed by the results, interpretations and discussion.

Many former studies have found that racetrack betting is not weak form efficient, but instead there exists a negative risk-return trade-off in the market. This study, exhibiting the negative risk-return trade-off and the favourite longshot bias, is consistent with previous studies. Using opening odds, there is much evidence to suggest that the favourite longshot bias exists 30 minutes before the tote closes but is essentially eliminated in the final 30 minutes of betting. The estimation of Henery's test is consistent with his results that bettors discount approximately 2% of their losses as 'not typical'. The implications of this are also discussed. The estimation of bettor's utility functions shows that bettors are risk lovers and, contrary to one study, the inclusion of the third moment is insufficient to prove bettors are in fact risk averse.

Acknowledgements

I am greatly indebted to my research supervisor, Professor John Gandar, Department of Economics, University of North Carolina at Charlotte, USA, for his extensive guidance, time and constructive criticism. Without his support, this thesis would not have been possible. The initial computer programming in this study must also be credited to John. I also wish to thank my second supervisor, Mr. Gary Buurman, Department of Applied and International Economics, Massey University, for his extensive proof reading and his unique ability to make the unreadable readable. I also owe gratitude to Dr. Claudio Michellini, Department of Applied and International Economics, Massey University, for his help with the econometric techniques adopted in this thesis. His advice, criticism and humour was greatly appreciated.

Thanks must also go to the Totalisator Agency Board (T.A.B.) for supplying me with the data set. Also, a special thanks to Ron McKenzie, System Support Manager at the T.A.B., who was always pleased to answer any queries I had throughout the year and for proof reading the section on the New Zealand Racing Industry.

I am also appreciative of my partner, Andrea Thomas, who has helped me proof read sections and has offered advice when asked. She can also be credited with helping me stay sane at times.

Also, a big thank you to my parents, Hugh & Jean, and my two brothers, Kelvin & Hayden, for their support, both financial and personal, throughout my days at Massey. Finally, a special thanks to my Mother for supplying me with my brains, as she so often reminds me.

This thesis is dedicated to my late Grandmother, Gladys McKee,
who after gaining her university entrance was not able to fulfil her dream of
completing a degree.

This one's for you Nana.

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1. Introduction

For centuries, societies have been intrigued with racing. They have been enthralled by racing everything; cars, bikes, boats, dogs, snails, frogs and of course, horses. More importantly, humans have been interested in trying to pick the winners of these races. People have a fascination with trying to predict the outcome of an uncertain event. Bettors believe that they can overcome this uncertainty and pick winners. It is from this aspect of human nature that betting was born. A bettor may think they can pick the winner of a race, and therefore they may be willing to put money forward as an indication of how much they believe in their choice. If bettors are able to find another person who is willing to back an opposing horse, we have a potential betting system, as systems require bettors with differing opinions. Bookmakers and organisations see this opportunity and hence, facilitate bets, as they sense there is money to be made by providing this service and bringing bettors together. In effect, they receive all the bets from bettors and pay back a proportion to those who correctly predict the race outcome.

1.1 New Zealand Racing Industry

The facilitator of bets in New Zealand is the Totalisator Agency Board, or the T.A.B for short. This board is closely monitored by Parliament and it must abide by the guidelines detailed in the Racing Act (1971) and its various amendments in 1986, 1989, 1992 and 1995. This Act prohibits any other person or organisation running their own bookmaking system, hence the T.A.B. has a monopoly in New Zealand.

The T.A.B. runs what is called a pari-mutuel betting system, meaning they take bets from the public, remove a percentage to cover costs, profits, the Governments' 6% tax on gambling, and return the remainder to the bettors who correctly predict the outcome. To illustrate this, consider bets placed on the winner of a race. The T.A.B. will receive money from thousands of bettors who place bets at odds offered by the T.A.B. Once the T.A.B. receives this money, they place it in what is called a win pool. When the race is finished and the winner is determined, they return the money less the track take to the bettors that correctly predict the winner. The T.A.B. cannot lose. Irrespective of the betting volume, the T.A.B. always retain a set percentage. In New Zealand, the track take is currently 15.5% for win and place bets, 21% for quinellas,

25% for trifectas and 26% for pick 6 and six pack. In the horse racing market, there are two main players; the bettors and the T.A.B. Since the T.A.B. always retains the track take, bettors as a whole MUST lose, even though it is possible for individual bettors to make money. Imagine a bettor that only makes one bet in their lifetime. If that bet wins, then this bettor has made money. In this situation, you will hear bettors say that they have made money out of the T.A.B., yet the T.A.B. have still collected their set percentage. The winnings are at the expense of fellow bettors.

