A NEW ZEALAND CROSSBRED WOOL FUTURES MARKET

by

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CHAPTER 1

INTRODUCTION AND THESIS GUIDE

1.1 Introduction

The New Zealand wool clip approximates six hundred and sixty million pounds greasy weight, and is made up of over ninety eight per cent crossbred wool.[1/]

Growers may sell their wool by public auction in New Zealand, by private treaty to an individual buyer on their farm, or by auction in the London market. Most wool is sold at auction with only about twelve per cent being sold privately. Auction sales are held in eight selling centres: Auckland, Napier, Wanganui, Wellington, Christchurch, Timaru, Dunedin and Invercargill.

1.2 Market Risks

Risk of loss arising from the uncertainty of future developments is an important element in agricultural marketing. The extent of these risks varies among farm products. While it may seem that risks would be greater for perishable products, in actual fact, greater aggregrate marketing risks may occur with less perishable commodities such as wool. This is because they are accumulated by sections of the marketing "chain" for comparatively longer periods, and the greater the period of ownership the greater the possibility of a decline in price. These price risks may be coming more important

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1. In New Zealand this term applies to lustre wool varying in fineness from 36's to 56's irrespective of the breed or cross of the sheep.

than physical risks which are being reduced with improved storage and handling techniques.

Risks in agricultural marketing may be handled by private enterprise or by group action. Group action includes floor price schemes and other centralised policies. Under private enterprise risks may be handled in five main ways. They may be covered by insurance, reduced through increased information, reduced by combining successive marketing services, assumed by the firms themselves, or "transferred" to others.

Price risks and some other risks may be "transferred" to others by means of forward contracts and/or futures markets, the more advanced and sophisticated of these being futures markets. This study deals with the feasibility and relevance of establishing a futures market for wool in New Zealand.

1.3 Objectives of the Study

This study was suggested by the New Zealand Wool Marketing Study Group. The original proposal called for a study of the relative "efficiencies" of existing wool futures markets in providing protection against price movements in crossbred wools, together with the likely gains to be obtained from basing storage decisions on cash and futures price information. Because of the considerable computer time necessary for such a study and the fact that the Study Group required completion of the work as soon as possible, it was decided to reduce the scope of the study to an estimation of the need for a crossbred wool futures market and factors to be considered in establishing such a market.

1.4 Sources of Information

The study is based on survey and historical data. The surveys used have been described in Chapter 2. The historical data on New Zealand wool prices was collected for other Wool Marketing Study Group projects. The prices are based on estimates of average wool prices made by the Wool Commission appraisers after each sale. Where more than one sale occurred in the same week, the estimated wool prices have been averaged.

The data on the Sydney futures market was collected from the files of a Sydney Floor member, while the data on other futures markets was gained from a variety of sources which have been referred to in the text. Where this has occurred (O) has been used to refer to those references which appear in full in the Bibliography. The Australian wool prices used are the Australian Wool Board's weekly quotations for 64's average quality wool which are related to prices paid for wool in Australia each week.

General information on the wool trade in New Zealand was supplied by the Massey University Wool Department.

1.5 Abbreviations

Throughout the text the Sydney Greasy Wool Futures Exchange, the London Wool Terminal Market and the Wool Associates of the New York Cotton Exchange, have been referred to as the Sydney, London and New York futures markets or exchanges.

1.6 Thesis Guide

This section describes the contents of the remaining chapters of the thesis.

The role of market surveys and the surveys used in the study have been described in Chapter 2. Chapter 3 discusses the economic functions of a futures market.

Chapter 4 describes the actual trading procedures of existing futures markets, while Chapter 5 estimates the effectiveness of the London and Sydney markets as hedging media.

An estimate of the need for a crossbred futures market is made in Chapter 6. This chapter summarises the extent and effects of crossbred wool price fluctuations and the stabilising influence that a futures market would have. The possible locations for a crossbred futures market and the likely success of a market in New Zealand are dealt with in Chapter 7. Chapter 8 examines some of the problems which may be encountered in setting up a futures market.

The main findings of the study, together with some administrative suggestions are given in Chapter 9.

Technical terms and terms peculiar to futures markets, which have been used in the text, are explained in Appendix A.

CHAPTER 2

THE SURVEY AS A RESEARCH METHOD

2.1 Introduction

This chapter begins by considering the common methods of market research and then goes on to examine market survey techniques. This is followed by a discussion of the more common types of surveys and concludes with a description of the types of surveys used in this study and the reasons why they were chosen.

2.2 Methods of Market Research

Market research can either be aimed at measuring characteristics which have occurred, or at predicting results which may occur given certain assumptions.

To measure characteristics which have occurred we need appropriate data. This may involve recorded statistics or a survey of market participants.

The survey method is a technique of gathering data by asking questions; the essential point being that the data is furnished by an individual in a conscious effort to answer questions.

The survey used may be aimed at simply obtaining facts about a certain aspect of a market, in which case we test a hypothesis and plan the questions accordingly; or alternatively a survey may be used to obtain information from market participants - in which case there may be no fixed hypothesis.[1/]

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1. In practice, the research worker will start with some ideas (i.e., a hypothesis) as to the pertinent information to be collected. However this idea or hypothesis may be modified in the light of increased information about the marketing system.

If we use our data in a formal model in order to reach conclusions about the values of the structural parameters of the system, then we say we are using econometric procedures. By the use of econometric methods we may be able to make predictions about the future based on past experience with a known degree of statistical probability.

To predict results which may occur given certain assumptions we need to use models. A model is a representation of a system designed to incorporate those features that are deemed essential for one or more specific purposes. If the perceived relationships that are incorporated in the model are translated into mathematical terms or symbols, the model is known as a mathematical model.

The reason for constructing models of marketing problems is to gain some insight into the structure of these problems. The preferred method in most instances would be to reach a conclusion through formal mathematical analysis. However, most marketing systems are too complex for this and when this occurs simulation offers a feasible method of studying the problem.

Simulation involves the construction of a model which usually consists of mathematical or logical expressions. These expressions are structured in such a way that the model represents the operational characteristics of the system it simulates. The model accepts inputs that depict hypothesized events occurring in the real system, and responds to these events in the way it is assumed the real system would respond. Accordingly, the effects of different choices of action can be evaluated by observing how the model reacts to such choices.

Simulation does permit the exploration of several different combinations of possible actions in a problem situation. It is usually impracticable, however, to test every conceivable situation. When this is the case, simulation can show only which of the combinations tested is the most desirable; it cannot guarantee to find the optimal combination of actions. Moreover, simulation, like most experiments in marketing, is generally completed using a sample of data from a larger universe and is consequently subject to sampling error.

2.3 Market Surveys

Market surveys may take many different forms, the more common being telephone and personal interviews, and mail questionnaires. With each type of survey respondents are required to answer certain questions and because of this all survey methods are subject to the following limitations:

(i) Respondents may not be able to remember,

(ii) respondents may not be able to generalise,

(iii) the inability of respondents to identify their motives or reasons for certain behaviour,

(iv) respondents possess certain biases,

(v) respondents may not answer accurately in an attempt to make a good impression on the interviewer.

Despite these limitations, surveys may be usefully employed in gathering a variety of information about a certain aspect of marketing. Each survey method has certain strengths and weaknesses which will be discussed in the following sections.

2.31 Mail questionnaires

There are two distinct types of mail questionnaires. Firstly, there is the single survey type[2] which collects information once about a certain topic and no attempt is made to re-contact respondents. Secondly, there is the mail panel[3] which is used for the continuous gathering of information and respondents are contacted in several different time periods. Single survey mail questionnaires are useful in that they:

(i) Permit a wide distribution of the components of the sample,

(ii) allow respondents to take time and care with their answers,

(iii) have low costs,

(iv) avoid the possibility of an interviewer bias.

There are however certain limitations to the single mail questionnaire method of survey:

(i) All types of respondents may not respond in the proportions in which they exist in the sample whenever the response rate is less than one hundred per cent,

(ii) it is difficult to get a high rate of return,

(iii) usually the questions must be kept brief,

(iv) the study usually requires a longer time to complete,

(v) visual data cannot be obtained,

(iv) it is possible to get a sequence bias because the respondent is able to read ahead before answering the questions.

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2. See forthcoming Masterate thesis by B. O'Donnell, Massey University for an example of a single survey.

3. A mail panel is at present being conducted with a number of farmers in Thames by the Massey University Department of Agricultural Economics.

The accuracy of response to mail questionnaires is in general related to a number of conditions such as the interviewing situation, questionnaire content, and the function of the respondent as a reporter for himself, or for his firm or family.

If there is a low rate of response to a questionnaire, then not all types of individuals may have responded in the proportions in which they exist in the original survey area. This means that if sample distortion is to be minimised a high rate of return is necessary. Factors governing this rate of return are:

(i) The reputation of the research worker or organisation,

(ii) the spirit of co-operation aroused by the covering letter accompanying the questionnaire,

(iii) the reluctance of respondents to divulge confidential information,

(iv) the respondents interest in the subject matter,

(v) the amount of time and effort required to fill out the questionnaire.

It is common with mail questionnaires to use controlled rather than random samples. If the questionnaire is controlled[4] with regard to the subject being studied, then the risk of sample distortion is reduced (1). Because controlled questionnaires are not probability samples their usefulness is confined to measuring attitudes or trends rather than parameters.

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4. A controlled questionnaire is one in which the respondents are purposively selected to ensure a representative sample e.g., if it was desirable to illustrate the effects of different incomes, then respondents would be chosen to ensure that a cross section of income levels was included in the sample.

2.32 Individual personal interviews

Individual personal interviews are conducted between the interviewer and respondents individually and may be used to obtain subjective data such as attitudes, intentions, expectations and motivations (2).

With this form of survey it is often desirable to have a free form interview[5] which allows the interview to move freely from topic to topic. This means that the interviewer must be careful to direct the discussion in such a way as to ensure that all the important topics are discussed.

The advantages of the personal interviews have been listed as (6):

(i) More questions may be asked,

(ii) it is possible to obtain information on subjects which may not be covered by mail or telephone, and visual data can be obtained,

(iii) the field work may be completed sooner than by mail,

(iv) the sample can be more accurately controlled,

(v) the response rate is usually higher than with mail questionnaires.

There are also several disadvantages:

(i) Bias and prejudice may be introduced by the interviewer,

(ii) they are costly and hence the size of the sample may be limited,

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5. This point has been emphasised by Candler (3) and Cartwright (2).

(iii) some respondents do not react well to personal interviews.

Of these failings the most important is the problem of interviewer bias. This will only be reduced by the use of well trained interviewers who are familiar with the objectives of the study, have a sound technical knowledge of the subject being studied, and have an appreciation of interviewing as a scientific procedure.

2.33 Group interviews

If we define a group as a number of interacting individuals having a community of interests, then there are several differences between group and individual interviews. In contrast to the individual interview in which the flow of information is uni-directional from the respondent to the interviewer, the group setting causes the opinion of each person to be considered in group discussion. Each individual is exposed to the ideas of the others and submits his ideas for consideration by the group.

The interaction among group members stimulatesnew ideas concerning the topic under discussion which may never be mentioned in an individual interview. As well as this the interviewer is able to observe how an individual reacts to a new idea rather than have the individual tell the interviewer. Group interviews may also be expected to provoke considerably greater spontaneity and candour and be more emotionally provocative on most individuals than would occur in an individual interview.

A third type of personal interview may arise (4) when the group members fail to interact with one another, but each member directs his

remarks to the moderator. This might better be described as multiple or serial interviewing, since group interaction does not occur.

2.34 Telephone interviews

Two forms of telephone interview surveys may be distinguished (5). Firstly, it is possible to draw a sample of telephone numbers and to interview respondents without any previous contact. This is the method employed by many marketing research agencies. Secondly, the telephone may be used to re-interview respondents from a previous survey.[6] In other words, the individuals in a representative sample drawn by the usual area sampling methods are first interviewed by personal contact, then at a later date the telephone owners in the sample are re-interviewed over the telephone.

The advantages of the telephone survey are (6):

(i) Information may be collected on current events,

(ii) errors resulting from failure of memory are reduced,

(iii) they have economy and speed,

(iv) unlimited call-backs[7] can be made at low cost.

The disadvantages of telephone surveys are:

(i) Visual pictures and diagrams cannot be used,

(ii) visual data cannot be obtained,

(iii) the sample is limited to telephone subscribers,

(iv) lengthy interviews are not usually possible.

In general the response rate will be lower with telephone surveys, the more personal or confidential the information required.

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6. See (7) for an example of each of these types.

7. A call-back occurs when the same individual is contacted more than once.

2.4 Criteria Used in Selecting Survey Methods

The first selection of survey methods is based on *a priori* standards. The type of information required often determines the method of data collection to use. If, for example, information is to be collected *from* people, then the study may be limited to telephone or personal interviews; while if information is to be collected *about* people, then a mail questionnaire may suffice.

If the selection of a survey technique cannot be made on *a priori* standards, then the selection may be made on the basis of accuracy and available finance. This second selection is particularly relevant when deciding between mail questionnaires and personal interviews. Because of the time involved, personal interviews may be very costly. However, they usually provide the most reliable data as they generally avoid the problem of low response rates.

2.5 Surveys Used in Futures Study

There were three surveys used to provide data for this study (for simplicity these have been called Surveys A, B, and C). The surveys took the form of mail questionnaires and individual and group interviews.

A mail questionnaire was sent to *all* Floor members of the Sydney Greasy Wool Futures Exchange. This survey (Survey A) was aimed at obtaining the *opinions* of the members concerning the establishment of a crossbred wool futures contract. The questionnaire used has been shown in Appendix B.

Survey B was aimed primarily at estimating the volume of business conducted by firms engaged in wool buying in New Zealand,

on existing futures markets. The survey used was sent to all the clients of one[8] New Zealand Associate member of the Sydney Exchange. The questionnaire used has also been shown in Appendix B. Personal and group interviews were also held with a sample of members of wool buying firms located in Christchurch and Wellington.

Other objectives of the survey were to attempt to gauge the level of knowledge concerning futures markets of members of the wool trade and to find whether or not their business activities were such that they would require the type of protection against price movements which might be afforded by a crossbred wool futures market. Finally, the survey was used to obtain the opinions of the respondents regarding the likely success of a crossbred futures market should one be established.

The final survey (Survey C) consisted of personal interviews with the leading wool processing and manufacturing firms and had similar objectives to Survey B.

2.51 Reasons for the selection of methods

A mail questionnaire was chosen for Survey A because of the high costs involved with other methods. This meant that all the disadvantages of a mail questionnaire such as low response rates[9] were unavoidable. This survey was probably affected by the refusal

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8. After talks with other sections of the wool trade the author estimated that this represented ninety per cent of the N.Z. traders operating on the Sydney market. This does not mean that it represents ninety per cent of the trading conducted by New Zealanders.

9. The response rate was in fact low, only six replies were received out of fourteen Floor members contacted. This, however, is not atypical as it is usual to get a response rate of between twenty and thirty per cent with this type of survey.

of the Management Committee of the Exchange to give its official sanction. This necessitated contact with each member individually reducing the anonymity of replies and this may have further lowered the response rate.

It was also necessary to use a mail questionnaire for part of Survey B. The Associate member understandably declined to supply the author with a list of his clients but agreed to send out the questionnaire on the authors behalf. The response rate in this case was twenty per cent. However, the replies were insufficiently complete to enable their inclusion in this study.

The reason for choosing interviews for Survey B was that it enabled the author to more accurately assess the attitudes of the remainder of the firms. This was important as it provided a more reliable assessment of a firms needs for, and likely response to, a crossbred futures market. In addition it helped to eliminate the response bias without adding greatly to the cost.[10]

Survey C covered only four firms and was similar to Survey B. Therefore, group interviews were able to be used without greatly increasing costs.

2.52 Selection of firms

Survey A was a population survey of the fourteen members of the Sydney Futures Exchange. Survey B's mail questionnaire may be thought of as a sub-population survey. The sub-population of ten firms was selected because it represented a cross section of traders known to use futures markets.

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10. Costs were kept down due to the large concentration of firms in two centres: Christchurch and Wellington.

Firms interviewed in Survey B were selected from a list of wool buying firms based in Wellington and Christchurch. Out of a total of forty five such firms a sample of twenty was obtained by taking every second firm alphabetically.

Fourteen of the sample firms had at least seventy per cent of their business connected with crossbred wool, two had approximately half their business with crossbred wool and half with fine wool, and the remaining firms dealt mainly in fine wools. Nine of the firms were commission buyers, four were employed by principals, and the remaining firms were merchants buying into stock. Twice as many firms were buying to cover forward sales as were buying for current orders.

The firms contacted in Survey C were chosen because they account for a high percentage of the output of New Zealand's wool processing industries. They produce products ranging from carpet yarn to merino tops.[11]

2.6 Interviewing Procedure and Experience

2.61 Survey A

Considerable correspondence between the author and a prominent Floor member on the Sydney Exchange preceeded the survey and provided an invaluable guide to the type of information which might be forthcoming.

The mail questionnaire in Survey B, which had been carried out

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11. Tops are a semi-manufactured stage in wool processing in which a continuous band or ribbon of combed fibres are laid parallel in an untwisted condition; all short and weak fibres (noils) have been combed out.

before Survey A, had shown that a low response rate could be expected. Steps were taken however to try and improve the response rate. Firstly, the original questionnaire was redrawn in an attempt to exclude all questions which required facts of a confidential nature. Secondly, contact was made with the Management Committee of the Sydney Exchange in an attempt to gain "official sanction" for the survey and to provide publicity for the questionnaire. "Official sanction" however was declined and any publicity may as a result have been unfavourable. The questionnaire was finally sent to the members individually.

2.62 Survey B

First contact with wool buyers was made at wool auctions at Wanganui and Wellington. The purpose of this "pre-interviewing" was to gain knowledge of wool buying procedures so that a meaningful outline could be prepared. Emphasis was placed on meeting as many members of the trade as possible in an informal atmosphere.

From this early contact an interview outline and mail questionnaire were prepared. These were then tested with local wool buyers and the staff of the Massey Wool Department. This exposed some minor problems which were corrected for the final surveys.

The nature of the interviews, which were of the "free-form" type varied widely, although each consisted of two main parts: a discussion of the firms overall activities and a period spent in discussing futures markets. When possible more than one member of the firm was interviewed at once as the author found that interaction between members of the firm made for a more "balanced" picture of the firms overall trading practices.

2.63 Survey C

This survey was conducted after Survey B and knowledge gained in that survey was used. Prior to the start of the survey the author had discussions with representatives of one of the largest wool processing firms in New Zealand to gain an understanding of the processing industry.

During the course of Survey C it was discovered that only one of the firms was using futures markets to a significant extent and where other firms had used futures this was arranged by their wool buying agents. For this reason, the firm's buying agents were contacted in some cases.

2.7 "Lessons" Gained from Futures Surveys

While a low response rate to Survey A was foreseen and steps were taken to counter this, certain alternative better procedures may have given improved results.

While "official" support may be useful the author feels that this should not be requested unless the person conducting the survey is confident that it will be granted. This could possibly be assessed by indirect approaches to people concerned. The chances of success may also be improved by the use of an "influential" third person to make the request. In the case of the futures survey a better approach would have been to have merely contacted each member individually using a covering letter from some well respected or influential member of the wool industry.

In an attempt to create a sense of anonymity in the replies, questionnaires were not numbered and the respondents were not asked

to put their names on the replies. This, of course, precluded the use of follow-up letters to the non-respondents which may have increased the response rate.[12]

The mail questionnaire in Survey B was also limited by the confidential nature of the replies. However, in this case the Associate member acting on the author's behalf, was able to send out reminder letters which did produce additional replies.

In summary, the study as a whole deals with a hypothetical question and, as such, the low response rates achieved by the questionnaires does not preclude the use of the results. This is because the object was merely to assess likely levels of interest. While non-respondents may feel quite differently about the subject than the respondents it would seem likely that the very fact they failed to reply indicates that they do not feel strongly on the subject.

2.8 The Use of Survey Results in Futures Study

Survey results are used to show the opinions of members of the wool trade regarding the effectiveness of present futures market in Chapter 5 and to show their attitude towards fluctuating prices in Chapter 6.

Chapter 7 utilises survey results to gain the opinions of members of the wool trade on the likely location of a crossbred futures market (Section 7.5) and the likely success of such a market should one be established (Section 7.622). Section 7.64 also uses survey data to assess whether or not traders considered a floor price scheme was compatible with futures trading.

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12. The importance of follow-up letters is illustrated in (8), where a follow-up letter six weeks after the questionnaire was sent almost doubled replies.

CHAPTER 3

THE FUNCTIONS OF A FUTURES MARKET

3.1 Introduction

A futures market may be defined as, "...trading conducted under special regulations and conventions, more restrictive than those applied to any other class of commodity transactions, which serve primarily to facilitate hedging and speculation by promoting exceptional convenience and economy of transaction."[1] This definition is interesting in that it defines a futures market by purpose rather than on more easily and objectively recognised criteria.[2]

This chapter examines the special economic functions of a futures market which facilitate hedging and speculation.

3.2 Hedging

Hedging may be defined in many ways. It usually refers, however, to trading on the futures market by people who either have accumulated wool stocks or alternatively have accepted orders for yarn before having bought wool to fill the order. In both cases an attempt is made to hedge against possible losses which might result from price movements

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1. See (9) page 315.

2. e.g., a futures market may be defined as the medium for bringing together those people in a trade; producers, merchants, and processors who wish to buy or sell a commodity in a stated month - near or distant - without actually having to accept or make delivery.

in the spot market.[3] In the former case the merchant will hedge his wool stocks by selling futures[4] while in the latter he will hedge his yarn sale by buying futures.[5] Thus a hedger operates in both the physical and futures markets.

3.21 Reasons for hedging

3.211 To insure against price fluctuations

Hedging has traditionally been explained in terms of a dealer in the actual or "spot" commodity who desires "insurance" against disadvantageous price movements in the spot commodity. An example would be a trader who "protects" his inventory position from the risk of price fluctuations by simultaneously selling a sufficient number of futures contracts to cover delivery of his stock, and when he resells his stock, simultaneously "liquidating" his position in futures by purchasing the same number of contracts (of the same future) as before. If the net change in spot price has been equal to the net change in the price of his future; i.e., if the price movements have been parallel to each other, the gain he enjoys in one market offsets the loss in the other and he is left with his "normal" merchandising profit less charges.

3.212 To exploit likely relative price fluctuations

Working (9) has challenged the traditional explanation claiming that a hedger does not seek primarily to avoid risk, but rather hedges

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3. A spot market may be described as a market where buyers and sellers come together to conduct transactions which represent goods actually on hand or readily available at the time a contract is made. In this case it is the auction system.

4. This is known as short hedging.

5. This is known as long hedging.

in anticipation of a "favourable change in the relation between spot and futures prices."[6] This means the trader does not possess a given sized inventory which has to be hedged against, but rather that he makes simultaneous adjustments to his position in both markets in the hope of exploiting likely price changes.

If the price of futures is high relative to the present spot price, then by increasing his stock of wool, and selling futures, the manufacturer can hope to make a profit provided futures prices return to their normal relationship with wool prices.

Similarly, if futures prices are low, the manufacturer can hope to gain by running down his stocks and purchasing futures in the hope of profiting if futures prices return to their normal relationship with spot prices.

3.213 To exploit likely absolute price fluctuations

It has been found recently (10) that an individual may also hold a mix of hedged and speculative[7] positions in response to his expectations regarding absolute price changes. This is a practice that is not well explained by either of the previous two theories.

If traders expect spot prices to rise, they tend to remove hedges and increase their inventory holdings. In some cases they take long positions in both the spot and futures markets as a more obvious speculative venture. On the other hand, if they expect spot prices to fall they increase their spot futures positions in excess of

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6. See (9) page 326.

7. The distinction between hedging and speculation in this context is fuzzy - the only real distinction is that hedging is conducted with respect to a primary or cash market which provides the trader with his main profits, e.g., a merchandising profit.

hedging requirements. In other words, hedging activities get mixed in very closely with speculative operations in the accounts of the individual trader.

3.214 To help finance operations

Even though Clearing Associations normally require a deposit with each contract (and credit is never extended) the banks are justified in lending more on hedged than on unhedged stocks because of the lower risk involved. The mainspring of futures trading is often thought to be the need to finance inventories in the face of fluctuating prices.

Generally, in the United States, seventy per cent of the value is lent on unhedged stock and up to ninety per cent on hedged stock.[8] This enables producers, dealers and manufacturers to reduce the amount of their operating capital tied up in inventory.

3.215 To ease buying and selling decisions

When hedging is practiced systematically, there is need only to consider whether the price at which a particular sale or purchase can be made is favourable in relation to other current prices; there is less need to consider whether the absolute level of prices is favourable.

When a trader buys wool he may sell futures of the same value. When the time comes for him to sell his wool he will then buy back the same amount of the same futures. This means that while delivery is made at the same time as the second contract is made, the effective price of wool is determined by the price ruling at the time the first contract is made. There may be a slight difference, however, if the

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8. As yet this has not applied in Australia, nor for New Zealanders using the Sydney Exchange.

futures and cash prices have not moved in a similar fashion.

3.216 As a protection against changes in Exchange Rates

In recent years, "... it has become accepted practice for some holders of sterling to insure against the capital losses inherent in devaluation of that currency by hedging in suitable Commodity Futures Exchanges."[9] Pre-eminent amongst these are the exchanges dealing in wool, a commodity which is traded on a world market and hence has a price which is less influenced by factors affecting individual producers. Consequently, each successive wave of weakness in sterling has initiated strong hedge-buying of wool futures, mostly in London and Sydney, and also to a lesser extent in New York, Antwerp and Roubaix.[10]

This was seen prior to the devaluation of sterling in November, 1967. In the week prior to devaluation, as fears for sterling swept the money and commodity markets, wool futures rose about ten points in Sydney and twenty points in London.[11] The fact that the Australian Wool Board Average 64's quotation for the same week fell by two cents[12] shows that this was overwhelmingly caused by protective buy-hedging.

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9. Kreglinger & Hirsch (Futures) Pty. Ltd., Report No. 266.

10. This is not hedging in the true sense as it is undertaken in response to expected relative price movements between futures and the money market rather than futures and the spot market - to this extent it may possibly be better described as speculation.

11. See "Wool Record" futures quotations:

    Nov. 17, 1967 Vol. 112 No. 3053, page 50.
    Nov. 24, 1967 Vol. 112 No. 3054, page 54.
    Dec. 1, 1967 Vol. 112 No. 3055, page 54.
    Dec. 8, 1967 Vol. 112 No. 3056, page 50.

12. This is the average price of all the wool of this type sold in Australia during the week.

3.3 Speculation

The word "speculation" has come to be used by laymen as synonymous with undesirable practices in commodity trading. In futures markets, however, the term has a more "respectable" connotation as it applies to an essential and desirable element in futures trading. In the language of the futures market, a speculator is simply a man who buys (or sells) futures without an offsetting transaction in the spot market.

Speculators accept the possibility of a financial loss in the expectation of, on average, making a net profit. This differs from hedging which aims merely at limiting income fluctuations due to price changes.

3.31 Reasons why speculators enter a futures market

A well organised futures market ensures that the conditions of a futures contract will be enforced giving traders confidence in their investment and because contracts may be traded freely on the exchange, speculators are able to enter and leave the market whenever they wish. In a futures market, unlike the cash market, speculators are able to operate by buying and selling at different points in time without holding stocks of the commodity.

Speculators tend to avoid markets with poor price quotations, high commission rates, and markets for commodities whose price is subject to a substantial degree of control to their disadvantage.

Recent studies have shown (11) that the volume of speculation on a market tends to increase with the amount of hedging business which the market attracts, which suggests that speculation arises primarily to accommodate the needs of hedgers.

3.4 The Advantages Hedgers obtain from a Large Volume of Speculation

3.41 The Provision of a "Continuous market"

It is conceivable that in a futures market the amount of long hedging[13] may just equal the amount of short hedging[14] but even if this were the case it would not be likely that there would always be a trader waiting to buy a contract just when another trader wanted to sell. Thus speculation is necessary to ensure that whenever someone wishes to buy or sell a contract there is always someone willing to take an opposite position. Provision of a "continuous market" as this is called, is of importance to both hedgers and speculators because it ensures that they can enter or leave the market whenever they wish.

3.42 Speculators transfer risk

Although speculators do not consciously assume the burden of risks caused by price fluctuations in the market, and although they do not charge a specified scale of rates for assuming these risks, their activities have practically the same effect. Risks that would normally have to be borne by the holders of wool, are now largely shifted to the shoulders of speculators by the process of hedging. This results in lower marketing costs which may benefit both producers and consumers.

3.43 A large volume of speculation reduces the "price effect" in a market

The price effect is the term used to refer to the difference

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13. Long hedging refers to trading in which the first operation is to buy a futures contract.

14. Short hedging refers to trading in which the first operation is to sell a futures contract.

between buyers and sellers price on a market (12). On a futures market a hedging order is usually placed for immediate execution, while speculators may only buy or sell if the price reaches some particular level. In any competitive market the urgent buyer must usually expect to pay a higher price than he would have to pay if he had time to seek someone eager to sell: the urgent seller must expect to sell at a lower price than he would if he took the time and trouble to seek out someone who was eager to buy.

In markets where there are frequent purchases and sales for whatever the market will bring, some traders make a more or less regular business of buying from urgent sellers in order to sell to urgent buyers. The more of such business there is to be done, and the shorter the expected interval between purchase and resale, other things being equal, the narrower is the usual margin between "buyers price" and "sellers price".

3.44 Speculators help with price formation

The dependability of futures prices is ensured by:-

(a) A large volume of trading conducted by specialised speculators in constant competition with each other, ensures that prices accurately reflect current knowledge.

(b) Speculators operating on several markets simultaneously ensure that if the prices in one market should move out of line with the prices in the others, then this will be remedied quickly. This is achieved by speculators selling in the higher priced market and simultaneously buying in the lower priced market, thus increasing supply in the higher priced market and increasing demand in the low

priced market.[15]

3.5 The Advantages all Market Participants Gain from the Presence of a Futures Market

3.51 Futures trading may reduce price fluctuations

The traditional view is that speculators on a futures market, by buying at low prices and selling at high prices do, in fact, reduce price fluctuations caused by changing market conditions. The result of speculator activity is thought to be smaller, but more frequent price changes.[16]

3.52 Futures markets provide continuous price quotations

Futures markets provide continuous price quotations even during periods when there are no auction sales. While, "... it is not unusual for Sydney futures to work higher at some points during breaks in auction ..."[17] they do tend to predict the true direction of wool prices. Thus while futures quotations may not give a completely accurate indication of the reopening auction prices, they do provide a better indication than would be the case with no published price estimates.

3.53 Futures prices provide a guide for inventory adjustment

Stocks are necessary to ensure that demand can be fulfilled at all times. If stocks were not held, then processors would have to reduce output when supplies were short. Provided there is no uncertainty regarding future demand, then there is no need for prices in the future to be higher than current prices by more than the marginal cost of storing the commodity until the future date.

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15. It is referred to as arbitrage.
16. This will be dealt with more fully in Chapter 6.
17. Personal communication from Floor member.

This does not hold with uncertainty as there is now a risk of losses due to price changes. The larger the stocks[18] held the greater this risk will be. This means that people involved in the storage of stocks will tend to base their decisions on expected future prices. By supplying simultaneous quotations for various subsequent dates, a futures market helps with the rational control of stocks.

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18. Over a range, increased wool stocks will simplify manufacturing. For instance, the bigger his stocks the better chance that the manufacturer has exactly the wool type in stock that he needs for a particular job. Thus a manufacturer can alter his stocks over quite a substantial range (in response to expected price changes), without becoming an explicit speculator.

CHAPTER 4

A DESCRIPTION OF THE NEW YORK, LONDON AND SYDNEY FUTURES MARKETS

4.1 Introduction

This chapter reviews the organisation and trading procedures on three established Wool Futures Exchanges as a guide to the procedures which would be required should a market be established in New Zealand.

There are currently eight Wool Futures Markets in the world, trading in contracts based on raw wool, wool tops and worsted yarn (See Table 4.1). The three markets discussed in this chapter are New York, London and Sydney.

The chapter begins by looking at the organisation and administration of these markets and then goes on to discuss trading procedures.

4.2 Organisation

The Sydney and London Exchanges are organised in a similar fashion.[1/] However, the New York Exchange differs because of its association with the New York Cotton Exchange.

4.21 Membership

Each of the three exchanges has basically two types of membership. One class is able to trade on the exchange floor and the other class must trade through the first class, but pays lower commission charges than "outsiders".

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1. The Sydney Market was modelled on the London Market.

TABLE 4.1

THE LOCATION AND ESTABLISHMENT OF WOOL FUTURES MARKETS

Location	Contracts		Date Established	Date Terminated
	Wool	Weight		
Le Havre (France)	Greasy (undefined)	2,250 kilos	1883	1914
Antwerp (Belgium)	Greasy (64's)	5,000 kilos	1887	1901
	Merino tops (60/64's)	2,250 kilos	1887	....
	Crossbred tops 48/50's)	2,250 kilos	1956	....
Rouxbaix-Tourcoing (France)	Tops (Merino)	2,250 kilos	1888	....
	Greasy (Merino)	2,250 kilos	1888	....
Leipzig (Germany)	Tops (Merino)	2,250 kilos	1890	1914
New York (U.S.A.)	Tops (64's)	5,000 lbs	1931	....
	Greasy (64's)	6,000 lbs	1941	....
London (U.K.)	Tops (Merino)	5,000 lbs	1953	....
	Tops (Crossbred 5o's)	5,000 lbs	1956	1961
Nagoya	Worsted Yarn	200 Kg	1951	....
Osaka	Worsted Yarn	200 Kg	1953	....
Tokyo (Japan)	Worsted Yarn	200 Kg	1953	....
Sydney (Australia)	Greasy (Merino)	3,000 lbs	1960	....

On the New York Exchange these two classes are referred to simply as Class A and Class B. Any member of the New York Cotton Exchange (which has a limited membership) is automatically a Class A member of the Wool Exchange. There are four hundred and fifty Class A members. Class B membership consists of one hundred and fifty members, mostly from the wool trade.

On the Sydney Exchange the two classes of membership are referred to as Floor and Associate members. There are fourteen Floor members who are, according to regulation, resident or incorporated in Australia. The number of Floor members may be changed only by a majority resolution of existing Floor members. Floor membership may be purchased, however, from an existing member provided the purchaser is also elected to membership by existing Floor members. Since January 31st, 1963, the same conditions relating to an increase in number have also applied to Associate membership. At present there are one hundred and sixteen Associate members, seventy are resident or incorporated in Australia and forty six are overseas firms (including five New Zealand firms).

Membership of the London Exchange is similar to the Sydney Exchange except that the Associate members are divided into Home and Overseas Associates. Floor membership is limited in this case to thirty, twenty of whom must have a bona fide interest in the wool trade.

Exchange members are required to pay a deposit when taking up membership plus an annual subscription. These charges vary from exchange to exchange and with the type of membership. On the Sydney Exchange, the deposit is $A10,000 for Floor members and $A1,000 for Associates. All members pay an annual subscription of $A200.

4.22 Administration

In the United States there is a Commodity Exchange Act (C.E.A.) which Congress may apply to commodity markets as it sees fit. This Act aims at maintaining fair market conditions on the commodity exchanges and is administered by an Authority (Commodity Exchange Authority), the head of which is responsible to the United States Secretary of Agriculture.

The Commodity Exchange Authority has been regulating trading in wool top futures since 1938 and wool futures since 1954. It keeps a check on trading by requiring that Exchange members as well as large traders (those whose open positions[2] in any one maturity exceed twenty four contracts) submit daily reports on their volume of trading and their open positions. When necessary the Authority may place regulations on aspects of trading which it enforces by warnings or by laying formal charges against the offenders.

Day to day running of the New York Exchange is handled by a Board of Governors who also have powers to regulate trading. An example is the ability of the Board to prescribe limits on the number of commitments that may be held by any one trader in any one trading month.

In Australia and the United Kingdom there are no similar Acts and control of the exchange is left in the hands of the respective Management Committee.

The London Market is controlled by an elected Management Committee which consists of eight representatives of the Floor members and four Home Associate representatives.

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2. A traders open positions are the uncancelled contracts he holds at the end of the day's trading.

The Management Committee of the Sydney Exchange consists of seven; five representing Floor members and two representing Associates. The Executive Officer of the Australian Wool Growers and Graziers Council is an ex-officio observer and is entitled to attend all meetings. All members of the Management Committee act in an honorary capacity with the Chairman and Vice-Chairman being elected by the Committee.

Most Management Committees elect sub-committees as needed and there is a small staff employed. On the Sydney Exchange the staff includes an Executive Officer, Secretary and Technical Officer. Appraisal of wool for delivery through the Exchange is carried out by a Board of three. These are the Technical Officer and two appraisers drawn by the Management Committee from a panel of appraisers.

Futures exchanges have professional and technical facilities in the form of bankers, solicitors, auditors and warehouse keepers at their disposal. There is also a Clearing House and Testing Authority associated with each Exchange.

On the London and Sydney Exchanges all Floor members are required to become members of the Clearing Association. On the New York Exchange, however, only fifty of the Class A members are also members of the Clearing Association.

The Clearing Association is the agency through which futures contracts are offset of fulfilled and through which financial settlement is made. For accounting purposes, all sales and purchases are made from and to the Clearing House. This means that the vendor or purchaser does not have to worry about financial failure on the part of the person who he actually buys from or sells to.

On the Sydney Exchange the Clearing services are provided by

the Australian Development Clearing House Pty. Ltd., a wholly owned subsidiary of Development Finance Ltd., which is a company engaged in industrial banking.

4.3 Trading Procedures[3/]

4.31 Trading periods

Each Exchange has a set trading period which may include one or several call periods. A call period is a period in which trading is conducted (usually through a Chairman) to establish a price level for each futures contract. This gives an indication of ruling market prices and speeds up subsequent trading. Trading can take place only in one month at a time during a call, but in free trading sessions (outside call periods) several months may be traded at once.

The London Exchange has only one call period at the start of each days trading, whereas the Sydney Exchange also has one at the resumption of the afternoon's trading and ten minutes before the end of the day's trading.

4.32 Delivery

4.321 Delivery months

Each Exchange has certain quoted or delivery months for trading. These are the months in which contracts which have not been "cancelled" by an opposite contract fall due, i.e., the physical produce which they represent must be delivered.

For the London and New York markets the delivery months are March, May, July, October and December. On the Sydney Exchange trading is also conducted in January and September.

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3. See Table 4.2 for a summary of the main features of selected futures markets.

TABLE 4.2

SUMMARY OF THE MAIN FEATURES OF SELECTED FUTURES MARKETS

PLACE	CONTRACT	MINIMUM FLUCTUATION * Per unit wt.	Per contract	DEPOSIT *	COMMISSION * AND FEES	STANDARD	DELIVERY RANGE
			WOOL				
New York	6,000 lbs (Basis clean)	1/10 cent per lb	$US6.00	$US600	$US48	64's	Grease 60's of finer
Sydney	3,000 lbs (Basis clean)	1/10 cent per lb	$A2.50	$A150	$A24.80	64's	Grease 60's to 70's
			WOOL TOPS				
Antwerp	2,250 kilos	00.25 Belg. frs. per kilo	562.5 Belg. francs	7% with min. 20,000 Belg. francs	21.00 Belg. francs	60/64's dry combed top	3% either side of standard
London	5,000 lbs	0.1d. per lb	£2. 1. 8.	£80. 0. 0.	£9. 1. 0.	64's B oil combed	60's to 70's
New York	5,000 lbs	1/10 cent per lb	$US5.00	$US500	$US48	64's tops	58's or finer
Roubaix	2,250 kilos	00.05 French frs. per kilo	112.5 French francs	1500 French francs	Negotiable	Wool Control type 163	A tolerance of plus 10% minus 4%
			WORSTED YARN				
Nagoya	200 Kg.	Limit of 5% more or less of closing quotes of previous day	—	Varies	1,000 Yen	Pure wool worsted weaving yarn 2/48's Nippon Keori AG Brand	Any one of 46 designated brands

* $(NZ) = $(A) = $(USA)1.12 = £Stg. 0.47 = 5.55 French Frs. = 1.78 Belg. Frs. = 500 Yen

In each exchange, contracts may be traded up to eighteen months ahead. As the "spot month" drops out of trading, then the appropriate month in the next year will be brought in, and in this way the eighteen month span is maintained.

The gaps between quoted months are deliberately designed to increase the volume of trading in the permissible trading months. This is important to a trader who does not wish to make actual delivery, because the greater the volume of trading the more confident he can be that there will be another trader prepared to make an opposite transaction to the one he holds.

4.322 Delivery grades

Each futures market has a regulation list of grades, or types of the spot commodity which may be used to deliver against a futures contract. The price of each of these grades or types has a strict relationship to one particular grade or type (basis grade). The premiums or discounts between the basis grade and each deliverable grade are fixed by the Management Committee on the first day of each month. The differentials are set with regard to prices paid for each grade of the cash commodity in the physical market in the previous month.

