The secondary market in less developed countries’ debt: development, efficiency and debt reduction

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The Secondary Market in Less Developed Countries' Debt: Development, Efficiency and Debt Reduction

By

Ian Charles Shepherdson

A Doctoral Thesis
submitted in partial fulfilment of the requirements of the award of

Doctor of Philosophy
of the

Loughborough University of Technology

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Acknowledgments

My grateful thanks go to Samuel Montagu and Co., who funded this study.

This thesis could not have been completed without the tireless and constructive help given freely by my supervisor, Dr. Eric Pentecost, and director, Prof. Ian Morison.

My thanks also go to all the debt traders who responded to my questionnaire, and to the numerous other people who gave up their time to talk or write to me.
Abstract

The thesis describes and analyses, within a framework of qualitative market development theory, the development of the Secondary Market in the bank debts of less developed countries. A survey of market participants is presented and analysed. The theory of financial market efficiency is assessed, and secondary market price data is used to test the theory in the secondary market context.

Market-based debt reduction is described in theory and in practice, with a qualitative and quantitative assessment of the Brady Initiative. Simulations and sensitivity analysis of the likely effect on debt servicing ability for the first three beneficiaries of Brady debt restructuring are presented. Suggestions for further research are presented in the concluding chapter.
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CHAPTER ONE

INTRODUCTION

1.1. **Background**

Since the early 1980s there has developed, as part of the commercial banks' response to the problems generated by the external payments difficulties of some of the Less Developed Countries (LDCs), a market in their external debt. The market is referred to in the literature and by market participants as the "Secondary Market", so-called because new debt is not issued directly onto it, as it would be in a "primary" market.

The Secondary Market has attracted considerable attention from the financial media since 1986 when the transition from individual deals to a true market began. The financial press has tended, however to focus its attention on the structure of Secondary Market transactions and their implications for the participating banks' balance sheets, rather than on the implications for debtor countries and the Debt Crisis as a whole. Only recently has the market become an area for serious discussion, stimulated in part by Argentina's citation of the low market price of its debt as one of the factors behind its cessation of interest payments on commercial debt in April 1988.

1. The payments difficulties and the subsequent actions of the debtors and creditors are popularly referred to as the "LDC Debt Crisis". Both this and the more formal description are used interchangeably here.
Remarkably, academic literature on the market has been, until recently, very limited. Economists’ apparent lack of interest in the early stages of the market’s development is all the more puzzling when compared with the intense academic interest in the broader issue of LDC debt. Partly as a result of the limited attention given to the market, debtors’ demands for reductions in outstanding debt principal based upon Secondary Market prices was not predicted. It must be said, however, that many of the institutions active in the market are secretive, making factual information (especially on price histories) difficult to obtain.

With the change of debtor and creditor strategy in the wake of the Brady Initiative in 1989 the market has assumed a new importance. Commercial bank creditors no longer insist on the ultimate 100% recovery of loan principal. Debtors publicly demand to be able to purchase their debt ("buy-backs") or to engage in swaps of existing loans for bonds on concessionary terms at discounts in line with those implied by the market. It should be noted that, in practice, the discount implied by the Secondary Market price is usually merely an unattainable "opening shot" in the negotiations. In the case of Mexico, the first debtor to benefit from debt reduction under the Brady Initiative, the banks initially offered a discount of 15% on the face value of loans to be swapped into bonds (this was only one element of the deal; the others are discussed in detail in Chapter Seven) while the Mexicans asked for the (then) market discount of 55%. Agreement was eventually reached at 35%.

The Secondary Market has also been subject to criticism because much of its activity is interbank trading which does not reduce the outstanding stock of LDC debt. It has been estimated that by the end of 1988, the
Secondary Market had been responsible for total debt reduction of only $26bn [Financial Times, 23 March 1989]. Criticism based on the relative proportions of primary issuance and intra-market trading, could however, easily be applied to almost any other financial market, with stock markets providing a prime example. The turnover in stocks which are already in existence is many hundreds of times greater than the value of new issues.

1.2. The Origins of the Debt Crisis

On 19 August 1982, the Financial Times (FT) reported that, according to its Finance Minister, Mexico had only just avoided bankruptcy the previous week. The paper reported that Mexico had secured $2bn credits from the United States (US) Government. Together with further funds from the International Monetary Fund (IMF) and the Bank for International Settlements (BIS), the international financial community effectively "rescued" Mexico, and thus prevented the possible collapse of some of the world's largest financial institutions. At that time, Mexico's total external debt was, according to Cline (1986), about $80bn, or 32.7% of Gross Domestic Product (GDP). More than seven years later, on 12 January 1990, the FT informed its readers that "Mexico and its leading creditor banks have agreed the final shape of a critical debt agreement after nine months of negotiations." Mexico's total external debt had then reached about $100bn or 50.4% of GDP.2

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It was apparent soon after the Mexican crisis in 1982 that other countries were also experiencing serious external payments problems: by mid-1983 many of the biggest debtors, including Brazil and Argentina, were negotiating the restructuring of their debts with their bank creditors. Mexico's crisis was merely the first of many - or alternatively it may be viewed as the first part of the overall problem to surface.

Whilst for many debtors (though there are notable exceptions, such as Argentina and Brazil) and banks the term "crisis" is no longer a helpful or accurate description of the LDC debt situation, the process of debtor/creditor negotiation which began with the 1982 Mexican emergency continues today - and is likely to do so for the foreseeable future.

The factors which propelled so many debtor countries into difficulties in the 1980s are extremely well documented. Perhaps the most authoritative account, and certainly one of the most frequently cited, is that of Cline (1986). Cline's summary of the causes of the debt problem is worth quoting in its entirety:

"The external debt crisis that emerged in many developing countries in 1982 can be traced to higher oil prices in 1973-74 and 1979-80, high interest rates in 1980-82, declining export prices and volumes associated with global recession 1981-82, problems of domestic economic management, and an adverse psychological shift in the credit markets." (pp.18-19).

While it is not the purpose of this particular study to examine in any detail the causes of the LDC debt situation, it is essential to consider

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3. There were many reschedulings in the 1970s and early 1980s before the Mexican crisis, but most of these were with the Paris Club of official creditors, and none of the major Latin American debtors had been involved. Kettell and Magnus (1986) provide further details.
the fundamental reasons for the payments problems of the 1980s in order

to set into context the subsequent development of the Secondary Market.

Accordingly, each of the factors cited by Cline as the key causes of the
debt crisis, with the addition of the most basic problem of all - the
stock of debt - are considered below.

The scale of the debt problem is enormous: according to the World Debt
Tables 1990-91, the crudest measure of debt, total long-term debt of
all debt-burdened developing countries covered by the World Bank's
Debtor Reporting System (DRS), was approximately $760bn at the end of
1989. Of this total, some $250bn was owed to commercial banks, and
$102bn to other private sector creditors.

The development of such a large debt burden, however, is largely a
phenomenon of the last twenty years. Until the 1970s, commercial banks' involvement with LDCs centred on the provision of trade credit,
infrastructure project lending, and some direct lending to governments,
tied to IMF stabilisation programmes. Of the total $48bn in total long-
term debt owed by debt-burdened countries in 1970, only $3.5bn (7.2%)

4. Total debt is a crude measure of the payments burden because it takes
   no account of the split between, for example, concessionary and
   commercial debt, restructured or original debt, capital
   repayment schedules, or the ratio of debt to GDP. Some of these problems can be
   overcome by using some form of “effective debt” measure, such as that used in
   Chapter Seven where debt is converted into a “commercial terms equivalent” sum,
   but even this is not perfect. For illustrative purposes, however, total debt is a
   convenient and conceptually simple accounting measure.