Currently there are four ways you can bet; on course, off course, by the telephone and over the internet. On course betting allows bettors at the race meeting itself to use the numerous betting windows operated by the T.A.B., who are contracted by the local racing club. The T.A.B. also operates what they term agencies and sub-agencies. The agencies are T.A.B. retail outlets scattered throughout the country which are operated by an agent on a commission basis. Sub-agencies are unrelated businesses offering T.A.B. services, most commonly being public bars, bookshops and service stations. Additionally, the T.A.B. operates a telephone betting system where bettors can put money into a T.A.B. account. When they ring up and quote a PIN, they can make bets with the money in their account. Winnings are credited to their account and losses debited. Internet betting works identically to telephone betting.

The most popular bets are on the win and place pools. When bettors bet in the win pool, they are attempting to predict the winner of the race. A place bet wins when the horse finishes 1st, 2nd or 3rd. Bettors can also bet on what are termed 'exotic bets', like quinellas, trifectas, doubles, trebles and pick 6. A quinella involves correctly picking the two horses that finish 1st and 2nd in any order. A trifecta requires accurately predicting the horses that finish 1st, 2nd and 3rd in the correct order¹. Picking the winner of two races at one race meeting is called a double, while a treble involves picking the winner of three races at one race meeting. The T.A.B. has also designed a betting system called 'Pick 6'. A bettor can attempt to pick the winners of six races themselves or they can get the T.A.B. computer to pick six horses in a lucky dip² situation. The computer chooses six horses with a weighting towards the favourites by assigning sets of numbers to all horses in the six races. As the level of favouritism falls, the horses have less numbers assigned to them. The computer then randomly chooses one number from

¹ A variation on a trifecta is to 'box' the horses so that they can finish in any order. You can also box three or more horses for a quinella bet. These options obviously cost more.

² Note that 'lucky dips' are available on all bet types.

each of the six races. You are more likely to get the favourite horse as more numbers are assigned to it, however, it is still possible to get allocated six longshots. This thesis studies data in the win pool only.

The question of when bettors can bet depends upon the size of the race and when it is being run. For a typical weekday race meeting, the tote 'on course' and 'off course' will open approximately 1 hour before the first race. At this time, you can bet on all the races up until the horses 'jump' at the start of the race. At the end of the raceday, 'on course' betting windows stay open for an hour, allowing bettors to collect their winnings on the last race and to bet on other races around New Zealand and Australia that have not yet finished. For a typical Saturday meeting, the 'off course' tote will open on the Friday. The 'on course' tote will not open until the morning of the races.

To comprehend the size of the New Zealand racing industry, in 1997 the T.A.B. took approximately 1 billion dollars worth of bets, equating to approximately \$275 per capita. A typical Saturday race meeting will gross approximately \$1,500,000. The biggest race meeting of the year is the Melbourne Cup, where the T.A.B. can gross approximately \$9,500,000 for all 10 races, with most of this from the cup race. The biggest race within New Zealand is the Auckland Cup, which grosses approximately \$4,700,000, followed by the Wellington Cup, which grosses \$3,000,000³.

There are three main horseracing publications in New Zealand; 'Turf Digest', 'Best Bets' and the 'Friday Flash'. All publications contain similar information about gallops. A vast amount of information about races is contained in these publications;

- Horse name
- Weight to be carried
- Barrier draw
- Trainers / owners and stable
- Age, sex, sire, dam
- Details of last three starts, including;
 - when, where, weight, race distance, details of run down the home straight, placing, margin, time, jockey
- Placing in last six starts
- Records on different tracks (NZR, F, E, S, H, C, D, FR) where NZR= NZ races, F = firm, E = easy, S = soft, H = heavy, C = current track, D = record over current distance, FR = racing fresh (after a spell of 42 days or longer)
- Prize money won

³ 1997 Figures

The New Zealand T.A.B. also covers some of the big race meetings in Australia. For these often major races, the fixed odds market may open a week before the actual race. In this situation, the T.A.B. runs what is termed fixed odds betting up until the day of the race, where the minimum bet is \$5. On the actual raceday, only pari-mutuel odds will be offered. The next section will outline how pari-mutuel and fixed odds systems work.