On the New York market the basis grade or Exchange standard is described as a United States 64's top as defined by the United States Department of Agriculture, made by the Exchange approved combers and containing one and a half per cent oil including natural fat. Wool tops made from wool or blends of wool grown anywhere in the world are deliverable provided they do not contain more than five per cent of scoured wool resulting from a previous mill scouring or not more than twenty per cent of pulled wool.

Sellers on the Exchange may deliver wool tops superior to the Exchange standard but the maximum premium is four per cent. Sellers may also deliver wool inferior to the standard, but only to the extent of sixteen per cent. This bracket of plus four per cent to minus sixteen per cent includes all commercial tops from a warp staple 70's to an average length 58's.

There is also a greasy wool contract on the New York Exchange which is based on a 64's quality graded wool shorn from living animals in the United States; of about two and one half inches average stretched length and of good colour.

The seller of wool futures may deliver greasy wool grown anywhere in the world and pulled wools if they are uniform in grade, but the maximum premium or discount is eleven per cent. This bracket of plus eleven per cent to minus eleven per cent includes all wool two and one quarter inches or longer in a 70's grade, to two and three quarter inches or longer in a 60's grade.

On the London market the basis grade is described as a 64's Noble Combed in oil from Australian wool. Other tops from 60's to 70's Combed from wool grown anywhere in the world are also deliverable.

The basis grade on the Sydney Exchange is a 64B type greasy wool (64's quality, Good Topmaking Australian Merino fleece wool). Wool from a 70's quality average Spinners and Best Topmaking warp Merino fleece wool, down to a 60's quality Good Topmaking medium length Merino fleece wool and selected Brokens, Pieces and Comebacks,[4]

4. Comeback sheep are not a pure breed, but a breed that evolved in Australia as a result of crossing Merino sheep with various British breeds such as Lincoln, Leicester and others. The wool from Comeback sheep has the properties of both its parents and is comprised of three main counts, namely 64's which is a super type, 60's and 58's.

provided the wool has been sold at auction and shorn from live animals, may also be delivered.

Usually, however, deliveries may consist of only one group of wool types having similar characteristics of length and quality. On the Sydney Exchange any delivery must be wholly of Merino types or wholly of Comeback types and must consist wholly of fleece wools or wholly of Pieces. A list of deliverable wools and acceptable groupings on the Sydney Exchange has been given in Appendix C.

4.323 Delivery weights

Not only does each futures contract represent a basis grade but it also refers to a specific weight of the commodity.

The London and New York tops contract both refer to 5,000 lb. of tops. The New York greasy contract represents 6,000 lb. (clean weight) of wool and the Sydney contract represents 3,000 lb. (clean weight)of wool. The Sydney contract was deliberately made smaller than the others in an attempt to attract trade from producers but it is doubtful whether this has had more than a marginal effect.[5/]

An allowance is made for weights either side of this standard, provided they are between 4,800 and 5,200 lb. in the case of the London contract and between 2,800 and 3,200 lb. for the Sydney contract.

4.324 Delivery points

To further standardise contracts the point of delivery is also specified on a futures contract.

Wool and wool tops for delivery through the New York futures market must be stored in an approved warehouse in Boston. Similarly, tops for delivery through the London market must be held in an approved warehouse in Bradford.

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5. See Section 8.6

The Australian Exchange differs here in that it enables deliveries to be made at any wool selling centre in Australia with the limitation that all the wool must be at one centre. Some centres may be grouped as one for this provision.[6/]

4.325 Tenders

Tenders, or notices of intention to deliver wool through the futures market must be made during a specific period. This period is usually a certain number of days within the delivery month, or the month the contract falls due.

On the Sydney Exchange tenders may be lodged any time between 2 p.m. on the first day of the delivery month and the end of trading on the twenty third day of the delivery month. Wool that has been tendered in fulfilment of one contract may be re-tendered during the same month or in subsequent months within twelve months from the date of sale at auction.

Before wool may be tendered it must be appraised for type by a panel of Appraisers appointed by the Exchange, and for yield by the Australian Wool Testing Authority. When this has been completed it is invoiced to the buyer by the Clearing House.

4.33 Deposits and margins

Each of the three futures exchanges requires that a deposit be placed with the Clearing House for each contract. As well as this traders may be called upon to make a margin payment to cover an adverse price movement should this occur while he holds an open position.

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6. For instance, Melbourne, Albury, Portland, Ballarat, Geelong, Launceston and Hobart are all treated as one.

The original deposits for the New York Exchange are $(US)500 for the tops contract and $(US)600 for the greasy contract (these are subject to alteration at different price ranges). These deposits may be waived for wool trade concerns or individuals using the market for hedging reasons.

In London the amount of the deposit was reduced from £Stg. 100 to £Stg. 80 in 1963, and in Australia the deposit required is $A150 on all contracts.

4.34 Price fluctuations

On each of the exchanges prices may only move up or down in certain units or multiples of units.

On the New York Exchange the unit is one tenth of a cent per pound which is equivalent to $(US)5.00 per contract for tops and $(US)6.00 per contract for the greasy contract. The Australian market also operates on one tenth of a cent per pound but because of the smaller size of the contract this only amounts to $A2.50 per contract.

The minimum price fluctuation allowed on the London market is one tenth of a penny per pound or £Stg. 2/1/8 per contract.

The New York Exchange also places a limit on the maximum fluctuations allowed for any one future in one trading day. There is also a limit to the amount that the prices for any future during any one day may vary above or below the closing range for that future on the preceeding business session of the Exchange. These limits are usually set at ten cents per pound but the rule does not apply to trading in a future on and after the fifteenth day of the delivery month. The limit may be changed or suspended by the Board of Governors without previous notice.

4.4 Summary of the Main Institutional Aspects of a Futures Market

Futures markets are primarily organised to provide, regulate and maintain a market place and to afford its members efficient facilities for trading in futures contracts.

Wool futures exchanges typically are "non-profit" public companies which do not have a share capital and are limited by guarantee. Members are required to place a deposit with the exchange on joining, as well as paying an annual subscription. There are normally two classes of membership - only one of which may trade on the exchange floor. Membership is usually restricted to ease the running and control of the exchange.

Administration of the exchange is handled by a Management Committee which acts in an honorary capacity and is elected by members. In some countries where futures trading is governed by official acts, the Management Committee may at times be required to enforce government rulings.

Sub-committees may be elected by the Management Committee to help with the day-to-day running of the exchange, and in addition a small staff is employed. The Management Committee also calls on professional bankers, solicitors and auditors when required.

The actual facilities required to enable members to buy and sell futures contracts are owned or leased by the exchange members and operated by its staff. To aid in the actual transferring of title and monies between contracting parties, clearing facilities are required. These are usually provided by an outside firm which acts separately but in conjunction with the futures exchange.

Because futures contracts may result in the actual delivery of the wool which they represent, efficient arrangements are required to ensure that this is conducted in a fair and orderly manner. Appraisal of wools for delivery through the exchange is carried out by a board of Appraisers selected by the Management Committee and the testing of the wool by an independent wool testing authority. Actual delivery must usually be effected through specified warehouses which are made available to the exchange by agreement with private warehouse keepers.

CHAPTER 5

THE EFFECTIVENESS OF THE LONDON AND SYDNEY FUTURES MARKETS AS HEDGING MEDIA

5.1 Introduction

This chapter begins with a consideration of the relationships which exist between spot and futures prices making special reference to actual conditions on the London and Sydney markets.

The second section examines the difficulties of actually measuring protection afforded to traders by hedging and then shows the results of a hedging model.

The chapter concludes with an actual hedging example and a summary of the effectiveness of the London and Sydney markets as hedging media.

5.2 The Relationship between Spot and Futures Prices

Spot and futures markets deal with the same commodity and their prices reflect the same market forces and are related through storage and processing decisions. There are, however, factors which may cause spot and futures prices, as well as near and distant futures prices to move differently. These movements are of prime importance to traders who want to hedge on a futures market.

5.21 Forces leading spot and near futures prices to be above the price of distant futures

A futures market in which the nearer months are selling at premiums to the more distant months (technically this is referred to as backwardation) is terms an "inverted market". Such a situation

might be considered "unusual" since prices in the future might be expected to be higher than present prices (a situation described by the trade as contango) in view of the storage costs of holding a commodity.

The fact that backwardation does occur in futures markets was explained by Keynes in his theory of normal backwardation (13). The theory of normal backwardation as originally stated assumed that speculators are net long,[1/] require positive profits, and are unable to predict prices. Under these assumptions a speculator who expects prices to remain at their present level will refuse to buy futures except at a discount sufficiently large to compensate him for his risk of losing money if a price fall occurs. The further into the future the contract matures, the bigger will the discount have to be. Short hedgers sell at a discount because they are willing to pay a premium for the protection from large price risks, provided the premium is not too large. Because futures markets are dominated by short hedging and long speculation, these two factors are thought to dominate price formation.

If the assumptions of the theory are to hold, the futures prices would need to rise on average during the life of each contract. Because speculators are assumed to be unable to forecast prices their profits, if any, may be considered to be a reward for risk-taking. In other words, the flow of monies between hedgers and speculators is similar to the flow of insurance premiums.

If a futures market does not show consistent backwardation, then this implies that profit flows are the result of price forecasting

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1. Long speculation is where traders hold "bought" contracts which do not correspond to a forward sale of the commodity.

rather than risk-taking. Evidence has been presented (14) which indicates that it is forecasting ability and not the bearing of risk that determines the profits of speculators. Thus while the theory of normal backwardation may be valid for particular markets under special conditions, it is not adequate as a general explanation of the flow of profits in commodity markets.

A relative shortage of wool or wool tops immediately available in the market, along with the anticipation of relatively larger supplies, tends to raise spot prices in relation to prices of futures contracts, particularly for the more distant months. The effects of such situations may be particularly noticeable during seasons of small clips and relatively small available supplies, especially if dealers, handlers, and topmakers have sold larger quantities of wool forward. Under such conditions the difficulty of obtaining wool to fulfil their commitments stimulates keen competition by merchants for the available supplies.

Price support programmes, floor price schemes and other forms of organised control may result in a relative shortage of supplies of wool immediately available in the market. Spot prices of wool may then be high in relation to prices of futures contracts, particularly for the more distant months even when the total physical quantity of wool in existence is relatively large.

While there is no definite limit to the extent of backwardation, because it is a sign that traders expect a fall in the price of wool, stockholders with large stocks will try to reduce these stocks and this reduction in demand will bring the price of wool down and diminish backwardation.

Backwardation for a future of a given delivery date tends to

decline over its life until it is practically zero in the delivery month. This is because the contract represents shorter and shorter periods over its life. As the maturity date approaches, more and more short hedgers will be buying back their contracts and this will increase the price of the future and diminish backwardation.

In the "spot month" or the month the contract falls due, the price of the futures contract is usually below the price of a similar type of wool in the open market. One reason for this is that in a futures market a buyer cannot choose his goods if he intends to accept delivery, i.e., he has to accept any one of the many deliverable types. Another factor may be that on occasions the difference between types, as set by the Exchange, may not accurately reflect the differences between types in the cash market. When this occurs the seller would confine his deliveries through the futures market to the quantity and qualities for which the price allowed on the futures contract, in relation to prices of the spot commodity, are relatively highest.

5.22 Forces leading spot prices to be below futures

This is the situation described by the trade as contango. The normal relationship between the prices of several futures, according to the "carrying charge" theory, is for each future within a wool selling season to command a premium over the price of the current month approximately equal to the costs of carrying certified stock to the date of maturity of the future and of delivering the stock onto the exchange.

Unlike backwardation, there is a limit to the extent to which spot prices of wool at delivery points, deliverable on futures contracts, can be depressed below the prices of futures contracts. The

limit is normally about equal to the costs of carrying the spot commodity to the date of maturity of the futures contract plus the costs of delivering it through the futures market.

5.23 The relationship between near and distant futures on the London and Sydney Exchanges

Chapter 8 will deal with the relationships between near and distant futures on the London, Sydney and New York markets which existed in their formative years. This section will deal with the longer term relationships on the London and Sydney Exchanges.

5.231 London

The price relationships which have occurred on the London Exchange from 1953 to 1959 have been shown in Figure 5.1. Two futures, March and September were compared throughout. From October through to March the two futures refer to the different selling seasons, while from April through to September they refer to the same selling season.

If contango (the distant future is higher priced than near futures) existsin the market, then the spreads between the two futures should be positive from April through to September. In the period shown in Figure 5.1 where the comparisons relate to the same season (the base line is solid, i.e., the September future), contango (the March future is higher priced than the September future) occurred in twenty eight months, there was no difference in one month, and backwardation (March future is lower priced than the September) occurred in nine months.

Where the comparisons were between seasons the base line is broken (i.e., March is in the old season and September is in the new

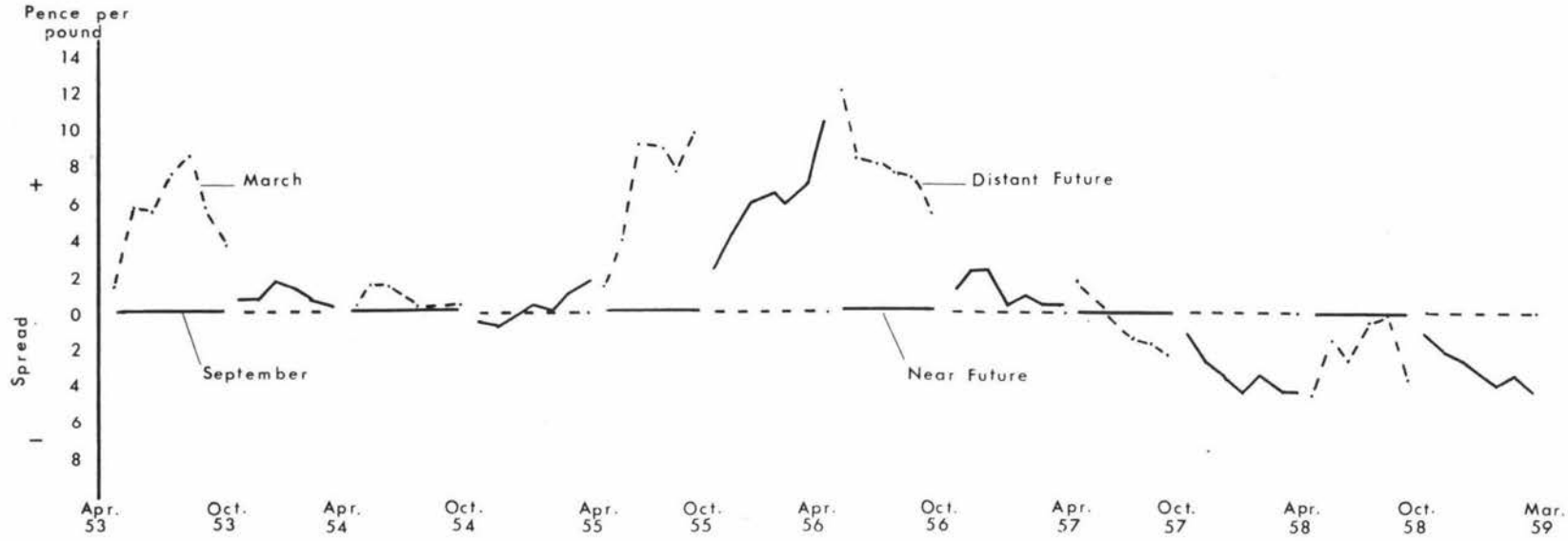

FIG. 5·1 LONDON; AVERAGE MONTHLY SPREAD BETWEEN MARCH AND SEPTEMBER FUTURES - from April 1953 to March 1959

SOURCE; 'Wool Record' Futures Quotations

season). In such cases contango (new seasons prices higher than old seasons) occurred in twenty four months, there was no difference in one month, and backwardation occurred in sixteen months.

The failure to find any consistent backwardation in the London market implies that profit flows from hedgers to speculators have been largely the result of speculators' forecasting ability and not a reward for risk-taking.

5.232 Sydney

The price relationships which occurred on the Sydney Exchange from 1960/61 to 1965/66 have been shown in Figure 5.2. The same two months as above (September and March) were taken and once again the September future has been represented by a continuous line and the March future by a broken line.

Where comparisons relate to the same season (the base line is solid, i.e., the September future), contango occurred in twenty three months and backwardation in eight months.

Where the comparisons were between seasons, the base line is broken (i.e., March is in the old season and September is in the new season). In such cases contango occurred in twenty two months, there was no difference in two months, and backwardation occurred in seventeen months. Therefore, there has been no consistent backwardation in the Sydney market over this period.

5.3 Hedging

It has been customary when describing participants on a futures market to divide them into speculators and hedgers.

In the language of the futures market, a speculator is simply

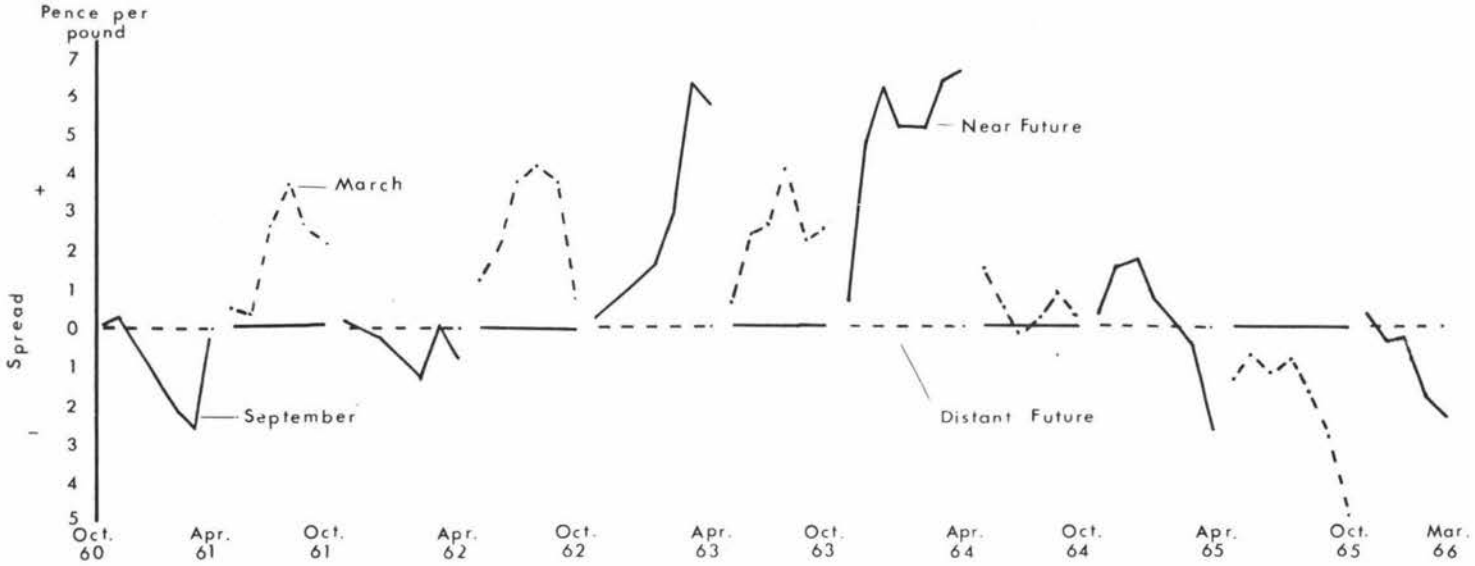

FIG. 5·2 SYDNEY: AVERAGE MONTHLY SPREAD BETWEEN MARCH AND SEPTEMBER FUTURES – from October 1960 to March 1966.

SOURCE: 'Wool Record' Futures Quotations.

a man who buys (or sells) futures without any offsetting transactions in the spot market. Hedging, however, is not as easy to define.

Hedgers have been described as traders who operate in both the physical and futures markets. For instance, a hedger on a wool futures market may either have stocks of wool, yarn, tops or cloth which he is planning to sell, or orders for wool, yarn, tops or cloth for which he has yet to buy the raw material.

A hedger who has more wool than orders is said to be long in wool; while a hedger who has more orders than wool is said to be short in wool.

It was originally thought that in order to protect themselves from price changes, hedgers with excess stocks of wool (long in wool) sell futures (go "short in futures") so that when the time comes for them to sell their stocks they can make an offsetting purchase of futures. Similarly, traders with excess orders (short in wool) buy futures (go "long in futures") so that when the time comes for them to buy wool to fill the orders they can make an offsetting sale of futures.

This simple version of hedging emphasises two properties of the hedge:

(i) That price movements of the physical commodity and the futures contract will be exactly offsetting (i.e., that the expected value of the hedged position is zero) and,

(ii) that the hedge eliminates the risk of price fluctuations (i.e., that there is no variance around this expected value).

Both of these ideas are incorrect. In normal hedging practice

price changes are not expected to be offsetting, and while risks will be reduced, they will not be eliminated (15).

Working (9) pointed out that in practice hedging normally involves simultaneous adjustments of wool inventories and futures commitments in the hope of exploiting likely relative price movements. In carrying a commodity from one point in time to another, the holder incurs carrying charges such as interest and insurance, takes on the risk of price fluctuations, and benefits from the convenience yield[2/] of the commodity. His willingness to carry the asset must depend on his ability to recoup the net costs of storage. Since in selling a futures contract as a hedge the merchant is setting the return he will earn on the spot commodity; if he holds it until the futures contract matures, the relation between the spot and futures prices is of the utmost importance to the hedge transaction. This view that a trader hedges in anticipation of making a profit however, does not mean that he will not settle for a smaller profit if this is accompanied by lower risks, but it does mean that he measures profit as carefully as risk reduction.

Another factor is that hedging does not eliminate risk. One of the elements in the supply of storage is the convenience yield of the commodity which offsets some or all of the carrying costs (15). These yields arise from the ability to use the holdings at the owners discretion, for non-storage purposes. The manufacture - owner can save production costs by using inventory instead of making unplanned purchases, while the merchant earns revenue by selling the goods.

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2. Over a range, increased wool stocks simplify manufacturing. For instance, the bigger his stocks the better chance that the manufacturer has exactly the wool type in stock that he needs for a particular job.

The convenience yield arises because of the "spot" nature of the commodity - because of its immediate usefulness and availability. The futures contract on the other hand, has a fixed maturity. Now the sale of a future for a short hedge does not commit the merchant to holding the inventory until the maturity of the futures contract. In fact, he will customarily plan on using his inventory prior to the maturity of the hedge. If he holds the inventory to maturity it can generally be assumed that the expected commercial opportunities did not develop. He is likely to hedge in the full knowledge that the quoted differences between spot and futures will not provide returns in excess of the costs unless he gets an opportunity to sell or use the inventory prior to the maturity of the futures contract. He hedges in expectation that he will get such an opportunity. It is the expected value of the selling opportunity which comprises the convenience yield. Once the possibility arises of not holding the hedge to maturity, the hedge is no longer a riskless alternative to holding inventories unhedged, but merely a less risky one.

5.32 The problems of measuring the protection afforded by hedging

Because people hedge for different reasons there is a problem of deciding what to use as a measuring rod when attempting to test the effectiveness of hedging.

In cases where traders are hedging to protect a given inventory position against adverse price movements, the price risk is usually measured by the size of the actual gain or loss due to the price change the hedger was faced with. Perhaps what should be done in this case, however, is that both the risk and the effectiveness of the hedge be treated quite apart from the risks of actual price change

because a price risk is something that exists in the mind of the trader at the beginning of the period. Thus, ideally price risks and the effectiveness of hedging should be treated in subjective terms - not in terms of ex-poste price changes. This adds problems because the measurement of expectations requires extensive and sophisticated survey methods and for this reason such studies are not usually attempted.

Another problem is that hedging, while it may help to reduce price risks, may also increase costs. Businessmen are generally concerned with making profits and not primarily with avoiding risks. Making profits involves taking risks, but there is a limit to the total amount of risk that any businessman can take prudently; consequently good business management requires avoiding risks that show little opportunity for profit, in order to take other risks that offer a better opportunity. This conflict between expected income and risk avoidance poses problems for theorists as the optimum combination of the two will vary among traders.

5.4 Existing Studies on the Hedging Protection Afforded by the London and Sydney Markets

In an attempt to measure the protection (in terms of effective insurance against price changes) which the London market provides, Gutman and Duffin (16) used two simple measures which they called K and P.

K measured the proportion the profit or loss from a hedge transaction differed from the initial outlay on the spot market. When K was positive it indicated that a profit had resulted from a selling hedge and a loss from a buying hedge, and vice versa when K was negative.

P compared the profit or loss resulting from a hedged transaction with the profit or loss that would have resulted from an unhedged transation on the same dates.

K and P were derived on the assumption that a perfect hedge occurs when the prices of wool and futures fluctuate in equal proportions.[3]

If the hedging operation cancels out fluctuations on the spot market then:

$$\frac{F_0 - F_1}{F_0} - \frac{S_0 - S_1}{S_0} = 0$$

where:

S_0 represents current spot price
S_1 represents spot market price in six months' time
F_0 represents current price of six months' futures
F_1 represents futures prices in six months' time

$$\text{let } K = \frac{F_0 - F_1}{F_0} - \frac{S_0 - S_1}{S_0}$$

$$\text{then } K = \frac{S_1}{S_0} - \frac{F_1}{F_0}$$

P was derived by dividing K by the proportionate profit or loss resulting from the spot market operations alone.

The latter is given by:

$$\frac{S_1 - S_0}{S_0}$$

$$\text{therefore } P = \frac{K}{\frac{S_1 - 1}{S_0}}$$

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3. On this assumption a woolgrower should sell a quantity of futures equal to the value of his clip (on a $ for $ basis): if prices move by the same amount he should sell a quantity of futures equal to the volume of his clip (on a lb. for lb. basis).

Using these measures Gutman and Diffen measured the effectiveness of the London market in its early years for two wool types, namely, 64's and 56's. They concluded that;[4]

> "For the whole of the initial period from September to December, 1953, K was negative for both 56's and 64's, indicating consistent loss on all selling hedges. At the same time, P was more often than not in excess of 100% which shows that futures operations, instead of offsetting losses (or gains) made on spot transactions, generally added to them; the realized value of the insurance offset by the market in these instances was therefore less than zero."

One interesting point which arose from this study was that in this early period the market (using the above criteria) was actually more effective for hedging crossbred wools than merino wools. This seems to have been caused by an unrelated movement in backwardation, which declined the next year (1954).

A more sophisticated study has been conducted by Weisser (17) on the Sydney and London markets. Weisser included transaction costs in his model and not only calculated the average revenue for hedged and unhedged positions but also the variance and semi-variance[5] of the revenues.

The gain or loss from carrying one pound of unhedged wool was taken as being equal to the difference between the realised selling price and the purchasing price, less carrying cost. The gain or loss from carrying one pound of hedged wool was taken as being equal to the gain or loss from carrying unhedged wool plus the gain or loss from

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4. See (16) page 190.

5. The semi-variance about a constant of a number of values of a variable is obtained by subtracting the constant from each value and replacing each positive difference by zero. The difference including the zeros are squared. The average of the squares is equal to the semi-variance. This measure was developed by H.M. Markowitz (18).

hedging, less the transaction costs of hedging. The gain or loss from hedging was taken as the difference between the price of futures at the opening of the hedge and the price of futures at the closing of the hedge.

When the price of 64's rose, the average price rise was fivepence halfpenny over eight weeks, six and three quarter pence over twelve weeks and eightpence halfpenny over sixteen weeks. According to Weisser's model, short hedgers on the Sydney market would have lost over 80 per cent of these rises, i.e., their gains would have been reduced by 80 per cent. On the other hand, when wool prices fell, the average decline was four and three quarter pence over eight weeks, six and a quarter pence over twelve weeks and sevenpence over sixteen weeks. Short hedgers would have obtained protection for an average of only fifteen per cent of the price falls.

The results of the hedging model using good 56's quality wool were even less favourable. During periods of rising prices, hedging converted gains into small losses (except when the price rises exceeded sixpence during eight week periods) and on average hedging afforded less protection during periods of falling prices than was provided for 64's.

According to the model, when comparing London and Sydney:

> "A short hedger who used the London market during the same period would have gained, on average, ½d. over 8 weeks, 1d. over 12 weeks and 1½d. over 16 weeks by placing his hedge in the London instead of in the Sydney market. When wool prices rose his advantage in London would have been 1½d. for 8- and 12- week hedges and 1¾d. for 16-week hedges. When prices fell, his advantage in London would have been ½d. for 12 weeks and 1d. for 16 weeks, but for 8 weeks he would have been better off by ¼d. in Sydney. When over an 8-week period prices fell by more than 6d., the advantage of hedging in Sydney was ¼d., but for a similar price fall over 12 or 16 weeks the advantage of hedging in London was 1d." 6/

6. See (17) page 40.

When studying the ratio of variances it was found that they tended to become smaller as the hedging period increased and that the variability in returns was reduced more by hedging in Sydney than by hedging in London.

5.5 The Hedging Model used in this Study

5.51 Purpose of this model

The purpose of the hedging model is to estimate the protection afforded by the London and Sydney futures markets for particular wool types when the trader hedges regularly.

Two situations are considered:

(i) Forward sale - The man who sells wool for delivery in n weeks time on the basis of current prices (and therefore hedges by buying futures now, and making an offsetting sale in n weeks).

(ii) Forward purchase - The man who buys wool at current prices, but will not be able to use the wool for n weeks (and therefore hedges by selling futures now, and making an offsetting purchase in n weeks time).

In each of these situations the trader is endeavouring to protect himself against adverse price movements in the cash market by taking an opposite position in the futures market. When the maturity date arrives he cancels his futures commitments (by buying or selling the same number of futures contracts).

5.52 The Model

For simplicity the purchaser is assumed not to relate his hedge to changes in the basis (or margin) between the spot price and the futures price he is hedging with[7], but merely to have expectations regarding

7. An estimation of the gains which could be achieved by basing grain storage decisions on cash-futures spreads was made (19) for the United States grain market. Here it was found that considerable gains could be made, especially in the period following the start of the season.

absolute price changes. This means his activities may be analysed on a general iso-variance, iso-expected return co-ordinate system.

The profits (or losses) for the forward seller or forward buyer who hedges, or who does not hedge, are as follows:

(i) Unhedged forward sales of wool

$$r_1 = P_i - P_{i+n}$$

where

r_1 = profit (or loss) from the transaction

P_i = price at which wool is sold forward in pence per pound

P_{i+n} = price of wool when delivery is made

(ii) Hedged forward sales of wool

$$r_2 = -(P_i + t\frac{P_i}{f_i}) + \frac{P_i}{f_i}f_{i+n} - t\frac{P_i}{f_i} + r_1$$

Where

r_2 = profit (or loss) from the transactions

P_i = price of wool in pence per pound when hedge is initiated (and hence the value of futures contracts purchased)

f_i = price of futures in pence per pound when hedge is initiated (thus $\frac{P_i}{f_i}$ is the <u>number</u> of futures contracts purchased)

t = commission charges on purchase (or sale) of contract expressed in pence per pound of wool in the contract. For simplicity t has been assumed equal for both transactions

f_{i+n} = futures price at time of delivery (hence $\frac{P_i}{f_i}f_{i+n}$ is the revenue from the sale of futures)

(iii) Unhedged forward purchases of wool

$$r_3 = -r_1$$

where

r_3 = profit (or loss) from the transaction.

(iv) Hedged forward purchases of wool

$$r_4 = P_i - t\frac{P_i}{f_i} - \left(\frac{P_i}{f_i}f_{i+n} + t\frac{P_i}{f_i}\right) - r_1$$

where

r_4 = profit (or loss) from the transactions

P_i, f_i, t and f_{i+n} have the same meaning as in (ii),

The measure of the variability of the profits for each type of transaction are: Average r_i, the variance of r_i, and the standard deviation of r_i; where i = 1 to 4. These have not been compounded to a point of time, since it is assumed that they could have occurred in any order.

The model assumes that the prices of wool and futures move in equal proportions so that a hedge involves the sale, or purchase, of an equivalent value of futures, i.e., if P_i and f_i are the present prices of wool and futures in pence (or cents) per pound, the hedger sells or buys futures contracts according to the ratio $\frac{P_i}{f_i}$ for each pound of wool bought or sold forward.

The calculations for the model were made on an I.B.M.1620 computer using a programme written in P.D.Q. FORTRAN. The results have been presented in table form in Appendix D.

5.53 Parameters used in the model

The transaction costs involved are the commission charges, Clearing House Fee and Stamp Duty on the purchase and sale of

the contract expressed in pence per pound of wool in the contract and in line with Weisser's findings[8] were taken to be 1.0d in all cases on the Sydney market and 1.3d per lb. on the London market.

n, the length of the hedge was varied from four to twenty four weeks.

5.54 Futures and wool prices used in the study

The futures prices taken were the quotations given in "Wool Record"[9] for the September and March futures. In each hedging transaction the closest future (least weeks to run) which exceeded the length of the hedging operation was used. The use of the September and March futures meant that it was not possible to increase the length of the hedging operation beyond twenty four weeks.

The 64B wool prices used were the Australian Wool Board's weekly quotations for that wool type on a clean basis. This wool is referred to as the Australian Central Wool Committee type 78 which is defined as a 64's quality, good topmaking Australian Merino fleece wool. In the weeks where there were no quotations a hedging operation was not initiated. This meant that the number of hedging operations varied slightly from year to year.

The New Zealand weekly average wool prices used were based on estimates of average clean wool prices made by the Wool Commission Appraisers after each sale, Where two or more sales occurred in the same week, the estimated wool prices were averaged.

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8. See (17) pages 32-33.

9. "Wool Record and Textile News" is published weekly in Bradford and is regarded as the "official" publication of the Wool Industry.

The type 11^{4} prices are based on the Wool Commission quotes on a clean basis for each sale. The New Zealand Wool Commission type 114 is defined as a 46/50's B grade, crossbred, good topmaking, fair to good colour, skirted, may contain the odd cott and/or very slight seed. Where there were no quotations that week was not included.

5.55 Criteria used in testing the effectiveness of hedging

In testing the effectiveness of risk reduction we need to have some measure of risk as well as some measure of costs. One way of measuring risk is to gauge the amount the traders income is likely to vary about the average figures. One such measure is the variance.

If we take the sum of all the deviations from the mean or average value they would come to zero. However, if we square the deviation from the mean or average value and then take their sum and finally divide by one less than the number of observations included in the sum, we have a measure of variability known as the variance. Because the sum of the squared deviations is divided by one less than the number of observations, we can compare variances obtained from different numbers of observations (20).

As a measure of the relative size of deviations, variance has one disadvantage in that the units of variance are squared deviations. By taking the square root of the variance, we get a related measure, the standard deviation, and this measure refers to the same units in which the deviations occur. Thus the standard deviation of a set of observations is the square root of their variance.

The standard deviation has another useful property. If the observations are normally distributed, then about ninety five per cent of all observations should fall within plus or minus two standard

deviations from the average value. In a normal distribution observations are centred around the average value with fewer large positive and negative deviations. It is the extent of the spread of the observations around the mean which we are trying to minimise in the hedging model.

5.6 Hedging on the Sydney Market

A comparison of the effectiveness of hedging a merino wool (Australian type 78), a crossbred wool (New Zealand Wool Commission type 114) and a hypothetical "average" New Zealand wool (based on New Zealand sale average prices) was made for the Sydney market. Hedging periods were taken which varied from four to twenty four weeks over the period beginning the 21st May 1960 and ending on the 18th February 1966.

Two situations were considered: firstly, a trader who sells wool forward and does or does not hedge his forward sale, and secondly, a trader who buys wool forward and does or does not hedge his forward purchase.

Each hedging operation involved selling or buying September or March futures depending on which maturity date exceeded the date set for the forward purchase or sale. When the life of both futures exceeded the length of the hedge, then the nearest future, or the future with the least time to run, was chosen.

Only the weeks in which each particular wool had been sold were chosen to initiate or close a hedge transaction. The buying and selling prices of the futures were taken as the mid-point between the highest and lowest prices paid for that particular future on the Wednesday of each week.

A continuous hedging programme was taken in each case. A hedge was initiated each week in which the particular wool type was sold on the physical market and hence such transactions could have occurred. This means that if the particular wool type was sold in ten consecutive weeks, then ten consecutive hedging transactions were initiated.

The average gains and losses for the entire period resulting from "short" or selling hedges and "long" or buying hedges, together with the variance and standard deviations of the gains and losses for average 64B quality wool (type 78) on the Sydney market, have been given in Table 1, in Appendix D. The same information has been presented for type 114 wool in Table 2 and New Zealand "sale average" wool in Table 3.

In each table column 2 gives the average gains or losses resulting from forward sales, while column 1 gives the average gains or losses which would have been achieved by hedging these forward sales on the Sydney market. Similar figures for forward purchases are given in columns 9 and 10. The differences between the average hedged and unhedged profits or losses in each case have been given in columns 3 and 11.

The variability of profits resulting from hedged and unhedged trading have been shown for forward sales in columns 4 and 5 and for forward purchases in columns 12 and 13. The ratio of variances expressed as a percentage for each situation have been given in columns 6 and 14.

5.61 Costs of hedging on the Sydney Market

Hedging costs may be divided into two types, a transaction cost and a cost in terms of a reduction in average income which results from

hedging. This latter cost may be thought of as an "insurance premium". The hedging model used has incorporated transaction costs into the hedging returns. This means that "costs" referred to in the following analysis refers to both types of cost. In each of the hypothetical situations hedging involved a cost in terms of a reduction in average income for traders using a hedged policy rather than leaving their commitments unhedged.

The costs of hedging forward sales of each of the three types of wool on the Sydney market have been shown in Fig. 5.3. In each case there was no regular or steady "pattern" in the movement of the costs as the hedging period increased. However, in each case the cost of hedging tended to decrease with the length of the hedging operation, and a profit was made for hedges of from seventeen to twenty one weeks. Generally, the costs of hedging type 78 wool (the basis type for the Sydney contract) were lowest and over the shorter hedging periods this amounted to as much as four pence per pound under the costs of hedging type 114 wool.

The costs of hedging forward purchases of each of the three wool types on the Sydney market (see Appendix D) followed a slightly different pattern. In no case was a profit made by hedging any of the three wool types. Costs tended to be highest over the medium length hedges in each case, with type 114 being the most costly for all periods.

5.62 The reduction in Variances resulting from hedging on the Sydney Market

In each of the hypothetical hedging situations hedging affected the variances of traders' returns. The extent of this effect may best be seen by taking the percentage reduction in variance which occurred in each case.

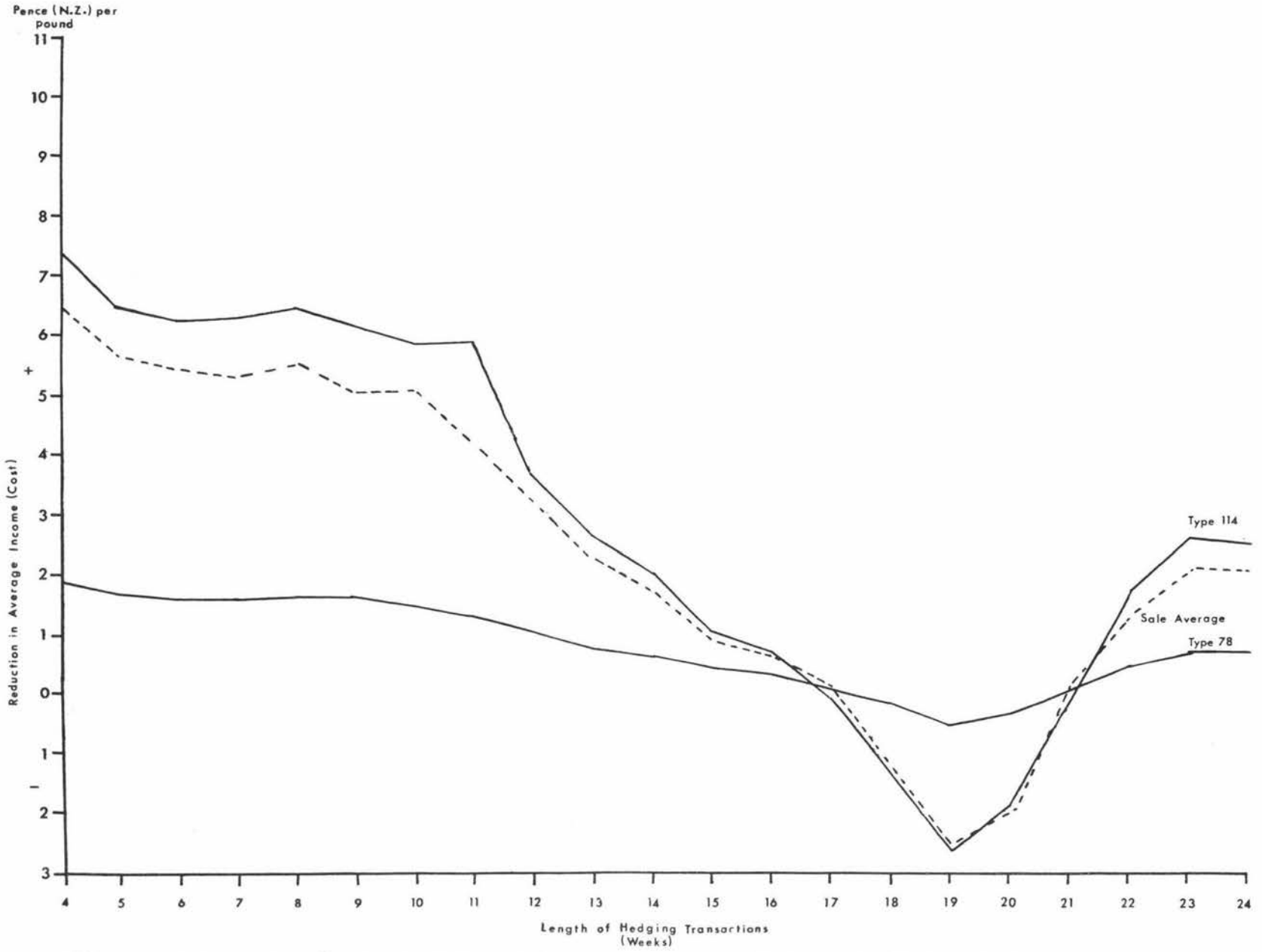

FIG. 5·3 SYDNEY: COST OF HEDGING FORWARD SALES OF TYPE 78, SALE AVERAGE AND TYPE 114, MAY 1960 TO FEBRUARY 1966

SOURCE: Data in Appendix D (Tables 1,2 & 3)

With this measure a figure of one hundred indicates that the variances are the same for the hedged and unhedged situations; a figure less than one hundred indicates that hedging has reduced the variability of traders' incomes while a figure greater than one hundred indicates that hedging has resulted in a greater variability.