5. “Long-term” debt is defined by the World Bank as "...debt that has
   an original or extended maturity of more than one year and that is
   owed to non-residents and repayable in foreign currency, goods, or
   services." (World Debt Tables, 1990-1, Vol. 1, p.115). This measure includes the debt of public sector bodies, debts guaranteed by public sector bodies, and private sector non-guaranteed debt.

6. “Debt-burdened” countries are defined by the World Bank as those with
   three of the following economic ratios above the thresholds quoted: total debt to
   GNP (30%), total debt to exports of goods and services (165%), accrued debt service to exports of goods and services (18%), and accrued interest to exports (12%).
was owed to commercial banks, with a further $8.2bn (16.9%) owed to other private sector creditors. In total, therefore, only 24.1% of the outstanding debt was owed to private sector creditors in 1970, compared to 46.5% in 1989.

The transformation of LDCs' balance sheets described by these figures took place largely in the mid-1970s to the early 1980s, as Table 1.1 illustrates.

It is not coincidental that bank lending to LDCs began to grow rapidly in the mid-1970s and peaked in the early 1980s. These periods followed directly the two oil price "shocks", when the Organisation of Petroleum Exporting Countries (OPEC) cartel forced up sharply the price of oil. This resulted in the generation of enormous balance of payments current account surpluses by OPEC members, with corresponding deficits in both the industrial countries and the non-OPEC LDCs. According to Kettell and Magnus, the current account deficit of the combined non-oil LDCs was $11bn in 1973 but rose to $37bn in 1974, while the OPEC countries saw their combined surplus rise from $7bn to $68bn during the same period.

For a variety of reasons, including the inability of domestic financial institutions to cope with such vast sums, a significant proportion of the OPEC oil revenues was deposited in the eurodollar\(^7\) markets, that is, in Dollar short-term deposits with commercial banks outside the USA. These deposits were popularly known as "petro-dollars". Faced with such an large inflow of interest-bearing current liabilities, the banks saw the LDCs, with their vast and largely untapped demand for capital as the

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7. Eurodollars are Dollars deposited outside the USA, not necessarily in Europe (though most are held there).
natural home for them. As Table 1.1 shows, the LDCs thus received a large inflow of bank lending, almost all of which was priced at floating margins over the three-month or six-month Dollar London Interbank Offered Rate (LIBOR). The process of accepting OPEC deposits and on-lending them to LDCs was known as recycling.

The result of the boom in commercial banks' lending after the oil shocks was that the debt-burdened LDCs' ratio of long-term debt to Gross National Product (GNP) rose sharply, from around 18% in 1970 to 26% in 1980, and 44% in 1984 (World Debt Tables, 1990-91). It is clear that one of the consequences of an increase in the stock of floating rate commercial debt is an increase in the sensitivity of the cash sum of interest payment flows to interest rates. In other words, a rise in nominal interest rates from, say 10% to 11%, is much easier to manage when the stock of debt affected by the higher rates is only equal to 10% of GNP than when it is equal to 30% of GNP. The percentage increase in total annual interest payments due would be the same in both cases, but the cash increase in the latter case will be three times that in the first (assuming identical debt structure).

As Cline pointed out, much higher interest rates in the 1980s compared to the 1970s (when inflation-adjusted LIBOR was often negative, meaning that effectively it paid to be a debtor) were a key catalyst of the payments' problems of the LDCs in the 1980s. Between 1974 and 1979, nominal three-month Dollar LIBOR averaged 8.5% according to the IMF.

---

8. There has always been a suggestion that official pressure was borne to bear on the commercial banks, firstly to take the huge OPEC deposits and secondly to recycle them to the LDCs; according to George (1988) "...(banks) claim there was a tacit agreement with Western governments to foster orderly placement of petrodollars as a matter of public interest." It is beyond the scope of this discussion to assess the accuracy or otherwise of this claim.
which calculated that in real terms this translated to -0.8%. By 1980, however, for a variety of reasons\(^9\) Dollar interest rates had risen very sharply to 14.2%, and by 1981 rates averaged 16.2%. The simultaneous sharp fall in US inflation meant that real Dollar interest rates rose from 0.8% to 7.6%. As a result, the proportion of debt-burdened countries' earnings from the export of goods and services devoted to debt service (interest and capital) rose by almost a third, from 26.5% in 1980 to 34.4% in 1983 (Source: World Debt Tables 1990-91, Vol. 1. A broadly comparable figure for 1970 would be around 22%).

A further consequence of the rise in Dollar interest rates and the fall in US inflation was the appreciation of the external value of the Dollar, which resulted in an immediate cost to the LDCs, whose floating rate commercial debts were almost exclusively Dollar-denominated.

The final (largely) external problem cited by Cline is the fall in foreign exchange earnings (both gross and net) at the same time as interest rates and the Dollar rose. The recession in the world economy in 1980-1 caused a sharp fall in developed countries' demand for the primary products of the LDCs. On the IMF definition\(^10\), the volume of exports by major borrowers fell by 8.0% in 1981, and was flat in 1983 before picking up in 1984. This fall followed average annual growth of export volumes of 24% in the previous four years [Source: IMF]. The

9. The causes of the rise in Dollar interest rates are not of prime concern here, but essentially they reflected the monetarist stance of the US Federal Reserve, which, wanting to avoid a repeat of the "stagflation" following the first OPEC oil shock in 1973/4, sought to use interest rates to bear down on inflation in the wake of the second OPEC oil shock.

10. The IMF definition of major borrowers comprised in 1983: Algeria, Argentina, Brazil, Colombia, Egypt, Hungary, India, Indonesia, Israel, S. Korea, Malaysia, Mexico, Morocco, Nigeria, Pakistan, Peru, Philippines, Portugal, Romania, S. Africa, Thailand, Turkey, Venezuela, Yugoslavia.
legacy of lower export growth was to persist during much of the 1980s. Between 1970 and 1980, average annual growth (compounded) of goods and services exports by all debt-burdened countries was 22% in Dollar terms, compared to 2% between 1980 and 1990.

Cline goes on to argue that LDCs' domestic economic mismanagement and a shift in creditor psychology also accounted for part of the LDC debt crisis. There can be little doubt that the economies of the LDCs were not well managed during the 1970s and 1980s. The preponderance of non-democratic governments in LDCs, with large, inefficient public sectors is undeniable, but some authors [for example, George (1988)] argue that the acknowledged failures of economic management reflected the constraints imposed by the debt crisis rather than vice-versa. It is beyond the scope of this study to examine these arguments in detail.

It is also beyond the scope of this thesis to consider the question of "creditor psychology" in any detail. The bald facts are clear: commercial bank lending to all debt-burdened LDCs fell from a peak of $28.4 bn in 1980 to only $7.5bn in 1989. The commercial banks' reluctance to lend new funds was made clear in the evidence to the British Treasury and Civil Service Committee in March 1990 by Sir Kit McMahon, the then Chairman of Midland Bank plc: "...we would be very sceptical at lending new money now." It should be noted, however, that it would be unreasonable, if not to say foolhardy, to expect the banks not to have changed their attitude towards lending to LDCs. The costs of the LDC debt crisis to the banking system have been huge and the reluctance of banks to make new loans is perhaps best explained simply in terms of the old banking maxim "Do not throw good money after bad".
1.3. **Structure of the Thesis**

This thesis is concerned with the investigation of several aspects of the origins, development and structure of the Secondary Market, and the related issues of market efficiency and market-based schemes for the reduction of LDCs' external debts.