1.2 Pari-mutuel and Fixed Odds Betting

The pari-mutuel betting system in New Zealand works as follows. Imagine there are N horses running in a race. Each of these horses has an amount bet on them to win, which is denoted as b_1, b_2, \dots, b_N . Let the total win pool for the j^{th} race be denoted by B_j , such that

$$B_j = b_1 + b_2 + \dots + b_N$$

Letting t denote the track take, supposing horse i wins the race, the payoff per dollar bet on horse i will be

$$OW_i = \frac{B_j(1-t)}{b_i}$$

where OW_i represents the odds quoted at T.A.B. agencies⁴. However, the OW_i quoted at the time the bettor places their bet may not be the same odds that get paid out if the horse wins. The odds that are to be paid out are calculated after the tote closes for the race. After a bet has been placed, the odds can change depending on where other bettors place their money.

The T.A.B. also runs a fixed odds betting system. This system is used for all sports betting and on important horse races as explained above. Once you make a bet under fixed odds, the odds quoted at the time are paid out if the bet wins, hence the payout is not dependent upon other bets. When the fixed odds market opens before a race like the Melbourne Cup, a large amount of information is made public between the time the fixed odds market opens and the race. If the T.A.B. only offered pari-mutuel betting prior to the race, this information could change the odds dramatically within that time. Compare this to pari-mutuel betting on the day of the race. By the raceday, most information affecting the odds has been made public. Bettors are able to predict the closing odds more accurately a day rather than a week before the race. If fixed odds are

⁴ Odds are rounded down to the nearest 5 cents. This is known as breakage.

offered, bettors are more likely to bet earlier in the week than with a pari-mutuel betting system.

1.3 Thesis Overview

There are four different areas of concern in this thesis, all related to each other. Firstly, there is the issue of efficiency. In Chapter 2, efficiency is formally defined and linked to the racing industry. This allows the hypothesis, that the New Zealand racing industry is inefficient since not all information is reflected in the odds, to be examined. The expected returns from adopting different strategies are also calculated. These strategies will be simple, for example, bet on 1st favourite to win, bet on 2nd favourite to win, bet on 3rd favourite to win and so on. Alternatively, what would the bettor's return be if they adopted a strategy of only betting on horses within a predetermined subjective probability interval? A test to see if the continued support of certain odd categories can make a positive profit will be conducted to test the hypothesis that, for every strategy, the returns will equal one minus track take. From here, some inference can be made as to which strategy is best.

The New Zealand racing data is then used to perform a well-documented test called the favourite longshot bias. This test will be performed on differing levels. For example, this thesis attempts to answer questions such as; 'is the favourite longshot bias more pronounced 30 minutes before a race than at the start of the race?', 'does the favourite longshot bias become more prolific throughout a raceday?', 'is there any vast difference in the favourite longshot bias when we define objective probabilities in different ways?'.

Henery (1985) discloses a theory that attempts to explain the occurrence of bettors participating in a "negative sum game". His idea is that bettors underestimate their losses. Henery's test will be conducted using the New Zealand data.

Another theory of why bettors participate in a "negative sum game" will then be examined. To explain this phenomenon, the New Zealand data will be tested for evidence of skewness using a test conducted by Golec and Tamarkin (1998). A power utility function developed by Ali (1977) will also be applied to the New Zealand data.

1.4 Importance of Research

Each of the tests performed in this thesis have been developed and tested by others using different countries data sets, however very little has been done using the New Zealand racing data. Although this study may not have a direct contribution to knowledge, the repetition of an idea with a new data set is not immaterial. It is possible that a new discovery could be found in the New Zealand racing industry that did not occur when the tests were performed in other countries. The results that are found will either confirm or reject conclusions of previous studies.

Two groups could benefit from this research. Firstly, because the T.A.B. do not conduct these sorts of tests on their data, they could use the results in numerous ways to make the betting market more efficient. Inefficiencies arise from three aspects of information. These are; a lack of information, a lack of information flow (where information is present in a market, but not everyone has access to it), and where a bettor has access to information but does not consider it when making their bets. This thesis could then make the market more efficient since it introduces new information.

By no means is this thesis an attempt to explore the efficiencies of a racing market in its entirety. New ideas and avenues are continually explored in an attempt to fully understand the intricacies of such a market. It is my hope that this thesis could be used in conjunction with further research to explore future ideas. Only through the continuation of research could we possibly understand the workings of such a market.

Finally, this thesis may induce some bettors to reassess where they should be investing their money.

1.5 Thesis Outline

Chapter 2 contains an extensive literature review followed by a chapter on research methodology, which defines exactly how each test will be conducted. Chapter 4 is devoted to disclosing the data; its size, origins and limitations. Chapter 5 then looks at the results of each test. The discussion of all the results and conclusions will come in Chapter 6, followed by a section on general conclusions in Chapter 7. Chapter 8 will discuss further research ideas.