The ratio of variances for hedged and unhedged forward sales of type 78 wool, type 114 wool and "sale average" wool has been given in Fig. 5.4. The greatest reduction occurred by hedging type 78 wool until the length of the hedging period reached twenty-two weeks. For the twenty-three and twenty-four weeks hedges, there was a slightly larger reduction for type 114 wool. The reduction in variability was always greater than fifty per cent for the type 78 wool. However, over most of the hedging periods there was only a slight reduction in variance for traders using type 114 wool and "sale average" wool.

The pattern for forward purchases was similar to the forward sales except that in each case the reduction in variance was slightly less for each of the three wool types.

The fact that there was a greater reduction in variance for forward sales suggests that over the period studied, contango has on average been present in the market. In other words, distant futures have been selling at a premium to near futures (see 5.232). When this occurs a selling hedge is usually advantageous whether spot prices subsequently advance or decline (21). This is because hedgers have the advantage of high premiums over spot prices when they sell futures, and normally these premiums decrease as the maturity date approaches. Under such conditions the buying hedge may actually increase the variability of traders' incomes. If backwardation had existed on average, then the results could have been reversed.

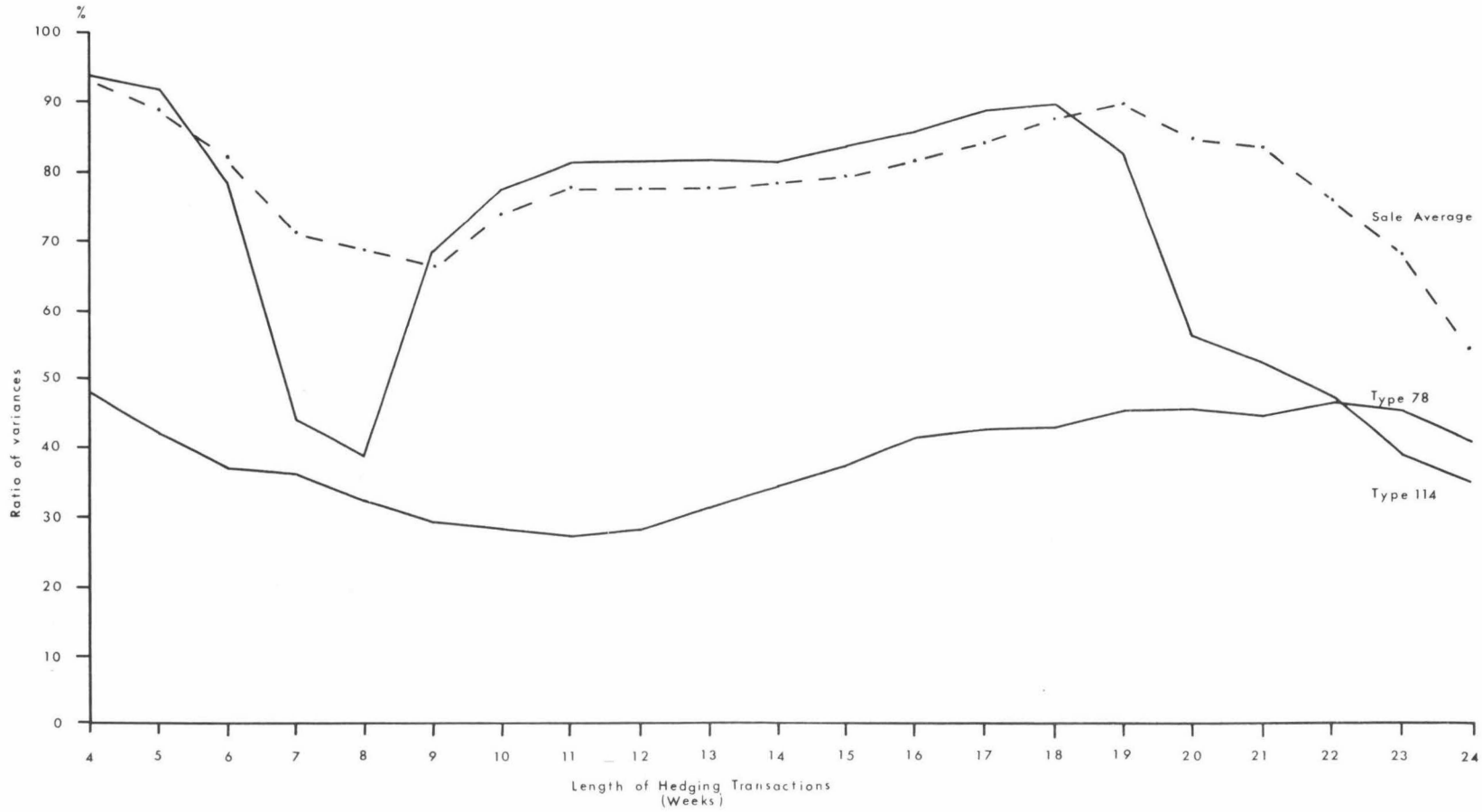

FIG. 5·4 SYDNEY: RATIO OF VARIANCES BETWEEN HEDGED AND UNHEDGED FORWARD SALES FOR DIFFERENT HEDGING PERIODS FROM MAY 1960 TO FEBRUARY 1966

SOURCE: Data in Appendix D (Tables 1, 2 & 3)

5.63 The relationship between the costs of hedging and the reduction in Variance

For any one individual trader there will exist preferred combinations of average or "expected" income and income variance.

For any given income an individual will prefer a less variable income, and for any given level of variance an individual will prefer a higher average income. Unfortunately, there is no way of knowing the preferred income-variance combinations which exist for each individual in the market or for the market participants collectively. Whenever there is a conflict between average income and variance (i.e., an individual may only increase his income by increasing his variance or vice versa); we are unable to show optimum combinations of the two.

If we plot the relationship between reduction in variance measured from a 100 in each instance and increase in costs for each of the hedging periods which occurred for type 114 and 78 (Fig. 5.5), then we can divide the graph into four sections; A, B, C and D, so that any point in C will be preferred to any point in A because the former represents a greater reduction in variance and a smaller increase in average costs. The only "conflict" occurs between the points in B and C and between the points in C and D because here it is possible to get a greater reduction in variance by accepting an increase in average costs, and vice versa. However, in general, it is reasonable to conclude that the hedging protection has been better for type 78, than type 114, and traders using type 78 wool would have experienced considerably "better" insurance terms of a reduction in variance for a given cost, than traders using type 114 wool.

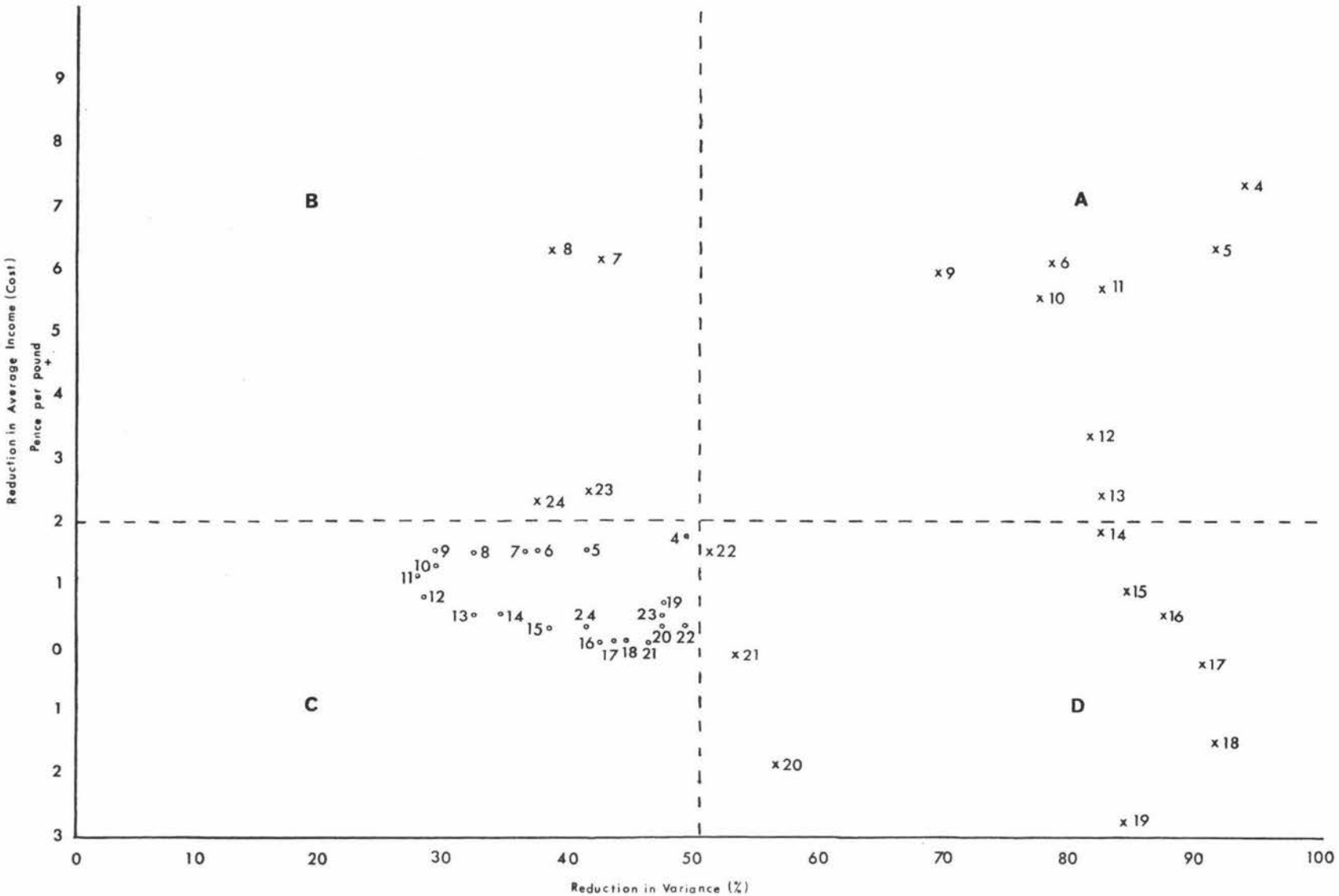

FIG. 5-5 SYDNEY: RELATIONSHIP BETWEEN VARIANCE AND INCOME FOR HEDGED FORWARD SALES OF TYPES 114 & 78*

* x Type 114 o Type 78

SOURCE: Data in Appendix D (Tables 1&2)

5.64 The difference between years in hedging protection afforded the Sydney Exchange

The previous analysis considered the average protection afforded from 1960 to 1966 to traders interested in certain wool types who hedge for varying periods. It is relevant to also consider how the effectiveness of the Sydney market may have varied between years.

Taking a hedging period of thirteen weeks as an example, and using the same three wool types (Table 4), we can see whether or not there have been any trends in variance reduction or costs over the seasons, and to what extent individual seasons varied from the average for the entire period from 1960 to 1966.

Table 4, in Appendix D, follows a similar pattern to the previous tables except that the seasons have been separated and the hedging period has been held constant at thirteen weeks. A thirteen week hedge was taken because it represented a period in about the middle of the range of hedging periods studied. The line titled "average" in the first column refers to the line for thirteen week hedges in the previous three tables. Thus Table 4 merely shows "variability" which was "hidden" in that particular line of the previous tables.

In each case there were no reliable trends in costs of hedging or in the reduction of variance over the seasons. There were, however, considerable variations in terms of hedging costs and variance reductions between the seasons. An example of the extent to which costs varied may be seen by taking 114 prices and forward selling (column 3).

Here, while the average hedging cost for the entire period for forward sales was 2.41 pence per pound, the seasonal range was from 2.06 pence per pound in 1963/64 (a profit on hedging) to -17.08 pence per pound in 1964/65. Similarly, the reduction in variances also

fluctuated. The average ratio for forward sales of hedged and unhedged type 114 wool was 81 per cent while the ratio for 1961/62 was 121 per cent (column 6) and for 1962/63 was 45 per cent.

5.65 Summary of hedging protection afforded by the Sydney Exchange

Under the assumptions of the hedging model a reasonably clear picture emerges regarding the type and extent of hedging protection which was afforded to the two hypothetical types of traders (viz., a trader who sells wool forward and does or does not hedge his forward sale on the Sydney Exchange and, secondly, a trader who buys wool forward and does or does not hedge his purchase on the Sydney Exchange).

The costs of hedging in terms of reduction in average profits were greater for crossbred wools (type 114 and sale average) than for merino wools (type 78) for both classes of trader. With forward sellers there was generally a greater reduction in variance for hedgers of fine wool (type 78) than hedgers of crossbred wools. The picture was very similar for forward buyers who hedged.

For all except four hedging periods (periods here refer to the number of weeks the hedging transaction covered) the costs were less and the reduction in variance greater for hedgers of type 78 wools than hedgers of crossbred wools. In each of the four cases where there was a greater reduction in variance for certain hedging periods of crossbred wool than certain other hedging periods of type 78 wool, the costs for the former were much larger than for the latter.

No reliable pattern over several seasons was discovered for thirteen week hedges of each of the three wool "types". However, there was considerable variation between seasons. This variation was greater for type 114 wool and sale average than for type 78 wool.

From the above results and given the assumptions of the model it may be concluded that the "insurance" provided on the Sydney Exchange has been both more costly and less effective in terms of variance reduction for crossbred wools than for merino wools.

5.7 Hedging on the London Market

A comparison of the effectiveness of hedging a merino top (64B tops), a crossbred wool (New Zealand Wool Commission type 114) and a hypothetical "average" New Zealand wool (based on New Zealand sale average prices) was made for the London Market. Once again hedging periods were varied from four to twenty four weeks over the period beginning on the 21st May 1960 and ending on the 18th February 1966.

The same two situations were taken; namely a trader who sells wool forward and does or does not hedge his forward sale, and a trader who buys wool forward and does or does not hedge his forward purchase. In each case a hedging pattern was used similar to that used for the Sydney market.

The average gains and losses for the entire period resulting from "short" or selling hedges and "long" or buying hedges together with the variances and standard deviations of the gains and losses for 64B tops on the London market have been given in Table 5, in Appendix D. The same information has been presented for type 114 wool in Table 6 and New Zealand "sale average" wool in Table 7.

In each table column 2 gives the average gains or losses resulting from forward sales while column 1 gives the average gains or losses which would have been achieved by hedging these forward sales on the London market. Similar figures for forward purchases

are given in columns 9 and 10. The differences between the average hedged and unhedged profits or losses in each case have been given in columns 3 and 11.

The variability of profits resulting from hedged and unhedged trading have been given for forward sales in columns 4 and 5 and for forward purchases in columns 12 and 13. The ratio of variances expressed as a percentage for each situation have been listed in columns 6 and 14.

5.71 Costs of hedging on the London Market

In each of the hypothetical situations hedging again involved a cost in terms of a reduction in average income for traders using a hedging rather than a non-hedging policy.

The costs of hedging forward sales of the three examples on the London market have been shown in Fig. 5.6. In each case the costs tended to increase as the length of the hedging periods increased. This was only slight for 64B tops (an increase of 0.62 pence per pound) but more pronounced for type 114 (an increase of 3.67 pence per pound) and "sale average" (an increase of 3.39 pence per pound). In each case the peak was reached at twenty four weeks. For all periods the costs were greatest for type 114 wool and smallest for 64B tops with the difference reaching 11.60 pence per pound for hedging periods covering twenty four weeks.

5.72 The reduction in Variance resulting from hedging on the London Market

The ratio of variances for hedged and unhedged forward sales of 64B tops, type 114 wool and "sale average" wool have been given in Fig. 5.7. The greatest reduction in variance occurred by hedging 64B

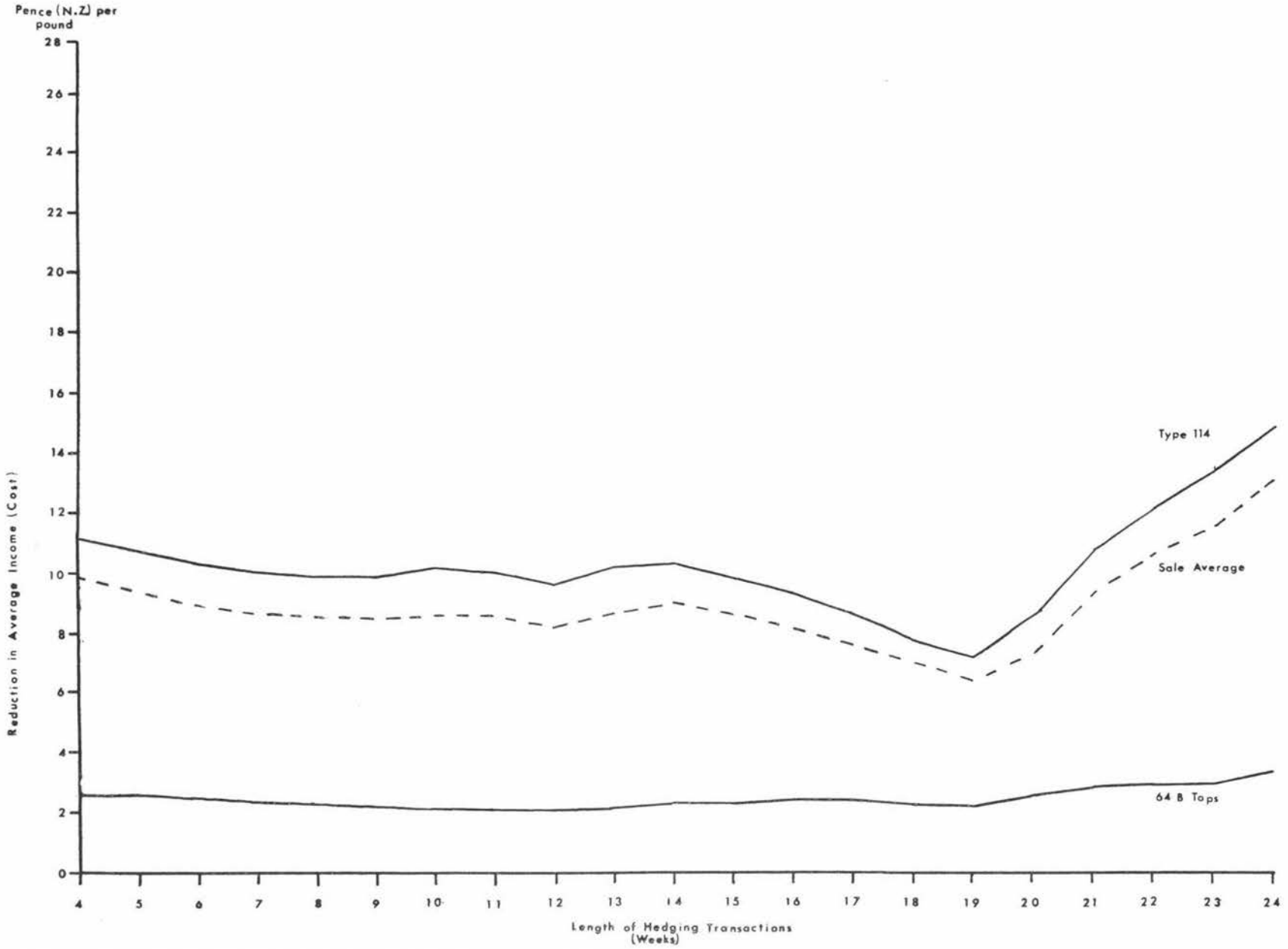

FIG. 5-6 LONDON: COST OF HEDGING FORWARD SALES OF 64 B TOPS, SALE AVERAGE AND TYPE 114, MAY 1960 TO FEBRUARY 1966

SOURCE: Data in Appendix D (Tables 5, 6 & 7)

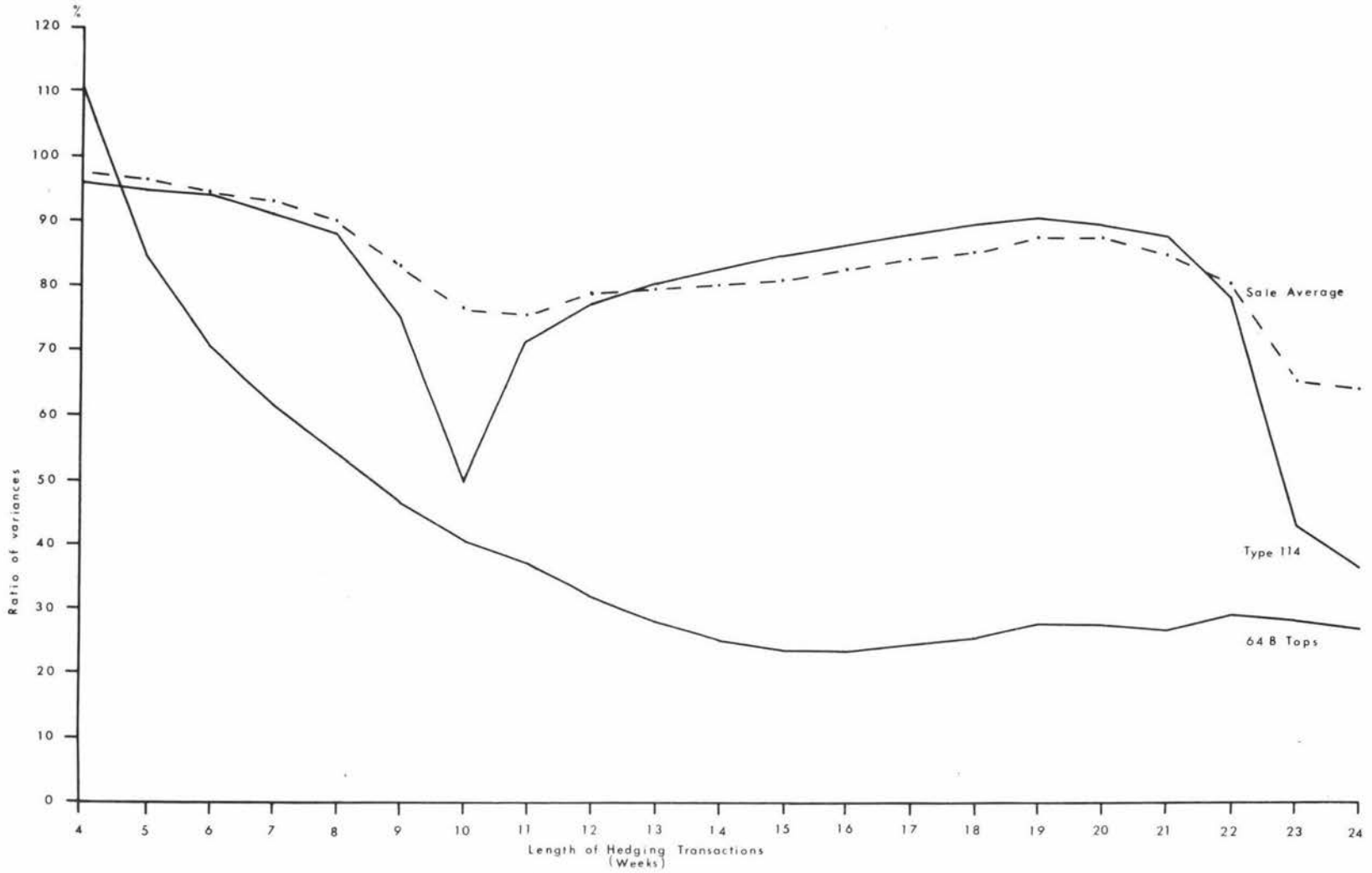

FIG. 5·7 LONDON: RATIO OF VARIANCES BETWEEN HEDGED AND UNHEDGED FORWARD SALES FOR DIFFERENT HEDGING PERIODS FROM MAY 1960 TO FEBRUARY 1966

SOURCE: Data in Appendix D (Tables 5, 6 & 7)

tops except for four week hedges. The reduction in variances for hedges using 64B tops increased as the length of the hedging increased until at twenty-four weeks hedging was removing over seventy per cent of the variability of profits. There was no regular pattern of variance reduction for the two crossbred wool types. However, in each case there was a larger reduction in variability with twenty-four week hedges than with four week hedges.

Once again the pattern for forward purchases was very similar to the pattern of forward sales.

5.73 The relationship between the costs of hedging and the reduction in Variances

In Fig. 5.8 the relationships which occurred between variance reduction and increases in costs for each of the hedging periods for type 114 wool and 64B tops have been plotted. Once again any point in C will be preferred to any point in A because the former represents both a reduction in variance and a smaller increase in average costs. The only "conflict" occurs between the three points in B and the points in C and the two points in D and the points in A. This is because it is possible to get a greater reduction in variability on occasions with crossbred wool (type 114) than for 64B tops. However, because these greater reductions in variances are achieved with a greater reduction in average incomes and they do not represent the same hedging periods, it is reasonable to conclude that "better" hedging was provided for traders using 64B tops than for traders using type 114 wool.

5.74 The difference between years in hedging protection provided by the London Exchange

The difference between seasons in the effectiveness of hedging 64B tops, type 114 wool, and "sale average" on the London market over

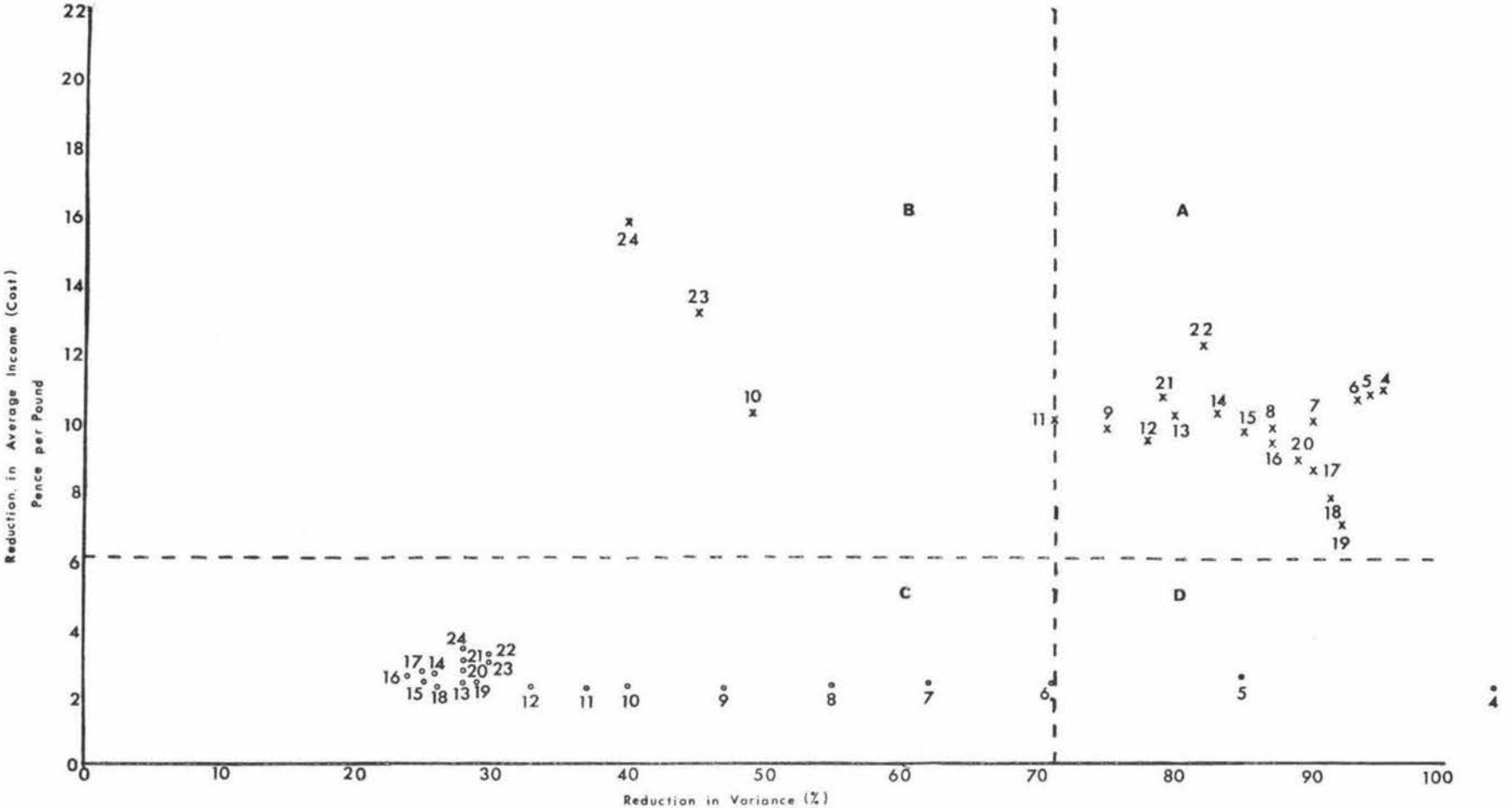

FIG. 5-8 LONDON: RELATIONSHIP BETWEEN VARIANCE AND INCOME – FOR HEDGED FORWARD SALES OF TYPE 114 AND 648 TOPS*

* x Type 114 o 648 Tops

SOURCE: Data in Appendix D (Tables 5&6)

periods of thirteen weeks have been given in Table 8 in Appendix D.

Table 8 follows the same pattern as Table 4 and shows the variability in the effectiveness of hedging on the London market which was hidden in the previous three tables.

The only "steady" pattern which was present over the seasons was found with the forward sales of "sale average" wool. With this hypothatical wool type there was a steady increase in the reduction in variance obtained by hedging. The costs of hedging varied considerably, however, ranging from a cost of 29.69 pence per pound to a cost of 3.61 pence per pound for hedging forward sales in 1962/63. The least variation in both costs and variance between seasons was found when hedging 64B tops, while the greatest variations were found with type 114 wool.

5.75 Summary of hedging protection afforded by the London Exchange

Under the assumptions of the hedging model a reasonably clear picture emerges regarding the type and extent of hedging protection which was afforded to the two hypothetical types of traders on the London Exchange.

The costs of hedging in terms of a reduction in average income were larger for crossbred wool (type 114 and "sale average") than for merino tops (64B tops) for each class of trader.

With forward selling the greatest reduction in variance occurred by hedging 64B tops for all hedging periods over five weeks. For hedgers using each of the three types of wool, the reduction in variance was larger over twenty-four weeks than over four weeks. In each case this pattern was similar for traders hedging forward purchases.

In all cases except five there was both a larger reduction in variance and a smaller reduction in average income associated with

hedging 64B tops rather than type 114 wool. The costs were always less for hedging 64B tops than type 114 wool. From this it may be concluded that better hedging was provided for traders using 64B tops than for traders using type 114 wool.

The pattern over the seasons in the effectiveness of hedging was very irregular. While there was a steady increase in the reduction of variance in the profits from forward sales of the hypothetical wool type "sale average", the others varied considerably.

5.8 A Comparison of the Hedging Protection provided by the London and Sydney Exchange

A comparison of the hedging protection provided by the London and Sydney Exchanges can be made at two levels. Firstly, we can compare their relative advantages in providing protection for traders concerned with their basis grades, and secondly, we can compare their relative advantages in providing protection for traders concerned with crossbred wools. The London contract is based on 64B tops and the Sydney contract is based on 64B wool (type 78).

Over the period studied the costs (in terms of a reduction in income) of hedging type 78 wool over various periods on the Sydney Exchange were always lower than the costs of hedging 64B tops on the London Exchange. On Sydney, the costs decreased, while on London costs increased, the hedging operations increased and over twenty-four weeks the costs on the London Exchange were seven times those on the Sydney Exchange (3.25 pence per pound as opposed to 0.46 pence per pound).

The ratio of variances showed a different pattern. The greatest reduction in variance occurred over eleven week hedges of forward sales on the Sydney Exchange (ratio twenty seven per cent). Generally the ratio tended to be around forty per cent. On the London Exchange, however, there was a steady decline in the ratio as the hedging period was increased from four to twenty four weeks when the ratio was twenty seven per cent.

While costs were generally higher on the London Exchange than the Sydney Exchange, this often resulted in a greater reduction in variability, thus it is not possible to state which of the two exchanges was the more effective in providing insurance for their basis grades. On the London Exchange the costs of hedging crossbred wools (type 114) were about double the costs on the Sydney Exchange. In each case costs followed a similar pattern to the costs of hedging the basis grades, except that they were at a higher level.
The reductions in variance tended to be very similar on each exchange for hedgers of forward sales of type 114 wool. This means that in terms of costs and reduction in variance the Sydney Exchange was more effective for traders concerned with crossbred wools than the London Exchange.

5.9 Limitations of the Results of the Hedging Model

The main limitations of the results of the hedging model lie in the simplifying assumptions. In practice a trader will not attempt to insure against price movements as such but will hedge in anticipation of countering certain expected absolute price movements. To this extent the model may have been improved by only measuring the effectiveness of

short hedging over periods of declining prices and long hedging over periods of rising prices. This, however, assumes that traders have accurate expectations regarding absolute price movements. If price movements are the result of new information, and hence random in nature, then it is unlikely that traders will be able to forecast these price movements, thus the model may be correct in measuring the effectiveness over both periods of rising and falling prices.

A more important limitation of the model is that it does not allow for changes in relative price movements. In practice traders will adjust their futures and stock positions in response to movements in the relative prices of each. In addition, traders will alter their futures commitments in response to relative movements in futures prices. In other words, if a distant futures becomes cheaper than the future held by the trader he will sell his original contracts and purchase the now cheaper alternative. Such flexibility of trading may mean that costs of hedging in terms of a reduction in average income may be far less for certain traders than was produced by the model.

Another factor not considered by the model is that when the effectiveness of hedging is studied during different periods of time it is found that hedging is most effective in periods of large cash price change (22). In periods of small cash price changes ineffective hedges may predominate. These are periods when risks are, of course, relatively low and hedging is less necessary as a protective measure. It has also been found (23) that the volume of hedging tends to increase as price variability increases. This means that the results of the model have probably been biased downwards.

Any model which utilises historical data is limited because the

results can only show what could have resulted using prices as they were. These prices may have been different had the postulated hedging actually taken place. For this reason the results should be interpreted as an approximation to what did happen for those traders who actually behaved in a similar fashion to the model, or alternatively, only be applicable to a small volume of additional hypothetical trading.

In conclusion, while the model may not be accurate in measuring the actual effectiveness of hedging on each of the exchanges, it still provides a reasonably accurate assessment of the relative effectiveness of hedging different wool types on different exchanges.

5.10 Actual Trading Experience on the Sydney Market

Hypothetical trading models are only approximations of actual trading patterns and for this reason it is valuable to study the results of traders operating in the market.

Gray (21) has provided evidence of one firm's trading pattern on the Sydney Exchange for the 1964/65 season. While other firms will have operated with a greater or lesser degree of success, this example still provides a valuable insight into the effectiveness of hedging on the Sydney market.

The firm studied followed Working's concept of hedging trading (9) in that it concentrated on predicting relative changes in the relationship between cash and futures prices rather than on the absolute level of prices. However, on three occasions the firm was sufficiently confident of absolute movements (in this case a price decline) that it chose to speculate on this prospect rather than hedge.

Ninety one out of the ninety nine transactions[10] were chosen as being representative of the firm's normal hedging principles.[11] These transactions covered a wide range of wool types and averaged about two hundred and fifty bales per sale. Sixty three, or about two-thirds of the transactions, were concluded after wool prices had declined, the remaining twenty eight were concluded after wool prices had risen. The actual purchase of wool to fill the order, on the other hand, was transacted at a lower price than the contract price sixty five times and at a higher price twenty six times.

The average margin of all the forward sales was +2.3 pence per pound, whereas the average margin on all the futures purchased was -0.8 pence per pound. Since the net margin was +1.5 pence per pound, it might appear that the firm would be better off not hedging its forward sales. However, because of the high inverse correlation ($r = -0.82$) between forward trading results and futures trading results, the firm was able to achieve considerable reduction in the variance of its net profits from hedged transactions as compared with the same transactions unhedged. The range of net profits was reduced from -6.31 to +15.39 pence per pound to from -6.7 to +9.51 pence per pound by hedging. As well as this, the hedged results were clustered much closer around the average or mean value than the unhedged forward trading results. This is shown by the standard deviations[12] which were 4.2 and 2.6 respectively.

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10. These transactions consisted of a forward sale of wool and a corresponding purchase of an equivalent quantity of futures.

11. The remaining eight transactions were excluded because they were considered atypical. However, they resulted in a net profit to the firm.

12. If the results are normally distributed, then 64.3% of the results will lie within one standard deviation either side of the mean.

From these trading patterns it appears that the firm in question prefers slightly lower net profits in return for a reduction in the variability of its profits. The firm now is willing to increase its arbitrary limit which it had imposed upon its volume of forward sales in the light of hedging experience. The additional volume of business which can be done on a hedged basis more than compensates, in their judgement, for the lower margins per pound.

In summary it appears that a firm which is following normal hedging practice, and which is evidently skilful in judging price relationships, has employed a hedging programme through a year of diversity with rather marked success.

5.11 The Opinions of Members of the Wool Trade Regarding the Effectiveness of Existing Futures Trading

In an interview survey (Survey B) which covered both users and non-users of present futures markets respondents (in New Zealand) were asked whether their business was such as to warrant futures protection. The results of this survey have been presented in Table 5.1

Five firms stated that their business required regular futures protection while eight firms stated that they only require occasional protection. Four of the firms who required protection were using existing futures markets and the remaining firm had found the available futures protection too costly. Of the eight who required occasional protection only four were using existing markets. Two of the remainder had found existing markets too costly and two lacked information regarding futures trading.

Of the eight firms using existing futures markets, six were

TABLE 5.1

WOOL BUYERS SURVEY

NUMBER OF FIRMS WHOSE BUSINESS WARRANTED FUTURES PROTECTION			
REGULARLY	OCCASIONALLY	NEVER	NO COMMENT
5	8	3	4

FIRMS USING EXISTING MARKETS	
YES	NO
8	5

MARKETS USED		REASONS FOR NOT USING EXISTING FUTURES MARKETS		
SYDNEY	SYDNEY & LONDON	LACK INFORMATION	NOT APPLICABLE	TOO COSTLY
6	2	7	2	3

OBTAINING ADEQUATE PROTECTION	
YES	NO
6	2

using Sydney and two were using both Sydney and London. The two latter firms were overseas based whose trading was handled by head office. Six of the traders using futures markets considered that they were obtaining adequate protection. However, other firms were dissatisfied to the extent of not trading in futures. The main reason for not using futures, however, was lack of information.

In discussions with woollen processors in New Zealand (Survey C) it was found that only one firm considered futures trading essential to its business, and this firm was using the Sydney market. The reason for lack of use of futures by other respondents was lack of understanding of futures trading. One respondent stated that the main reason for the firm's declining profits was the variability of wool prices and yet the respondent did not consider futures trading applicable to their type of business.

5.12 Summary

Hedging on a futures market enables traders to obtain a degree of "insurance" in terms of reduced variability of profits and the opportunity to benefit from expected price movements. As producers, handlers and processors become more sophisticated in their business activities, then the more emphasis they are likely to place on profit stabilisation and hence the more likely they are to use futures markets.

It is difficult to measure the success of a futures market in terms of its success in providing insurance for traders. However, the model used in this study was able to show that both the London and Sydney markets are less effective in this respect for crossbred wools than for the commodities they are designed for. This means that there would probably be advantages in establishing a separate crossbred

futures contract.

The criteria in deciding whether a market should be established should be whether or not the New Zealand wool trade would gain from such an action. In surveys conducted on a small cross-section of the wool trade in New Zealand, it was found that there was a degree of dissatisfaction with present hedging facilities and that traders generally would prefer a separate crossbred contract.