It is hoped that by examining these issues (and others), as well as providing a comprehensive description and analysis of the activities of the Secondary Market, this study will contribute to the debate on some important aspects of the "Debt Crisis", which have not perhaps received the attention they warrant. The thesis contributes to knowledge of the market and issues of market-based debt reduction in several ways:

Chapter Two examines the origins and development of the market in the contexts of financial market development in general and of the securitisation of bank balance sheets in particular. The Secondary Market displays characteristics of both advanced and developing markets together. Even so, the transition from *ad hoc* transactions to a genuine financial market has been remarkably rapid. The remainder of the Chapter examines the structure of Secondary Market transactions and sets out explicitly the rationale for trading and its implications for banks' balance sheets and LDC debt portfolios.

Chapter Three presents the results of the first comprehensive survey of market participants and attempts, on the basis of the participants' responses, to break down the aggregate value of transactions into those initiated for different motives: position-taking for profit, purchases for debt-equity swap transactions, and portfolio management. The survey
reveals that market participants themselves differ widely on their views of even fundamental aspects of the market, such as volumes and liquidity, indicating that there are significant information asymmetries.

Chapter Four presents the theory of market efficiency, discussing the conflict between the two main schools of thought and drawing upon analogies from the Secondary Market where possible to illustrate the argument. Chapter Five presents the results of some of the tests for "market efficiency" performed on Secondary Market price data, which suggested that some LDC debt markets behaved inefficiently over the period in question. Simple "filter" trading rules confirm this "inefficiency" in the sense that someone following the trading rule could systematically have generated higher returns in the market of those countries' debts than a naive strategy of "Buy and Hold". The implication of this result is that the Secondary Market prices of some countries' debt may not reflect all known relevant information and that, accordingly, they are not necessarily valid reference points for negotiations on discounted loan for bond swaps.

Chapter Six discusses the theory of market-based debt reduction, and assesses qualitatively the Brady Initiative in the light of the theory. Chapter Seven presents the results of simulations of the impact of the first actual Brady deals on both the external debt burdens and the likely servicing capacity of the countries concerned under several

11. As Chapter Four shows, the term "market efficiency" has several meanings. It is used here in the broadest sense.
12. The limitations of the available price data mean that some of the newer techniques discussed in Chapter Four cannot be applied to the Secondary Market, but reference is made to the possibility of using these more sophisticated methods in future.
plausible scenarios for interest rates and export performance. These simulations demonstrate and quantify the conditions under which the key debt servicing ratios of the Brady countries should fall below critical levels.

Chapter Eight ends the thesis with some general concluding remarks and suggestions for further research.
Table 1.1. Bank Lending ($bn) to non-Opec LDCs

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CHAPTER TWO

THE ORIGINS AND DEVELOPMENT OF THE SECONDARY MARKET IN LDC DEBT

2.1 The Nature of Financial Markets

The purpose of any market, whether the traded commodity is a financial instrument, a good or a service, is to facilitate the trading of that commodity at a lower cost (in terms of the value of the time that would otherwise be expended in seeking out the necessary information required to engage in private arrangements) than would be the case if the market did not exist. A market need not have a physical location; indeed some of the most sophisticated markets in the world, such as the London equity market, no longer have a physical location but exist as a set of counterparties linked by computer. Of course, markets where immediate delivery or prior inspection of the traded commodity is required will always need a physical location. This is not necessarily inconsistent with increasing sophistication of market participants. The Secondary Market in LDC debt is one in which non-immediate delivery lent itself early in the development of the market to a structure without physical location - it is often referred to by participants as a "telephone market" for obvious reasons.

Goodhart (1989) describes in detail the characteristics of markets, both primitive and developed, and it is worth dwelling on some of his

1. The London Stock Exchange still retains its offices in Threadneedle Street, but the trading floor no longer operates as the site of equity dealing.
analysis before examining the origins and development of the Secondary Market in LDC debt.

The most important constraints on economic agents are time and information. It takes time to gather information, and time is scarce and costly. This is one of the key reasons why barter systems fail the test of economic efficiency - seeking out a suitable counterparty to one's desired transaction (in other words, finding a double coincidence of wants) is expensive. The other key problem is finding a double coincidence of perceived values. The recognition of this latter point leads easily to recognition of the need for money, while the appreciation of the former makes clear the desirability of markets, that is, "trading posts, at which buyers and sellers can gather at prearranged times and places" [Goodhart, 1989, p.3].

The classic example of the trading post is the auction house, where buyers and sellers are brought together to conduct business at known times. This method reduces the potential price volatility that results from relying on indeterminate (and infrequent, in the case of commodities with few buyers and sellers) coincidence of desired buying with desired selling. For example, should 10 buyers coincide at the trading post with only one seller, the price at which a deal is struck is likely to be much higher, ceteris paribus than if, one hour later, 10 sellers coincide with only one buyer.

Clearly then, the organised marketplace with prearranged dealing times has distinct advantages over unorganised individual transactions in terms of time and information costs and price volatility. Yet, as Demsetz (1968) observed, the infrequent, discrete nature of auctions and
other "trading post" markets is that participants suffer from "loss of immediacy". In other words, a true developed market needs to have, within reason\(^2\), the capacity to perform trade continuously.

The final stage of the development of a sophisticated market is the existence of market-makers, that is, market participants prepared to quote buying and selling prices at all times when the market is open, and to keep inventories\(^3\) to be able to maintain reasonable liquidity. Market-makers thus facilitate continuous trading, providing, as Demsetz (op cit) points out, insurance against price volatility to other market participants as well as giving the immediacy lacking in auction-type markets.

The financial return to market-making is in two forms. Firstly, a feature of most financial markets is commissions, calculated as a percentage of the value of a transaction. Secondly, market-makers earn the spread between the price at which they are prepared to sell and that at which they are prepared to buy. The more liquid the market, the greater the competition between the market-makers, and the less volatile the underlying value of the asset\(^4\), the narrower will be the spread. Market-makers may also take positions based on their view of market trends (note that such positions are treated differently from

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\(^2\) Few would argue, for example, that there is no market in, say, clothing in the UK, despite the difficulties of performing transactions at night or on Sundays. The point is surely that in a developed market, transactions can be arranged and performed at times when most participants want to do so.

\(^3\) Most sophisticated financial markets have facilities for the lending of financial instruments to allow market-makers to cover buy orders from other participants.

\(^4\) It may sound incongruous to talk of volatility in underlying asset values, but in the case of LDC debt it is appropriate. Debts of countries which are, for example, coup-prone are, ceteris paribus, likely to experience greater swings in perceived underlying value than countries with stable governments.
inventories of stocks maintained directly for market-making purposes), but this ability is not restricted to market-makers.

Goodhart's analysis suggests, therefore, that the development of a fully-fledged, sophisticated financial market has three distinct stages:

- **Stage One** is the commencement of individual, discrete, private transactions conducted entirely between counterparties. It is possible, as was the case in the Secondary Market, that at least some of these first deals may be barter (i.e., swap) transactions, with no exchange of cash.

- **Stage Two** is the development of a marketplace, with prearranged times at which dealing can take place between counterparties. Greater transparency of prices and quality (in the case of non-homogeneous goods) can be achieved if there is some central conduit through which transactions take place; such a conduit would be an auctioneer. At this stage of market development, brokers begin to appear, to buy or sell on behalf of clients unable or unwilling to visit the marketplace in person.