CHAPTER 6

THE EFFECTS OF FUTURES MARKETS ON PRICE STABILITY

6.1 Introduction

There are two ways a futures market may affect the variability of traders incomes. Firstly, they provide a means whereby individual traders may obtain "insurance" against expected adverse price movements and secondly, they may cause greater overall stability in the cash market. The first aspect was dealt with in Chapter 5. This chapter deals with the effect a futures market may have on the stability of prices in the cash market.

The Chapter is divided into three main sections. The first deals with the extent of wool price fluctuations and compares these with the fluctuations experienced in the prices of other fibres. The second section examines the attitudes of members of the wool trade towards fluctuating prices. The final section considers the effects futures markets have on price stability and compares a futures market with a reserve price scheme. The chapter concludes with a summary of the need for a futures market as a method of stabilising crossbred wool prices.

6.2 The Extent of Wool Price Fluctuations

The data used in determining the extent of price fluctuations has not been obtained from independent observations, but from historical records that have been collected at regular intervals in time. Such data are known as time series. The analysis offered in this chapter

assumes that the series can be decomposed into four basic parts, namely trend, cyclical, seasonal and irregular movements.

Trend refers to the general and persistent movements in a time series. It measures change in the variable per unit time. A trend may be positive or negative, linear or curvilinear. Although the rate of change in the trend may vary, or even the direction may change, these changes usually follow a gradual and smooth pattern.

Cycles are very difficult to define as each cycle is a unique historical phenonemon and may differ to a greater or lesser degree from any other cycle in duration, amplitude and causation. Accordingly, the information contained in past cycles may have very little relevance in the future.

Seasonal fluctuations follow a pattern of regular recurrence over time. The word "seasonal" refers to a daily, weekly or monthly pattern. The only requirement is that the period of the seasonal fluctuation be contained within a year, and the observed pattern be repetitive. Climate is often the chief cause of seasonal patterns.

Irregular movements are the movements caused by numerous erratic and temporary factors. It is these irregular movements which are often referred to as unwarranted price fluctuations.

To allow "efficient" allocation of resources, prices should reflect adjustments to long term supply and demand conditions. Prices may also move above or below the trend line because of short term changes in supply and/or demand conditions. The concern is, however, that prices fluctuate much more widely around the trend than such changes warrant because of inaccurate expectations regarding future conditions.

This chapter will look at the extent of the price fluctuations which have occurred in the wool market, but will not consider the reasons for these fluctuations.[1]

6.21 Cycle-trend movements which have occurred in crossbred wool prices

Wool prices may follow a trend resulting from long term relative changes in the supply and demand for wool. As well as this prices may follow cyclical movements around the trend caused by the business cycle or other effects.

To analyse these effects would require a time series model. One of the simplest and most commonly used time series models is known as the multiplicative model (26) e.g.

$$Y = T.C.S.I.$$

Where:

Y = value of the original series

T = value of the trend

C = value of the cycle

S = value of the seasonal component

I = value of the irregular component

The method of analysis is to de-seasonalize the data and then take a moving average of the remaining series. This moving average will contain the trend, cycle and irregular components. The irregular component can then be removed by taking a moving average of the remaining data. The trend is then fitted by least squares and the final residual deviations about the trend give an estimate of the cyclical components.

1. For a review of the causes of instability in wool prices see Yap's thesis (25).

The longer the time interval taken for the moving average the greater the dampening down of the cycle effects. For this reason it is usual to treat the trend and the cycle effects together. This has been done in Table 6.1 which gives a five year moving average of the seasonal average prices of all greasy wool sold at auction in New Zealand from 1940/41 to 1966/67. Because this table deals in averages it only gives a very rough idea of the trend-cycle effects for New Zealand wool prices.

6.22 Seasonal fluctuations

Most primary products experience fluctuations in price due to an inbalance between supply and demand caused by the seasonal nature of production.

It has been customary to illustrate these movements by graphing them over selected periods.[2] While such graphs appear to show seasonal movements in wool prices, in actual fact reliably consistent patterns can only be shown accurately using mathematical analysis. One method is to measure the autocorrelation and power spectrum which exist over different time periods.

If a seasonal pattern does exist this will be shown by something aperiodic in the autocorrelation figures as well as a high power spectrum[3] for the same period.

This method was used employing the formula given in Appendix E and using the average prices received for all type 114 wool sold at auction in New Zealand over four weeks by periods starting with the thirtieth week in the year and finishing with the twenty third week in

2. See (27) pp. 25 - 27 for a recent example.
3. For an explanation of power spectra see (29) pp. 27 - 35.

TABLE 6.1

AVERAGE PRICES OF GREASY WOOL SOLD AT AUCTION IN N.Z.
SEASONS 1940/41 to 1966/67

Season	Pence per lb greasy	Differences between seasons (In pence)	Five year moving average
1940/41	12.22		
1941/42	12.24	+0.02	
1942/43	12.25	+0.01	12.92
1943/44	13.95	+1.70	13.28
1944/45	13.97	+0.02	13.61
1945/46	13.98	-0.01	14.75
1946/47	17.96	+4.08	16.98
1947/48	25.11	+7.15	19.35
1948/49	25.81	+0.70	24.15
1949/50	37.98	+12.17	38.94
1950/51	87.84	+49.86	43.39
1951/52	40.19	-47.68	47.60
1952/53	46.19	+6.00	52.49
1953/54	50.25	+4.06	54.83
1954/55	49.67	-0.58	46.50
1955/56	46.19	-3.48	49.41
1956/57	54.76	+8.57	48.41
1957/58	41.16	-13.60	45.57
1958/59	36.07	-5.09	44.57
1959/60	44.65	+8.58	43.40
1960/61	40.34	-4.31	40.26
1961/62	39.18	-1.16	40.62
1962/63	42.84	+3.66	44.42
1963/64	55.07	+12.23	43.91
1964/65	42.14	-12.93	44.17
1965/66	41.62	-0.52	43.39
1966/67	35.26	-6.36	

Source: Wool Commission Reports.

the following year. This means that only twelve four weekly periods were taken and the period from the twenty fourth week to the thirtieth week was ignored each year. This period was typically without sales so this "shortening" of the year would not affect any seasonal patterns.

When there was no type 114 wool sold during a four weekly period the average price in the previous period was used. This should not affect the results as it is reasonable to assume that if wool was, in fact, sold privately during this period it would be sold with regard to prices received in the previous period.

The period covered was from the thirtieth week in 1952 to the twenty third week in 1965. The data used has also been shown in Appendix E. The autocorrelation figures which were obtained have been given in Table 6.2.

The theoretical range of values is from +1 to -1. An autocorrelation of +1 would mean that prices move in exact proportion, zero would mean that there was absolutely no connection between price movements, and -1 would mean that the two movements were in the opposite direction.

The figures show that while prices received in any one month are likely to be similar to those received in the previous month (.929), there is no guarantee that they will be similar to those received twelve months ago (-.090).

Because there is nothing aperiodic in these figures[4] we can say that there were no regular seasonal movements in the prices for type 114 wool sold at auction over the period from 1952 to 1965.

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4. A variation of ±.2 would be classed as aperiodic.

TABLE 6.2

AUTOCORRELATION FIGURES FOR
TYPE 114 WOOL 1952 - 1965

Months	Autocorrelation
1	.929
2	.852
3	.773
4	.684
5	.577
6	.487
7	.382
8	.278
9	.186
10	.104
11	.004
12	-.090

TABLE 6.3

POWER SPECTRUM FIGURES FOR
TYPE 114 WOOL 1952 - 1965

Months	Power
2	19.21644759
3	18.59291068
4	17.61724723
5	25.52371221
6	17.39063372
7	28.82026104
8	33.00678621
9	26.46070995
11	14.02737682
12	15.24624574

The power spectrum results emphasised this point also[5] as all figures were relatively low (see Table 6.3, page 88). From these figures and the fact that price movements in different crossbred types tend to be highly correlated (see Section 6.234), it would be safe to conclude that there have been no regular seasonal movements in crossbred wool prices during the survey period[6] and that any fluctuations around the long term movements have probably been random in nature.

6.23 Irregular movements in wool prices

6.231 Fluctuations between seasons

As shown in Table 6.1 (page 86) there has been a tendency for the New Zealand average sale prices to fluctuate markedly between seasons. Of more interest to the individual grower, however, are the fluctuations between seasonal average prices at a particular selling centre. These have been shown in Table 6.4 which gives the centre average selling prices from 1952/53 to 1964/65 inclusive. Taking the differences in pence per pound in prices received between seasons at each selling centre from 1952/53 - 1953/54 to 1963/64 - 1964/65 as are shown in Table 6.5 (page 91) we can see that there have been some variations in the differences for each individual centre.

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5. It is hard to put an exact figure on what the variation in power spectrum results would need to be to provide a significant variation. However, in practice any pattern will normally give a figure about ten times as large as the others.

6. There are other tests which may be applied to time series data which will isolate trends which have occurred for short periods (28). However, time and computer facilities did not enable these to be conducted.

TABLE 6.4

CENTRE AVERAGE SELLING PRICES
(In pence per pound greasy at auction)

Season	Auckland	Napier	Wanganui	Wellington	Christ-church	Timaru	Dunedin	Invercar-gill
1952/53	44.35	44.23	43.99	45.38	49.16	47.99	49.59	47.37
1953/54	47.21	49.22	46.98	48.69	55.12	51.56	54.55	50.22
1954/55	47.09	48.41	45.52	49.62	52.60	51.40	51.77	51.38
1955/56	44.21	46.12	44.88	49.95	46.96	46.56	46.59	47.39
1956/57	51.91	53.65	51.72	54.58	57.73	56.00	56.34	57.24
1957/58	37.44	40.92	38.10	40.41	45.56	42.35	45.10	39.97
1958/59	34.44	35.78	33.79	36.41	37.69	34.78	37.97	37.19
1959/60	43.53	45.18	42.73	45.15	44.20	45.23	45.59	44.88
1960/61	38.26	40.55	39.25	40.94	41.38	40.50	41.08	41.19
1961/62	37.14	38.54	37.29	39.31	40.95	40.20	41.01	39.49
1962/63	42.97	42.80	41.55	43.03	44.11	42.77	43.14	41.93
1963/64	51.67	54.45	53.83	56.50	57.10	56.35	56.03	56.07
1964/65	40.11	41.47	39.74	41.79	43.44	43.54	45.80	42.14
Ten year average	42.17	43.95	42.39	44.51	45.91	44.83	45.87	44.75

Source: Table 2, page 2, Wool Price Fluctuations (29).

TABLE 6.5

DIFFERENCES IN PENCE PER POUND IN PRICES RECEIVED BETWEEN SEASONS AT EACH SELLING CENTRE

Season	Auckland	Napier	Wanganui	Wellington	Christ-church	Timaru	Dunedin	Invercar-gill
1952/53-1953/54	+2.86	+4.99	+2.99	+3.31	+5.96	+3.57	+5.24	+2.85
1953/54-1954/55	-0.12	-0.81	-0.46	+0.93	-2.52	-0.16	-2.78	+1.16
1954/55-1955/56	-2.88	-2.29	-1.64	-2.67	-5.64	-4.84	-5.18	-3.99
1955/56-1956/57	+7.70	+7.53	+6.84	+7.63	+10.77	+9.44	+9.75	+9.85
1956/57-1957/58	-14.47	-12.73	-13.62	-14.17	-12.17	-13.65	-11.24	-17.27
1957/58-1958/59	-3.00	-5.14	-4.31	-4.00	-7.87	-7.57	-7.13	-2.78
1958/59-1959/60	+9.00	+9.40	+9.94	+8.74	+6.51	+10.45	+7.62	+7.69
1959/60-1960/61	-5.27	-4.63	-4.48	-4.21	-2.82	-4.73	-4.51	-3.69
1960/61-1961/62	-1.12	-2.01	-1.96	-0.43	-0.43	-0.30	-0.07	-1.70
1961/62-1962/63	+5.83	+4.26	+4.26	+3.72	+3.16	+2.57	+2.13	+2.44
1962/63-1963/64	+9.70	+11.65	+12.28	+13.47	+12.99	+13.58	+12.89	+14.14
1963/64-1964/65	-11.56	-12.98	-14.09	-14.71	-13.66	-12.81	-12.23	-13.93
Ten year average	6.67	7.03	7.18	7.11	7.04	7.51	6.76	7.35

Source: **Table 1**, page 2, Wool Price Fluctuations (29).

6.232 Within season fluctuations

Fluctuations in the average price paid for wool at different selling centres are mainly explained by the different wool types being offered and the stage of the selling season at which the sale occurs. There are, however, "unexplained" fluctuations caused by neither of these two factors.

The average price paid for greasy wool sold at each selling centre in the 1963/64 season has been listed in Table 6.6, page 93. The largest variation was a difference of 5.43 pence per pound between the seasonal average prices at Auckland and Invercargill. The significance of these variations was noted in the Wool Marketing Study Group Report which stated that,

> "...there are considerable disparities in price received within each centre for similar periods (say first to third main sales). Even when the other centres offerings are substantially similar price fluctuations are still quite marked."7/

6.233 Within sale fluctuations

Table 6.7, page 94, shows the standard deviation of prices paid for individual lots during the 1964/65 season of the same type in the same day together with the seasonal average price for each type. The data used were type and price data for all lots at different sales over the entire selling season. While in some cases as much as fifty three per cent of the variation could be explained by yield differences, in general only about twenty per cent was explained by this factor and in one case it accounted for as little as nine per cent.

There are many other factors such as wool presentation, the presence of fault or discolouration which help to cause variations in

7. See (29) p.3.

TABLE 6.6

AVERAGE PRICES FOR GREASY WOOL AT EACH SELLING CENTRE
1963/64 SEASON

Sales	Average Prices (In pence per lb. greasy)							
	Auck.	Nap.	Wang.	Wgtn.	Ch'Ch.	Tim.	Dun.	Inv.
Winter sale	46.40	43.62	42.14	44.69	46.63	47.91	47.49	43.84
Main sales								
First	58.01	57.50	59.00	61.13	55.67	57.65	53.65	54.75
Second	52.82	55.68	55.64	58.27	60.50	59.35	61.44	59.24
Third	56.76	57.28	53.96	58.18	61.81	56.36	59.60	58.06
Fourth	53.28	54.64	45.46	55.12	50.56	-	60.04	58.85
Fifth	42.06	46.18	-	45.93	-	-	45.62	49.58
Sixth	46.07	-	-	-	-	-	-	-
Season Average	51.67	54.45	53.83	56.50	57.10	56.35	56.03	56.07

Source: Adapted from Table 4, page 3, Wool Price Fluctuations (29).

TABLE 6.7

STANDARD DEVIATION OF PRICES PAID FOR INDIVIDUAL LOTS OF THE SAME TYPE IN THE SAME DAY TOGETHER WITH THE SEASONAL AVERAGE FOR EACH TYPE

Quality No.	Grade	Average price for season (cents/lb.)	Standard Deviation of Lot prices	Percentage Variance explained by Yield Diffs. (%)
	B	44.6	1.6	16
52's	B/C	41.5	1.5	9
	C	39.6	1.8	22
	B	43.1	1.4	18
50's	B/C	40.6	1.4	16
	C	39.0	1.6	23
	B	41.0	1.3	22
48/50's	B/C	38.5	1.3	24
	C	37.1	1.5	37
	B	41.5	1.1	21
46/50's	B/C	37.7	1.0	27
	C	36.2	1.2	45
	B	39.0	1.1	23
46/48's	B/C	36.7	1.1	30
	C	35.2	1.5	48
	B	38.7	1.2	22
46's	B/C	36.5	1.1	32
	C	35.4	1.5	53
	B	39.0	1.0	11
44/46's	B/C	36.7	1.1	26
	C	35.2	1.4	46

Source: Table 5, page 5, Wool Marketing Study Group Final Report (33).

the prices paid for wool of the same quality number and grading. Unfortunately, no attempt was made by the Study Group to analyse these influences.

6.234 Fluctuations in the Margins between wool types

A study conducted by the Wool Marketing Study Group (30) measured the spread in the average sale prices between seven wool types (Table 6.8) from 1952/53 to 1964/65. The greatest average spread occurred between Types 86 and 506. These types represent very different wool as the former is a finer wool (56's quality) and the latter refers to Bulky Pieces.[8] The greatest variation in margin (difference between maximum and minimum margins) occurred with Types 86 and 100. This is unusual because both types are in the finer quality range.[9]

A better indication of the variability of margins is shown in Table 6.9. This table shows the number of weeks when the average sale differential was less than a penny, a penny to twopence, twopence to threepence and more than threepence away from the seasonal average margin for the 1952/53 to 1964/65 seasons inclusive.

Of more importance when comparing relative price movements is the correlation between them. Table 6.10 lists the correlation coefficients between weekly average prices of nine wool types. In all cases the correlation coefficient was positive and very close to unity which means that all the types shown tended to move in step with each other.

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8. Pieces refer to the wool removed from the fleece during skirting.

9. A quality number is an arbitrary number which refers to the fineness of the wool.

TABLE 6.8

SPREAD IN AVERAGE SALE PRICES AMONGST SELECTED WOOL TYPES+
1952/53 to 1964/65

Price of Type		Less Price of Type						
		100	107	114	128	506	E695	730
86	min.	-.6	.9	1.4	1.9	5.7	4.0	3.8
	av.	4.8	6.0	6.7	7.1	9.7	7.9	8.4
	max.	15.5	16.0	17.0	17.0	13.9	15.5	13.5
100	min.		-.5	0	6.3	-4.5	1.4	1.5
	av.		1.3	1.9	2.5	2.3	4.9	5.3
	max.		3.7	5.0	6.0	7.5	11.0	13.8
107	min.			-.3	-1.0	-5.0	.3	.5
	av.			.7	1.2	1.6	3.2	3.4
	max.			2.7	3.5	7.5	10.5	12.6
114	min.				-1.8	-6.0	-.8	-.5
	av.				.5	.8	2.6	2.8
	max.				2.3	7.0	9.2	12.4
128	min.					-6.0	-.7	-1.3
	av.					.5	2.0	2.0
	max.					7.0	9.5	12.1
E695	min.							-7.5
	av.							0
	max.							6.7

+ Wool Commission Type 506 was not offered at the same sale as E695 and 739.

Source: Table 1, page 5, Fluctuations in the price of New Zealand Wool 1952-1965, (30).

TABLE 6.9

PROPORTION OF SALES WHEN WEEKLY AVERAGE MARGIN WAS LESS THAN A PENNY, TWOPENCE, OR THREEPENCE AWAY FROM SEASONAL AVERAGE MARGIN * (1952/53 to 1964/65)

Margin between Types		Proportion Relative to Type (percentage)						
Type	Margin	100	107	114	128	506	E695	739
86	0 ± 1.0d	50.8	37.5	34.4	35.5	63.8	29.4	62.3
	± 1.1d to ± 2.0d	26.6	39.1	39.8	38.8	31.9	36.8	25.8
	± 2.1d to ± 3.0d	13.3	13.3	15.6	17.4	0	25.0	12.9
	greater ± 3.1d	9.4	10.2	10.2	8.3	4.3	3.8	0
100	0 ± 1.0d		93.2	85.8	78.2	53.2	55.1	50.0
	± 1.1d to ± 2.0d		5.9	11.8	23.5	27.7	30.1	30.7
	± 2.1d to ± 3.0d		.9	2.4	3.4	12.8	10.8	14.0
	greater ± 3.1d		0	0	.9	6.4	4.0	5.3
107	0 ± 1.0d			99.4	93.6	48.9	66.7	16.4
	± 1.1d to ± 2.0d			.3	6.1	31.9	26.6	22.8
	± 2.1d to ± 3.0d			.3	.3	8.5	3.4	13.2
	greater ± 3.1d			0	0	10.6	3.4	2.6
114	0 ± 1.0d				97.6	44.7	64.6	65.2
	± 1.1d to ± 2.0d				2.4	31.9	29.4	22.6
	± 2.1d to ± 3.0d				0	12.8	4.1	9.6
	greater ± 3.1d				0	10.6	2.1	2.6
128	0 ± 1.0d					55.6	67.4	65.2
	± 1.1d to ± 2.0d					22.2	25.7	23.5
	± 2.1d to ± 3.0d					8.9	4.6	8.7
	greater ± 3.1d					13.3	2.3	2.6
E695	0 ± 1.0d							60.9
	± 1.1d to ± 2.0d							31.0
	± 2.1d to ± 3.0d							3.6
	greater ± 3.1d9							4.5

* Wool Commission Type 506 was not offered at the same sale as E695 and 739.

Source: Table 3, page 6, Fluctuations in the price of New Zealand Wool 1952-1965, (30).

TABLE 6.10

CORRELATIONS BETWEEN WEEKLY AVERAGE PRICES OF SELECTED WOOL TYPES + 1952/53 to 1964/65

Correlation of Wool Type	With Wool Type							
	160	107	114	128	506	E695	739	Sale Av.
86	.901	.907	.899	.900	.957	.952	.968	.888
100		.991	.989	.980	.871	.972	.953	.860
107			.998	.995	.843	.976	.953	.885
114				.997	.833	.976	.957	.871
128					.832	.973	.953	.894
506						-	-	.916
E695							.957	.925
739								.944

+ Wool Commission Type 506 was not offered at the same sales as E695 and 739.

Source: Table 7, page 12, Fluctuations in the price of New Zealand wool 1952-1965, (30).

6.3 Fluctuations between the Prices Paid at Different Stages of Manufacture

Fluctuations between the prices paid at different stages of manufacture do not directly affect wool growers but are of importance to tops and yarn manufacturers.

The spread in weekly prices for New Zealand sale average wool, London spot futures, tops and yarn from 1952/53 to 1964/65 have been shown in Table 6.11. The largest average spread was between 50's yarn and wool, being 68.6 and the largest variation in spread (difference between maximum and minimum values) occurred between 50's yarn and spot futures where the difference was 73.0.

A further and perhaps better measure of the way the prices tended to move together is provided by the correlation coefficient.[10] The correlation coefficients between New Zealand average sale price, London spot futures, 64B, 56's and 50's tops and 50's yarn are given in Table 6.12, page 101. These correlation coefficients have been calculated on the basis of weekly quotations from the week ending August 28th, 1953, to the week ending July 4th, 1964 (31). This table gives the total correlation (i.e., using all observations) of the weekly average prices. The highest correlation occurred between

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10. If prices move together perfectly (so that they always move up or down in the same proportion), then the correlation coefficient is 1. If they move perfectly in opposite directions (so that one price moves up in exact proportion to the amount the other moves down), then the correlation coefficient is -1. If the two prices move entirely independently (so that knowing one price is up tells you nothing about whether the other price will be up or down), then the correlation coefficient is 0.

    If the correlation coefficient between two prices is positive, this means the two prices tend to move in the same direction. If the correlation coefficient is negative, this means the two prices tend to move in opposite directions.

TABLE 6.11

SPREAD IN WEEKLY PRICES FOR WOOL, FUTURES, TOPS AND YARN
1952/53 to 1964/65

Price Of		Less Price Of				
		Wool	Futures	Tops 64B	Tops 56's	Tops 50's
Futures	min.	46.4				
	av.	68.1				
	max.	108.6				
Tops 64B	min.	53.4	-7.0			
	av.	75.6	5.3			
	max.	124.1	13.0			
Tops 56's	min.	33.4	-67.0	-77.0		
	av.	43.2	-25.2	-33.4		
	max.	61.4	-8.0	-16.0		
Tops 50's	min.	22.9	-75.0	-88.0	-15.0	
	av.	36.6	-31.7	-40.1	-6.7	
	max.	48.6	-11.0	-19.0	-1.0	
Yarn 50's	min.	48.4	-49.0	-63.0	8.0	19.0
	av.	68.6	.6	-8.8	24.6	31.3
	max.	89.4	24.0	16.0	35.0	42.0

Source: Table 1, page 4. Price Movements of New Zealand Wools and Related Futures, Tops and Yarn Prices 1952-1965, (31).

TABLE 6.12

CORRELATIONS BETWEEN WEEKLY AVERAGE PRICES OF WOOL, FUTURES, TOPS AND YARN 1952/53 to 1963/64

Correlation of	With				
	Futures	64B	Tops 56's	50's	Yarn
Wool	.702	.605	.828	.854	.617
Futures		.987	.782	.682	.307
Tops 64B			.743	.605	.216
Tops 56's				.948	.726
Tops 50's					.816

Source: Table 9, page 16. Price Movements of New Zealand Wools and Related Futures, Tops and Yarn Prices 1952-1965, (31).

the price of London futures and 64B tops. Since the futures contract represents a promise to deliver 64B tops, this correlation should be high. Other reasonably high correlations occurred between New Zealand average sale price and 50's and 56's tops, between 50's and 56's tops and between 50's yarn and 50's tops.

6.4 Summary of Wool Price Fluctuations

From the previous sections it may be concluded that the within season fluctuations in the prices received for crossbred wool types have been largely irregular and that at times these fluctuations have been considerable.

It has also been shown that prices for similar wool types have tended to move in sympathy with each other. This has been illustrated in Figure 6.1 which not only shows the correlation coefficients which occurred between various wool types and the New Zealand average sale price, but also those between various stages of manufacture.

The general price movements for the New Zealand average sale price, London spot futures, 64B tops and 50's yarn prices have also been graphed in Figure 6.2 for the years 1952 to 1965 inclusive.

6.5 Wool Price Fluctuations Compared with Fluctuations in the Prices of Other Fibres

Of interest to knitters and weavers is the difference in price fluctuations which occur between certain fibres.

If we take the quoted prices for fibres in the United Kingdom from 1955/56 to 1966/67 inclusive, we can show the different percentage fluctuations for each fibre during that period (32). The results have been listed in Table 6.13. The "natural" fibres (especially wool and

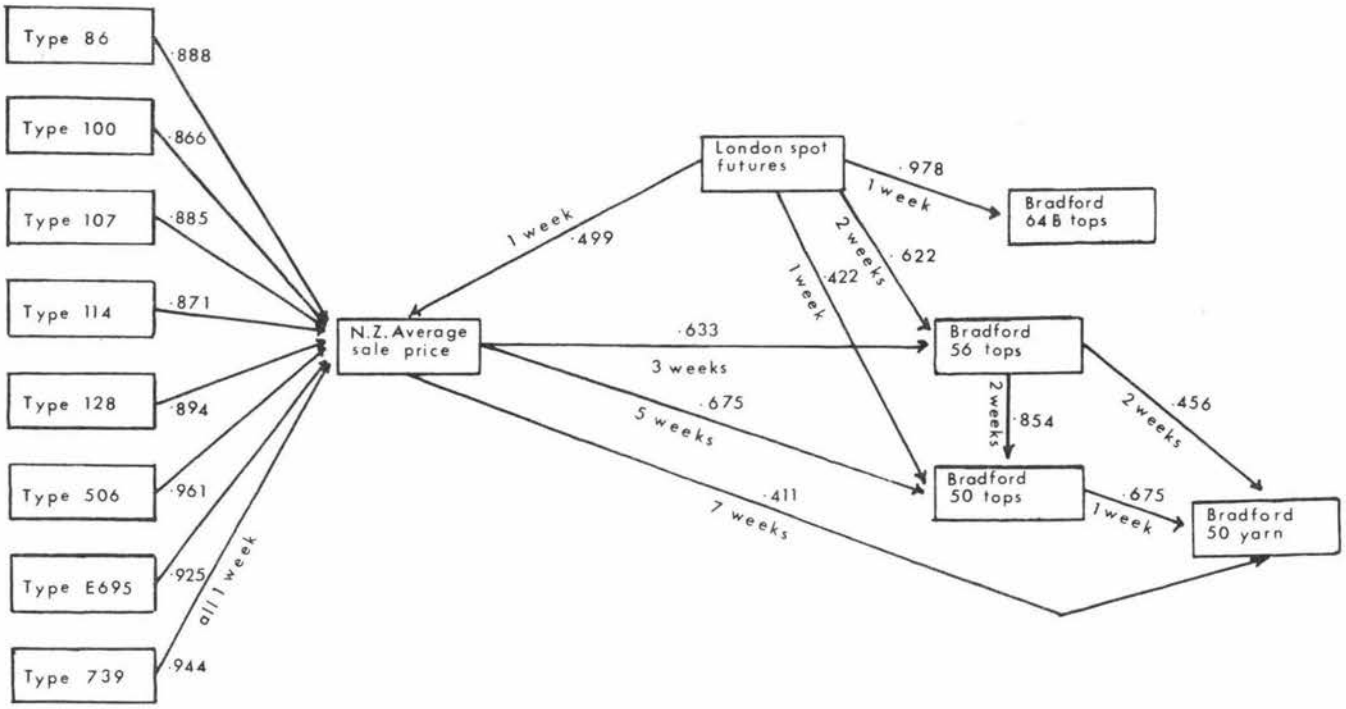

FIG. 6·1 SIMPLIFIED REPRESENTATION OF RELATIONSHIPS BETWEEN WOOL, FUTURES, TOPS AND YARN PRICES.

SOURCE: Price movements of New Zealand wools and related futures, tops and yarn prices (31)

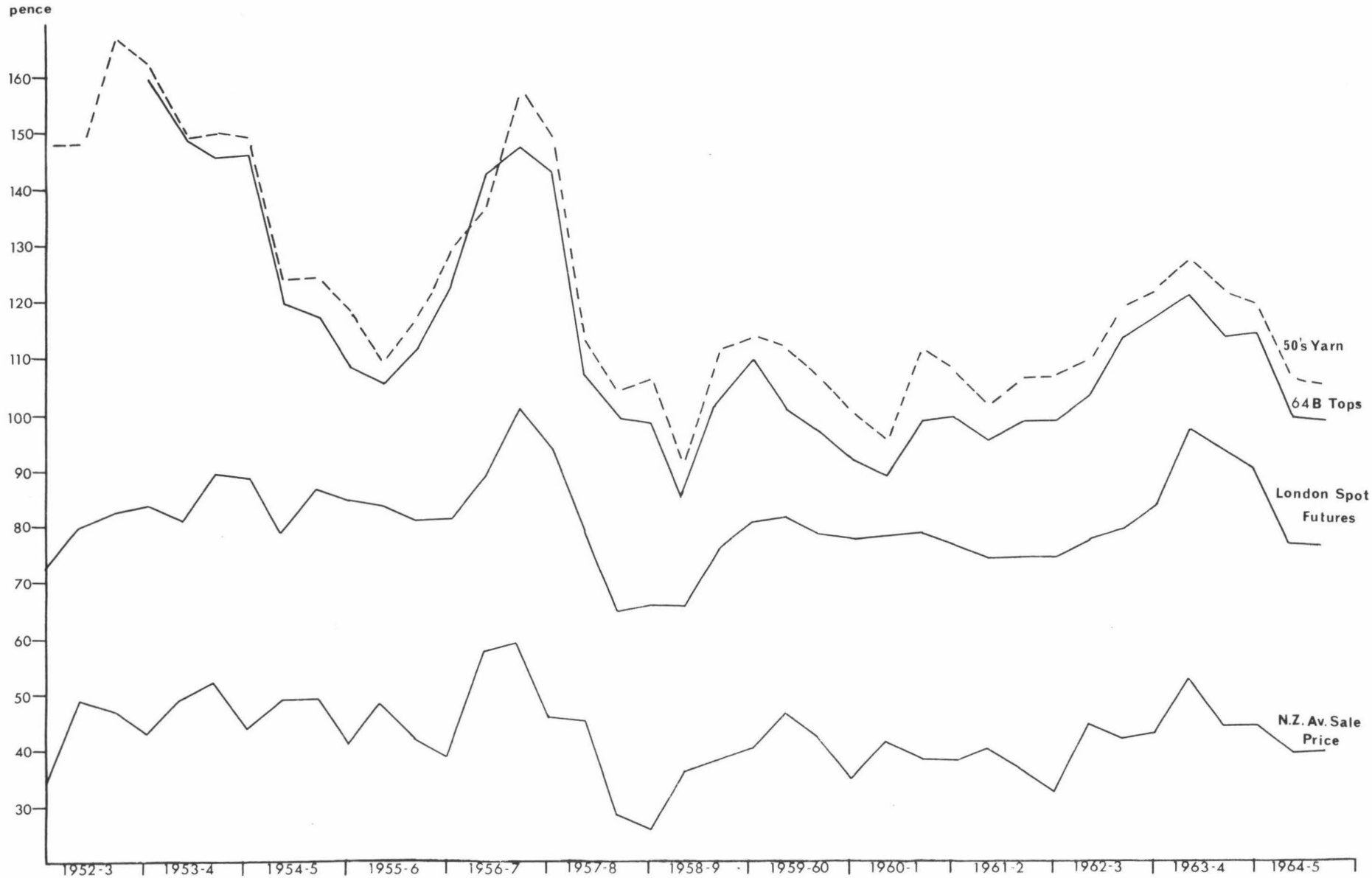

FIG. 6·2 GENERAL MOVEMENTS IN PRICES OF WOOL, FUTURES, YARN AND TOPS. 1952-3 to 1964-5

SOURCE; Fig. 1 Price movements of New Zealand wools and related futures, tops and yarn prices (31).

TABLE 6.13

FLUCTUATIONS IN FIBRE PRICES

N.Z. Auction	Representative of Fibres Quoted in Gt. Britain						
Period	N.Z. Wool	Jute	Cotton	Rayon + (percentage)	Nylon +	Acrylic +	Polyester +
1955/56 to 1959/60	17.3	15.7	8.0	1.0	-	0.8	-
1960/61 to 1962/63	7.3	17.8	1.7	-	2.3	4.3	3.1
1963/64 to 1964/65	17.2	8.1	2.2	1.0	6.8	4.8	12.3
1965/66 to 1966/67	14.8	13.7	4.5	0.7	2.9	3.0	4.9

+ The movements in rayon and synthetic prices are not fluctuations in the normal sense as they are all the result of falling prices only.

Source: Table 2, page 2, Wool Marketing Study Group Final Report, (33).

jute) have fluctuated[11] much more than the "artificial" fibres. This is even more significant than it appears because the movements in rayon and synthetic prices are not fluctuations in the normal sense as they are the result of falling prices only. There is, however, one complication which obscures the true picture and that is the fact that artificial fibres are often not sold at list prices but may fluctuate below depending on each individual order. Even a straight fall in prices is of significance to manufacturers who hold stocks of the fibre.

6.6. The Attitudes of the Wool Trade Towards Fluctuating Prices

Price fluctuations affect various sectors of the wool trade in different ways. Some merchants and topmakers who make profits through skilful buying and selling find price fluctuations essential to their business (33). In general, however, the further the section of the trade is away from the raw material, i.e., the more advanced the stage of manufacture, the greater the dissatisfaction with price instability. This is due to the larger number of production variables affecting the manufacturing process.

The New Zealand Wool Marketing Study Group (33), in a survey covering six countries[12] which included a cross section of the wool trade, found that,

> "...stability in raw wool prices would be welcomed by most respondents." [13]

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11. Fluctuation in this context refers to percentage movements in prices.
12. The countries were Belgium, Britain, France, Germany, Italy and the United States.
13. See (33) p.12. Para.41.

The results of the survey have been summarised as:

Stability	Percentage of Total
For	86
Against	12
Not stated	2

There were a number of comments attached to the German, French and American reports on this aspect. The French considered that "better" stability (less severe fluctuations) was desirable but that total stability was not possible. Some German respondents preferred to accept the risk of price fluctuations. From America came the opinion that small fluctuations were good for trade, and that it was an advantage to conceal prices from competitors.

The weaver and knitter normally decide between the use of wool or synthetics, or blends of the two. The function of the merchant, topmaker and spinner is purely one of supplying the weaver and knitter with the material they require. When these firms were asked whether they changed inputs when prices changed, by far the greatest proportion claimed that they did not. The proportion declined from between eighty and ninety per cent of the sample at the ten per cent price change level, to about sixty per cent when prices change by greater than twenty per cent.

In a personal interview survey (Survey C) the main New Zealand woollen manufacturers[14] were unanimously in favour of more stable prices.

Price stabilisation only becomes a worthwhile policy objective if fluctuating prices are actually increasing costs or causing other fibres to be used in preference to wool. The results of questions put to manufacturers in Australia (34) show that for no fibre was the

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14. These manufacturers account for over ninety per cent of New Zealand's wool processing.

unstable price of wool the main reason for manufacturers changing over from wool (Table 6.14).

6.7 The Effects Futures Markets have on Price Stability

6.71 Through the buying and selling of contracts by speculators

The view traditionally held by economists is that profitable speculation on a futures market, by increasing demand at low prices and increasing supply at high prices, is price stabilising. This contention is not subject to direct empirical testing for two reasons. Firstly, if all commodity futures trading is viewed as speculation, then this is a zero-sum game[15] which moots the question of profitability, and secondly; if only that trading which is classified as speculation, in contra-distinction to hedging, be considered then the stabilising effect is seen to be indirect since it is the hedgers who perform the relevant temporal re-allocation of stocks. For these reasons most arguments have tended to be on an a priori basis.

If we accept Friedman's proposition that profitable speculation necessarily stabilises prices (35) as having a high degree of generality, then it would only require a demonstration that certain speculative activity is indeed profitable to establish a stabilising effect. However, some workers (36) (37) have claimed that profitable speculation could have a destabilising influence on prices provided certain

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15. This is a term used in Game Theory and refers to a conflict between competitors where the amount gained by one person is exactly the amount lost by his opponent(s), and no competitor has an advantage (i.e., the expected gain from playing such a game is zero).

TABLE 6.14

ANALYSIS OF MANUFACTURER'S REASONS FOR USING MAN-MADE FIBRES
(Weighted by Points for Order of Mention)

Reason	Cellulose	Nylon	Polyester	Acrylic
		(%)		
Demand from customer	9	36	40	43
Qualities in final product	8	43	34	27
Assistance in promotion	-	5	12	11
Prices relative to wool	51	3	2	-
Stable prices	19	7	8	12
Other	13	6	4	7
Total	100	100	100	100
	Number of Manufacturers using Specified Fibres			
Users giving reasons	45	37	49	26
Users not giving reasons	18	12	7	10
Total Users	63	49	56	36

Source: Table 10, page 14, The Australian Wool Textile Industry, (34).

assumptions hold.[16] While this conclusion has to some extent been countered on theoretical grounds (38), to oppose the belief that speculation generates unwarranted price fluctuations with traditional economic arguments to the contrary is futile because sound logical reasoning can lead to either conclusion depending on the assumptions made regarding speculative behaviour. Speculative behaviour is too diverse and too difficult to appraise directly and hence to prove on a priori grounds that its effects are either stabilising or destabilising (39).

6.72 By better price formation

For the efficient intertemporal allocation of resources the marginal revenue of each resourse supplied in a particular period should equal the marginal cost of its supply in that period. This implies that the price which is realised in the period is that which was expected to rule (40).

Hicks (41) mentions four possible causes of dis-equilibrium or divergence between expected and realised price:

(i) Inconsistency of different peoples price expectations.

(ii) Inconsistency of plans to buy and sell even if price expectations are consistent.

(iii) Wrong estimates of future wants or supplies even when price expectations and plans are consistent.

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16. Assumptions needed to show that speculation can be destabilising are:
(a) That the supply of the commodity traded is independent of price and in fact varies sinusoidally with time.
(b) That non-speculative demand depends linearly on price alone.
(c) That speculative demand reaches a peak just after price has reached a minimum and reaches a minimum just after price has reached a peak.

(iv) Curtailment of output as a buffer against uncertainty.

If all those in the market participated in forward selling, the first two problems would be eliminated and complete co-ordination of buyers and sellers would be achieved.

The third problem is the important one and is dependent on the reliability of price formation. The reliability of futures price quotations is ensured by the following:

(i) The large volume of trading conducted by specialised speculators who ensure, through competition, that prices accurately reflect current knowledge.

(ii) Speculators operating on several markets simultaneously ensure that one market cannot get "out of line" with the others for any length of time. This is achieved by the speculators selling in the higher priced market and simultaneously buying in the lower priced market (this practice is known as arbitrage).

This view is based on the assumption of free and unrestricted competition in markets dominated by well informed traders who work on the best available supply information. However, the wide occupational range (23) of speculators on futures exchanges in the United States would suggest that traders are not all well informed; in fact studies have shown (42) that the accuracy of speculators predictions have been little better than fifty per cent successful in some commodity markets. This may, however, not be due to inaccurate forecasting but the serial independence of futures prices which means that it would not have been possible to predict future price movements which, in turn, would mean that price formation has been accurate.

6.73 By controlling price manipulation

Adequate regulations usually enable price manipulation to be controlled on a futures market. However, in some of the larger American markets, which are characterised by large numbers of poorly informed speculators who trade on margins, it has been possible for a large influential trader to affect prices by fictitious transactions which give a false impression of trade activity.

If futures markets enable greater manipulation of prices than occurs in the cash market then they may destabilise prices.

6.74 Empirical evidence on the stabilising influence of futures markets

It is very difficult to empirically test whether or not futures trading helps to stabilise prices. This is because we are forced to compare known prices with hypothetical prices, i.e., prices which may have occurred had there, or had there not been a futures market operating. Alternatively, of course, we may measure prices for different time periods, countries or commodities but in each case some factors are not consistent between the two examples. To isolate the true effect is usually very difficult, if not impossible.