- **Stage Three** sees the development of continuous trading, usually through competitive market-makers, who are often overseen by a central regulatory body. At this stage of development, the fundamental need for a physical marketplace may disappear, to be replaced by telephone trading with computer communication between participants. The role of brokers is usually very important in developed markets, with their role made much easier by instant access to price quotations from competing
market-makers. Markets at this stage of development are likely also to have some form of regulatory structure or rule-making body\(^5\), to ensure that the business of the market is performed honestly and that competition is fair. Regulatory bodies may also be able to insist upon the licensing of new market-makers, for example market-makers in British Government gilt-edged debt stocks must be licensed by the Bank of England.

These three stages of market development can be applied equally to secondary markets as well as primary and mixed primary/secondary (the most usual form) markets. A secondary market is one in which assets are traded between counterparties at any time after their initial issue, while in a primary (financial) market new instruments are issued directly to market participants. Stock exchanges, for example, are both primary and secondary - companies can issue new shares directly onto the market (the primary role) and these shares can subsequently be traded between parties who did not necessarily participate in the initial launch (the secondary role). The LDC debt market is (almost) exclusively a secondary one (hence its usual term of reference as "the Secondary Market"), because no new issues take place\(^6\) directly onto it. Only loans or bonds which have been granted or issued previously are traded. If in the future, LDCs are more creditworthy and begin significant direct market issuance of debt, the primary role of the

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5. There may even be more than one regulatory body, as in the case of the UK Government gilt-edged debt stock market, which is overseen by both the Bank of England (which issues all the stock) and the Stock Exchange.

6. New instruments will appear on the market as loans are swapped for bonds under the auspices of the Brady Initiative, but the new bonds are issued directly to the holders of the original loans rather than to the market.
market will thus expand, but the secondary role will remain far greater and it is unlikely that the market will be renamed.

2.2. **Securitisation and the Secondary Market in LDC Debt**

It is helpful to consider the Secondary Market in LDC debt in the context of securitisation, a phenomenon specific to banking, before describing the birth and subsequent development of the market in the light of the above discussion on the nature of markets.

The commercial debt referred to in this study consists mostly of syndicated bank loans, not bonds as was the case in the 1930s when 17 Latin American countries defaulted [Kettell and Magnus (1986)]. The key difference between the two in the context of the LDC debt situation is that bond defaults may affect many different types of creditor, from private individuals to the largest institutional investors, but before the development of the Secondary Market a syndicated loan default would affect only the original lenders - by definition, a bank. Hence when the payment difficulties of LDC debtors arose in the 1980s, there was no mechanism by which the creditors could restructure their portfolios to reflect changing perceptions of risk and return. Portfolio theory is irrelevant if there is no way of changing the structure of the portfolio.

The 1980s, however, saw the development of another major trend in international financing - securitisation. Although this has not (yet) occurred in its "pure" form defined below in the LDC debt markets (with the exception of the bonds created under the Brady Initiative and the earlier Mexican "Morgan Bond", both discussed below), it has perhaps
provided the rationale for the existence of secondary transactions in LDC debt (and subsequently the Secondary Market itself, following the process of market development described above).

There is no generally accepted definition of securitisation, but the version provided Henderson and Scott (1988, p.2) is acceptable for our purposes:

"...the process which takes place when a lending institution's assets are removed in one way or another from the balance sheet of that lending institution and are funded instead by investors who purchase a negotiable financial instrument evidencing the indebtedness, without recourse (or in some cases with limited recourse) to the original lender."

Securitisation thus involves the transformation of loans (or other receivables, for example, residential property mortgages and credit card debts are increasingly securitised, especially in the USA) into tradeable securities, thus removing the original loan from the balance sheet of the lender, as Henderson and Scott state in their definition.

The term "securitisation" is also used to describe the switch in the preferences of large borrowers, both corporate and sovereign, away from the traditional syndicated bank loan towards issuing securities as a way of raising medium-term funds (and short-term, through the Euro-Commercial Paper market). The reason for this trend is straightforward: many "blue-chip" companies have credit ratings which enable them to borrow more cheaply on the capital markets than the banks to which they would have previously turned for finance. Table 2.1 details the expansion of the corporate bond market and the contraction of the syndicated loan market in the 1980s. The table also shows how LDCs received a smaller share of a diminishing market. As stated above, the issuers in the bond markets were high grade corporates and developed
sovereign borrowers, so the LDCs, with their lower (and falling) credit ratings were unable to follow the trend away from syndicated loans into the bond markets. The Bank of England commented in its Quarterly Bulletin in March 1984 (p.59):

"There was a sharp reduction in new lending to countries outside the BIS reporting area - particularly to developing countries...In contrast to the syndicated credit market gross issues of international bonds and notes in 1983 - at $76 billion - were slightly up on 1982. The strength of this market has not benefited the developing countries however since the market is confined almost entirely to borrowers in OECD countries and to international institutions."

The benefits from securitisation from the banks' point of view are also large: the process brings the "...obvious benefit of liquidity to the portfolio of the original lender." (Henderson and Scott, op cit, p.4) Clearly securitisation gives a bank a far greater degree of flexibility in the structuring of its portfolio. On the basis of the discussion of securitisation thus far, the answer to banks plagued by the Debt Crisis appears obvious: securitise and sell. Indeed, Henderson and Scott consider the sale of "Third World Debt" to be the obvious example of the potential benefits from securitisation as a means of exposure reduction. Unfortunately, they go on to explain why this apparent solution is not feasible. The key to activity in the capital markets is creditworthiness, a characteristic which is conspicuously lacking in the LDCs. If the borrower is not creditworthy, then:

"...the successful securitisation of such assets [the banks' loans] would either call for massive over-collateralisation of the security, or, as is more usually the case, some form of credit enhancement via private insurance may be necessary if the security is to be floated off at a price which makes sense to the original lender." (Henderson and Scott, p.5).
Given that collateralisation of a sovereign debtors' assets is not a viable option (but see below), then securitisation of LDC debts will only be possible if the quality of the resulting securities are enhanced in some way, as Henderson and Scott state. In fact, this has occurred twice in the case of Mexico: firstly in 1988 with the so-called "Morgan Bonds" (the deal was arranged by J P Morgan) and secondly, on a much larger scale with the 1990 agreement under the auspices of the Brady Initiative (discussed in detail in Chapter Seven).

In the first example, Mexico's bank creditors were invited to submit bids, offering Mexico loans to be swapped at a discount to their face value in return for new bonds, the principal repayment of which was guaranteed by Mexico's purchase of non-tradeable zero-coupon US Treasury bonds with its reserves. Only $3.66bn of the planned $10bn loans were actually swapped [Financial Times, 4 March 1988], at a discount averaging 32.23%, principally because the interest payments on the new bonds were not guaranteed and were thus pure Mexican risk. Taking this into account, many banks believed there was little point in offering their existing loans at a discount in return for new bonds which they considered were also likely to trade at a discount. In fact, by mid-August 1989 the new bonds traded at a premium of roughly 30% to the benchmark United Mexican States (UMS) restructured loan in the Secondary Market, but as the latter were then trading at only 43% of their face value this still represented a substantial discount to par [Purcell and Canavan (1989)]. Banks which had swapped UMS loans for the new bonds were thus left with an asset worth roughly 38% of the face value of their original loans, representing a loss of about 5 cents per Dollar of loans swapped for the bonds compared to market sales of the original loan. This of course ignores the value that holders of the bonds place
on the principal guarantee, and on the belief that Mexico would be far more reluctant to interrupt payments on bonds than on loans. This belief has so far been justified in that Mexico has continued to service its bonds without interruption.