Evidence is slowly accumulating, however, (43) which suggests that where futures are widely used, price variability decreases as the amount of hedging increases. As well as this it appears that inventory holdings for commodities with futures markets have tended to move in step with supply and demand conditions (43).

A test for the reliability of futures prices is based on the serial independence of price changes. From the point of view of economic theory, the independence of successive price changes has a

bearing on the efficiency of the market process because in a theoretically ideal commodity market all price changes would be serially independent (44).

The existence of a trend in futures prices would be intepreted by those who accept the risk premium concept[17], as simply the mechanism by which speculators earn a normal return. However, a trend in prices does not preclude the possibility that changes in futures prices may be reliably anticipatory in the sense that the changes are mainly appropriate responses to changes in information.

Telser (45) in studying soybean and corn futures found that the results were,

> "... consistent with the hypothesis that by maintaining a long position in futures one cannot expect a systematic positive return except from inflation of the general price level that is unanticipated."[18]

In other words, the futures price can be regarded as the market expectation of subsequent spot prices. In contrast, however, in the early years of the London Exchange, futures quotations did not provide a reliable guide to longer term trends in wool prices and even short term movements in the spot market were not forecast with any measure of accuracy (16).

6.8 A Futures Market Compared with a Floor Price Scheme

Experience has shown that restriction programmes aimed at raising prices have in general been a failure.[19] Some have caused

17. As outlined in Section 5.21.

18. See (45) p.174.

19. In the United States, the cotton programme has resulted in a cut of the United States export market by half, hastened the irretrievable loss of markets to synthetics, encouraged the inefficient production of inferior types in disadvantaged areas whilst discouraging efficient production of better types elsewhere.

demonstrable and serious harm to the commodity sector supposed to benefit. Because of this the moderate goal of price stability is sought by many in the wool industry,[20] who advocate conservative price support schemes. The logic underlying a true reserve price scheme, whose sole objective is price stability around long term trends is sound. It recognises simply the tendency of prices to fluctuate about their average levels (including any secular trends) and postulates that inventory accumulation at low prices and de-cumulation at high prices will diminish price fluctuations about the average. This, as pointed out in Section 6.71, is also what occurs with successful private speculation. The issue thus becomes one of whether speculation should be carried out by private traders of official agencies.

It is useful to distinguish between speculation and manipulation by describing speculation as trading aimed at identifying price changes which will occur apart from the influence of the trader, and manipulation as trading aimed at influencing prices. With official speculation there is a high concentration of decision making in a single hand and for this reason it is most likely to be transformed into manipulation. On the other hand, with futures trading, safeguards against manipulative practices may be provided.[21] Also the contest is not one between the research staff of a single official agency and a single speculative or merchandising firm, but rather one between a single agency and all of that section of the wool trade which uses a futures market.

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20. Attempts have been made to establish a floor price scheme in Australia and there are, of course, floor price schemes in New Zealand and South Africa.

21. Perhaps the most closely regulated futures trading occurs in the United States where certain exchanges have been brought under the control of the Commodity Exchange Act.

Another great advantage of private speculation is that whoever makes the mistake bears the cost of it. If the agency errs, the cost is borne by agency funds, whatever their source. As well as this there is the complication that official mistakes may bestow windfall benefits upon private speculators. Thus not only is the incentive to achieve appropriate inventory levels stronger under private organisation, but the culling out of failure augurs a better selection process.

The final analysis, however, must rest with what the evidence shows. Evidence collected by Working (46) for the wheat market (where futures are well established and widely used) shows that inventory levels and price differentials were closely inter-correlated and the resultant holdings could be judged appropriate by objective retrospective standards.

So pronounced has been the tendency however, for official plans to drift towards attempts to maintain artificial price stability or to support artificial price levels, that there is little or no evidence of the success with which they may approach appropriate inventory levels.

6.81 The possibility of using a combination of the two for stabilisation purposes

Houthakker (47) has argued that in some commodities insufficient capital is attracted to inventory holding, thereby allowing unwarranted price fluctuations. In such a case an official agency could supplement the speculative capital by taking up positions in futures markets for delivery six to twelve months ahead, with buying and selling prices about fifteen per cent apart and based on say a

three year moving average of spot prices.

The advantage this type of scheme would have over a straight futures market is that the official agency would be providing "storage capital" should prices fall below a certain level as well as allowing the placing of a ceiling on the market. A scheme of this type would be more economical than a straight floor price scheme as the agency would not be burdened with the physical wool until the spot month arrived. In the spot month the man who originally sold the contracts would have to buy them back or, alternatively, deliver the wool. If he chooses to deliver the wool this would have to be bought at auction and would stimulate spot values.

There is, however, the problem that the official agency would remove some of the scope for speculation when prices approached the upper or lower limit. This would mean that speculative capital was merely being supplied by agency funds instead of from private funds.

This type of scheme would only be needed in a market with insufficient private speculation. It is not possible to gauge accurately how much speculation is likely to eventuate in a futures market should one be established in New Zealand.[22] The nearest indication obtainable is the experience of the Syndey futures market and as expressed by Professor Gray,

> "...where at least Sydney wool futures are concerned, there is no evidence whatsoever of inadequate futures speculation, there being every indication at least where Sydney is concerned, that speculation will grow apace (with hedging)."[23]

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22. See Section 7.63

23. See (43) p.9. brackets have been inserted by the author.

6.9 Summary

Historically, New Zealand wools have been subject to considerable within season fluctuations in price which have been largely irregular in nature. At the same time prices for similar crossbred wools have tended to move in step with each other.

Most handlers and manufacturers of wool would prefer more stable prices than have occurred in the past. However, there is insufficient evidence to show that price fluctuations are affecting consumption or the average price levels of crossbred wools. Assuming that some reduction in price variability is desirable the question becomes one of whether this reduction should take the form of stabilisation or manipulation.

If market forces are to be allowed to operate freely and excessive fluctuations caused by market imperfections are to be reduced (stabilisation), then the introduction of a crossbred futures market may have a place. Alternatively, if the aim is to reduce short term price movements caused by short term changes in supply and/or demand conditions (manipulation), then a reserve price scheme becomes the obvious choice.

Basically there is no reason why a conservative reserve price scheme cannot be operated in conjunction with a futures market, provided a reserve price scheme did not manipulate prices to the extent that there was no scope for market forces to operate. If this occurred there would be no need for traders to insure themselves against adverse price movements (hedge) and there would be no scope for speculation. There are advantages, however, from operating a floor price scheme through a futures market. A futures market would also enable an agency to put an effective ceiling over the wool market.

In conclusion, while there is probably little to be gained in terms of price stabilisation from the introducing of a crossbred futures market, a futures market would allow a more efficient floor price (and ceiling price) to be operated which, in turn, would benefit producers, handlers and end users of wool.

CHAPTER 7

THE ESTABLISHMENT OF A CROSSBRED WOOL FUTURES CONTRACT

7.1 Introduction

This chapter examines possible locations for the establishment of a crossbred wool futures contract and considers opinions of members of the wool trade on this topic.

The chapter begins by discussing the advantages and disadvantages of establishing a crossbred futures contract on an existing market. It then goes on to consider the desirable location from New Zealand's point of view, taking into account survey results.

The Chapter concludes with an estimate of the likely success of a futures market should one be established in New Zealand.

7.2 The Advantages of Establishing a Crossbred Contract on an Existing Futures Market

7.21 Arbitrage would be expedited

If two contracts were operating on the same market, not only is it easier to buy and sell in both contracts but it is also cheaper.

Where markets are placed in different countries it is often costly for operators on both markets to remain continually in contact with each other. In addition currency problems may be encountered which could prevent effective arbitrage between the two markets.

7.22 It would save the cost of establishing a market

The provision and maintenance of exchange premises and communication facilities are the major costs associated with the establish-

ment of a futures exchange. In the early years premises could possibly be provided by the New Zealand Wool Board. A staff of at least three would be required to maintain it. Salaries would probably amount to around $NZ10,000 per year.

The floor members of the exchange would also be faced with certain costs which would need to be covered if their membership was to be profitable. A broker would require a minimum of three additional employees: two floor operators and a typist. The salaries for this group would probably amount to $NZ12,000. In addition he would have to pay his original deposit of say $NZ10,000 and an annual subscription of say $NZ200. There would also be other running expenses required to cover cables, rent for office, etc., which would probably amount to $NZ10,000 per year.

Summary of Floor Members Costs ($NZ)

	Original Deposit		10,000
Annual costs:			
	Salaries and Wages	12,000	
	Subscription	200	
	Operating Expenses	10,000	
		22,200	22,000
	Total Expenses for first year:		32,200

Assuming the exchange began with eight members then capital of just over one quarter million dollars ($NZ257,600) would have to be found in the first year. Not all of this amount would need to come from the first year's trading profits because there are advantages to be gained from being a Floor member for which a member would be willing to pay. Also firms would take a "longer" view and be prepared

to wait a year or two before recouping their deposit. However, it is reasonable to assume that in the long term commission profits should approximate the variable costs.

If we assume that ninety five per cent of all business will be conducted on the behalf of Associate members and five per cent for non-members with the commission charges of $11.00 and $22.00 round turn[1] per contract respectively, then the Floor members would need to handle at least two thousand[2] contracts per year to meet annual costs. This would amount to sixteen thousand contracts per year in total.

7.3 The Disadvantages of Establishing a Crossbred Futures Contract on an Existing Market

Historically it has often been claimed (17) that when a futures market deals in more than one contract based on closely related products, one contract tends to flourish at the expense of others. Some of the reasons for this are now discussed.

7.31 One market may attract most of the hedging business

Working (12) in studying the historical evidence claimed that in the case of products which attract much public interest, the volume of business on a futures market or contract depends primarily on the amount of hedging business that it attracts. Working illustrated this point by taking figures for the number of open positions and showing that for thirty years, the larger changes in open positions could all be explained in terms of factors which could be expected to influence the level of hedging. If we accept this fact that the volume of open positions does vary closely with the amount of hedging

1. The completion of both a purchase and an offsetting sale.
2. The exact figure, given the above assumptions is 1923.

then it becomes clear why futures trading in a commodity tends to concentrate in a single market or contract. This is because the larger contract or market will always offer hedgers an advantage of economy as in a larger "liquid" market hedgers are able to place and remove hedges with little "price effect".[3/]

This would mean, in the case of Sydney, that most traders hedging crossbred wool would tend to use the merino contract due to its larger volume. The Sydney contract, which is based on a merino wool type (see Table 4.2, page 36) covers a range of types which represent about $1\frac{3}{4}$ million bales out of a total production in Australia of $3\frac{3}{4}$ million bales. In comparison, New Zealand's total production amounts to approximately $1\frac{1}{4}$ million bales. Even with trading from other crossbred wool producing countries the merino contract would probably remain the dominant contract on the Sydney Exchange.

This would also apply with the London Exchange where the volume of transactions in merino, or apparel type wools on the Bradford physical market far exceeds the volume of business conducted in crossbred wools.

Trading may also concentrate on a single contract as a reflection of the trading interests of the floor and associate members. Most traders rely on information from members of the exchange for their trading procedures, and if the members are more familiar with the physical commodity for one of the contracts, then there is likely to be a bias in this contract's favour when it comes to making recommendations to non-members.

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3. See Section 3.43 for an explanation of the "price effect".

The Sydney, London and New York contracts are all based on merino wool or merino tops and it is reasonable to assume that most floor members would prefer to use these existing contracts rather than follow the movements in prices of other very different wool types even if the latter represented a slightly more profitable alternative for their clients.

There have been several historical examples of trading concentrating in a single contract on a futures exchange. Perhaps the most striking examples have occurred on the New York and London Exchanges.

The New York Exchange, which originally dealt only in a 64's tops contract, introduced a 64's greasy contract in 1941. This latter contract rapidly assumed dominance on the market and now the tops contract exists on a very low level of trading. The average number of contracts traded per day for each of the two contracts has been shown from 1960 to 1966 in Figure 7.1.

On the London market, which began trading in merino tops, a second contract was also introduced. This was a wool tops contract for crossbred (50's) tops. The contract only remained in operation for five years, in which time only 3,287 contracts were traded.

On this evidence it would appear that hedging business tends to concentrate on a single contract in a futures market.

In some of the futures markets for other commodities in the United States it has been possible for a smaller contract to survive and prosper in the face of competition from a larger contract,[4] but this has occurred only where the smaller contract has been able to

4. This has occurred with wheat futures where the Minneapolis market, which offers a contract for hard Spring wheat, has survived the competition from contracts based on Winter wheat.

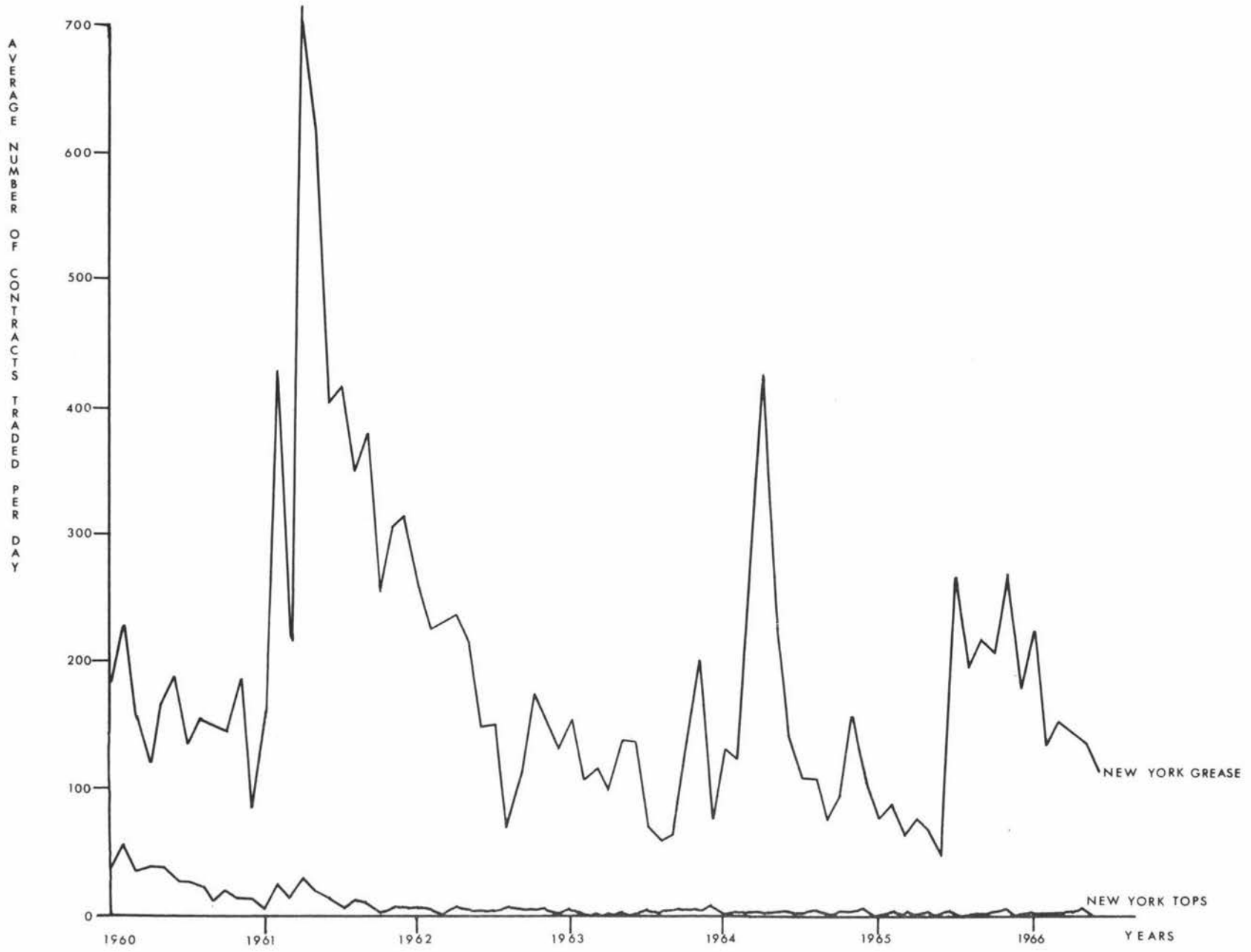

Fig.7·1 NEW YORK WOOL FUTURES EXCHANGE: VOLUME OF TRADING IN WOOL AND WOOL TOP FUTURES FROM 1960 TO 1966

offer hedgers some advantage that outweighs the lower cost of hedging in the larger contract. It is doubtful whether a crossbred contract would be sufficiently different to a merino contract to offer such an advantage.

7.32 There is no existing wool futures market in a major crossbred wool producing country

It has been stated (9) that other things being equal, the closer a futures market is to the source of supply of the raw material, the larger will be its level of trading.[5] This could be due to a number of factors. It is in the producing country that the factors affecting supply are easiest to determine and there is the biggest concentration of merchants who deal in the raw product. As well as this, in the producing country, speculator "interest" from "outsiders" will tend to be highest. In New Zealand for example, wool prices are quoted frequently in the press and over radio and television during the wool selling season and any unexpected movement in prices tends to receive much publicity. A final point is that producers will be more able to make use of a futures market if it is located in the producing country.

An example of two markets; one situated in the producing country and one in the manufacturing country are the Sydney and London markets.[6] While there are other differences between the two markets apart from location, the Sydney market has grown to a point where it is far larger than London. This has been shown in Figure 7.2

5. In the United States, no futures market for a commodity which is chiefly imported has flourished like the markets for the more important domestically produced commodities (9).

6. e.g., the London contract is based on 6,000 lb. of merino tops, while the Sydney contract is based on 3,000 lb. of greasy merino wool.

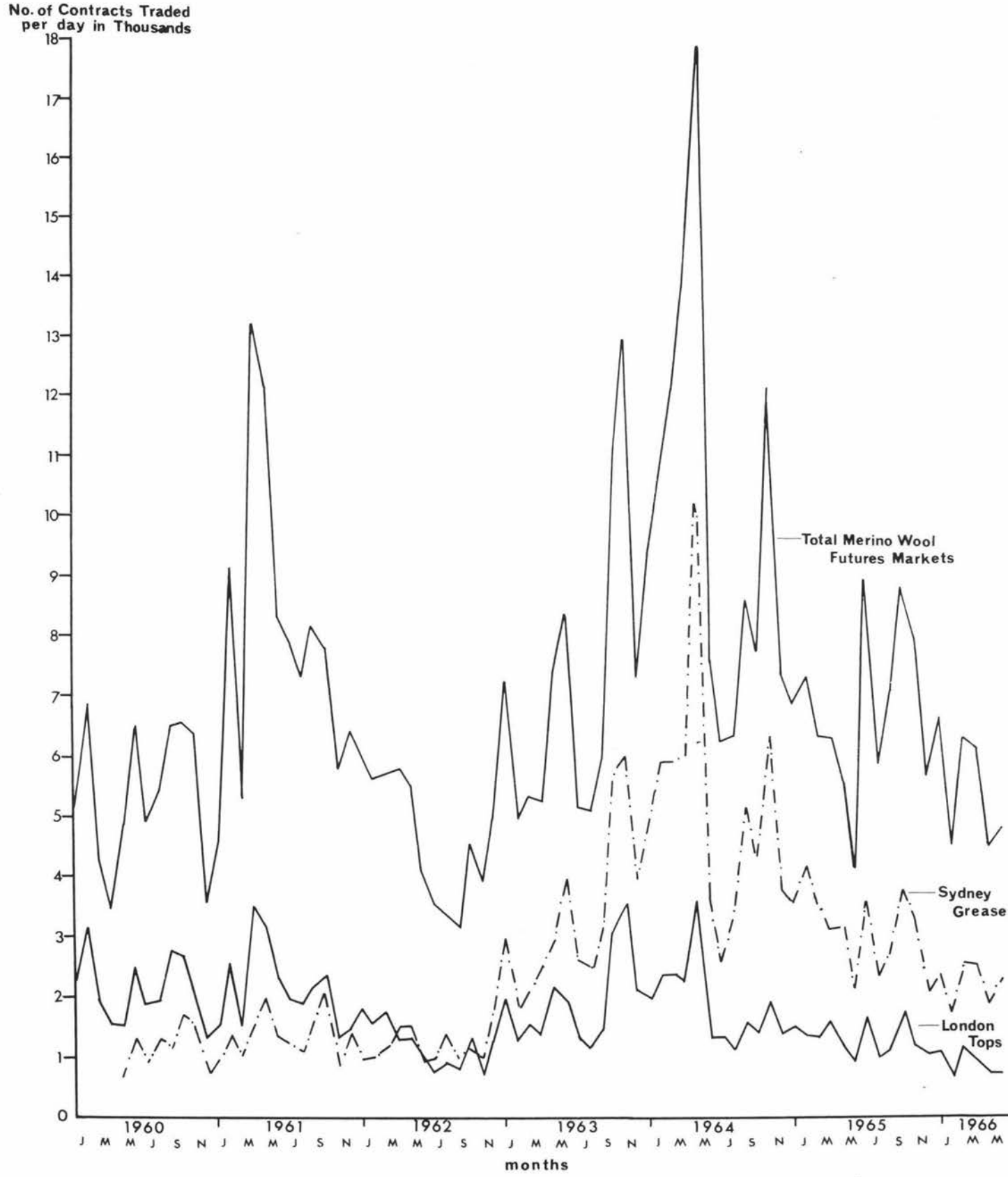

Fig.7·2 AVERAGE NUMBER OF CONTRACTS TRADED PER DAY ON THE LONDON AND SYDNEY MARKETS AND TOTAL FOR ALL MERINO WOOL FUTURES MARKETS (JANUARY 1960 TO JUNE 1966)

SOURCE; Appendix Q. Australian Futures Reference Book (59).

which gives the average number of contracts traded per day averaged for each month from January 1960 to June 1966 for the London and Sydney contracts. Also shown are the total figures for the period for the London, Sydney, New York, Antwerp and Roubaix markets.

7.4 The Desirable Location from New Zealand's Viewpoint

There are disadvantages, from New Zealand's point of view, in establishing a crossbred wool futures contract in another country. These will now be discussed.

7.41 Delivery would be more difficult for New Zealand traders

If a futures market for crossbred wool is established overseas, it would be difficult for traders in New Zealand to adjust their stocks and futures commitments in response to expected relative price movements between the cash and futures markets.

This would be caused either by increased delivery costs caused by storage, transport and duty charges, or by the lack of contacts and facilities to buy the spot commodity.

When delivery is hampered for a large section of traders, there is a less close connection between prices in the spot and futures markets which, in turn, tends to discourage hedgers from using a market.

7.42 Trading on an overseas futures market may affect New Zealand's Balance of Payments

It would be to New Zealand's advantage to have a market located in New Zealand rather than overseas because instead of currency leaving the country to enable traders to hedge on a futures market, this

currency would remain in New Zealand.[7] In addition, funds would be attracted into New Zealand from overseas traders. Both factors would affect New Zealand's balance of payments.

7.43 Currency regulations

At present the Reserve Bank is prepared to allocate overseas funds for deposits, margins and commissions to enable New Zealand operators to negotiate hedging transactions on approved wool futures markets direct with members of the market both on their own account and for their clients. It is not prepared, however, to provide overseas funds to enable speculators to operate on futures markets. These exchange control approvals are subject to variation or termination at any time.

While these regulations are probably adequate for present trading requirements, they would not allow speculator support from New Zealand for a crossbred futures market outside New Zealand, and to this extent a crossbred futures market would be less viable.

7.5 The Opinions of Members of the Wool Trade on the Location of a Crossbred Futures Market

In the interview survey covering a section of New Zealand's wool buying firms (Survey B) twenty firms were asked where, in their opinion, a crossbred futures contract should be established. The following results were obtained:

	New Zealand	Overseas	No Comment
Number of Firms	8	2	10

One of the firms in favour of an overseas contract gave London

7. As will be mentioned in Section 8.2, this was the main reason for the establishment of the London Futures Market.

as the best place and the other gave Sydney. Both these firms were overseas based and both gave as their reason, lack of confidence in New Zealand's currency.[8]

Of the six replies received from the questionnaire sent to Floor members of the Sydney Exchange (Survey A), two stated that New Zealand would be the preferable location. One stated that London would be preferable because crossbred wools are subject to the divergent movements of more sources of supply than the fine wools and that information from all these sources could best be collected in London. One firm preferred Melbourne to New Zealand because of the currency restrictions and the fact that the Australian trade was already educated in using futures.

7.6 The Problems of Estimating the Likely Success of a Crossbred Futures Market in New Zealand

7.61 Convervatism

When any new system is introduced it normally faces conservatism, or a reluctance to change the status quo. When it is a system which requires some degree of technical sophistication on the part of the trader, then "natural" conservatism is increased. These problems are particularly relevant to futures trading. Even in the United States where futures markets are very highly developed and widely used[9] they are often subjected to much unfounded criticism.[10] In Australia this problem was, and to some extent still is, being en-

8. The survey was conducted in February, 1967.

9. In the United States there are fifteen Commodity Exchanges trading in seventy eight different types of futures contracts and the volume of contracts traded has increased each year from five million in 1961/62 to nearly nine million in 1965/66.

10. See (39) and (49).

countered also.[11] For these reasons it would seem reasonable to expect the conservative influence to be even greater in New Zealand, a country which has never had a futures market and which is largely isolated from American and Continental influences.

7.62 Lack of knowledge

To some extent this problem is linked with the problem of conservatism. However, in the wool buyers survey (Survey B), three firms stated that they were unable to answer the questions through a genuine lack of knowledge rather than a lack of interest. This is a contributing factor to the lack of use made of futures by producers as was discovered in a mail questionnaire sent to a random sample of one thousand New South Wales wool growers on the reasons for their use or non-use of futures markets (40). The results appear to indicate that the main reason why futures markets are not used more extensively is that growers have insufficient knowledge of the benefits and mechanics of using them. There is, however, no necessary presumption that greater knowledge of these factors would result in increased use. The Sydney Exchange publishes a regular News Sheet as well as other publications[12] to try and overcome this problem.

7.63 Accuracy of replies

When conducting surveys there is always the problem of inaccurate replies. This may not always be deliberate as in some cases

11. This was borne out in letters from an Australian Floor member to the author.

12. The Sydney Exchange publishes "Wool Futures News" and has published a Handbook (1964), revised (1967) as well as promotional pamphlets for producers.

it may be due to a genuine lack of knowledge. An example here would be a wool buyer who is a representative of an overseas based firm who states that his firm does not use futures while in fact all his purchases are covered by futures from Head Office.

There is also a problem of accuracy with expectations. People will state one thing when being interviewed and then act differently when faced with the actual situation.

Prior to the establishment of the Sydney Exchange a survey was conducted by the Bureau of Agricultural Economics in Australia and while some traders were in favour of futures trading,

> "...most of the other comments received were generally unfavourable or indifferent to the idea of futures trading . . . one quarter of the raw wool users indicated they were unlikely to operate on futures markets." 13/

While there has been no study conducted to determine the extent of current trade usage of the Sydney Exchange, the volume of trading has increased considerably since its inception and it is commonly believed that most manufacturers in Australia do now buy and sell futures contracts.[14]

7.64 Changing economic environment

One of the reasons for the establishment of the London Wool Futures Market was the decline, at the time, in the number of forward orders which the Bradford topmakers and spinners had on their books (see Section 8.2). Forward selling, while it reduces risk for top makers and spinners, actually increases risks for wool buyers. Over recent years there has been a notable decrease in commission buying

13. See (34) p.23.

14. Comment from Sydney Floor member to author.

of crossbred wool and a notable increase in forward buying.[15] This means that wool buying firms are becoming far more exposed to fluctuating prices than they formerly were. If there was a general return to commission buying in New Zealand, then fewer firms would be interested in futures trading.

Another influence which affects attitudes towards futures markets is the overall activity and prosperity of the wool trade as a whole. The surveys in this study were conducted during a period of rapidly declining prices and a decrease in trade activity caused by the buying in of wool by the New Zealand Wool Commission. These, and other factors, may have affected the interest individuals showed in futures trading.

7.7 Likely Hedging Activity

Present evidence points to the fact that hedging is the main factor responsible for the growth of a futures market (48). In most markets there is a predominance of "short" hedging[16] thus it seems that the mainspring of futures trading is the need to finance inventories in the face of fluctuating prices. It follows that considerable inventories are needed to sustain futures trading.

If the forty eight types shown in Appendix F were chosen as deliverable types on a New Zealand futures exchange, then the New Zealand contract would be based on a potential volume of approximately one hundred and sixty eight thousand bales of wool.

15. This point was made repeatedly during discussions between the author and members of the wool trade.

16. A trader who sells futures to hedge a stock of wool is called a "short hedger" because when operating his hedge he is "long" in wool, but "short" in futures. In practice there is no way of distinguishing between short hedging and short speculation.

The problem is to estimate how much of this potential volume of trading would eventuate. Surveys conducted during this study attempted to estimate the volume of trading likely to eventuate from New Zealand traders. However, because most of New Zealand's wool is bought by overseas interests it is reasonable to assume that this is where most of the hedging business would come from. This complicates any estimate of likely hedging activity.

7.71 Results of surveys

The twenty wool buyers interviewed in Survey B were asked whether the risks of a rise or fall in wool prices warranted their protecting their transactions with a futures hedge. The results were:

regularly	5
occasionally	9
never	6

Of those who stated never, three had over half their business involved in buying for current orders. The other three were ill-informed as to the functions of a futures market and were unable to state what advantages firms might obtain from using a futures market.

Only two firms felt that the lack of a crossbred contract was limiting their dealings in crossbred wool. However, all those who were using futures stated that they would prefer to use a crossbred contract if one could be successfully established.

During the interviewing of the manufacturing firms in Survey C it was found that only one firm considered that there was a need to use futures markets and this firm stated that it would prefer a crossbred contract.

From these surveys, and assuming they covered a representative sample of New Zealand's wool buyers and processors, it would appear that a significant volume of hedging trading would be forthcoming on a New Zealand exchange.

7.8 Likely Speculative Activity

It is not possible to accurately gauge how much speculation is likely to eventuate on a futures market should one be established in New Zealand. However, in talks with business, professional and farming personnel, the author discovered much dissatisfaction with the New Zealand stock market as a means of speculation. It was commonly agreed that since currency restrictions have prevented trading on the Sydney Stock and Futures markets, speculative activity by New Zealanders has generally declined in total. This is because traders consider the New Zealand Stock Market, "dead", "dull" and "inactive" and thus a poor market for speculative activity. For these reasons it is reasonable to assume that a "latent stock" of speculative capital exists in New Zealand which may possibly be transferred to a futures market should one be established.

7.9 The effect a Floor Price Scheme would have on a futures market

In New Zealand a floor price scheme is in operation. The main difference between a futures market and a floor price is that the former utilises private speculation while the latter utilises official speculation. By definition there should be no conflict between the two, except that, should the amount of official speculation become large, i.e., prices fall to floor price levels, then the scope for private speculation will decrease. If the floor price was set at an

artificial level, and rather than stabilising the market was in fact manipulating it, then this would either discourage private speculation completely, or alternatively encourage speculation against the floor price.

This latter effect may occur because New Zealand has demonstrated its inability to maintain stated policies and any future attempts to hold a floor price in New Zealand at a level where it could influence the market would almost certainly be regarded as temporary. Speculators would then act in anticipation of a collapse in prices, and this would cause a further deterioration in the original situation.

During the 1966/67 season when the New Zealand Wool Commission was buying large quantities of wool at auction, wool buyers (Survey B) were asked whether they considered a crossbred futures contract would be compatible with the New Zealand floor price scheme. The results were:

No opinion	3
Were not sure	3
Yes (compatible)	7
No (non-compatible)	2
Compatible (qualified)	4

Two of the cases of "qualified compatibility" considered that there would be no problems provided the futures market was free to operate at levels below the floor price (this in effect would be speculation against the floor price). The other qualifications were that the floor price would need to return to its former conservative level.

7.10 Currency problems

At present currency regulations only provide for hedging operations on overseas markets. The question of what the exchange regulations would be, should a futures market be established in New Zealand, is not easy to answer. This is because it is a matter of policy for the Reserve Bank of New Zealand not to formulate such hypothetical regulations.

If a market were to be established in New Zealand, then certain essential elements would need to be embodied in regulations concerning such a market. Speculation and hedging from overseas traders should be permitted and there should be as few controls as possible.

If controls were imposed the likely success of a market in New Zealand would be greatly impaired as most of the hedging business would probably originate from overseas. Both the London and Sydney promoters of the respective futures markets pointed out that legislation to allow a free flow of funds by overseas traders would be essential before a market could be established. In both countries this legislation was provided and the markets successfully established.

7.11 The likely success of a crossbred futures market in New Zealand

There are basically two criteria which determine the success of futures trading in a commodity which is subject to considerable price fluctuations:

(i) There should be a reasonably high correlation between the movements in prices of a sufficiently large volume of the commodity, and

(ii) the volume of trading in futures contracts should be large enough to make transaction costs distinctly

smaller than in the cash market and to ensure futures price movements remain reasonably correlated to movements in the price of the spot commodity.

These two points will not be examined.

7.111 Volume of crossbred wool

As pointed out in Section 7.7, if the suggested types were chosen as being deliverable types on a New Zealand exchange there would be a potential volume of one quarter of a million bales of wool available to traders on the exchange. This would be more than sufficient to ensure that monopolistic practices did not eventuate on the exchange. Also price movements in these crossbred wool types have tended to be highly correlated in the past (see Section 6.234).

7.112 Volume of trading

7.1121 Hedging

It is difficult to accurately assess the likely level of hedging trading which would eventuate on a New Zealand wool futures exchange. Part of the difficulty lies in the fact that most of New Zealand's wool is purchased by overseas interests and it is reasonable to assume that this is where most of the hedging business would come from.

Another factor is that the main reason for traders not having used futures markets in the past was due to a lack of knowledge, and for this reason these traders were unable to state whether they would use a New Zealand market.

In spite of these difficulties a useful estimate may be obtained by gauging the level of business conducted from New Zealand on existing exchanges. While only a quarter of the interviewed wool buyers

and manufacturers are using futures markets at present (Section 7.71), it is the volume of trading and not the number of traders which is important. No accurate figures were available to the author as to the level of trading from New Zealand. However, after talks with futures brokers it was evident that the volume of trading is increasing significantly and has at times reached from one and a half to two thousand contracts per week. This amount alone would probably support a futures market.

7.1122 Speculation

As explained in Section 7.8, likely levels of speculation are very difficult to estimate. However, the fact that the Sydney market has been received favourably and has had adequate speculative capital would suggest that the same would probably be true in New Zealand. Another factor is that the New Zealand share market does not offer the scope for speculation which is found on larger share markets which represent a more diversified economy, and for this reason additional speculative channels would probably be welcomed in New Zealand.

7.12 Summary

The establishment of a crossbred futures contract on an existing market would have advantages by way of easier and cheaper arbitrage between different contracts, and lower costs. It has, however, the disadvantage that trading may tend to concentrate on only one contract in the market. There is no conclusive evidence available as to why hedging business tends to concentrate into a single contract or market. However, the fact that this has occurred means that it would be unwise to attempt to establish a crossbred futures contract on an existing market. As New Zealand is the largest producer of

crossbred wools in the world, it is here that a market should be located if one is to be established.

Before a market is established it is desirable to estimate whether there will be a sufficient volume of trading to support a market. Section 7.111 showed that there is a sufficient volume of crossbred wool in New Zealand; the crucial point, however, is whether owners and users of wool will hedge their inventory positions on a futures market. While there are many problems associated with estimating likely levels of trading, survey results indicate that sufficient hedging business would eventuate. In addition, there is no reason to assume that there would be insufficient speculative capital forthcoming to provide a "broad" market for hedgers.

In conclusion, if a crossbred contract is to be established, then it should be located in New Zealand. There is some indication that such a venture could be successful.

CHAPTER 8

THE PROBLEMS OF ESTABLISHING A FUTURES MARKET

8.1 Introduction

This chapter investigates some of the problems which are likely to be encountered when setting up a futures market. Information has been drawn from the early experience of the New York, London and Sydney wool and wool tops futures markets. Unfortunately the only market of the three on which adequate information is available is the New York market. The author, however, was fortunate in obtaining access to the private files of an individual Floor member of the Sydney Exchange which enabled additional knowledge on that market to be acquired.

8.2 The Problem of Obtaining "Official" Permission and Trade Support for the Establishment of an Exchange

Futures exchanges have traditionally been subjected to much unfounded criticism which has stemmed from a lack of understanding of their economic role in an industry.[1] This has tended to result in new exchanges being faced with opposition at all levels which has first to be overcome.

The problems faced in establishing the London Wool Exchange[2] have been well documented and provide an insight into this problem.

Early discussions concerning the establishment of the London market began between interested parties in January 1952. These arose

1. See (49).
2. There was already futures trading in many commodities being conducted in London.

because of a notable increase in the number of Bradford firms taking advantage of the "cover" afforded by the Antwerp futures market which, in turn, was caused by a decline in forward orders, making it necessary for topmakers and spinners to take additional risks. The disadvantages for the United Kingdom traders using Antwerp or New York markets were the necessity to apply for the required amount of foreign currency and, in the case of contracts taken up, the payment of import duty on the tops entering the United Kingdom.

It was decided that two courses of action were open (50). Either they could establish a market in the United Kingdom, or they could try and induce Antwerp to change the basis of its contracts from francs per Kilo to pence per pound and further, that topmakers - combers in Bradford might be included in the Belgian list of approved combers. The former alternative was decided upon.

In July, 1952, the Wool Textile Delegation set up a committee to consider the question of a wool top futures market for Bradford. The report of this committee was far from encouraging and, as reported in the "Wool Record",

> "After investigating the arguments for and against the proposition, it concluded that a local futures market would not benefit the industry very materially and would have possible commercial disadvantages." (51)

The Chairman of the above committee, Mr. James Thompson, said the reason for the interest in Antwerp was due to abnormal conditions in the world wool market and that in normal times the British practice of forward selling (which is much more extensive than on the Continent), fulfils many of the functions of a futures market (52).

The main arguments against setting up a Bradford futures market seemed to be that:

(i) Futures tend to exaggerate market trends both upward and downward.

(ii) They have no significant effect on employment in the local industry.

(iii) There would be difficulties in establishing satisfactory wool and tops standards in the United Kingdom and the production of speciality tops might diminish, thus damaging the export trade in such goods.

(iv) A narrow futures market could actually reduce confidence in buying wool for import rather than increase it particularly when, as sometimes is the case, the futures quotation is below the replacement cost.

Amongst this early pessimism, and lack of understanding, the main spokesmen for a futures market were the Treasury and Bank of England officials who stated that if a significant section of the wool trade continued to use existing futures markets,

> "... the Treasury would probably have to impress firmly on the industry that these facilities should be provided in the United Kingdom." (53).

Despite this warning, the announcement on the 29th October, 1952, that a futures market in wool tops was to be opened in London early in the next year took the majority of Bradford wool men by surprise for few had expected such a move after the publication of the Wool Textile Delegation's report on the subject (54).

The London Exchange was launched by the London Produce Clearing House Ltd., a subsidiary of the City Finance House, United Dominions Trust Ltd., which was established in 1888. The London Produce Clearing House, in pre-war years conducted the Clearing House for the sugar and cocoa markets (54).

The London Clearing House Ltd. formed an advisory technical committee from members of the industry, consisting mainly of Bradford firms. The committee was responsible for discussing such points as the basic type of top, appraisement, selection of approved combers and storage warehouses. At the same time, a larger committee was set up to decide on general financial and other arrangements.

After the Bank of England had amended its regulations to allow trading by overseas firms, the market finally began operations on Wednesday, April 29th, 1953. A notable feature of the first few days trading was the widespread interest, particularly from the United States. By the opening day, ninety firms (including thirty eight overseas firms), representing ten[3] important wool growing or wool consuming countries had registered as Associate Members (55).

Between the opening on April 29th and the end of October, transactions had totalled 4,876; representing a weight of tops exceeding twenty four million pounds. The average number of contracts made per working day throughout this period was thirty eight.

The Sydney Exchange which began operations in 1960 had also to overcome a certain degree of conservatism and lack of knowledge,[4] but did not have to face any serious opposition. This may have possibly been due to the increased understanding of futures markets in recent years.

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3. These countries included Australia, Canada, New Zealand, South Africa, United States of America, Channel Islands, France, Italy, Belgium, Japan and Palestine.

4. This was emphasised in a letter from one of the original Floor members of the Sydney Exchange to the author and also borne out in a study (34) conducted prior to the establishment of the exchange.

There are a growing number of New Zealand wool trade members taking advantage of existing futures markets which is tending to "educate" the New Zealand wool trade as a whole towards futures trading. The author has also found during talks with wool trade members, that while some members of the trade are not interested at present in the establishment of a New Zealand wool futures market, on no occasion did a member state that he was actively opposed. It may thus be concluded that the establishment of an exchange in New Zealand would not be met with the opposition which occurred in the United Kingdom and perhaps may even be more favourably received than the Australian Exchange.

8.3 The Problem of Obtaining Growth in the Volume of Business

There are two methods of measuring the volume of business conducted on a futures exchange. The first is to measure the volume of transactions which occur on the Exchange. This gives a picture of the number of times contracts actually change hands. The second method is to measure the level of open positions or open contracts which are present in the market. This latter method is thought to provide a better picture of the volume of hedging business which the exchange attracts (11).

Both the volume of trading and the level of open contracts have been recorded monthly for the New York Wool Top Exchange from 1931/32 to 1939/40. However, only the years from 1935/36 to 1939/40 are shown in Fig. 8.1. Prior to 1936 there was little evidence of growth in the volume of trading. In fact, the trading in the first month (1931) of 475,000 lbs was exceeded in only two of the following fourteen months. By 1935/36 a plateau seems to have been reached and

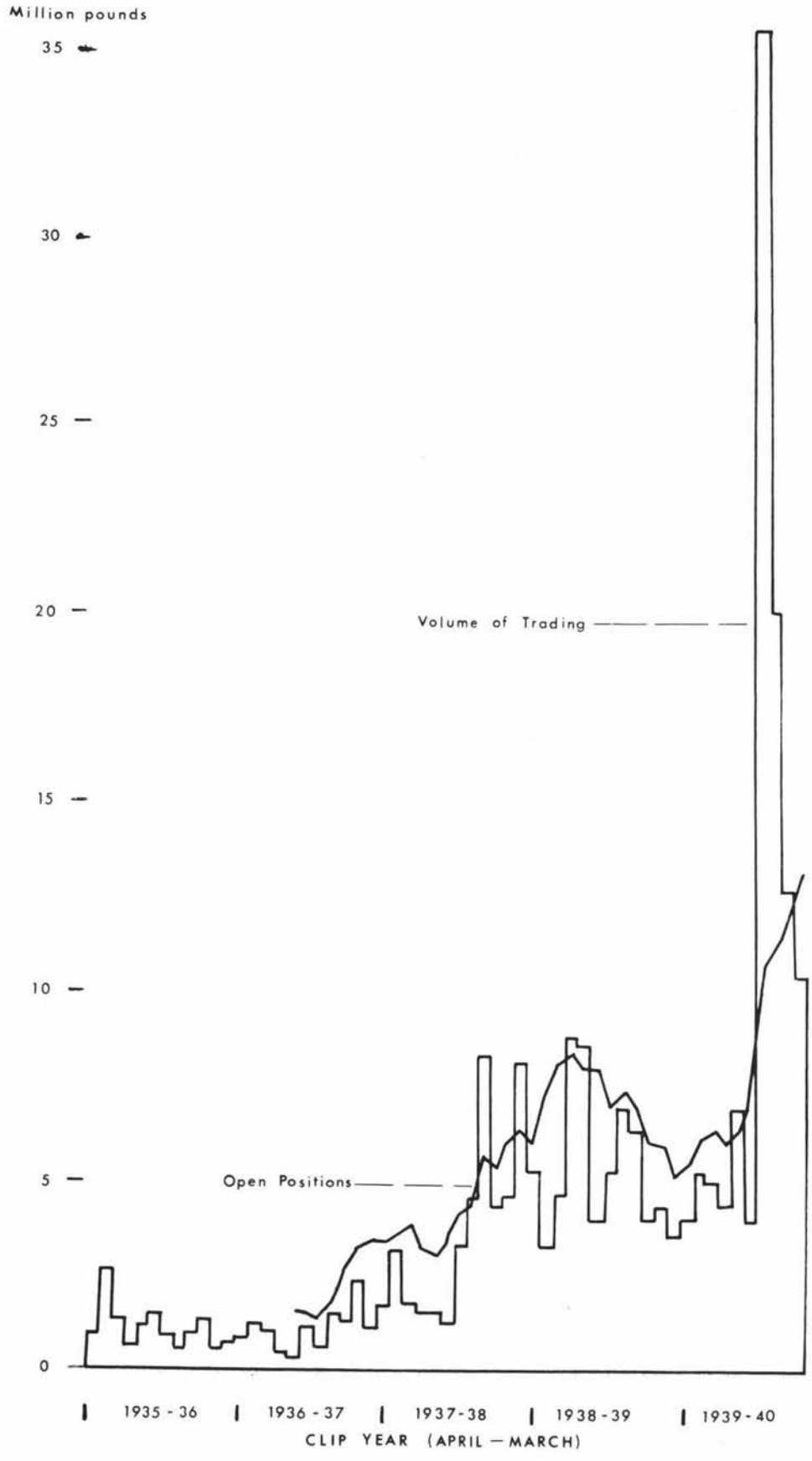

FIG. 8·1 MONTHLY VOLUME OF TRADING AND OPEN CONTRACTS ON THE NEW YORK WOOL TOP EXCHANGE 1935/36 TO 1939/40

SOURCE: Fig. 4, p. 17 Trading in wool top futures (23).

it was not until 1937 that any substantial growth in the volume of trading occurred.

It is reasonable to assume that there should be a close connection between the volume of trading and price movements. For example, violent price movements provide more scope for speculation and create a greater need for hedging protection and this could cause an increase in the number of contracts changing hands. During the first five years of the operation on the New York Wool Tops futures market, however, there was no evidence of any significant relationship between price movements and trading activity. A relationship began to appear by 1936 and both open contracts and volume of trading declined from mid-1938 to mid-1939, a period in which there was relatively little price movement. With the outbreak of war in September, 1939, there was a tremendous increase in the volume of trading which was, of course, accompanied by a sharp increase in price.[5/]

Both the level of open positions and the volume of trading on the Sydney Exchange have been recorded from October 1961. The figures for the monthly volume of trading and open positions for the Sydney Exchange from October, 1961, to April, 1967, have been shown in Figure 8.2.

While the initial trading was heavier on the Sydney Exchange than on the New York Exchange, the growth over the early periods was almost as slow. In October, 1961, there were 2947 lots traded on the Exchange and this figure was exceeded only once between October, 1961, and January, 1963, (this occurred in May, 1962, when 3080 lots were traded). From the beginning of 1963 the market showed a steady in-

5. See (23) p.20.

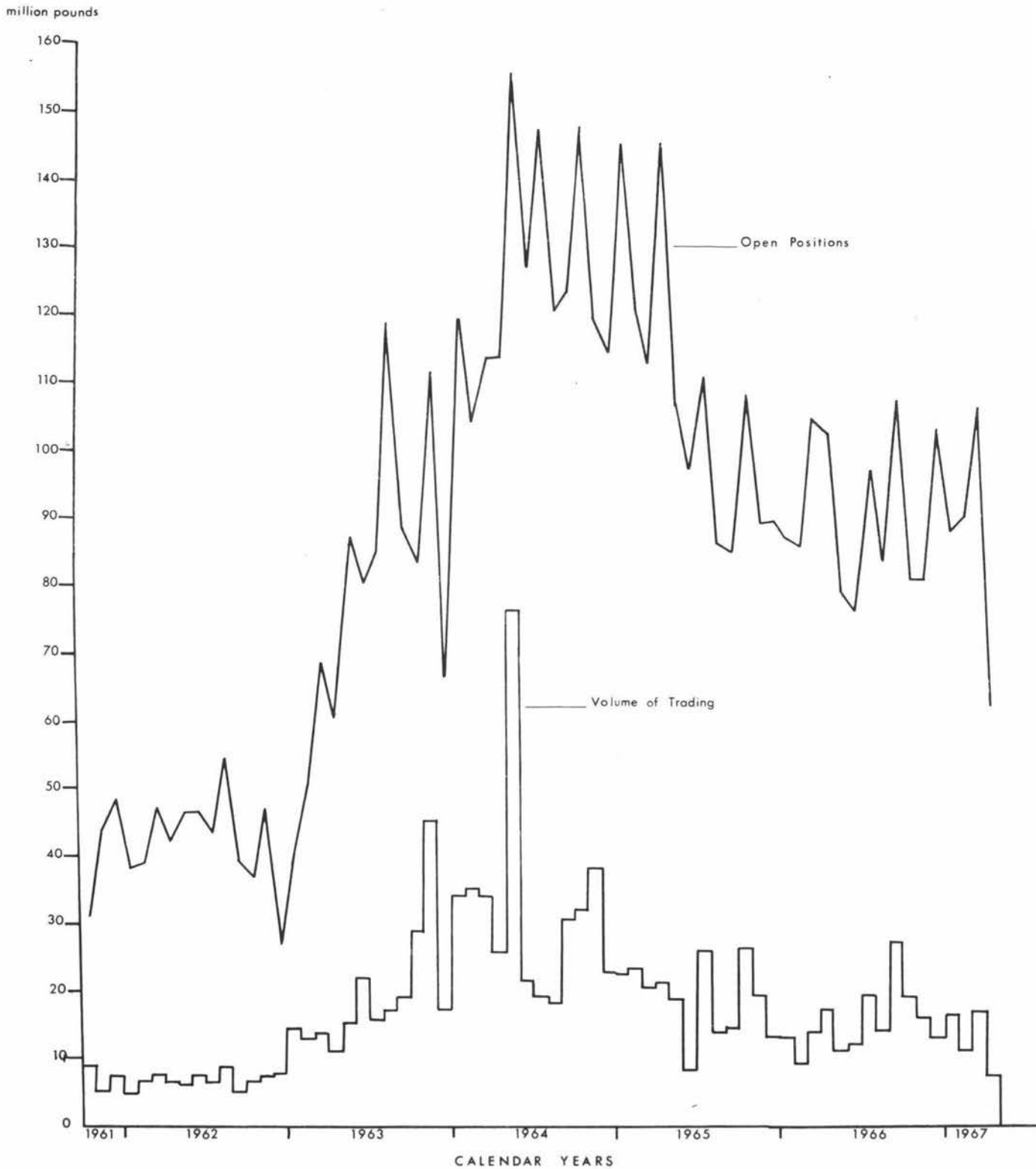

FIG. 8·2 MONTHLY VOLUME OF TRADING AND OPEN CONTRACTS ON THE SYDNEY WOOL FUTURES EXCHANGE OCTOBER 1961 TO APRIL 1967

SOURCE: Data supplied by Sydney Floor Member. (Appendix G)

crease until a peak was reached in November, 1963, of 15,115 contracts. The market then settled down to a plateau of between 20,000 and 30,000 contracts traded per month. The figures for the level of open contracts have followed a similar pattern.

From these figures for the Sydney and New York markets it appears that it takes from three to five years from the time of establishment for a futures market to reach its long term level of trading.

While there are many factors which will influence this rate of growth, such as the extent of price fluctuations in the cash market, perhaps the most important influence is trade "education". Since its inception the Sydney Exchange has undertaken many extension programmes and this may have been the reason for the exchanges more rapid growth

8.4 The Availability of Certified Stocks

Before wool or wool tops may be delivered through futures market it must have been inspected and valued with reference to the Exchange standard. When this has been completed a certificate is issued and the wool or wool tops are available for delivery through one of the approved warehouses.

On the Sydney Exchange the testing is conducted by the Australian Wool Testing Authority. Because only certificated wool may be delivered it is important that traders who hold open or "sold" positions ensure that they have ample certificated wool at their disposal so that if futures become dear in comparison to wool prices they are able to deliver wool rather than buy back their futures commitments.

While it is important that traders who have sold futures have the option of delivering wool or wool tops should this become desirable,

in practice only a small percentage of all trades result in actual delivery (usually around 2 per cent).

Table 8.1 shows the volume of stocks of certified wool tops on hand in approved public warehouses in Boston by months from October, 1931, to December, 1939. It may be seen from this table that for the early period of the New York market there was a steady increase in the amounts of wool tops available for delivery. Only in one year (1935) did the levels fall. The worst point occurred in May, 1955, when 40,000 lbs of tops were delivered (see Table 8.2, page 145) and this exhausted available supplies. This does not seem to have arisen through a difference in price between the spot and futures market as the volume of deliveries was quite small with only 40,000 lbs verses 390,000 lbs in December of the same year. Figures for the level of open positions are not available for that period but there was a low level of trading which would suggest that there was, in fact, little hedging business being conducted on the exchange at that time.

On the Sydney Exchange, at no time during its establishing phase did a situation similar to the above occur. The levels of certificated stocks on hand in approved warehouses by months from October, 1961, to April, 1967, have been shown in Table 8.3, page 146. The volume of actual deliveries which took place on the Exchange from September, 1960, to May, 1963, are shown in Table 8.4, page 147. This table contains more information than was available for the New York market because as well as the actual deliveries which have been given as a percentage of the numbers traded in all months and the largest number of open positions, the table also shows the number of contracts traded in the delivery month.

TABLE 8.1

STOCKS OF CERTIFICATED WOOL TOPS IN APPROVED WAREHOUSES IN BOSTON, IN MONTHS, FROM OCTOBER 1931 TO DECEMBER 1939.

(In thousands of pounds)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1931	-	-	-	-	-	-	-	-	-	70	70	75
1932	60	65	60	90	85	95	100	110	135	105	100	60
1933	75	70	150	145	195	135	50	50	50	60	145	210
1934	350	420	560	625	585	530	530	475	435	350	285	205
1935	115	35	10	25	-	60	25	35	180	220	220	400
1936	490	315	265	275	285	360	430	405	420	340	180	130
1937	190	115	85	140	300	460	540	530	480	835	925	880
1938	775	815	1080	860	1075	1045	1270	1175	1255	1600	1460	1195
1939	1045	600	285	70	90	410	295	280	175	90	120	115

Source: Table 3, p.7, Trading in Wool Top Futures (23).

TABLE 8.2

VOLUME OF DELIVERIES ON NEW YORK WOOL TOPS EXCHANGE BY FUTURES, MAY 1931 TO DECEMBER 1939 (1)

(In thousands of pounds)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1931	-	-	-	-	(2)	-	-	-	40	5	15	20	80
1932	35	5	5	15	5	-	20	40	25	35	10	30	225
1933	5	5	155	10	105	10	45	20	35	60	55	160	665
1934	80	135	130	105	75	5	40	15	190	15	15	55	860
1935	15	5	25	-	40	10	10	45	65	75	40	390	720
1936	40	-	130	10	105	10	80	40	15	90	45	110	675
1937	180	10	95	35	240	30	385	125	55	685	15	345	2200
1938	50	20	750	10	545	20	500	25	-	585	-	315	2820
1939	5	-	105	-	260	-	55	-	-	130	-	285	840

(1) Source: Clearing Association, Inc., of New York Cotton Exchange, May 1931 to July 1938, inclusive; Commodity Exchange Administration, beginning August 1st 1938.

(2) Trading began May 18th, 1931.

Source: Table 4, p.8, Trading in Wool Top Futures (23).

TABLE 8.3

STOCKS OF CERTIFICATED WOOL IN APPROVED WAREHOUSES IN AUSTRALIA, BY MONTHS, FROM OCTOBER 1961 TO APRIL 1967

(In thousands of pounds)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1961	-	-	-	-	-	-	-	-	-	4	5	5
1962	3	2	3	2	3	2	4	5	5	9	10	10
1963	11	9	11	16	7	4	4	3	4	6	13	8
1964	10	4	13	18	24	18	22	14	11	10	16	15
1965	20	16	25	30	24	17	26	17	18	29	20	23
1966	19	15	13	8	11	11	14	10	6	4	7	15
1967	12	12	17	7	-	-	-	-	-	-	-	-

Source: Figures supplied by Sydney Floor member.

TABLE 8.4

SYDNEY: SPOT FUTURES IN DELIVERY MONTHS - NUMBERS TRADED AND DELIVERED

Maturity	Numbers traded in delivery month				Deliveries		Average Premium + or Discount - on Av.64's	Maximum Premium	Maximum Discount
	Up to 23rd	Last 5 days	Last 3 days	Actual	As a percentage of				
					Numbers traded in all months	Largest number of open positions			
1960							pence	pence	pence
September	6	3	1	6	0.8	n.a.	+3.2	7	-¾
October	76	49	16	48	1.3	n.a.	+5.3	7	0
December	101	19	15	61	0.4	n.a.	-1.3	0	-3½
1961									
January	104	55	34	34	1.9	n.a.	0.0	11½	-2½
March	190	48	18	99	2.2	n.a.	+1.3	3½	-4¼
May	84	28	16	20	0.5	n.a.	-0.4	7	-4½
July	99	41	34	45	1.1	n.a.	(+3.9)	6½	0
September	38	8	5	27	1.8	n.a.	+0.4	2	-¼
October	145	42	10	24	0.5	n.a.	+0.6	2½	-1¼
December	117	18	15	51	0.9	11.1	-1.9	0	-3¼
1962									
January	63	20	4	24	1.0	8.0	+0.8	¾	-2½
March	159	31	21	19	0.4	3.5	-2.1	0	-5½
May	255	56	22	37	0.7	6.4	-1.5	0	-5½
July	429	277	153	68	1.0	8.5	(+3.2)	½(8½)	-2
September	135	30	24	77	3.0	22.2	-1.2	2½	-2
October	275	72	51	142	2.0	16.5	-4.4	0	-5¾
December	331	104	45	147	2.2	16.4	-5.7	0	-7
1963									
January	127	12	-	57	4.1	28.2	-6.6	0	-8
March	174	88	69	151	3.5	26.9	-5.6	0	-7
May	408	98	53	89	1.5	13.2	-1.9	0	-6½

Figures in brackets are based on interpolations of W.S.S.* quotations for periods without wool auctions. n.a. Not available. * Wool Statistical Service

Source: Table 5, p.58, The Sydney Wool Futures Market (17).

8.5 The Occurrence of "Undesirable" Practices

Closing transactions may be carried out in uncompetitive conditions either because the market is "thin"[6] or because some traders are able to gain monopoly powers. Monopoly powers may be caused by concentration of trading into the hands of a few traders, or in the spot or delivery month when all but a few positions have been liquidated and there are only one or two operators left on either side. In the latter case, if a holder of a sold position happens to be short of wool he has the alternative of finding wool or closing out his contract at a price acceptable to the long side. If the wool is for some reason difficult to obtain, he is very much at the mercy of the long side with regard to price. Failure to meet his commitments may result in costly and unpleasant consequences including legal proceedings.

Control of a large part of the open bought positions of a maturity by a single operator or by a small group of operators may raise the price of the future. Normally this will be limited by the price of deliverable wool. If stocks of certificated wool should be temporarily in short supply due to the time required for testing, then the controlling interest will be able to raise its selling price without actually controlling deliverable stocks or having to take delivery.

8.51 Concentration of trading

Concentration of trading both in terms of the number of contracts held by one trader, or group of traders, and in the number of contracts traded in any one month is of interest to traders because the likelihood of monopolistic practices increases with an increase in the

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6. A thin market is described as a market in which prices may be affected by the level of trading.

trading concentration.

8.511 Number of traders

The New York market is the only wool futures market for which figures on this aspect are available. In the early period of the market a thorough survey of market participants was undertaken by the United States Department of Agriculture (36). It was found that from August 31st, 1936, to June 30th, 1938, the number of traders increased to slightly less than four times the number in the market at the beginning. During this period the level of open contracts had increased fivefold.

The extent of concentration is seen in the fact that ten traders (between 2 per cent and 3 per cent of the total number of traders) did more than half the trading in wool top futures during the survey period.[7] The distribution of traders by scale of trading is set out in Table 8.5. Some traders had positions on September 1st 1936, which were liquidated during the survey period, and other traders acquired during the survey period positions which were still held at the end. Consequently, purchases and sales are not necessarily equal for an individual trader nor for a group; and it is more convenient to measure scale of trading in terms of purchases plus sales than in terms of either purchases or sales alone. Trading activity has a broader meaning, therefore, in Table 8.5 than in the usual practice in which volume of trading is given for "one side only".

For ninety seven traders the total activity of each during the survey period amounted to only 5,000 to 10,000 lbs. Those who traded only 5,000 lbs either initiated or liquidated a single contract

7. See (23) p.45.

TABLE 8.5

NEW YORK WOOL TOP FUTURES
DISTRIBUTION OF TRADERS BY VOLUME TRADED,
SEPTEMBER 1ST, 1936, TO JUNE 30TH, 1938.

Volume/trader (1,000 lbs) *	Traders	Total Volume Traded
5-10	97	835
15-20	69	1,335
25-50	70	2,530
55-100	50	3,920
105-200	45	6,435
205-500	43	14,460
505-30,325	57	135,395

* Purchases plus sales

Source: Table 21, p.46, Trading in Wool Top Futures (23).

during the survey period. At the other extreme there were fifty seven traders who each traded a total of more than 500,000 lbs (purchases plus sales). In numbers they were 13 per cent but their trading accounted for more than 82 per cent of total volume.

Concentration may mean something more than a comparison of the relative total amounts traded by fairly large groups of traders of two extremes. It is to be expected that any concentration of trading great enough to affect the market seriously by subjecting it to control, or by impairing the effectiveness of competition would ordinarily involve fewer traders than the fifty seven who are included in the group trading over 500,000 lbs. Thus the degree of concentration may better be indicated by taking the proportion of total trading conducted by the largest three, or the largest six traders. For wool top futures from September 1st, 1936 to June 30th, 1938, the largest three traders combined did 31.9 per cent of the trading, while the largest six accounted for 42.4 per cent of all trades.[8] There was, therefore, considerable concentration of trading on the New York wool top futures market during the survey period.

Unfortunately there have been no similar studies conducted on the Sydney and London wool and wool top markets.

8.512 Trading months

Trading or delivery months for the Sydney Exchange are restricted to January, March, May, July, September, October and December. The gaps between these months are deliberately designed to ensure an adequate level of trading in each future. Taking the number of contracts traded in each future (Fig. 8.3) it will be seen that since the September con-

8. See (23), p.47.

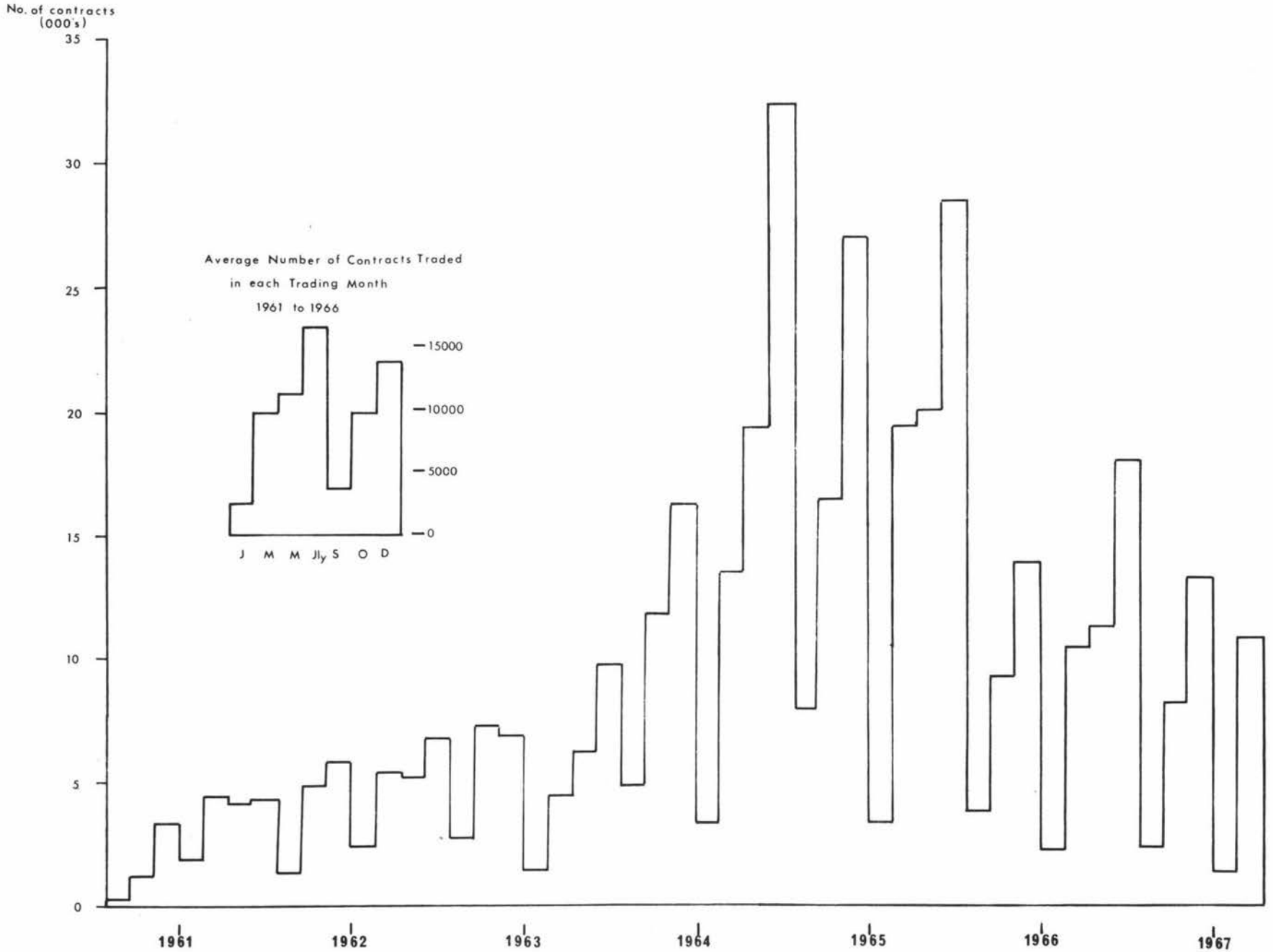

Fig. 8·3 SYDNEY: Number of Contracts Traded in each Trading Month – September 1960 to March 1967.

SOURCE: Data in Appendix G

tract of 1960 there have been no cases of less than 1,000 contracts being traded over the life of any one future. There have been sixteen contracts which have exceeded the 10,000 mark and three which have exceeded 25,000. These figures become more significant when it is realised that for the entire period in which the crossbred tops contract[9] was in operation on the London market there were only 3,287 contracts traded.

The insert of Fig. 8.3 shows the average figures for each month from September, 1960, to March, 1967. Here it will be seen that July and December have been the most active trading months with January and September the least active. This tendency to concentrate trading into a few trading months appears to have become progressively more marked from the 1960/61 season through to the 1965/66 season.

8.52 Evidence of uncompetitive trading

When traders remain "short" until the delivery month arrives and then find that there is insufficient deliverable wool at their disposal they are said to be "cornered". If those holding the contracts force the issue and demand higher prices before they will sell the contracts then a "squeeze" is said to have occurred.

Trading on the New York Exchange is more closely regulated than on the Sydney Exchange[10]. One such regulation is that day-to-day fluctuations in the traded price must be limited to ten cents (US). But this limitation is lifted on the fifteenth day of the delivery month. Squeezes not resulting from manipulation are thus recognised as an ordinary contingency of futures trading requiring no remedial action.

9. See Table 4.1, p.31.

10. See Section 4.22.

Since the detailed study of wool top futures trading extended back to a period prior to the application of the Commodity Exchange Act to such trading, some of the practices of the earlier period were discovered which would have been illegal if the Act had then applied to wool tops.

During the early period many wash sales took place.[11] These are sales in which the buyer and seller are the same person and there is in fact no actual trading involved. This creates a false impression of trade activity, and if no other sales take place on the day, the prices quoted are quite fictitious. Wash sales are illegal under the Commodity Exchange Act and also contrary to the Rules of the Exchange.

Matching of orders has also occurred on the New York Exchange. This occurs when a commission merchant or a Floor member with an order to buy and an order to sell matches these orders in whole or part and records the trade as executed between his two customers. In such cases the price set is very questionable, as often these were the only trades conducted in a single day. While this practice was prevalent with the opening of the wool tops futures contract, it declined as the volume of trading increased.

The taking of the opposite side of customers orders without the prior consent of the customer is prohibited under the Commodity Exchange Act. It is also violating the rules of practically all commodity futures exchanges. This practice was found to have existed on the wool top exchange prior to April, 1938.

The number of spot futures contracts and the number of deliveries actually conducted on the Sydney Exchange have been listed in Table 8.4, page 147. Also shown in the table are the average and maximum premium or

11. See (23), p.59.

discount on the price of average 64's at which these deliveries took place. Weisser (17), in examining the evidence, found that the most substantial squeeze up until May, 1963, had occurred in July, 1962, which, he claims, was due to a lack of available deliverable wool which caused the price of the spot future to exceed the price of the next delivery by 8.09 pence on the 17th July.

The number of trades on the Sydney Exchange which have occurred at a premium of fivepence or more above the Wool Statistical Service quotations for average 64's have been shown in Table 8.6. While the cases in 1960 may be put down to inexperience on the part of traders, it would appear that there is a definite market imbalance in June due to the large volume of futures trading in that month which coincides with a tapering off of wool sales.

8.53 Summary

Monopolistic conditions may arise when the majority of trading is conducted by a few traders; there is a general low level of trading in a delivery month; or traders remain "short" (hold sold contracts) until the delivery month and there is a shortage of certified stocks available. When monopolistic conditions do occur prices may be temporarily distorted from their true level. Such conditions were not of great importance on either the Sydney or New York markets during their early period.

Other trading aimed at distorting prices to the advantage of an individual, or group of traders, was found to occur during the early years of the New York exchange. These transactions tended to decrease as the volume of trading increased and more regulations were imposed.

On both exchanges there was no evidence presented to show that

TABLE 8.6

NUMBER OF TRADES AT THE SYDNEY WOOL FUTURES MARKET IN SPOT FUTURES OF DELIVERY MONTH AT PRICES FIVEPENCE OR MORE ABOVE WOOL STATISTICAL SERVICE AVERAGE 64's

Maturity	Days of Delivery Month 1 - 7	8 - 14	15 - 23	Total
1960				
September			2	2
October		1	44	45
1961				
May			3	3
July	39	8		47
1962				
July			(171)	(171)

Figures in Brackets are based on interpolations of Wool Statistical Service quotations for periods without wool auctions.

Source: Table 6, p.60. The Sydney Wool Futures Market (17).

prices had been distorted to the detriment of growers and in both cases the "climate" for, and occurrence of, such trading declined with the life of the exchange.

8.6 The Difficulty in Obtaining Producer Participation

It is often stated[12] that for a futures market to be really successful in a producing country it must obtain producer support. The evidence, however, tends to refute this contention.

A grower may use a futures market for hedging purposes by selling futures to protect the value of his clip well ahead of his normal sale at auction. Working (56) has applied the term anticipatory hedging to such trading because while wool growers normally sell their wool at a fixed time in the year, they may hedge at any time during the year. This means that if they wish to hedge prior to the date they are able to sell their wool, the decision must be based mainly on their expectation of future price movements.

In the early years of the New York wool futures market little use was made of the market by wool growers (23). Not only was the number of traders small but their commitments in the market amounted to only 3 per cent of the long commitments and 1.2 per cent of the short commitments. This figure had not increased by the second survey on June 30th, 1938.

While some of the "industry connected speculators" may also have been producers it still remains clear that little use was made of the New York wool futures market by wool producers.

In order to measure the actual grower participation in the

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12. Many traders made this point to the author during Survey B.

Sydney market a questionnaire was sent to a random sample of one thousand New South Wales wool growers asking the reasons for their use or non-use of the futures market (40). The results have been shown in Table 8.7 and echo the New York experience as only 1 per cent of the respondents had used the market.

The main reason for the lack of interest appears to be lack of knowledge, but as Phillips stated,

> "... there is, however, no necessary presumption that greater knowledge of these factors would result in increased use." 13/

Since the establishment of the Sydney market the Management Committee has been trying to encourage producer participation. However, because this problem still persists on the American grain markets (where futures have been operating for many years), it is doubtful whether attempts to encourage producer participation will ever have more than a marginal effect.

8.7 The Problem of Creating a "Balanced Market"

The balance or imbalance in futures markets has been measured (57) statistically by measuring the general tendency for futures prices to rise over extended periods for which the beginning and ending spot prices were substantially the same.

The balance of a market determines whether it will be a costly buyers or sellers market. Markets which are imbalanced are characterised by large hedging positions on both sides, which suggests that the speculative to hedging ratio is probably lower than for other futures markets. This means that the markets serve those who do the buying

13. See (40), p.63.

TABLE 8.7

AUSTRALIAN WOOL GROWERS SURVEY

Response to Futures Questionnaire

	Number
Response rate	560
Have used market	6
Have not considered using market	249
Have considered using market	305
Reasons for not using:	
(1) Ignorance of possible benefits	189
(2) No information on how to use market	155
(3) In times of high prices, futures are at too large a discount	158
(4) Not prepared to take risk of price of wool rising after selling futures	98
(5) Futures markets are harmful to the wool industry	113
Reasons for using:	
(1) Anticipatory hedging	4
(2) Selective hedging	2
(3) Finance hedging	1

Source: Table 1, p.63. The Theory and Practice of Futures Trading (40).

and selling anyway and thus little risk is transferred to outside speculators and a higher percentage of all transactions result in delivery. As mentioned in 7.8 there is no reason to expect that this situation would occur should a market be established in New Zealand.

8.8 The Price Relationship between Near and Distant Futures on the New York, London and Sydney Markets in their Early Years.

8.81 New York

The price relationship which occurred on the New York Exchange has been studied (23) and the results have been shown in Figure 8.4. Two futures, March and October, were compared throughout. From April through to October the two futures refer to the same selling season while from November through to March they refer to different selling seasons.

If contango (the distant future is higher priced than near futures) exists in the market, then the spreads between the two futures should be positive from April through to October and negative from November through to April.

Figure 8.4 relates to the opening period of the New York Exchange (1931 - 1939). In the periods each year where the comparisons relate to the same season (the base line is solid, i.e., the October future) contango (March future higher priced than the October future), occurred in forty six months, there was no difference in one month and backwardation (March future lower priced than the October), occurred in fourteen months.

Where the comparisons were between seasons the base line is broken (i.e. March is in the old season and October is in the new

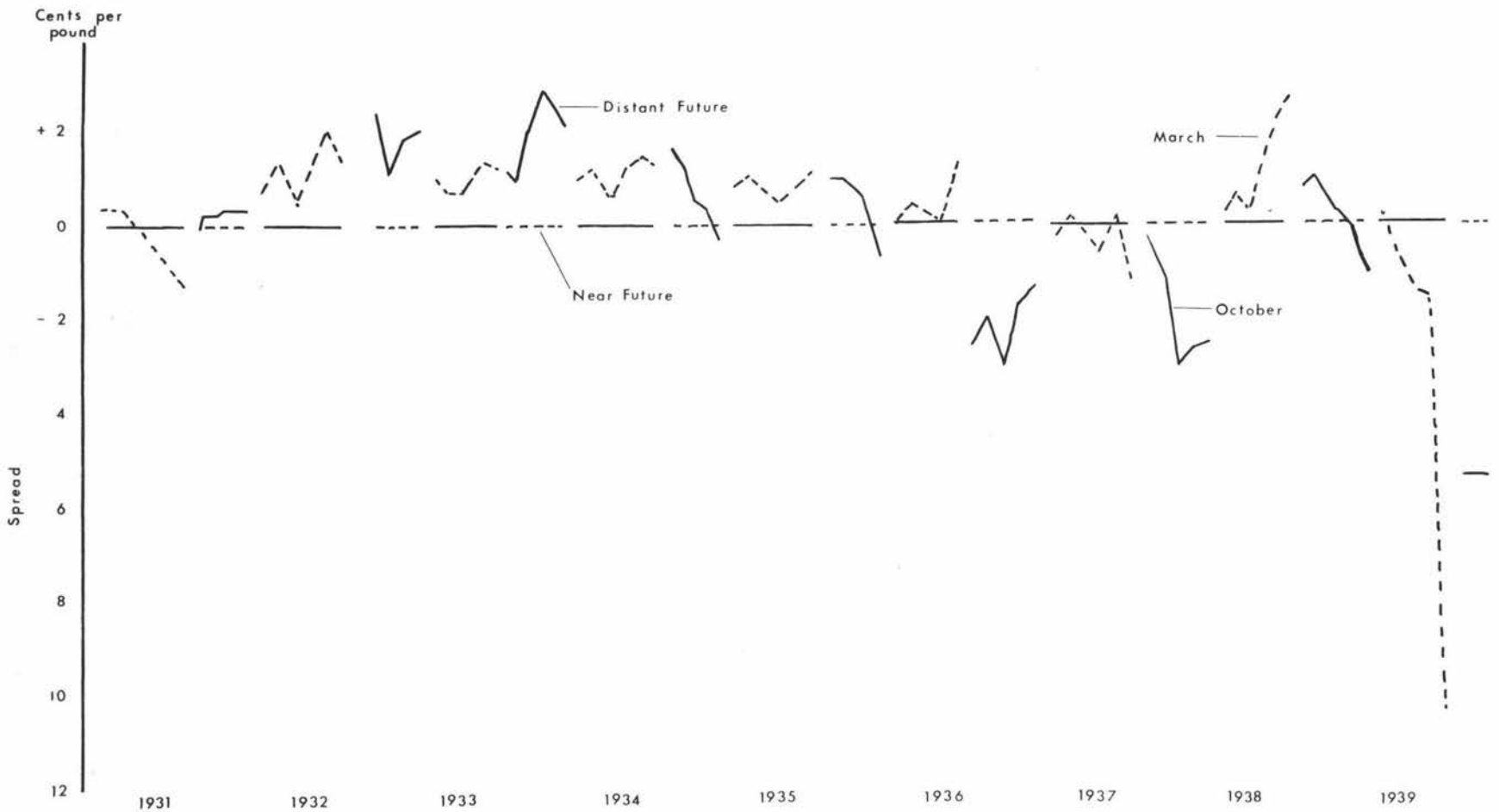

FIG. 8·4 NEW YORK; AVERAGE MONTHLY SPREAD BETWEEN MARCH AND OCTOBER FUTURES – from May 1931 to December 1939.

SOURCE; Fig. 3, p. 15, Trading in Wool Top Futures (23).

season). In such cases contango (new season prices were higher than the the old seasons) occurred for twenty three months, while backwardation occurred for eighteen months. Backwardation, which is considered the most likely situation only occurred in two months up to the end of 1935; compared with nineteen months in which contango occurred. From this evidence it would appear doubtful that in the early years the market had developed sufficiently to provide effective registration of price conditions as between futures.

8.82 London

The price relationship which occurred on the London Exchange in its early period was examined by Gutman and Duffin (16). To estimate the amount of backwardation, the quotations for futures of three, six, nine and twelve months maturity were averaged on a weekly basis and subtracted from the average weekly spot price of the standard top. Where no futures quotations existed for the required delivery month, the prices of the corresponding week for the months before and after the required month were averaged. Backwardation for each successive period of three months in twelve months was then calculated from the figures for three, six, nine and twelve months backwardation.

The figures showed an irregular decline in backwardation until September, 1954, when a sharp drop occurred. An average was calculated for four periods, during each of which backwardation was fairly stable. The results have been reproduced in Table 8.8.

If we neglect the backwardation for the three month future (its higher rate may be partly explained by costs such as commission, etc.), then backwardation declined from a high level of about 1d a month in the two earlier periods to about $\frac{1}{4}$d a month in the third.

TABLE 8.8

AVERAGE BACKWARDATION: LONDON WOOL FUTURES MARKET: FOUR PERIODS

Period (weeks ended)	Average Backwardation (Monthly av. in brackets)			
	Spot to 3 months	3 months to 6 months	6 months to 9 months	9 months to 12 months
2/10/53 to 4/12/53 (10 weeks)	11.2 (3.7)	3.7 (1.2)	3.3 (1.1)	3.4 (1.1)
3/3/54 to 27/8/54 (26 weeks)	4.5 (1.5)	3.4 (1.1)	2.9 (1.0)	2.1 (0.7)
17/9/54 to 14/1/55 (16 weeks)	1.8 (0.6)	0.7 (0.2)	0.6 (0.2)	0.9 (0.3)
4/2/55 to 2/6/55 (14 weeks)	n.a.	0.2 (0.1)	0.8 (0.3)	0.6 (0.2)

n.a. not available

Source: Table 1, p.188. London Wool Top Futures Market (16)

8.83 Sydney

Weisser (17) calculated the extent of backwardation or contango which existed on the Sydney Exchange in its first three years of operation. During this period backwardation of six months futures on average 64's quality wool as quoted by the Wool Statistical Service, average 1d for the first two years but in the third year rose to 6d, making the overall average 3d. The largest backwardation for this period occurred on 5th April, 1963, when it was 16d om the wool quotations of 103d. The highest contango, however, occurred in the week ended November 11th, 1960, when it was 4½d for average 64's quotations of 98d.

8.9 Summary

There do not appear to be any serious problems to be overcome in establishing a futures market or in obtaining "official" sanction for one. In London government officials were instrumental in establishing the exchange and no "opposition" was encountered in Australia. It is reasonable to assume that New Zealand officials would not be any less co-operative.

Once established, exchanges tend to create their own demand and in both cases studied the long term trading levels were reached in a relatively short period. During this period of growth, however, the chances of monopolistic and other undesirable practices occurring is greater. On both the Sydney and New York markets the extent and effect of such trading was not marked.

Exchanges in producing countries do not appear to be dependent on producer participation for their success. On both the New York and

Sydney markets efforts to encourage producer usage have met with only limited success. However, to the extent that an exchange would benefit from additional trading the extension effort required to encourage producer participation may still be worth while.