In the second example, the Brady deal offered banks the opportunity to swap their loans for bonds at a 35% discount in return for market interest rates on the new bonds, or a face value ("par") swap with the new bonds paying 6.25% fixed interest. The lessons of the Morgan Bond had been learned and the new bonds are enhanced with an 18-month interest guarantee (funded by Mexico's reserves and borrowing from the IMF and the Japanese Ex-Im Bank) as well as a principal guarantee backed, as before, with zero-coupon US Treasuries. This should make the new bonds more attractive to non-banks, but the limited length of the guarantee means that interest payments will revert to pure Mexican risk after 18 months and hence a the bonds began to trade at a discount [Berg (1989)]. This was despite guarantees worth some $7bn on a deal covering $52bn of debt [Financial Times, 17 January 1990]. If guarantees of the same proportion of the debt were required in deals covering every debtor, then to securitise the entire stock of LDC bank debt would require enhancements worth at least $50bn. The true figure would almost certainly be much higher than this, as the Mexican economy was in a far better condition at the time of the deal than those of many other debtors including the two largest, Argentina and Brazil. Finally, it must also be remembered that $1.3bn [Financial Times, 25 July 1989] of the $7bn enhancements for Mexico came from her own reserves, and this would not be possible for many other debtors. True securitisation and non-bank participation in the LDC debt market as a whole is a long way off.
With the recognition of the practical impossibility of large-scale securitisation in the short-term, the LDCs' bank creditors have sought to create liquidity by another means - the trading of the original loans themselves, without the creation of securities. This is the essence of the Secondary Market in LDC bank debt. The market may be considered as a half-securitised one in that it achieves one goal of securitisation, that is, the removal of the assets from the balance sheet, but not the other, the sale of the asset in another form (securities) to non-bank investors. Henderson and Scott refer to markets of this type as "Transferable Loan Markets", with reference to the first of the two methods commonly used to transfer the loans from one party to another. This first method is assignment which is facilitated by the addition of instruments to the basic syndicated loan agreement, creating "Transferable Loan Agreements". Under assignment, only the rights of the original lender are transferred and hence the method is only used for credits which are fully drawn.

Novation is the second method of transfer, and involves replacing the original creditor with a new one. All the original rights and obligations of the borrower, the original lender and the agent bank are transferred to the new lender.

By March 1985, the Bank of England stated in its Quarterly Bulletin (p.61) that "trading of claims on troubled debtors seems to be infrequent", but nonetheless "an innovation has been transferable syndicated loans, which provide explicitly for Secondary Market trading: eight such loans for $1.5 billion were arranged in 1984." Hence there was official recognition of some secondary activity as early as 1984.
Clearly, the Bank of England's description suggests a market at only the first stage of development.

2.3 The Birth of the Secondary Market

It is impossible to state exactly when the Secondary Market began to justify its name, as the transition from what we have termed Stage One (individually negotiated one-off transactions) to Stage Two ("trading post") did not occur overnight. The first transaction probably took place in late 1983 (see below), but for the next two years the use of the term "market" to describe the transactions in LDC debt would be an exaggeration. During this period there were none of the features of developed, Stage Two or Stage Three markets (that is, prearranged known dealing times, regularly quoted prices, and market-makers) and the value of transactions was relatively low (see Table 2.2).

By 1988, however, some 50 regular participants performed transactions worth an estimated minimum of $40bn [Shepherdson (1989)] with several American institutions quoting two-way prices for approximately 25 worldwide debtors. Whilst there is some controversy concerning the degree to which these prices are purely indicative (see Chapter 4), the emergence of market-makers and the increasing value of transactions means that the trading in LDC debt may now legitimately be said to take

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7. Most of the market-makers are American, for example Merrill Lynch, Citibank, Salomon Brothers, Chase Manhattan, Bankers Trust, and Morgan Guaranty; Chartered West LB (a joint venture by Standard Chartered and Westdeutsche Landesbank) and NMB (Netherlands) are also market-makers [Purcell and Canavan, (1989)]. It should be noted that whilst these market-makers do not formally guarantee to quote prices and deal in all debts at all times (there is no regulatory body to insist upon this), they will usually quote prices in all but the most illiquid, low volume debts.
place within a developed market, at the transition between Stages Two and Three as defined above.

The secrecy which surrounded the market for the first few years of its existence and which to some extent persists today means that it is not possible to pinpoint exactly the first transaction. However, the deal frequently cited (see for example Sandler, (1984) as being the first\(^8\) took place in December 1983 between Bankers Trust of the USA and Banco Real of Brazil.

Bankers Trust wanted to adjust the structure of its portfolio whilst Banco Real needed to raise cash. The banks, which had a correspondent relationship, eventually agreed a swap with Bankers Trust taking $190m of Banco Real's loans to the Mexican Government in exchange for $100m Brazilian loans and $90m cash. From Bankers Trust's point of view, the deal represented a cut of approximately 10% in their Brazilian exposure, but of course their exposure to Mexico - already the highest in the US at 5.5% of their total loans - rose (Sandler, op cit). With the benefit of hindsight, the American bank was extremely generous: according to Salomon Brothers' "Indicative Prices for LDC Loans", by 28 September 1989 the Mexican loans Bankers Trust received were worth 40.75% of their face value (that is, $77.43m) whilst the cash and loans received by Banco Real were worth $117.75m with Brazilian loans trading at 27.75% of face value.

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8. It is likely that other discounted deals preceded this one, but they are not documented in specific detail. For example Libra Bank (a now-defunct consortium bank based in London but specialising in Latin America) claims to have been swapping Mexican and Brazilian loans in separate transactions with unspecified counterparties during 1983 (Harvey, (1988)).
As well as making what now appears to have been a poor commercial decision, Bankers Trust made itself rather unpopular with the other banks on the Brazilian Steering Committee (which negotiates on behalf of all Brazil’s creditor banks) because of the example which it set to the many small institutions, especially the American regional banks. They soon realised that provided the regulatory difficulties which initially prevented them from selling loans at a loss could be overcome, the market provided an escape route from the endless negotiations (in which they had no direct say) and the liability to provide further loans based on their existing exposure under New Money Agreements. Of course, the sale of debts by the smaller banks would mean that more of the burden of New Money would fall more heavily onto the larger creditors, who at that time simply could not afford to sell their loans - and even if they could have, with exposures of several hundred million Dollars each the market would not then have been able to absorb them.

In the event, the US regional banks were not major sellers until after the Citicorp-led round of provisions beginning in May 1987, which made the prospect of cash sales less unattractive because the resulting losses were reduced by the amount of provisions already made against the loan. From a regulatory point of view, the capital strengthening which resulted from the provisions was also welcome.

2.4. Volume Growth 1984-90

Unlike larger, more sophisticated financial markets\(^9\), the LDC debt market has no regulatory body or official recording of transaction

\(^9\) For example, developed Stock Exchanges and Government bond markets. Of course, these are much larger than the LDC loan market.
volume or value (a feature usually found in Stage Three financial markets). This means that most of the estimates of market size which appear in the financial press are those of various participants. This creates several problems:

- The trader or institution which is asked to estimate the size of the market may have a strategic or operational motive for under- or over-estimating the size of the market.

- The researcher has no way of knowing precisely how the respondent has arrived at his figure, and hence whether his estimate is valid. None of the sources quoted in this chapter gave an indication of their calculation methodology.

- The problem of double-counting is a considerable handicap in ascertaining true levels of market activity. Only one of the sources quoted [McDougall (1987)] explained that matched deals\textsuperscript{10} count as one trade, while loans bought for later resale count as two. It is also debatable whether or not this distinction is a valid one - there seems no practical reason why debt held for a day should be treated differently to identical debt which is immediately resold. A more useful distinction would perhaps be that between broker and principal - if the bank puts the debt through its own books before resale then two deals would be recorded, otherwise there would be just one.

\textsuperscript{10} In this context a matched deal is either a swap between two institutions with no broker, or a deal arranged by a broker where both sides of the transaction are agreed before any purchases/sales are made, so that although the broker may take the debt onto his own books for a short period, he never has an outstanding position.
Notwithstanding the above problems, several estimates are available for market size from 1984 onwards, and these are given in Table 2.2. With the exception of Shepherdson (1989) where the estimate for 1988 is calculated from the replies to the survey detailed in Chapter Three, all of these figures almost certainly originated directly from traders at the more active institutions. Where the institution is known, it is stated in parentheses after the source article.

There are several factors behind the expansion of the market from 1984. During 1984 the swapping example set by Bankers Trust and Banco Real was followed, but the lack of debt-equity swap schemes (see 2.7.3) to provide the final non-bank demand prevented the development of a cash market. Most deals were swap arrangements between banks with the aim of restructuring their portfolios in line with their perceptions of the changing economic and political situations of the debtors. At this time, brokers were not used as the banks did not want to acknowledge openly that a discount market existed as this would have amounted to an admission that their loans might not be fully recoverable, contrary to their public pronouncements [Purcell and Canavan (1989)]. This would have increased the pressure on them to set aside large provisions, which they were not then able to do.

In May 1985 the market received a "long-awaited impetus" [Harvey (1989)] with the commencement of the highly successful Chilean debt-equity swap programme. The effect of this scheme was dramatic, and, according to Harvey, was largely responsible (together with the Mexican scheme which began in April 1986) for the quadrupling in the size of the market between 1985 and 1987. The programme generated demand for Chilean debt from Multi-national Corporations (MNCs) and wealthy Chilean nationals.
who were also able to participate in the scheme. This increase in
demand meant that the price of Chilean debt rose\textsuperscript{11} (Harvey, op cit) and
a shortage developed. Eventually, this led to the expansion of the
markets in the debts of other countries, as Harvey explained:

"...a bank that would not sell Chilean debt for cash would swap it
for, say, Brazilian debt. This created demand for Brazilian debt.
Perhaps the bank selling the Brazilian debt would only swap it for
Venezuelan debt, thus creating demand for Venezuelan debt. The
Chilean debt conversion scheme, in creating cash demand for
Chilean debt, opened up a whole new market." (p.2)

The volume expansion of the market was threatened, however, on 21
February 1987 by the start of the Brazilian moratorium on interest
payments on its medium-term debt. The moratorium lasted until the end
of October; during its currency the dramatic reduction in demand pushed
the price of Brazilian debt down from 72.5 to 42.5 cents, according to
Salomon Brothers' "Indicative Prices for LDC Bank Loans". However, the
reduction in volume which would probably have accompanied the fall in
demand was offset by another major event in 1987: the announcement on 19
May that Citibank was to make second-quarter provisions of $3bn against
its (then) $14.9bn LDC loan portfolio (Citicorp Report, 1987). This
action was followed by most US banks (and British ones) over the next
few weeks (see Table 2.3) and as a result the supply\textsuperscript{12} of debt on the
market rose rapidly and prices fell accordingly (see 2.5 below).
Although organic growth continued in 1987 as new players entered the
market and transactions grew more complex (see 2.7 below), the mean
estimate of market size, $11.8bn, represented an increase of only 59.5%

\textsuperscript{11} It is impossible to quantify the extent of the price rise induced
by the debt-equity programme because no published price data is
available for the period in question.

\textsuperscript{12} Increased provisions reduce the future profits "hit" (i.e., loss)
from future sales of a debt, hence the price at which a bank is
prepared to sell a particular portion of debt falls after
provisions on it are made/increased. Therefore, the supply curve
shifts to the right.
on the 1986 total of $7.4bn. This was low compared to the 1985 expansion of about 100% and the 1986 figure of about 150%.

In 1988 the high growth rates of 1985 and 1986 were surpassed as the value of transactions increased by some 270%, from $11.3bn to about $43.5bn. Several factors contributed to this upsurge in activity. First, debt conversion of all kinds in Brazil, including informal conversions (see 2.7.3 below) and the monthly official auctions (suspended in December) reached approximately $8bn [Financial Times, 31 October 1988]. The Chilean programme continued, retiring over $2.6bn [J P Morgan (1988)] of debt. Second, large-scale cash sales by US regional banks began [Andrews, (1988)]. Third, the larger US banks began, in the wake of the 1987 round of provisions, to increase their activity in the market for portfolio restructuring purposes, though the largest “Money Center” (sic) banks were still not cash sellers [Andrews, op cit]. Finally, the appearance of more brokers (both “pure” brokers and position-takers) facilitated more transactions of increased variety and complexity [Purcell and Canavan, op cit].

By the end of 1988, activity was reduced as the Brazilian debt-equity programme was suspended in December, thus reducing non-bank demand. Interbank transactions continued unabated in 1989 but as prices continued to fall (see 2.5) the oft-touted non-bank investor demand failed to materialise in any significant way [Financial Times, 19 December 1989]. End-user activity centred on the Chilean debt-equity scheme, though there was less activity here than in previous years. There were official buybacks by Chile and the Philippines and unofficial
buying of their own debts by other countries \(^{13}\) [Financial Times, 24, 30 November and 19 December 1989].

The announcement of the Brady Initiative in March 1989 provided a price and volume fillip for the market in anticipation of the potential enhancement of some debtors' obligations, but the year-end estimate of turnover reported in the Financial Times (19 December 1989) of $60-80bn implies an increase over 1988 of between 36% and 82%, a rather slower rate of growth than in previous years.

The continuing dearth of debt-equity opportunities in 1990 meant that interbank transactions continued to dominate the market. A volume boost came from the trading of post-Brady instruments and derivatives [Berg, (1989)]; indeed the Economist reported on 12 May 1990 that the market was "fizzing", though its statement assertion that turnover was "...up by about 5-10% on the same period last year" rather flattens the reported effervescence, given the rates of growth seen in previous years. The paper also optimistically reported that $80bn-worth (face value) bonds (as distinct from the original bank loans) could be on the market by the end of 1990, with new Brady Plan instruments from Venezuela and Brazil. (In fact, this did not happen.) Finally, the Economist's argument that Japanese banks would be keener to play the market now that their provisions have been raised to 25% (since early 1990) seems rather thin given the well-publicised problems of under-capitalisation of the banks and their current rapid retrenchment.

\(^{13}\) Under most original loan agreements, market buybacks by the debtor are forbidden for obvious reasons. However, as many banks are now determined to reduce their portfolios on the grounds that enhancement is too expensive, time-consuming and may not be ultimately successful, any source of final cash demand for the debt is unofficially welcomed in many cases.
Ultimately a market in which end-user demand is limited and probably falling cannot continue to expand indefinitely.