To the extent that profitable hedging depends on the relationship between near and distant futures and futures and spot prices, then the degree of backwardation or contango which exists in a market is important. The London, New York and Sydney markets have all experienced a different pattern in this respect. Contango characterised the New York Exchange while slowly decreasing backwardation characterised the London Exchange. Sydney, on the other hand, showed an increase in the average backwardation but this seems to have been accompanied by a decrease in variability of the backwardation.

CHAPTER 9

CONCLUSIONS AND SUGGESTIONS FOR THE IMPLEMENTATION OF A CROSSBRED WOOL FUTURES MARKET

9.1 Introduction

This chapter summarises the main findings of the previous chapters regarding the feasibility and relevance of establishing a crossbred wool futures market in New Zealand. It also investigates some of the problems which may be encountered in setting up a market in New Zealand and concludes with some administrative suggestions.

9.2 The Need for a Crossbred Futures Market

There are several reasons why a futures market may be needed in New Zealand. The first and most important being the provision of a medium whereby traders can insure themselves against expected adverse price movements and hence reduce the variability of their profits. At the moment the only way businessmen handling crossbred wool can avoid price risks which show little opportunity of profit is by entering into forward contracts and/or using existing futures markets. The latter have been shown to be a relatively costly alternative for traders concerned with crossbred wools. This means that if crossbred wool users and handlers are to be able to compete with competitors using other fibres, price must be stabilised artificially, or facilities provided to enable them to obtain "reasonable" reduction in the variability of their profits at a cost comparable to the costs facing their competitors.

As a method of stabilising prices (in terms of helping the market to reach its true equilibrium price as determined by current knowledge),

and to limit fluctuations about this equilibrium point, futures markets also have a place. If, however, the aim is to manipulate the market and cause an artificial degree of stability or to raise prices above their market equilibrium, then a reserve price or similar scheme is needed. As a market manipulator a futures market could still play an important role as not only would it enable an official body to place a floor under the market but it would also enable a ceiling to be placed over the market.

Another reason why a crossbred wool futures market is needed in New Zealand is to save overseas funds. If a market were established here, then rather than currency leaving the country to enable traders to hedge on existing markets, currency would actually enter New Zealand from overseas traders.

While these are good reasons for establishing a futures market in New Zealand, such a market would not be acceptable if the costs of establishment were prohibitive; or alternatively if it was not used by a sufficient number of traders.

The costs of establishing a futures market in New Zealand are not large when compared with our annual wool income or even the monies spent on advertising and promotion to make New Zealand wools more competitive. Also, as the costs would be met largely by private individuals and not from any agency funds, there is no direct "opposition" to the expenditure.

9.3 The Location of a Crossbred Futures Market

Historical evidence presented in Chapter 7 showed that attempts to establish two futures contracts for similar commodities on the same

exchange have failed. Therefore, if a crossbred contract is to be established it should be on a separate exchange. The question is where this exchange should be located.

New Zealand produces approximately six hundred and sixty million pounds greasy weight of wool annually, ninety eight per cent of which is classed as crossbred wool, making New Zealand the world's largest crossbred wool producing country. Thus if a futures market is to be placed in a producing country, then in terms of volume of wool New Zealand becomes the first choice.

The alternative to placing a futures market in New Zealand would be the establishment of a separate exchange in the United Kingdom. The successful establishment of the Sydney Exchange and its growth to the point where it is larger than the London market indicates that exchanges are perhaps better located near the source of supply of the commodity. In addition, a past attempt to establish a crossbred contract (tops) on the London Exchange was unsuccessful which means that it probably requires more than the business likely to arise from crossbred tops manufacturers to secure the success of a crossbred contract. Whether the lack of use by the crossbred tops manufacturers of the crossbred contract was due to price conditions on the spot market which existed at the time, or to a larger "price effect" with hedging in the smaller contract is not clear. However, it does not seem probable that the factors which caused the failure of that contract would also cause the failure of a crossbred greasy contract in New Zealand.

9.4 The Likely Success of a Crossbred Futures Market in New Zealand

As was explained in Section 7.11, the likely success of a futures

market in wool depends primarily on two conditions: the existence of large volumes of similar wool types, and enough futures trading to ensure low trading costs. As far as could be estimated both these conditions would be satisfied in New Zealand.

9.41 Floor membership

The first step in exchange establishment is to attract a sufficient number of floor members. The Sydney Exchange began operations with fifteen members. About one half the existing members are leading wool-buying firms, five are futures brokers, one is a wool broker and one a processor. Overseas interests are represented either in the forms of an Australian branch, or in a joint enterprise with an established local firm. Countries represented are the United Kingdom, France, Belgium, the United States of America, Switzerland and Japan.

During talks with members of the wool trade in New Zealand, five firms indicated to the author that they would be interested in becoming floor members of a New Zealand exchange. There may also be other firms who were not contacted as well as overseas firms who would be interested. It is common for some of the larger overseas firms to be members of all the existing wool futures markets so it is reasonable to assume that they would also be interested in joining a New Zealand exchange.

From this evidence it would appear that an adequate number of floor members would be obtained to enable a futures market to be established in New Zealand.

9.5 The Use of a Futures Market by Farmers

A futures market would provide several benefits to wool growers such as allowing them to take advantage of expected price movements to

"fix" their income within limits at any time during the season. This latter advantage is helpful when farm budgets are being drawn up for development programmes. In spite of these advantages, however, it is unlikely that any significant grower participation would be forthcoming in the initial stages.

In the United States some of the very large growers and grower co-operatives use futures (24). In Australia where there are numerous large farmers, and farmers retain ownership until the wool is acquired by processors and hence even more scope for the use of futures, little grower use of futures has eventuated. Gray considers that this is due to,

> "... the "traditional" emphasis upon production, characteristic of most farmers and growers." 1/

In New Zealand where there is a smaller number of "large" farmers there may be even less grower participation. If, however, there is an appreciation of the uses and limitations of futures by growers, then they may use futures to a greater extent and a futures market would benefit accordingly. This would probably depend on the amount of effort and resources put into a planned extension programme for farmers.

9.6 Organisational Suggestions

9.61 Institutional requirements

The institutional requirements for trading in wool futures contracts are not extensive. The essentials are a room in which the purchase and sale of contracts can take place, clearing facilities to enable efficient financial organisation, and facilities to enable wool to be delivered should this be required. As stated in Section 4.4 the

1. See (24), p.19.

trading room and its associated facilities are usually owned or controlled by the floor members. The other facilities are normally provided by private enterprise.

If necessary in the early stages, the New Zealand Wool Board could probably make available a trading room for a New Zealand exchange. Adequate delivery facilities could be provided by members of the New Zealand Wool Brokers' Association. There are existing industrial bankers who could handle the clearing facilities. Wool testing could adequately be handled by the Wool Testing section of the New Zealand Wool Board, which currently undertakes wool testing for private clients on a commercial basis or, alternatively, by a private wool testing firm.

9.62 Control

Federal intervention in futures trading exists in the United States while in the United Kingdom and Australia management of futures exchanges is left completely to private enterprise (Section 4.22).

Weisser, in examining the need for government regulation in Australia concluded that:[2]

> "Interference with the management and conduct of the market should be avoided as long as fair and competitive trading conditions continue to be maintained. However, for the purposes of gaining insight into the market structure and of providing any outside interests with the means of ascertaining that competitive conditions do in fact prevail at all times, statutory arrangements for the collection of statistics as practised in the U.S.A. would be well worth considering."

As recently as 1967, however, the Australian Wool Marketing Committee reported,

> "... that the Sydney futures market should be licensed by the Australian Wool Marketing Authority and that this Authority should have powers of investigation into the operations of the market at any time considered desirable."[3]

2. See (17), p.68.

3. See (32), p.16, para.116.

The committee stated that:

> "... it had no evidence of undesirable practices within the Sydney futures market but it considered that the possibility of these arising in the future cannot be excluded in the view of the history of some futures markets in other parts of the world." 4/

and further that:

> "... licensing the market would promote confidence in it by users and potential users." 5/

While the author agrees with Weisser that there should be as little interference as possible in the running of a futures market, should one be established in New Zealand, the licensing of it on the lines suggested above would have advantages as it would prevent any unfounded criticism, especially if the Authority collected and published full trading statistics.

9.63 Delivery grades and dates

While a futures contract is not meant to be delivered, there is still the problem of ensuring that manipulation does not occur with the wool available for delivery.

9.631 Delivery grades

The difficulty with wool futures lies in the standardisation of wool into a few invariable grades (58). Having as wide a delivery range as possible means that the futures contract covers a larger volume of wool. This ensures that the deliverable stocks are less likely to fall into the hands of an individual or group of traders, and hence manipulation is less likely (47). On the other hand, if there is too wide a range of types deliverable there is always a danger that speculators will sell futures and then insist on delivering the "cheapest" available type, i.e., the one with a lower relative price

4. See (32), p.16, para. 117.
5. Loc.cit., para. 118.

than has been allowed for by the official exchange premium or discount.

Another factor is that the "quality" of the contract for hedging purposes decreases as the delivery range increases. If only one type of wool was deliverable, then anyone wanting to hedge exactly this wool type has a maximum "quality" hedge, since any predictions he has to make about the future are about the future price of exactly his type of wool. If a wide range of wools is accepted for delivery, then he has also to consider price movements in these other wool types and the hedge is no longer as good for a person concerned with the original wool type.

There is also the danger that traders may be forced to accept wool not suitable to their business[6/] and thus be faced with a possible extra cost of re-selling the wool.

Crossbred wools are more diverse in nature than merino wools and for this reason have a greater number of end uses. The shorter, coarser wools are used mainly for carpet and blanket production while the finer wools may be used for apparel production.

As shown in Appendix C there are seventy three deliverable types on the Sydney Exchange. However, only forty eight types were recommended in Section 7.61 for a New Zealand exchange. This lower number may be more realistic for a crossbred wool futures market. If these types were found to present too narrow a range, then perhaps the additional types also shown in Appendix F could be included. This would increase the volume of wool by about 60,000 bales.

The most suitable basis type would be type 128. This type would be preferable to type 114, which is often spoken of as New Zealand's "average" type, because the production of type 128 (which

6. This is thought to be one of the reasons for the lack of use of the London crossbred tops contract.

represented 6502 bales in the 1966/67 season) is increasing while the production of type 114 (which represented 1765 bales in the 1966/67 season) is decreasing.

9.632 Delivery dates

During the establishment of an exchange in New Zealand it would be better to have a slightly restricted number of dates to increase the volume of trading in the permissible months.

Suitable months would be March, May, July, October and December. The Sydney Exchange also included September and January, neither of which attracted much trading.

9.64 Foreign Exchange regulations

The importance of allowing a free flow of funds in and out of the country by overseas traders cannot be stressed too strongly. Because most of New Zealand's wool is sold to overseas firms, it is reasonable to assume that it is from these traders that a lot of the potential exchange business will come. This would be especially true in the early years. Any regulations should cover all trading as there is no logical reason why speculation should be excluded by regulation. It may even be found that the exclusion of overseas speculative capital would prevent an exchange from becoming viable.

9.65 Rules of the exchange

The rules of a New Zealand exchange could adequately be modelled on the Sydney Exchange. There may, however, be necessary differences which could only be determined after thorough discussions between members of the Sydney Exchange and the New Zealand wool trade.

The quantity of wool to be delivered under the Sydney contract is considerably smaller than the quantities called for on the New York

and London markets. This was a deliberate attempt to encourage small growers to enter the market. However, as Weisser has stated:

> "There is, however, some doubt whether this measure can have more than a marginal effect on turnover, or would have, even if growers' participation in the market were to become more widespread than it is at present." 7/

There is, however, another argument for making a New Zealand contract the same size as the Sydney contract. In New Zealand over sixty per cent of the wool is re-classed or bulk-classed by the selling brokers which has resulted in the average lot size of approximately thirteen bales which is approximately the size of a 3,000 lb. contract.

The venue of delivery could possibly be in any registered wool brokers store in any one of the eight wool selling centres in New Zealand. Having to take delivery at a distant centre may significantly increase costs for a New Zealand wool user, but the difference would in most cases not be significant for overseas interests taking delivery. This system would be in line with Australia but differ from New York and London where only one centre is allowed. In Australia wool cannot be tendered unless it has been auctioned within the last twelve months. In the author's view this regulation is unnecessary as the auction system should be able to exist without it. The only effect such a regulation would have would be to increase costs in some cases, and to prevent private wool buyers from delivering wool purchased outside the auction system.

9.7 Steps in Establishing a Futures Market

The first step in setting up a futures market would be to hold discussions between interested parties to decide on a course of action. There seems little advantage to be gained from setting up a special

7. See (17), p.21.

committee to investigate futures trading, as occurred in the United Kingdom (see Section 8.2). However, an advisory technical committee should be set up from members of the industry. This committee should be responsible for discussing with trade members and members of existing markets such points as the basis grade, appraisement and selection of storage warehouses. At the same time, a larger committee could be set up to decide on general and financial arrangements.

Once a general trading regulation has been formulated, the next step would be to educate members of the wool trade in futures trading. To achieve this a publicity programme must be initiated. Publicity should be designed to advance the ideas of futures trading by using mass media. Groups to be reached in a publicity programme should include:

1. Farmers
2. Wool merchants
3. Wool buyers
4. Wool processors and manufacturers
5. Banks and other financial institutions
6. Stock brokers
7. Advisory services
8. General public

To be successful, a publicity programme would need to be well planned and co-ordinated with the establishing date of the exchange.

9.8 Avenues for Further Study

During this study information was not available on some topics which would have helped in providing additional conclusions.

Little knowledge was available on the reasons for the lack of use of the London crossbred tops contract while it was in operation. Information on this topic would be helpful in providing guidelines for

the organisation of a New Zealand exchange. It could probably be obtained by personal discussions with members of the United Kingdom wool trade.

When estimating likely trade activity it would have been useful to know who uses futures and why, on the Sydney Exchange, so that similar potential New Zealand operators could have been contacted.

9.9 Conclusion

This study has investigated the need and likely success of a crossbred wool futures market in New Zealand.

There are many economic and trading advantages which the New Zealand wool industry would obtain from the establishment of a crossbred futures market, especially if it were located in this country. Perhaps the most important advantages are the provision of effective hedging facilities and increased efficiency in the operation of the Floor price scheme. However, if present trends continue United Kingdom experience may be repeated, in which case the motive for establishing a futures market may arise out of a need to conserve and obtain overseas funds.

The success of any marketing scheme depends primarily on efficient organisation and sufficient trade usage. Survey results and communication with traders involved in futures trading indicates that a New Zealand futures market would attract sufficient trading. This chapter has presented an outline for possible trading regulations which would facilitate the smooth operation of a futures market.

With a futures market the costs of operation are carried by the users and there is no conclusive evidence to show that well

organised futures trading has indirect adverse effects on non-users. For this reason a futures market provides a means of adding to and improving on present selling methods without adversely effecting sections of the wool industry.

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APPENDIX A

EXPLANATION OF WOOL AND FUTURES TERMS USED IN STUDY

Arbitrage

Buying cheap and selling dear. If the prices in different markets or commodities should move out of line then speculators will purchase in the cheaper market or commodity and sell the same quantity simultaneously in the dearer market or commodity. This may occur between markets, or between futures contracts of different delivery dates. If the more distant future rises in relation to current contracts by more than the cost of buying wool and storing it, then a special form of arbitrage can occur with speculators buying wool (and storing it) for delivery on distant futures contracts sold.

This activity (arbitrage) ensures that prices in different markets for the same commodity remain closely in line.

Backwardation

The term used to describe the situation in which spot prices are higher than futures prices; and near futures higher priced than distant futures.

This is an "unusual" situation since prices in the future might be expected to be higher than present prices (a situation described by the trade as contango) in view of the storage costs of holding a commodity. One situation in which "backwardation" may be expected to be large is immediately before the start of a new season when speculators can see adequate supplies in a few months time even though the commodity is currently in short supply.

Bale

A package of wool, in a wool pack, weighing at least 200 lb. and having a maximum weight of 400 lb. for fleece wool and 450 lb. for oddments.

Basis

The difference at any one point in time between the spot price and the price of the futures contract being referred to.

For example, if the contracts for delivery in twelve months time are being sold at ninety six cents and the "spot" commodity is being sold at one hundred and two cents, then the basis will be six cents below spot. The term is also used to describe the "normal" margin between prices.

Basis grade

The exact standard and grade referred to in the futures contract. Prices for all other deliverable grades are related to this.

For example, the exact basis grade for the Sydney Wool Futures Exchange is defined as 64's quality, good topmaking Australian Merino fleece wool.

Bellies

Wool shorn from the belly of sheep. Belly wool is packed separately from fleece wool.

Break

Distinct tenderness in wool caused by sickness, lack of food or water, or a sudden change of pasture.

Brokens

A sort made from the larger pieces skirted off the fleece, and after the short wool and dirty ends have been removed.

Call

A period in which trading is conducted (usually through a chairman) to establish a price level for each futures contract. This gives an indication of ruling market prices and speeds up subsequent trading.

Carding Wool

Wool suitable for the woollen trade. It is shorter than combing or worsted quality wool.

Carrying charge

This commonly refers to the costs involved in owning commodities over a period of time, such as, storage costs and insurance. On a futures market, it refers to the cost of taking delivery and then storing it and re-entering it on to the exchange in another later delivery month. It is this carrying charge which sets the limit to the amount that prices for distant futures may rise above the price of earlier maturing contracts. If futures rise above this limit, then wool storage for delivery on futures contracts is likely to take place.

Clean Basis

Price of scoured wool minus loss and charges incurred in the scouring operation.

Clearing House

This is the separate agency associated with a futures exchange through which futures contracts are offset or fulfilled and through which financial settlement is made. For accounting purposes all purchases (and sales) are made from (and to) the Clearing House. This means that the vendor (or purchaser) does not have to worry about financial failure on the part of the person from whom he actually buys from or sells to.

Comebacks

Wool shorn from comeback sheep, which in Australia refers to a breed of sheep obtained by crossing the Lincoln-Merino halfbreed (i.e., 1st cross) with the Merino ram to give the quarter breed, which is again crossed with the Merino ram to give the "Comeback".

Contract grades

The grades of a commodity listed in the Rules of the Exchange as those which can be used to deliver against a futures contract. On a futures market wool types are used.

For example, on the Sydney Exchange there are seventy three deliverable types, their quality ranging from 70's down to 60's.

Corner

If, towards the end of trading in the delivery month, all but a few positions have been liquidated and there are only one or two operators left holding sold and bought contracts, a holder of a sold position who happens to be short of wool has the alternative of finding wool or buying back his contract at a price acceptable to the people holding bought positions. If the wool is, for some reason or

other, difficult to get, he is very much at the mercy of those traders on the "long" side with regard to price and he is said to be cornered.

Cotted

Term applied to wool which has become partially felted or matted while on the sheep's back.

Crossbred wool

In New Zealand this term applies to lustre wool varying in fineness from 36's to 56's irrespective of breed or cross of the sheep.

Crutchings

Wool shorn from the crutch and back of hind legs. This is done to prevent formation of dags.

Delivery

The tendering of the actual commodity in fulfilment of a "sold" or "short" position in the futures market. There are many rules governing the type and quantity of produce to be delivered as well as the place and method of delivery.

Because of the additional costs involved in selling wool in this manner, most contracts are "cancelled" before they fall due and usually about two per cent of futures contracts are fulfilled by actual delivery.

Delivery month

The month in which the futures contract matures and within which delivery of the physical commodity must be made on all remaining "open contracts".

For example, on the Sydney Exchange, January, March, May, July, September, October and December are delivery months.

Differentials

The premiums or discounts of the deliverable types with respect to the contract grade as set by the Management Committee on the first trading day of each month.

The differentials are set with regard to prices paid for each grade of the cash commodity in the physical market in the previous month.

Dry combing

Preparing and combing of worsted stock devoid of oil or emulsion.

Floor broker

A member of a futures exchange who has the privilege of trading on the Exchange floor. Floor brokers or members may execute orders on their own account or on behalf of clients.

Greasy wool

Wool in its natural condition as shorn from the sheep.

Hedging

Hedging normally refers to an operation in which a trader endeavours to cover his position in the cash market against adverse price movements by taking an offsetting position in the futures market.

For example, unsold stock would be covered by the sale of futures contracts and an uncovered forward sale would be covered by

the purchase of futures.

Inverted market

A futures market in which the nearer months are selling at premiums to the more distant months. This may also be called "backwardation".

Limit

On some futures exchanges there is a limit or maximum price advance or decline permitted in any one trading session. Limits may also be used to refer to the maximum number of contracts one trader may hold on some exchanges.

Both types of limits apply on the New York futures market, but not on the Sydney market.

Liquidation

The "buying back" of a sold contract, or alternatively, the "selling" of a bought contract.

Long

When the first operation is to buy a futures contract, the operator is said to be "long" on futures. Similarly, if a trader owns actual commodities which have not been hedged he is said to be "long" on the commodity and "short" on futures. He is "long" on the things he actually owns, and "short" on the things he has promised to deliver or accept.

Lot

Any parcel of wool catalogued and offered for sale as one line.

Margin

On some exchanges this refers to the original payment required as a security or guarantee of contract fulfilment (called a deposit on some exchanges). It may also refer to the payment called to cover an adverse price movement.

An example of the latter would be where a trader has bought contracts at one hundred cents in June for December delivery and by July the current market value of his contracts has fallen to ninety five cents. He now has two alternatives: if he thinks prices will fall further between July and December, he may sell his contracts and accept five cents per pound loss on each contract. Alternatively, if he thinks prices may increase he can hold the contracts and pay an additional five cents per pound for each contract to cover this decline in value. In this way the Clearing House is assured that at all times a trader's liabilities do not amount to more than the market value of his contracts. This eliminates any risks of default in payment.

Maturity

The time in which futures contracts must be settled by delivery of the actual commodity if it has not been "cancelled" by an offsetting transaction. It is the period between the "first notice day" and the "last trading day".

On the Sydney Exchange this is any day between the 1st to the 23rd of the month. However, if the seller notifies the Clearing House on or before the 23rd of his intention to tender, then he may do so until the 30th of the month.

Noble comb

Also known as the circular comb, it is used on the English or Bradford system in making worsted yarn.

Noils

Short and weak fibres extracted from the long during the combing process, used in the woollen and felt trade.

Open positions

The number of contracts registered with the Clearing House which remain to be settled. It is equal to either the number of long positions in a market or the number of short positions. Since it takes both a long and a short to make one contract, the number of longs and shorts in a market is always equal.

Pieces

The wool removed from the fleece during skirting.

Position

If a trader is either net long or short in the market he is said to hold a position in the market.

Quality (number)

Refers to the fineness of the wool which is relative and is indicated by an arbitrary number which originally had reference to the spinning value of the wool.

Round turn

The completion of both a purchase and an offsetting sale.

Scoured wool

Wool which has been washed or scoured to remove all or most of the non-wool constituents.

Short

Initiating a transaction by the sale of futures, i.e., selling futures without having previously purchased futures. The opposite to long.

Speculative short selling

Selling futures contracts which do not represent actual commodities on hand, i.e., to undertake to deliver at a future date commodities which the seller does not have in his possession at the time the undertaking is made. This will be profitable if the cash market declines.

Spot month

The first quoted month on the market. In some cases this may not be the current month. On the Sydney Exchange in August the spot month will be September because August is not a delivery month.

Spot price

The price at which physical sales of the commodity are actually taking place. In Australia it is usually the ruling auction price.

Squeeze

The forcing of speculators who have been cornered (i.e., caught without access to deliverable grades of the commodity) into paying a higher price to buy back their contracts. This usually results in a large loss to those caught short and a big profit to

those forcing the corner. Normally these are rare in practice.

Straddle

The simultaneous buying of one quoted month and the selling of a different quoted month in anticipation of the price relationship between the two months changing sufficiently for the operator to make a profit.

Wash sales

These are fictitious transactions in which one broker arranges to sell to another at an artificially high price. Other speculators are misled into thinking that there is a real reason for the reported advance in price.

Wool tops

This refers to a semi-manufactured stage in wool processing in which a continuous band or ribbon of combed fibres are laid parallel in an untwisted condition; all short and weak fibres (noils) have been combed out.

Yield

The weight of clean wool of normal condition expressed as a percentage of the weight of greasy wool.

APPENDIX B

Questionnaires

I. SURVEY B: FUTURES MARKET QUESTIONNAIRE FOR WOOL BUYERS

1. What percentage of your firm's business is done with crossbred wools? .....

2. Which of the following types best describes your firm's operations?

   (i) Commission buying (____)

   (ii) Employed by principals (____)

   (iii) Merchant buying into stock (____)

   OTHER: Please specify .....

   .....

   .....

3. What percentage of your business involves:

   (i) Buying for current orders .....

   (ii) Buying to cover forward sales .....

4. In this class of business do you believe the risks of a rise and fall in wool prices warrants you protecting your transactions with a futures hedge.

   (i) Regularly (____)

   (ii) Occasionally (____)

   (iii) Never (____)

5. Do you use existing futures markets?

(i) Yes (____)

(ii) No (____)

If NO, go directly to Question 8.

5a. Which markets do you use?

.....

.....

.....

5b. How many wool futures contracts have you bought or sold in each of the last three seasons? (Do not include closing contracts).

1964/65 .....

1965/66 .....

1966 to date .....

5c. On which futures markets have the contracts been transacted?

1.....

2.....

3.....

5d. Do you use these markets to:

(i) Hedge or protect your crossbred wool transactions,

As a routine practice (____)

Under some circumstances (____)

SPECIFY .....

(ii) As a speculative venture,

Yes (____)

No (____)

5e. If YES, do you feel you are getting as much protection as you would like, considering the amount that you pay?

Yes (____)

No (____)

If NO, why not? .....

.....

.....

6. You have said you are using wool futures at present

a. Do you consider that the current price of futures affects the buying and selling price of wool?

Yes (____)

No (____)

If YES, in what way? .....

.....

.....

b. Do you consider that the current price of futures affects the quantity of wool you would handle?

Yes (____)

No (____)

If YES, in what way? .....

.....

.....

7. Do you use futures markets for reasons other than for hedging and/or speculative purposes?

Yes (____)

No (____)

If YES, for what purpose? .....

.....

8. From Question 3 (Never)

You are not using futures markets at present. Is this because:

(i) You lack information on futures (____)

(ii) Futures are not applicable to your business (____)

(iii) You consider the protection you would gain from futures is too costly (____)

OTHER REASONS: Please specify .....

.....

.....

9. Does the fact that there is no special wool futures contract for crossbred wool limit your firm's dealings in crossbred wool?

Yes (____)

No (____)

Perhaps (____)

10. Suppose a market specialising in crossbred contracts were to be established, should it operate in:

(i) An exchange in N.Z. (____)

(ii) The Sydney Exchange (____)

(iii) Other country - name .....

11. If a futures market to deal in crossbred contracts was established in N.Z., do you think it would succeed?

Yes (____)

No (____)

If NO, why not? .....

.....

.....

12. A London contract was discontinued in 1961. Do you have any opinion on why this happened?

Yes (____)

No (____)

If YES, please specify .....

.....

.....

13. Suppose a crossbred futures market was established successfully in N.Z.

(i) What advantages would your firm gain from it?

.....

.....

.....

(ii) The wool industry as a whole gain from it?

.....

.....

.....

(iii) In your opinion would it be compatible with the N.Z. floor price scheme?

.....

.....

.....

II. SURVEY A: FUTURES MARKET QUESTIONNAIRE FOR FLOOR MEMBERS OF THE SYDNEY FUTURES EXCHANGE

1. The London crossbred contract was discontinued in 1961.

Do you feel this was due to:

(i) The fact that it was in wool tops and not greasy wool (____)

(ii) Too large a deliverable range (____)

(iii) Too far from source of supply (____)

(iv) Crossbred wool users felt that their business did not require the type of protection that could be gained from hedging (____)

(v) Would have been better in a separate market (____)

(vi) There is insufficient trade in crossbred wool to support a futures contract (____)

OTHER: Please specify .....

.....

.....

2. Do you feel there is, at present, a large enough volume of crossbred wool to warrant a crossbred contract?

Yes (____)

No (____)

3. If a crossbred contract were established on the Sydney Exchange, do you think it would succeed?

Yes (____)

No (____)

If NO, why not? .....

.....

.....

4. Would you favour the establishment of a crossbred contract on the Sydney Exchange?

Yes (____)

No (____)

Please give reasons: .....

.....

.....

5. Do you consider a crossbred futures contract could successfully be established in another country?

Yes (____)

No (____)

If YES, where? .....

.....

.....

APPENDIX C

SYDNEY GREASY WOOL FUTURES EXCHANGE

DELIVERABLE WOOLS

The following Australian Central Wool Committee types are deliverable:

MERINO FLEECE

Average Spinners and Best Topmaking - Warp

54	...	...	70's and/or upwards
55	...	...	64/70's
56	...	...	64's
56A	...	...	64/60's
57	...	...	60/64's
58	...	...	60's

Warp and Half Warp

60	...	...	70's and/or upwards
61	...	...	64/70's
62	...	...	64's
62A	...	...	64/60's
63	...	...	60/64's
64	...	...	60's

Half Warp

65	...	...	70's and/or upwards
66	...	...	64/70's
67	...	...	64's
67A	...	...	64/60's
68	...	...	60/64's
69	...	...	60's

GOOD TOPMAKING

Shafty

70	...	...	70's and/or upwards
71	...	...	64/70's
72	...	...	64's
72A	...	...	64/60's
73	...	...	60/64's
74	...	...	60's

Good to Average Length

76	...	...	70's and/or upwards
77	...	...	64/70's
78	...	...	64's
78A	...	...	64/60's
79	...	...	60's

Medium Length

82	...	...	70's and/or upwards
83	...	...	64/70's
84	...	...	64's
84A	...	...	64/60's
85	...	...	60's

MERINO BROKENS, NECKS, PIECES AND BELLIES

Broken, Warp, Free or Practically Free

127	...	...	70's and/or upwards
128	...	...	64/70's
129	...	...	64's
130	...	...	64/60's
131	...	...	60's

Broken, Necks and/or Pieces, Good to Average Length, Free or Practically Free

132	...	...	70's and/or upwards
133	...	...	64/70's
134	...	...	64's
135	...	...	64/60's
136	...	...	60's

Best Topmaking Broken, Necks and/or Pieces, Good Length and Style

140	...	...	70's
141	...	...	64/70's
142	...	...	64's
142A	...	...	64/60's
143	...	...	60/64's
144	...	...	60's

Average Topmaking Broken, Necks and/or Pieces, Good Average Length

146P	...	...	70's
146	...	...	64/70's
147	...	...	64's
147A	...	...	64/60's
148	...	...	60/64's
149	...	...	60's

Medium Length Broken, Necks and/or Pieces, Length $2\frac{1}{4}$ to $2\frac{3}{4}$ inches

	156	... ...	70's
	157	... ...	64/70's
	158	... ...	64's
	158A	... ...	64/60's
	159	... ...	60/64's
	159A	... ...	60's

COMEBACK FLEECE

Good

	420	... ...	64's
	421	... ...	60/64's
	422	... ...	60's
Good Average	430	... ...	64's
	431	... ...	60/64's
	432	... ...	60's

COMEBACK PIECES

Skirtings, etc., Extra Super Bulky Broken

	460	... ...	60/64's

Super Bulky Broken and 1st Pieces

	468	... ...	60/64's

Average Broken, 1st Pieces and Best Combing Bellies, Good Length

	476	... ...	60/64's

Deliverable Lines

The following are the approved types having similar characteristics of length and quality. A tender made up of wools of more than one type must consist of the compatible wools as specified in any one group.

MERINO FLEECE, IN GROUPS

Group	Quality	Warp	Shafty	Warp & Half Warp
1.	70,64/70	T54,T55	T70,T71	T60,T61
2.	64/70,64	T55,T56	T71,T72	T61,T62
3.	64,64/60,60/64	T56A,T56,T57	T72,T72A,T73	T62,T62A,T63
4.	64/60,60/64,60	T56A,T57,T58	T72A,T73,T74	T62A,T63,T64

Group	Quality	Warp & Half Warp	Good to Av. Length	Shafty
5.	70,64/70	T60,T61	T76,T77	T70,T71
6.	64/70,64	T61,T62	T77,T78	T71,T72
7.	64,64/60,60/64	T62,T62A,T63	T78,T78A,T79	T72,T72A,T73
8.	64/60,60/64,60	T62A,T63,T64	T78A,T79,T80	T72A,T73,T74

Group	Quality	Half Warp	Medium Length	Good to Av. Length
9.	70,64/70	T65,T66	T82,T83	T76,T77
10.	64/70,64	T66,T67	T83,T84	T77,T78
11.	64,64/60,60/64	T67,T67A,T68	T84,T84A,T85	T78,T78A,T79
12.	64/60,60/64,60	T67A,T68,T69	T84A,T85,T86	T78A,T79,T80

COMEBACK FLEECE

Group	Quality	Good	Good Av.
13.	64,60/64,60	T420,T421, T422	T430,T431, T432

MERINO BROKENS AND PIECES

Group	Quality	Warp (Alone)
14.	70,74/70	T127,T128
15.	64/70,64	T128,T129
16.	64,64/60	T129,T130
17.	64/60,60	T130,T131

Group	Quality	Good to Av. Length	Good Length	Good Av. Length
18.	70,64/70	T132,T133	T140,T141	T146P,T146
19.	64/70,64	T133,T134	T141,T142	T146,T147
20.	64,64/60	T134,T135	T142,T142A,T143	T147,T147A,T148
21.	64/60,60	T135,T136	T142A,T143,T144	T147A,T148,T149

Group	Quality	Good Av. Length	Medium Length
22.	70,64/70	T146P,T146	T156,T157
23.	64/70,64	T146,T147	T157,T158
24.	64,64/60,60/64	T147,T147A,T148	T158,T158A,T159
25.	64/60,60/64	T147A,T148,T149	T158A,T159,T159A

COMEBACK PIECES

Group	Quality	Extra Super Bulky Broken & 1st Pieces	Super Bulky Broken Broken & 1st Pieces
26.	60/64	T460	T468

Group	Quality	Average Broken 1st Pieces & Best Combing Bellies Good Length
27.	60/64	T476 (Alone)

APPENDIX D

RESULTS OF THE HEDGING MODEL

This Appendix summarises the results of the model constructed to test the effectiveness of the hedging protection provided by the London and Sydney Futures markets. The model tested the effectiveness of hedging in terms of their basis contracts and for crossbred wool. A description of the layout of the tables has been included in the body of the text.

TABLE 1

AVERAGE GAINS AND LOSSES RESULTING FROM SHORT AND LONG HEDGING OF AVERAGE 64's QUALITY WOOL ON THE SYDNEY EXCHANGE TOGETHER WITH THE VARIANCES OF THE GAINS AND LOSSES FROM 21.5.60. TO 18.2.66.
(pence N.Z. per lb.)

		Forward Sales								Forward Purchases							
Period of hedging (weeks)	No. of trans-actions	Av.profit (+) or loss (-)		Diff. 2-1	Variance		Ratio 4÷5 %	Std. Deviation		Av.profit (+) or loss (-)		Diff. 10-9	Variance		Ratio 12÷13 %	Std. Deviation	
		Hedged (1)	Unhedged (2)	(3)	Hedged (4)	Unhedged (5)	(6)	Hedged (7)	Unhedged (8)	Hedged (9)	Unhedged (10)	(11)	Hedged (12)	Unhedged (13)	(14)	Hedged (15)	Unhedged (16)
4	266	-1.99	-.22	-1.77	5.84	11.91	49	2.41	3.45	-2.06	+.22	-2.28	6.06	11.91	51	2.46	3.45
5	254	-1.94	-.40	-1.54	6.94	16.45	42	2.64	4.05	-2.12	+.40	-2.52	7.27	16.45	44	2.69	4.05
6	242	-1.86	-.44	-1.42	7.59	20.57	37	2.75	4.53	-2.20	+.44	-2.64	7.99	20.57	39	2.82	4.53
7	231	-1.69	-.27	-1.42	8.86	24.65	36	2.97	4.96	-2.38	+.27	-2.65	9.37	24.65	38	3.06	4.96
8	220	-1.63	-.20	-1.43	9.25	29.36	32	3.04	5.41	-2.44	+.20	-2.64	9.83	29.36	33	3.13	5.41
9	209	-1.63	-.26	-1.43	10.21	35.32	29	3.19	5.94	-2.44	+.26	-2.70	10.90	35.32	31	3.30	5.94
10	198	-1.66	-.36	-1.30	12.02	42.75	28	3.46	6.53	-2.41	+.36	-2.77	12.88	42.75	30	3.58	6.53
11	187	-1.74	-.64	-1.10	13.84	50.89	27	3.72	7.13	-2.33	+.64	-2.97	14.84	50.89	29	3.85	7.13
12	175	-1.85	-1.02	-0.83	16.09	57.94	28	4.01	7.61	-2.22	+1.39	-3.24	17.24	57.94	30	4.15	7.61
13	163	-1.92	-1.33	-0.59	20.10	64.77	31	4.48	8.04	-2.15	+1.33	-3.48	21.49	64.77	33	4.63	8.04
14	151	-1.94	-1.48	-0.46	24.41	71.57	34	4.94	8.45	-2.13	+1.48	-3.61	26.11	71.57	36	5.11	8.45
15	139	-1.81	-1.57	-0.24	28.19	76.51	37	5.30	8.74	-2.27	+1.57	-3.84	30.19	76.52	39	5.49	8.74
16	127	-1.66	-1.51	-0.15	31.39	77.52	41	5.60	8.80	-2.43	+1.51	-3.94	33.68	77.52	43	5.80	8.80
17	115	-1.57	-1.64	+0.07	33.78	80.44	42	5.81	8.96	-2.53	+1.64	-4.17	36.25	80.44	45	6.02	8.96
18	103	-1.53	-1.92	+0.39	35.59	83.93	42	5.96	9.16	-2.58	+1.92	-4.50	38.26	83.93	46	6.18	9.16
19	91	-1.34	-2.06	+0.72	38.31	85.10	45	6.18	9.22	-2.77	+2.06	-4.83	41.25	85.10	48	6.42	9.22
20	80	-1.07	-1.61	+0.54	40.37	89.12	45	6.35	9.44	-3.06	+1.61	-4.67	43.65	89.12	49	6.60	9.44
21	70	-1.08	-1.20	+0.12	41.03	92.77	44	6.40	9.63	-3.05	+1.20	-4.25	44.44	92.77	48	6.66	9.63
22	60	-1.30	-1.00	-0.30	46.36	98.30	47	6.80	9.91	-2.82	+1.00	-3.82	50.30	98.30	51	7.09	9.91
23	50	-1.15	-.66	-0.49	52.17	116.88	45	7.22	10.81	-2.98	+.66	-3.64	56.93	116.88	49	7.54	10.81
24	40	-0.86	-.40	-0.46	51.64	128.86	40	7.18	11.35	-3.27	+.40	-3.71	56.76	128.86	44	7.53	11.35

TABLE 2

AVERAGE GAINS AND LOSSES RESULTING FROM SHORT AND LONG HEDGING OF N.Z.W.C. TYPE 114 WOOL ON THE SYDNEY EXCHANGE TOGETHER WITH THE VARIANCES OF THE GAINS AND LOSSES FROM 21.5.60. to 18.2.66.
(pence N.Z. per lb.)