2.5. **Price Trends 1986-89**

Figure 2.1 illustrates the overall trend which Secondary Market prices followed from early 1986, when prices first began to circulate regularly, to mid-1989. Figure 2.2 shows the price trends over the same period for three very different debtors: Brazil, Chile, and Peru. Note that the discontinuity in prices arose because Salomon Brothers did not issue an "Indicative Price" list between 2 December 1986 and 20 February 1987. Essentially, the reason for the downward slide in prices is that for virtually the whole of the market's life, most of the "shocks" (i.e., new information) which it reflects in its prices have been adverse. In recognition of this there have usually been more sellers than buyers, with the inevitable result that prices have fallen. Shocks fall into two broad categories:

- Economic or political news which the market believes indicates a potential change in a country's ability and/or willingness to repay its debts. Examples of such shocks include Brazil's announcement of its moratorium in February 1987 (adverse), the speech by US Treasury Secretary Brady in March 1989 (positive), the election of Snr. Menem as Argentinian President (adverse).

- Technical shocks not directly related to changes in debt service ability. The prime example of this is the 1987 provisioning round, which constituted an adverse shock as it released large quantities of debt for sale and thus increased supply, pushing prices down.
As figure 2.1 shows, until 1987 prices overall were relatively stable compared to their decline since then. The index declined by only 3.2% from 67.8 to 65.6 between March and December 1986. Interestingly, as figure 2.2 shows, the price of Peruvian debt in 1986 was considerably more volatile than that of either Brazil or Chile. This may have been due to the lack of liquidity in the Peruvian market in 1986 - Salomon Brothers said it was "rarely traded" - which would have resulted in large price changes when deals did actually occur. From 1987 onwards that higher volume may have resulted in more frequent trading and a smoother downward price path until the market bottomed at a steady 5 - 6 cents in mid-1988. Little "news" (except the general impact of provisions) emerged from Peru over this period and hence the price remained stable. After the price adjustments following the provisioning in May, Brazil and Chile exhibited considerable volatility, reflecting the large volume of data reaching the market. In February 1987 the start of the Brazilian moratorium caused a sharp decline in the price of that country's debt, from 72.5 on 20 February to 64.0 on 7 April (an 11.7% fall).

In the five months following the start of the 1987 provisioning the index fell from 63.3 to 45.8 - a drop of 27.6%. There was a brief rally in which the index peaked at 50.03 on 30 November, but the long-term downward trend soon began again. The post-provisions drop and the partial recovery is clearly illustrated in the paths of the prices of Brazil and Chile.

During 1988 the trend was again generally downwards as the economic prospects in the major debtors failed to improve. The Brazilian debt-equity swap programme, however, contributed significantly to end-user
demand and this, coupled with the absence of further major provisions, prevented prices from falling as quickly as in 1987. The index fell from 48.29 on 31 December 1987 to 39.33 on 22 December 1988, a decline of 18.3%. The Brazilian market performed reasonably well in the early part of the year, rising from 46.5 on 31 December 1987 to 55.75 on 13 May 1988, before finishing the year on a downward trend at 40.38, an overall decline of 13.2%. End user demand for Chilean debt enabled its market to outperform the index easily, registering a decline of only 6.9% as the price moved from 61.75 to a reasonably stable 57.5.

The final few weeks of 1988 and the first quarter of 1989 witnessed a sharp acceleration of the downward price slide, due to the suspension of the Brazilian debt-equity auctions in December and worries about the general elections in Venezuela (December 1988), Argentina (May 1989) and Brazil (December 1989). The index slipped from 40.36 on 8 December 1988 to a low of 31.04 on 2 March 1989 - a fall of 23.1%.

Market sentiment improved dramatically after the announcement of the Brady Initiative (detailed in Chapter 6) on 10 March 1989. This was despite widespread unease within banks as to its possible implications; a feeling that was exacerbated by uncertainty as to the form the Initiative would eventually take [see for example Financial Times, 15 and 20 March 1989]. For this reason, the proposals were referred to as the "Brady non-Plan" by some bankers. In the weeks following the announcement, the prices of major debtors rose, led by Mexico, the expected (and actual) first country to test Brady. The index climbed from 31.04 on 2 March to 37.23 on 27 April, when uncertainty set in as to the scale of relief likely to materialise under the proposals and the probable long timescale involved - "Parachute check for Air Brady", as
Figure 2.2

Secondary Market Prices
Brazil, Chile, Peru

Price, cents per dollar of face value

2 March 1986 2 Dec 20 Feb 29 June 31 Dec 23 June 22 Dec 8 June 1989

Brazil
Chile
Peru
Salomon Brothers succinctly described the position - and the index retreated to 34.54 by 8 June. Mexico rose from 33.38 on 2 March to 43.13 on 27 April, before falling back to 39.5 on 8 June. The price remained roughly at this level for the rest of the year. Brazil and Chile tracked this trend, as figure 2.2 shows, though the Brazilian price was more volatile.

2.6. Prices and Volumes, 1985-89

A picture of the development of the Secondary Market can be produced by combining the mid-year values of the price index with the estimates of volume turnover for 1985-9 inclusive as listed in Table 2.2. Listed below are the mid-year values of the index used in figure 2.3.

<table>
<thead>
<tr>
<th>Secondary Market Price Index, 1985-9</th>
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<tbody>
<tr>
<td>Year</td>
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<tr>
<td>------</td>
</tr>
<tr>
<td>1986</td>
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<td>1987</td>
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<td>1988</td>
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<td>1989</td>
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The plotted figure of 80.00 for 1985 is an estimate by Salomon Brothers (Purcell and Orlanski, op cit) as no published figures are available until March 1986. The mean value, $\bar{P} = 57.63$.

The price/volume combinations positions plotted on figure 2.3 show clearly the effect of the major provisioning in 1987 and to lesser extent in 1988, with these years showing a large increase in volume and substantial price reductions, consistent with a large increase in supply.
Figure 2.3

Secondary Market Prices and Volumes
1985–1989

Price index, cents per $ face value

Face value of transactions, $bn
Unfortunately, with only five data points it is not possible to perform any meaningful econometric analysis of supply and demand. However, if the assumption is made (in the absence of sufficient data to prove any contrary view) that the locus of points shown in figure 2.3 represents some kind of the demand curve, it is possible to estimate the price elasticity of demand, $E_d^p$ for debt in the Secondary Market between 1985 and 1989:

$$E_d^p = \frac{\Delta Q}{\Delta P Q}$$

$$= \frac{-67.00 \times 57.63}{45.46 \times 27.14}$$

Hence $E_d^p = -3.13$

This indicates that a 1% price fall will be accompanied by an increase in demand of 3.13%, that is, demand is price elastic (Note that this result is only valid about the mean price).

2.7. **The Structure of Secondary Market Trades**

2.7.1. Introduction

There is an almost infinite variety of possible transactions structures in the Secondary Market, so generalisations must be made. Essentially, transactions involve combinations of cash sales and purchases as well as (or alternatively) swaps of loans. In the early years of the market (Stage One of its development) swaps were more common, but the advent of exposure reduction activity, first by the US regional banks and later by the larger creditors increased the importance of the cash market. Even
so, according to Harvey (op cit) there are periods when either cash or swaps may predominate, with a "cash market" (prices falling, sellers only willing to accept cash for loans) being analogous with a bear stock market and a "swap market" (prices rising, sellers willing to take other loans as payment) with a bull stock market.