Period of hedging (weeks)	No. of transactions	Forward Sales: Av.profit (+) or loss (-)		Forward Sales: Diff. 2-1	Forward Sales: Variance		Forward Sales: Ratio 4÷5 %	Forward Sales: Std. Deviation		Forward Purchases: Av.profit (+) or loss (-)		Forward Purchases: Diff. 10-9	Forward Purchases: Variance		Forward Purchases: Ratio 12÷13 %	Forward Purchases: Std. Deviation	
		Hedged (1)	Unhedged (2)	(3)	Hedged (4)	Unhedged (5)	(6)	Hedged (7)	Unhedged (8)	Hedged (9)	Unhedged (10)	(11)	Hedged (12)	Unhedged (13)	(14)	Hedged (15)	Unhedged (16)
4	266	-12.89	-5.64	-7.25	2524.91	2685.49	94	50.24	51.82	-3.85	+5.64	-9.49	2687.65	2685.49	100	51.84	51.82
5	254	-12.37	-6.07	-6.30	2640.51	2885.60	92	51.38	53.38	-4.39	+6.07	-10.46	2817.79	2885.60	98	53.08	53.71
6	242	-8.11	-2.09	-6.02	1098.20	1410.32	78	33.13	37.13	-8.80	+2.09	-10.89	1170.33	1410.32	83	34.21	37.55
7	231	-5.33	+0.81	-6.14	279.65	657.85	43	16.72	25.64	-11.69	-0.81	-10.88	292.15	657.85	44	17.09	25.64
8	220	-4.35	+1.89	-6.24	293.79	771.13	38	17.14	27.76	-12.71	-1.89	-10.82	306.64	771.13	40	17.51	27.76
9	209	-5.94	+0.04	-5.98	1308.39	1910.66	68	36.17	43.71	-11.07	-0.04	-11.03	1401.96	1910.66	73	37.44	43.71
10	198	-8.43	-2.81	-5.62	2396.50	3133.20	77	48.95	55.97	-8.48	+2.81	-11.29	2582.42	3133.20	82	50.81	55.97
11	187	-11.07	-6.41	-5.66	3594.57	4442.27	81	59.95	66.65	-5.74	+6.41	-12.15	3887.36	4442.27	88	62.34	66.65
12	175	-11.20	-7.75	-3.45	3855.75	4777.92	81	62.09	69.12	-5.61	+7.75	-13.36	4177.45	4777.92	87	64.63	69.12
13	163	-11.42	-9.01	-2.41	4032.00	4989.46	81	63.49	70.63	-5.38	+9.01	-14.39	4383.17	4989.46	88	66.20	70.63
14	151	-12.07	-10.24	-1.83	4141.62	5129.97	81	64.35	71.62	-4.70	+10.24	-14.94	4521.91	5129.97	88	67.24	71.62
15	139	-12.47	-11.56	-0.91	4348.16	5262.94	83	65.94	72.54	-4.29	+11.56	-15.85	4763.40	5262.94	91	69.01	72.54
16	127	-13.58	-13.00	-0.58	4856.80	5709.31	85	69.69	75.56	-3.13	+13.00	-16.13	5324.96	5709.31	93	72.97	75.56
17	115	-14.84	-15.06	+0.22	5577.77	6354.35	88	74.68	79.71	-1.85	+15.06	-16.91	6118.41	6354.35	96	78.22	79.71
18	103	-15.67	-17.19	+1.52	6488.41	7281.74	89	80.55	85.33	-0.97	+17.19	-18.16	7122.69	7281.74	98	84.39	85.33
19	91	-5.00	-7.80	+2.80	2979.98	3630.67	82	54.58	60.25	-12.04	+7.80	-19.84	3257.25	3630.67	90	57.07	60.25
20	80	+1.97	-0.16	+2.13	737.17	1345.37	55	27.15	36.67	-19.27	+0.16	-19.43	777.43	1345.37	58	27.88	36.67
21	70	+3.33	+3.05	+0.28	690.11	1328.69	52	26.27	36.45	-20.67	-3.05	-17.62	773.43	1328.69	58	27.08	36.45
22	60	+4.48	+6.00	-1.52	697.40	1398.67	50	26.40	37.39	-21.88	-6.00	-15.00	753.39	1398.67	54	27.44	37.39
23	50	+3.94	+6.34	-2.40	637.98	1629.73	39	25.25	40.37	-21.31	-6.34	-14.97	694.77	1629.73	43	26.35	40.37
24	40	+3.49	+5.85	-2.36	725.44	2046.33	35	26.93	45.23	-20.84	-5.85	-14.99	781.83	2046.33	38	27.96	45.23

TABLE 3

AVERAGE GAINS AND LOSSES RESULTING FROM SHORT AND LONG HEDGING OF "SALE AVERAGE" WOOL ON THE SYDNEY EXCHANGE TOGETHER WITH THE VARIANCES OF THE GAINS AND LOSSES FROM 21.5.60. to 18.2.66.
(pence N.Z. per lb.)

		Forward Sales								Forward Purchases							
Period of hedging (weeks)	No. of trans-actions	Av.profit (+) or loss (-)		Diff. 2-1	Variance		Ratio 4÷5	Std. Deviation		Av.profit (+) or loss (-)		Diff. 10-9	Variance		Ratio 12÷13	Std. Deviation	
		Hedged (1)	Unhedged (2)	(3)	Hedged (4)	Unhedged (5)	% (6)	Hedged (7)	Unhedged (8)	Hedged (9)	Unhedged (10)	(11)	Hedged (12)	Unhedged (13)	% (14)	Hedged (15)	Unhedged (16)
4	266	-9.82	-3.52	-6.30	1636.21	1776.00	93	40.45	42.14	-4.83	+3.52	-8.35	1729.89	1776.00	97	41.59	42.14
5	254	-8.22	-2.75	-5.47	1778.07	1998.52	89	42.16	44.70	-6.48	+2.75	-8.23	1998.52	1998.52	113	3.39	44.70
6	242	-6.11	-0.90	-5.21	1462.77	1783.41	82	38.24	42.23	-8.68	+0.90	-9.58	1531.07	1783.41	86	39.12	42.23
7	231	-4.73	+0.45	-5.18	1002.51	1404.43	71	31.66	37.47	-10.13	-0.45	-9.68	1042.47	1404.43	74	32.28	37.47
8	220	-5.64	-0.31	-5.33	1160.27	1688.17	69	34.06	41.08	-9.20	+0.31	-9.51	1206.66	1688.17	71	34.73	41.08
9	209	-6.92	-1.76	-4.84	1323.21	1979.63	67	36.37	44.49	-7.91	+1.76	-9.67	1380.40	1979.63	70	37.15	44.49
10	198	-9.26	-4.42	-4.84	2216.84	3007.39	74	47.08	54.83	-5.50	+4.42	-9.92	2346.58	3007.39	78	48.44	54.83
11	187	-11.55	-7.55	-4.00	3180.85	4107.51	77	56.39	64.08	-3.12	+7.55	-10.67	3394.61	4107.51	83	58.26	64.08
12	175	-12.41	-9.40	-3.06	3371.30	4402.89	77	58.06	66.35	-2.24	+9.40	-11.64	3602.51	4402.89	82	60.02	66.35
13	163	-13.61	-11.49	-2.12	3623.69	4733.27	77	60.19	68.79	-1.00	+11.49	-12.49	3872.95	4733.27	82	62.23	68.79
14	151	-13.27	-11.68	-1.59	3943.30	5048.99	78	62.81	71.05	-1.37	+11.68	-13.05	4222.08	5048.99	84	64.97	71.05
15	139	-11.38	-10.67	-0.71	3915.45	4933.55	79	62.57	70.23	-3.37	+10.67	-14.04	4203.10	4933.55	85	64.83	70.23
16	127	-11.02	10.65	-0.47	3865.5	4757.43	81	62.15	68.97	-3.71	+10.65	-14.36	4160.78	4757.43	87	64.50	68.97
17	115	-11.13	-11.55	+0.42	4441.67	5263.12	84	66.64	72.54	-3.61	+11.55	-15.16	4792.12	5263.12	91	69.22	72.54
18	103	-8.14	-9.69	+1.55	4722.70	5418.05	87	68.72	73.60	-6.71	+9.69	-16.40	5115.50	5418.05	94	71.52	73.60
19	91	-1.45	-4.18	+2.73	3341.35	3765.62	89	57.80	61.36	-13.63	+4.18	-17.81	3590.43	3765.62	95	59.92	61.36
20	80	+4.23	+2.05	+2.18	1592.47	1886.85	84	39.90	43.43	-19.55	-2.05	-17.50	1653.22	1886.85	88	40.65	43.43
21	70	+6.65	+6.10	+0.55	1831.18	2216.43	83	42.79	47.07	-22.06	-6.10	-15.96	1915.37	2216.43	86	43.76	47.07
22	60	+8.23	+9.33	-1.10	1803.11	2403.85	75	42.46	49.02	-23.64	-9.33	-14.31	1902.54	2403.85	79	43.61	49.02
23	50	+13.54	+15.36	-1.82	1721.30	2518.03	68	41.48	50.17	-29.08	-15.36	-13.72	1809.09	2518.03	72	42.53	50.17
24	40	+18.11	+19.91	-1.81	1349.07	2501.50	54	36.72	50.01	-33.66	-19.92	-13.74	1445.68	2501.50	58	38.02	50.01

TABLE 4.

AVERAGE GAINS AND LOSSES RESULTING FROM SHORT AND LONG HEDGING OF THREE WOOL TYPES FOR 13 WEEKS ON THE SYDNEY EXCHANGE TOGETHER WITH THE VARIANCES OF THE GAINS AND LOSSES FOR INDIVIDUAL SEASONS
(pence N.Z. per lb.)

Season	Wool Type	Forward Sales: Av.profit (+) or loss (-) Hedged (1)	Forward Sales: Av.profit (+) or loss (-) Unhedged (2)	Forward Sales: Diff. 2-1 (3)	Forward Sales: Variance Hedged (4)	Forward Sales: Variance Unhedged (5)	Forward Sales: Ratio 4÷5 % (6)	Forward Sales: Std. Deviation Hedged (7)	Forward Sales: Std. Deviation Unhedged (8)	Forward Purchases: Av.profit (+) or loss (-) Hedged (9)	Forward Purchases: Av.profit (+) or loss (-) Unhedged (10)	Forward Purchases: Diff. 10-9 (11)	Forward Purchases: Variance Hedged (12)	Forward Purchases: Variance Unhedged (13)	Forward Purchases: Ratio 12÷13 % (14)	Forward Purchases: Std. Deviation Hedged (15)	Forward Purchases: Std. Deviation Unhedged (16)
1960/61	78	-2.78	-5.14	+2.36	25.65	53.46	48	5.06	7.31	-1.23	+5.14	-6.37	26.67	53.46	50	5.16	7.31
1961/62	"	-3.72	-1.80	-1.92	26.13	62.57	42	5.11	7.91	-0.30	+1.80	-2.10	26.92	62.57	43	5.18	7.91
1962/63	"	-1.87	-2.66	+0.79	26.17	33.12	78	5.11	5.75	-2.36	+2.66	-5.02	27.50	33.12	83	5.24	5.75
1963/64	"	+0.80	+1.50	-0.70	10.63	145.36	73	3.26	12.05	-5.05	-1.50	-3.55	11.01	145.36	76	3.31	12.05
1964/65	"	-0.51	+3.29	-3.80	5.22	10.01	52	2.28	3.16	-3.29	-3.29	-2.78	5.48	10.01	55	3.16	3.16
Average	"	-1.92	-1.33	-0.59	20.10	64.77	31	4.48	8.04	-2.15	+1.33	-3.48	21.49	64.77	33	4.63	8.04
1960/61	114	-38.00	-50.67	-12.67	21154.16	20164.74	105	145.44	142.00	-64.67	+50.67	-115.34	23062.92	20164.34	114	151.86	142.00
1961/62	"	-4.00	-4.13	-8.13	207.00	171.29	121	24.38	13.08	-12.41	-4.13	-8.28	204.67	171.29	119	14.30	13.08
1962/63	"	-11.04	-14.10	+3.06	119.08	264.71	45	10.91	16.27	-5.23	+14.10	-19.33	125.71	264.71	47	11.21	16.27
1963/64	"	-19.73	-16.23	-3.50	387.99	3650.80	106	19.69	60.42	+1.42	+16.23	-14.81	420.72	3650.80	115	20.51	60.42
1964/65	"	+6.66	+23.74	-17.08	841.72	1826.59	46	29.01	42.73	-24.08	-23.74	-10.34	937.68	1826.59	51	30.62	42.73
Average	"	-11.42	-9.01	-2.41	4032.00	4989.46	81	63.49	70.63	-5.38	+9.01	-14.39	4383.17	4989.46	88	66.20	70.63
1960/61	Sale Av.	-24.33	-35.32	+10.99	10981.58	9995.18	110	104.79	99.97	+9.82	+35.32	-25.50	11945.84	9995.18	120	109.29	99.97
1961/62	"	-8.91	-2.66	-6.25	2238.32	1481.88	151	47.31	38.49	-5.18	+2.66	-7.84	2311.84	1481.88	156	48.08	38.49
1962/63	"	-32.38	-35.26	+2.88	22286.01	2345.03	97	47.81	48.42	+18.40	+35.26	-17.86	2437.74	2345.03	104	49.37	48.42
1963/64	"	-6.37	-1.93	-4.44	3728.83	10108.34	37	61.06	100.54	+10.14	+1.93	-12.07	3909.50	10108.34	39	62.52	100.54
1964/65	"	-4.51	+10.06	-14.57	992.11	1286.99	77	31.49	35.87	+10.37	-10.06	-0.31	1011.47	1286.99	79	31.80	35.87
Average	"	-13.61	-11.49	-2.12	3623.69	4733.27	77	60.19	68.79	-1.00	+11.49	-12.49	3872.95	4733.27	82	62.23	68.79

TABLE 5

AVERAGE GAINS AND LOSSES RESULTING FROM SHORT AND LONG HEDGING OF 64B TOPS ON THE LONDON EXCHANGE TOGETHER WITH THE VARIANCES OF THE GAINS AND LOSSES FROM 21.5.60. to 18.2.66.
(pence N.Z. per lb.)

Period of hedging (weeks)	No. of transactions	Forward Sales: Av.profit (+) or loss (-)		Diff. 2-1	Forward Sales: Variance		Ratio 4÷5	Forward Sales: Std. Deviation		Forward Purchases: Av.Profit (+) or loss (-)		Diff. 10-9	Forward Purchases: Variance		Ratio 12÷13	Forward Purchases: Std. Deviation	
		Hedged (1)	Unhedged (2)	(3)	Hedged (4)	Unhedged (5)	% (6)	Hedged (7)	Unhedged (8)	Hedged (9)	Unhedged (10)	(11)	Hedged (12)	Unhedged (13)	% (14)	Hedged (15)	Unhedged (16)
4	271	-2.58	+0.05	-2.63	6.33	5.70	111	2.51	2.38	-2.88	-0.05	-2.83	6.54	5.70	115	2.55	2.38
5	259	-2.57	-0.02	-2.55	7.16	8.45	85	2.67	2.90	-2.89	+0.02	-2.91	7.41	8.45	88	2.72	2.90
6	247	-2.58	-0.12	-2.46	7.99	11.25	71	2.82	3.35	-2.87	+0.12	-2.99	8.29	11.25	74	2.87	3.35
7	235	-2.57	-0.20	-2.37	8.61	13.90	62	2.93	3.72	-2.89	+0.20	-3.09	8.96	13.90	64	2.99	3.72
8	223	-2.48	-0.19	-2.29	9.16	16.78	55	3.02	4.09	-2.98	+0.19	-3.17	9.57	16.78	57	3.09	4.09
9	210	-2.36	-0.14	-2.22	9.17	19.77	46	3.02	4.44	-3.10	+0.14	-3.24	9.59	19.77	49	3.09	4.44
10	198	-2.37	-0.15	-2.22	9.06	22.88	40	3.01	4.78	-3.10	+0.15	-3.25	9.49	22.88	41	3.08	4.78
11	187	-2.34	-0.16	-2.18	9.57	26.20	37	3.09	5.11	-3.13	+0.16	-3.29	10.08	26.20	38	3.17	5.11
12	176	-2.37	-0.22	-2.15	9.35	29.07	32	3.05	5.39	-3.10	+0.22	-3.32	9.84	29.07	34	3.13	5.39
13	165	-2.49	-0.21	-2.28	8.87	32.65	27	2.97	5.71	-2.99	+0.21	-3.20	9.34	32.63	29	3.05	5.71
14	154	-2.44	-0.04	-2.40	9.39	36.88	25	3.06	6.07	-3.04	+0.04	-3.08	9.98	36.88	27	3.15	6.07
15	143	-2.34	+0.05	-2.39	10.02	40.98	24	3.16	6.40	-3.14	-0.05	-3.09	10.67	40.98	26	3.26	6.40
16	132	-2.40	+0.03	-2.43	10.23	44.80	23	3.19	6.69	-3.08	-0.03	-3.05	10.93	44.80	24	3.30	6.69
17	121	-2.32	+0.09	-2.41	11.79	48.80	24	3.43	6.98	-3.17	-0.09	-3.08	12.62	48.80	26	3.55	6.98
18	109	-2.39	-0.07	-2.32	13.30	52.67	25	3.64	7.25	-3.11	+0.07	-3.18	14.22	52.67	27	3.77	7.25
19	97	-2.48	-0.20	-2.28	15.32	54.41	28	3.91	7.37	-3.02	+0.20	-3.22	16.35	54.41	30	4.04	7.37
20	85	-2.85	-0.31	-2.54	14.85	55.48	27	3.85	7.44	-2.64	+0.31	-2.95	15.79	55.48	28	3.97	7.44
21	73	-3.27	-0.36	-2.91	15.73	59.70	26	3.96	7.72	-2.21	+0.36	-2.57	16.85	59.70	28	4.10	7.72
22	61	-3.40	-0.45	-2.95	19.13	66.98	29	4.37	8.18	-2.08	+0.45	-2.53	20.95	66.98	31	4.57	8.18
23	50	-3.51	-0.58	-2.93	20.64	72.98	28	4.54	8.54	-1.97	+0.58	-2.55	22.78	72.98	31	4.77	8.54
24	44	-3.72	-0.47	-3.25	21.65	81.13	27	4.65	9.00	-1.73	+0.47	-2.20	23.98	81.13	30	4.89	9.00

AVERAGE GAINS AND LOSSES RESULTING FROM SHORT AND LONG HEDGING OF N.Z.W.C. TYPE 114 WOOL ON THE LONDON EXCHANGE TOGETHER WITH THE VARIANCES OF THE GAINS AND LOSSES FROM 21.5.60. to 18.2.66.
(pence N.Z. per lb.)

Period of hedging (weeks)	No. of transactions	Forward Sales: Av.profit (+) or loss (-)		Forward Sales: Diff. 2-1	Forward Sales: Variance		Forward Sales: Ratio 4÷5 %	Forward Sales: Std. Deviation		Forward Purchases: Av.profit (+) or loss (-)		Forward Purchases: Diff. 10-9	Forward Purchases: Variance		Forward Purchases: Ratio 12÷13 %	Forward Purchases: Std. Deviation	
		Hedged (1)	Unhedged (2)	(3)	Hedged (4)	Unhedged (5)	(6)	Hedged (7)	Unhedged (8)	Hedged (9)	Unhedged (10)	(11)	Hedged (12)	Unhedged (13)	(14)	Hedged (15)	Unhedged (16)
4	271	-15.71	-4.53	-11.18	2560.18	2662.58	96	50.59	51.60	-7.70	+4.53	-12.23	2776.51	2662.58	104	52.69	51.60
5	259	-18.11	-7.40	-10.71	3491.17	3675.92	95	59.08	60.62	-5.25	+7.40	-12.65	3797.17	3675.92	103	61.62	60.62
6	247	-20.79	-10.49	-10.30	4455.52	4748.28	94	66.74	68.90	-2.52	+10.49	+13.01	4862.49	4748.28	102	69.73	68.90
7	235	-19.37	-9.37	-10.00	3839.06	4218.15	91	61.96	64.94	-4.12	+9.37	-13.49	4197.63	4218.15	99	64.78	64.94
8	223	-17.29	-7.44	-9.85	3186.57	3637.15	88	56.44	60.30	-6.41	+7.44	-13.85	3488.11	3637.15	96	59.06	60.30
9	210	-11.92	-2.08	-9.84	1460.48	1954.85	75	38.21	44.21	-12.06	+2.08	-14.14	1589.41	1954.85	81	39.86	44.21
10	198	-9.16	+0.86	-10.02	521.66	1074.49	49	22.83	32.77	-14.97	-0.86	-14.11	551.38	1074.49	51	23.48	32.77
11	187	-11.63	-1.86	-9.77	1652.72	2334.58	71	40.65	48.31	-12.37	+1.86	-14.23	1805.35	2334.58	77	42.48	48.31
12	176	-14.86	-5.28	-9.58	2856.29	3688.50	77	53.44	60.73	-8.98	+5.28	-14.26	3144.71	3688.50	85	56.07	60.73
13	165	-18.46	-8.44	-10.02	4061.38	5082.06	80	63.72	71.28	-5.18	+8.44	-13.62	4501.45	5082.06	89	67.09	71.28
14	154	-21.48	-11.27	-10.21	5409.91	6582.50	82	73.55	81.13	-1.97	+11.27	-13.24	6034.07	6582.50	92	77.67	81.13
15	143	-25.48	-15.69	-9.79	6980.16	8270.83	84	83.54	90.94	+2.25	-15.69	-13.44	7820.22	8270.83	95	88.43	90.94
16	132	-31.42	-22.07	-9.35	8785.34	10182.83	86	93.73	100.91	+8.50	+22.07	-13.57	9874.04	10182.83	97	99.36	100.91
17	121	-37.67	-29.06	-8.61	10961.71	12434.04	88	104.69	111.50	+15.06	+29.06	-14.00	12353.41	12434.04	99	111.14	111.50
18	109	-41.00	-33.23	-7.77	12049.73	13532.86	89	109.77	116.33	+18.57	+33.23	-14.66	13614.00	13532.86	101	116.67	116.33
19	97	-44.58	-37.41	-7.17	13441.01	14950.01	90	115.93	122.27	+22.33	+37.41	-15.08	15220.76	14950.01	102	123.37	122.27
20	85	-38.88	-30.34	-8.54	11198.80	12613.51	89	105.82	112.30	+16.29	+30.34	-14.05	12704.47	12613.51	101	112.71	112.30
21	73	-31.14	-20.31	-10.83	8192.02	9459.07	87	90.50	97.25	+8.12	+20.31	-12.19	9309.15	9459.07	98	96.47	97.25
22	61	-17.78	-5.63	-12.15	3854.64	4826.43	80	62.08	69.47	-5.92	+5.63	-11.55	4379.01	4826.43	91	66.17	69.47
23	50	-7.09	+6.20	-13.29	589.28	1374.32	43	24.27	37.07	-17.10	-6.20	-10.90	665.64	1374.32	48	25.80	37.02
24	44	-5.60	+9.25	-14.85	544.50	1457.26	37	23.33	38.17	-18.63	-9.25	-9.38	640.96	1457.26	44	25.31	38.17

TABLE 7

AVERAGE GAINS AND LOSSES RESULTING FROM SHORT AND LONG HEDGING OF "SALE AVERAGE" ON THE LONDON EXCHANGE TOGETHER WITH THE VARIANCES OF THE GAINS AND LOSSES FROM 21.5.60. to 18.2.66.
(pence N.Z. per lb.)

Period of hedging (weeks)	No. of transactions	Forward Sales: Av.profit (+) or loss (-)		Forward Sales: Diff. 2-1	Forward Sales: Variance		Forward Sales: Ratio 4÷5 %	Forward Sales: Std. Deviation		Forward Purchases: Av.profit (+) or loss (-)		Forward Purchases: Diff. 10-9	Forward Purchases: Variance		Forward Purchases: Ratio 12÷13 %	Forward Purchases: Std. Deviation	
		Hedged (1)	Unhedged (2)	(3)	Hedged (4)	Unhedged (5)	(6)	Hedged (7)	Unhedged (8)	Hedged (9)	Unhedged (10)	(11)	Hedged (12)	Unhedged (13)	(14)	Hedged (15)	Unhedged (16)
4	271	-14.60	-4.87	-9.73	2122.18	2194.11	97	46.06	46.84	-5.96	+4.87	-10.83	2293.05	2194.11	105	47.88	46.84
5	259	-15.99	-6.70	-9.29	2797.62	2925.61	96	52.82	54.08	-4.55	+6.70	-11.25	3039.71	2925.61	104	55.13	54.08
6	247	-16.65	-7.70	-8.95	3577.62	3798.01	94	59.81	61.62	-3.92	+7.70	-11.62	3904.59	3798.01	103	62.48	61.62
7	235	-16.39	-7.80	-8.59	3808.11	4110.77	93	61.70	64.11	-4.27	+7.80	-12.07	4165.31	4110.77	101	64.53	64.11
8	223	-12.71	-4.25	-8.46	3073.98	3411.43	90	55.44	58.40	-8.16	+4.25	-12.41	3343.49	3411.43	98	57.82	58.40
9	210	-9.08	-0.63	-8.45	2069.18	2496.72	83	45.48	49.96	-11.98	+0.63	-12.61	2228.11	2496.72	89	47.20	49.96
10	198	-8.98	-0.39	-8.59	1696.58	2232.51	76	41.18	47.24	-12.12	+0.39	-12.51	1803.76	2232.51	81	42.47	47.24
11	187	-10.62	-2.20	-8.42	1954.75	2606.54	75	44.21	51.05	-10.43	+2.20	-12.63	2084.91	2606.54	80	45.66	51.05
12	176	-14.50	-6.28	-8.22	2848.68	3641.86	78	53.37	60.34	-6.36	-6.28	-12.64	3084.31	3641.86	85	55.53	60.34
13	165	-18.75	-10.10	-8.65	3875.04	4896.27	79	62.24	69.97	-1.90	+10.10	-12.00	4233.02	4896.27	86	65.06	69.97
14	154	-23.52	-14.61	-8.91	5036.43	6311.10	80	70.96	79.44	+3.10	+14.61	-11.51	5537.00	6311.10	88	74.41	79.44
15	143	-26.50	-17.95	-8.55	5892.07	7311.44	81	76.75	85.50	+6.23	+17.95	-11.72	6532.99	7311.44	89	80.82	85.50
16	132	-28.84	-20.56	-8.28	7278.74	8829.97	82	85.31	93.96	+8.69	+20.56	-11.87	8111.23	8829.97	92	90.06	93.96
17	121	-31.21	-23.55	-7.66	8871.52	10578.73	84	94.18	102.85	+11.19	+23.55	-12.36	9935.65	10578.73	94	99.67	102.85
18	109	-29.97	-22.96	-7.01	9805.21	11555.31	85	99.02	107.49	+9.93	+22.96	-13.03	11012.12	11555.31	95	104.93	107.49
19	97	-27.76	-21.34	-6.42	10860.07	12480.72	87	104.21	111.71	+7.65	+21.34	-13.79	12228.55	12480.72	98	110.58	111.71
20	85	-22.98	-15.50	-7.48	10223.05	11799.61	87	101.10	108.62	+2.63	+15.50	-12.87	11542.86	11799.61	98	107.43	108.62
21	73	-15.11	-5.61	-9.50	8276.13	9730.87	85	90.97	98.64	-5.68	+5.61	-11.29	9334.45	9730.87	96	96.61	98.64
22	61	-1.18	+9.45	-10.63	4559.22	5742.51	79	67.52	75.77	-20.25	-9.45	-10.80	5137.62	5742.51	89	71.67	75.77
23	50	+11.03	+22.64	-11.61	1701.01	2637.21	65	41.24	51.35	-32.98	-22.64	-10.34	1901.91	2637.21	72	43.61	51.35
24	44	+11.85	+24.97	-13.12	1928.00	2996.86	64	43.90	54.74	-33.75	-24.97	-8.78	2182.86	2996.86	73	46.72	54.74

TABLE 8

AVERAGE GAINS AND LOSSES RESULTING FROM SHORT AND LONG HEDGING OF TWO WOOL TYPES AND WOOL TOPS FOR 13 WEEKS ON THE LONDON EXCHANGE TOGETHER WITH THE VARIANCES OF THE GAINS AND LOSSES FOR INDIVIDUAL SEASONS
(pence N.Z. per lb.)

Season	Wool Type	Forward Sales: Av.profit (+) or loss (-) Hedged (1)	Forward Sales: Av.profit (+) or loss (-) Unhedged (2)	Forward Sales: Diff. 2-1 (3)	Forward Sales: Variance Hedged (4)	Forward Sales: Variance Unhedged (5)	Forward Sales: Ratio 4÷5 % (6)	Forward Sales: Std.Deviation Hedged (7)	Forward Sales: Std.Deviation Unhedged (8)	Forward Purchases: Av.profit (+) or loss (-) Hedged (9)	Forward Purchases: Av.profit (+) or loss (-) Unhedged (10)	Forward Purchases: Diff. 10-9 (11)	Forward Purchases: Variance Hedged (12)	Forward Purchases: Variance Unhedged (13)	Forward Purchases: Ratio 12÷13 % (14)	Forward Purchases: Std. Deviation Hedged (15)	Forward Purchases: Std. Deviation Unhedged (16)
1960/61	Tops	-4.79	-2.52	-1.97	11.31	44.34	26	3.36	6.65	-0.65	+2.52	-3.17	11.56	44.34	26	3.40	6.65
1961/62	"	-2.85	+0.26	-3.11	6.04	19.30	31	2.45	4.39	-2.62	-0.26	-2.36	6.36	19.30	33	2.52	4.39
1962/63	"	-3.46	-2.36	-0.79	5.20	12.30	42	2.28	3.50	-2.07	+2.36	-4.43	5.27	12.30	43	2.29	3.50
1963/64	"	-0.40	-2.16	-1.76	11.17	57.52	19	3.34	7.58	-5.23	+2.16	-3.07	11.12	57.52	19	3.33	7.58
1964/65	"	-2.26	+5.06	-7.32	7.24	15.92	45	2.69	3.99	-3.18	-5.06	-1.88	7.62	15.92	48	2.76	3.99
Average	"	-2.49	-0.21	-2.28	8.87	32.63	27	2.97	5.71	-2.99	+0.21	-3.20	9.34	32.63	29	3.05	5.71
1960/61	114	-60.71	-53.32	-7.39	21673.07	22726.47	95	147.21	150.75	+38.65	+53.32	-14.67	24244.71	22726.47	107	155.70	150.75
1961/62	"	-6.90	+6.50	-0.40	151.38	227.08	67	12.30	15.06	-16.43	-6.50	-9.93	159.83	227.08	70	12.64	15.06
1962/63	"	-17.13	-12.70	-4.43	242.61	344.70	70	15.57	18.56	-5.54	+12.70	-18.14	256.30	344.70	74	16.00	18.56
1963/64	"	-19.92	-26.43	-6.51	1102.33	3397.08	32	33.20	58.28	-5.22	+26.43	-31.65	1139.24	3397.08	34	33.75	58.28
1964/65	"	-4.10	+29.76	-33.86	1329.10	1823.77	73	36.45	42.70	-20.71	-29.76	-9.05	1416.83	1823.77	78	37.64	42.70
Average	"	-18.46	-8.44	-10.02	4061.38	5082.06	80	63.72	71.28	-5.18	+8.44	-13.62	4501.45	5082.06	89	67.09	71.28
1960/61	Sale Av.	-49.05	-42.52	-6.53	11223.38	10810.09	104	105.94	103.94	+29.28	+42.52	-13.24	12519.14	10810.09	116	111.93	103.97
1961/62	"	-17.14	-6.23	-10.91	1988.19	1458.66	136	44.58	38.19	-2.87	-6.23	-3.36	2103.05	1458.66	144	45.85	38.19
1962/63	"	-34.47	-30.86	-3.61	2837.55	2927.56	97	53.26	54.10	+15.00	+30.86	-15.86	3025.80	2927.56	103	55.00	54.10
1963/64	"	-6.68	-11.90	-5.22	4527.86	8666.16	52	67.28	93.09	-16.13	+11.90	-28.03	4777.38	8666.16	55	69.11	93.09
1964/65	"	+5.17	+34.86	-29.69	616.48	1372.05	45	24.82	37.04	-26.73	-34.86	-8.15	694.92	1372.05	51	26.36	37.04
Average	"	-18.75	-10.10	-8.65	3875.04	4896.27	79	62.24	69.97	-1.90	+10.10	-12.00	4233.02	4896.27	86	65.06	69.97

APPENDIX E

AUTOCORRELATION AND POWER SPECTRA

Autocorrelation

Assume that the function $f(t)$ is available only as a sequence of T observations

$$\{x(t)\}$$

Then the autocorrelation $\phi_{11}(n)$ (an integral) must be approximated by a sum

$$\frac{1}{T-K} \sum_{j=K+1}^{T} x_j x_{j-K} \qquad \text{where K is the lag}$$

It is convenient to refer the observations $x(t)$ to their mean value $\bar{x}$, so that the sum becomes

$$R_{xx}(K) = \frac{1}{T-K} \sum_{j=K+1}^{T} y_j y_{j-K}$$

where $y_j = x_j - \bar{x}$

It is further convenient to normalise this sum in units of standard deviation

Let s_j = std. deviation of the (T-K) values y_j

s_{j+K} = std. deviation of the (T-K) values y_{j+K}

Then we will define the (discrete) autocorrelation function of $\{x(t)\}$ as

$$\rho(K) = \frac{\sum_{j=K+1}^{T} y_j y_{j-K}}{(T-K)s_j s_{j+K}} = \frac{R_{xx}(K)}{R_{xx}(0)}$$

These coefficients will have a maximum value of +1 and a minimum value of -1

Power Spectrum

A similar approximation to the power density spectrum $\phi_{11}(\omega)$ is made by the sum

$$\rho(\Omega) = \frac{1}{\pi} \sum_{K=0}^{K=n} R_{xx}(K)\cos K\,\Omega$$

This is called simply the power spectrum of the function $\{x(t)\}$

$$\Omega = \frac{2\pi}{T} \quad \text{where } T = \text{period.}$$

TIME SERIES DATA ON THE PRICE OF TYPE 114 WOOL
FOUR WEEK PERIODS FROM 1952 TO 1965

Period	Av. Price (pence N.Z. per lb.)	Period	Av. Price (pence N.Z. per lb.)
T	X(T)	T	X(T)
1	55.85	40	62.37
2	55.85	41	63.25
3	55.85	42	66.97
4	62.23	43	68.68
5	60.06	44	63.39
6	62.23	45	63.50
7	59.69	46	65.98
8	59.99	47	64.96
9	63.29	48	64.96
10	66.79	49	63.81
11	67.89	50	63.81
12	67.89	51	63.81
13	64.67	52	68.49
14	64.67	53	73.71
15	64.67	54	73.72
16	71.75	55	73.28
17	67.13	56	75.65
18	63.02	57	75.92
19	62.71	58	78.55
20	66.62	59	84.17
21	66.65	60	80.65
22	70.83	61	77.04
23	73.08	62	75.92
24	74.93	63	75.92
25	74.93	64	67.34
26	74.93	65	63.91
27	74.93	66	61.57
28	65.13	67	58.02
29	61.71	68	58.02
30	64.21	69	51.97
31	65.82	70	50.30
32	69.21	71	46.66
33	68.89	72	51.31
34	70.09	73	50.00
35	71.57	74	48.02
36	71.44	75	48.02
37	63.55	76	46.67
38	63.55	77	48.28
39	63.55	78	48.99

Period	Av. Price (pence N.Z. per lb.)	Period	Av. Price (pence N.Z. per lb.)
T	X(T)	T	X(T)
79	48.15	118	56.26
80	50.35	119	55.71
81	50.20	120	55.67
82	57.49	121	56.17
83	62.41	122	55.58
84	60.46	123	55.58
85	62.17	124	54.26
86	66.10	125	57.50
87	66.10	126	59.39
88	63.76	127	62.98
89	64.36	128	62.98
90	67.18	129	60.41
91	65.78	130	62.50
92	64.97	131	63.37
93	62.46	132	64.76
94	63.89	133	69.87
95	62.27	134	69.77
96	62.89	135	69.77
97	60.00	136	73.42
98	59.70	137	82.79
99	59.70	138	80.48
100	56.17	139	80.21
101	58.96	140	81.65
102	56.97	141	82.20
103	57.01	142	71.13
104	59.00	143	76.63
105	57.50	144	74.06
106	58.05	145	72.85
107	60.77	146	74.61
108	59.67	147	74.61
109	58.66	148	68.18
110	59.93	149	67.66
111	59.93	150	60.97
112	58.67	151	59.18
113	58.31	152	58.35
114	57.01	153	57.24
115	55.52	154	56.92
116	56.40	155	60.30
117	55.55	156	59.67

APPENDIX F

POSSIBLE DELIVERABLE TYPES FOR A NEW ZEALAND WOOL FUTURES EXCHANGE

CARDING

BB: Good colour, well grown, well skirted, free or practically free from seed, may contain slight tender

Type	Bales (1966/67)	Quality
85	1201	56
85a	59	54
92	402	50/56
92a	26	50/54
833	599	52
99	1047	50
106	555	48/50
113	89	46/50
120	80	48
127	543	46/48
134	530	46
141	93	44/46

B: Good topmaking, fair to good colour, skirted, may contain odd cott and/or very slight seed

86	11538	56
86a	236	54
93	6299	50/56
93a	4840	50/54
834	7324	52
100	13419	50
107	7235	48/50
114	1765	46/50
121	13901	48
128	6502	46/48
135	12917	46
142	5262	44/46

NECKS

Good/Superior: Good colour, may contain a little vegetable matter

Type	Bales 1966/67)	Quality
843	17	50
465	16	48/50
469	59	46/50

Average: Fair colour containing vegetable matter

844	2155	50
466	3109	48/50
470	10126	46/50

BULKY PIECES

Good/Superior: Good colour, free, may be irregular in quality

852	11	50
515	15	48/50
520	6	46/50

Average: Fair colour, may be irregular in quality and contain slight seed

853	2616	50
516	2072	48/50
521	3260	46/50

BELLIES

Good: Good colour free

646	7	50
868	-	48/50
650	7	46/50

Average: Fair colour, may be slightly seedy

647	356	50
869	646	48/50
651	4771	46/50

SECOND SHEAR FIRSTS

Good: Good colour, good length, may be irregular, fairly well skirted, free or practically free from seed

Type	Bales (1966/67)	Quality
E690	219	50/56
E694	428	46/50
E698	340	44/48

Average: Fair to good colour, fair length, may be slightly seed and lightly skirted

E691	2683	50/56
E695	11949	46/50
E699	26574	44/48

TOTAL Bales: 167,904

POSSIBLE ADDITIONAL DELIVERABLE TYPES FOR A NEW ZEALAND WOOL FUTURES EXCHANGE

CARDING

C: Topmaking, fair colour, may contain few cotts, may be unskirted and/or bush stained and/or part seedy

Type	Bales (1966/67)	Quality
87	2790	56
94	2659	50/56
835	2335	52
101	5526	50
108	2851	48/50
115	1726	46/50
122	3767	48
129	6270	46/48
136	9890	46
143	7358	44/46

NECKS

Inferior: Poor colour, may be mixed and contain light to medium seed

854	849	50
517	1190	48/50
522	5311	46/50

BULKY PIECES

Inferior: Poor colour, may be mixed and contain light to medium seed

Type	Bales (1966/67)	Quality
854	849	50
517	1190	48/50
522	5311	46/50

BELLIES

Inferior: Poor colour, may contain light to medium seed, suitable for local scouring

648	107	50
870	868	48/50
652	1572	46/50

SECOND SHEAR FIRSTS

Inferior: Poor colour, fair length, may contain light to medium seed

E692	507	50/56
E696	855	46/50
E700	1847	44/48

TOTAL Additional Bales: 60,987

APPENDIX G

UNPUBLISHED SYDNEY GREASY WOOL FUTURES EXCHANGE STATISTICS USED IN STUDY

Volume of Trading

(000's lb. of wool)

Year	Month	Contracts Traded	Open Positions
1961	Oct.	8,841	31,854
	Nov.	5,559	44,574
	Dec.	7,773	48,597
1962	Jan.	5,310	38,601
	Feb.	6,546	39,324
	Mar.	7,407	47,064
	Apr.	6,834	42,064
	May	6,240	46,230
	June	7,372	46,779
	July	6,168	44,070
	Aug.	8,568	54,279
	Sept.	5,493	39,825
	Oct.	6,381	37,320
	Nov.	7,252	47,232
	Dec.	7,983	27,696
1963	Jan.	14,340	40,320
	Feb.	13,059	51,087
	Mar.	13,920	68,088
	Apr.	11,721	60,837
	May	15,630	87,699
	June	22,086	81,468
	July	15,987	85,764
	Aug.	17,244	118,869
	Sept.	19,023	88,806
	Oct.	29,952	83,994
	Nov.	45,345	111,870
	Dec.	17,793	66,669
1964	Jan.	34,113	119,295
	Feb.	35,310	104,829
	Mar.	34,215	113,292
	Apr.	26,943	114,399
	May	178,765	155,832
	June	21,057	127,200
	July	19,518	147,672
	Aug.	18,855	120,558
	Sept.	30,141	123,363
	Oct.	32,469	147,789
	Nov.	38,139	119,376
	Dec.	23,361	114,417
1965	Jan.	23,070	145,758
	Feb.	23,811	120,792
	Mar.	20,583	113,013
	Apr.	21,060	145,782
	May	18,747	106,431
	June	8,418	97,233
	July	26,064	110,885
	Aug.	14,097	86,337
	Sept.	14,763	85,650
	Oct.	26,127	108,414
	Nov.	19,473	89,334
	Dec.	13,827	89,409
1966	Jan.	13,641	87,952
	Feb.	9,681	86,358
	Mar.	14,070	104,610
	Apr.	17,811	102,609
	May	11,775	79,539
	June	12,111	76,803
	July	19,338	97,431
	Aug.	14,358	84,315
	Sept.	27,465	107,541
	Oct.	19,899	81,639
	Nov.	16,029	81,070
	Dec.	13,632	103,995
1967	Jan.	16,245	88,584
	Feb.	11,607	90,471
	Mar.	16,971	106,932
	Apr.	7,875	62,292

Number of Contracts Traded in each Trading Month

Year	Jan.	Mar.	May	July	Sept.	Oct.	Dec.
1960					131	1,199	3,353
1961	1,952	4,431	4,051	4,208	1,481	4,956	5,808
1962	2,448	5,369	5,124	6,625	2,529	7,275	6,706
1963	1,404	4,404	6,012	9,638	4,652	11,765	16,188
1964	3,309	13,445	19,077	32,180	7,633	16,286	26,766
1965	3,194	19,275	19,864	27,626	3,561	9,328	13,841
1966	2,191	11,129	12,161	17,999	2,159	8,088	13,090
1967	1,348	10,573					
TOTAL:*	14,498	58,053	66,289	98,276	22,015	57,608	82,399

* 1961 to 1966 inclusive.