2.7.2. Interbank Trading

It must be noted that banks participate in both intra-country (different instruments from the same country) and cross-border (instruments from different countries) trades, but as the analytical treatment of both is identical the distinction is not made in future and the examples given are of cross-border deals. The most simple type of trade is the cash deal, where debt is traded between counterparties at an agreed price, with cash settlement. As well as trading bank loans, "exit bonds" are also traded for cash. These instruments (such as the Mexican Morgan Bonds) have been created from the original loans but, as discussed in 2.2. above, they have different characteristics and are bonds rather than portions of syndicated loans. The operation of the market is now sufficiently advanced for such deals to be completed on the day they are agreed (Harvey, op cit). According to Harvey, there is now an established market in debt options (derivative instruments such as options are indicative of a developed, Stage Three market), which are useful to investors who are uncertain as to whether their bids, which are required under some debt-equity swap programs as a means of rationing debt conversion by price, will be accepted. Such options may be available at no charge in a weak market, or at a fee if the market is bullish.
The two basic types of swap transaction are described below (the names are those used by Purcell and Orlanski (op cit):

(a) One-for-One Swaps: Debt of equal face value is exchanged, with the difference in the Secondary Market value of the debts being paid in cash. For example, a one-to-one swap of $1m Argentinian for Brazilian debt in September 1989 would have required a payment of approximately $95000 from the original holder of the Argentinian debt because (according to Salomon Brothers' Indicative Price List on 28 September) the market value of the Argentinian debt was only $186250 compared to $281250 for the Brazilian. According to Purcell and Orlanski, the main benefit of the one-for-one swap is that in many countries the cash difference may be treated as a fee, thus allowing the banks to perform the transaction without having to record any change in the book value of their portfolio.

(b) Ratio (or Par) Swaps: In this form of transaction, the face values of the debts swapped are different and the cash payment is made to balance the nominal balance sheet value of the transaction from the point of view of both banks. This requires that the implied loss on the disposal of the debt by each of the parties is matched by the implied profit on the acquisition of the other debt, with cash filling the resulting hole in the balance sheet of the bank disposing of the higher value debt. For example, consider two banks A and B. Bank A holds $5m face value of Chilean debt on 28 September 1989. According to Salomon Brothers the price of Chilean debt was then 61.5 cents per Dollar making A's holding worth $3.075m, implying a loss on disposal of $1.925m. In order to swap this for Bank B's Mexican debt, which was then trading at 41.125 cents per Dollar, it would be necessary for B to give up
$1.925m/(1-0.41125) = $3.270m face value of Mexican debt. B would also have to pay $5m - 3.270m = $1.73m cash in order to restore A's balance sheet:

<table>
<thead>
<tr>
<th></th>
<th>Bank A</th>
<th>Bank B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chilean loan</td>
<td>-5.00</td>
<td>5.00</td>
</tr>
<tr>
<td>Mexican loan</td>
<td>3.27</td>
<td>-3.27</td>
</tr>
<tr>
<td>Cash</td>
<td>1.73</td>
<td>-1.73</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

The situation is more complex if provisions have been made against the debts. Suppose 20% provisions have been set aside against the Chilean debt, and 35% against the Mexican debt. Bank A's disposal of the Chilean debt now results in a loss of $5m(1-0.615-0.2) = $0.925m. To generate this loss from disposal of Mexican debt, Bank B would have to remove debt with a face value of $0.925m/(1-0.41125-0.65) = $3.87m from its own Balance Sheet. The cash adjustment would be made so as to equalise the Balance Sheet effect on a net (after provisions basis), so the gross Balance Sheet adjustment would be non-zero:

<table>
<thead>
<tr>
<th></th>
<th>Bank A</th>
<th>Bank B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chilean loan</td>
<td>-5.00</td>
<td>5.00</td>
</tr>
<tr>
<td>Mexican loan</td>
<td>3.87</td>
<td>-3.87</td>
</tr>
<tr>
<td>Cash</td>
<td>1.48</td>
<td>-1.48</td>
</tr>
<tr>
<td></td>
<td>0.35</td>
<td>-0.35</td>
</tr>
</tbody>
</table>

Both banks benefit from the deal: Bank A reduces its overall exposure by $1.13m gross ($1.48m net of provisions) and receives $1.48m cash, which compensates for the swap into a lower quality debt. Bank B increases the quality of its portfolio by swapping out of a poor quality debt into a better one. Its total exposure rises but it must believe that the improvement in the quality of its portfolio is worth the increase in exposure and the cash cost of $1.48m.
Hence portfolio management transactions like those outlined above are the main reason for interbank swap transactions. Changing political and economic circumstances mean that banks wish to restructure their holdings of debt without the loss that would occur with straightforward cash sales. Portfolio restructuring may take the form of consolidation (reducing the number of risk-bearing instruments in the portfolio) or diversification (increasing the number of risks). With the former, banks seek to reduce the costs of exposure management and to improve the liquidity of their portfolio by consolidating out of several borrowers in the same country into (say) the most commonly traded debt of that country. For example, a bank could swap out of Mexican short-term oil export acceptances (Pemex) and Interbank lines into the benchmark UMS debt. Hence most consolidation activity is on an intra-country basis, but there is also an intra-continent trading (e.g., out of Mexico and Brazil into Chile), and a cross-continent trading (e.g., out of Poland and Yugoslavia into Mexico).

The aim of diversification is to reduce overall portfolio risk by spreading the total portfolio over a greater number of debtors. The principles of portfolio diversification are well-known, the seminal article on the subject being Markowitz (1952). Of course, the bank seeking to diversify its portfolio must believe that the reduced risk profile thus achieved is not offset by the increased administration and management costs arising from increasing the number of debtors with which it must negotiate.

A single portfolio restructuring exercise may involve many different individual cash deals and swaps at once, including both par and one-to-
one swaps, with a bank dealing with several counterparties, directly and through brokers and others. Most trades are conducted by telephone - but a recent American innovation is real-time screen-based trading.

2.7.3. Trading Involving Non-Bank Counterparties

This general heading covers a huge range of transactions including debt-equity swaps, and so the examples given below are intended only to indicate the type of transactions which occur. Non-banks, normally Multi-national Corporations (MNCs) require debt for its usefulness within the debtor country as an instrument through which they can make investments more cheaply than by conventional methods.

The mechanism through which debt-equity swaps are performed is well known; see for example Bird (1988), Helpman (1989) and The Economist (1989). Briefly, the investor (usually an MNC) purchases eligible debt on the Secondary Market via its bank (which in turn may use a broker, especially if it is not a major market player and it is necessary to source debt from several holders) and presents this debt to the debtor's Monetary Authorities for conversion into local currency. The conversion may be at the full face value of the debt or at a discount (though if at a discount it will be less than that in the Secondary Market) and the exchange rate may be either an official or free market rate, depending upon the country concerned. Hence the MNC obtains local currency at a subsidised exchange rate. In return, there will usually be restrictions on the nature of the MNC's investment in terms of the sector of the economy in which it may operate, and on remittance of dividends and (more strictly) capital. Typically, dividend remittances are restricted for between three and five years, and capital remittances for between
seven and 12 years, though there are wide variations. A typical debt-equity swap transaction is described and illustrated in Appendix I.

The benefits to the creditor bank and the MNC are clear. The banks which participate in the deal do so with the aim of either restructuring their portfolios (the broker/creditor bank transactions may take the form of swaps or cash deals) or simply reducing their exposure at what they consider to be a favourable price. The MNC obtains local currency at a better exchange rate than it would have received by simple purchase of the currency in the Foreign Exchange market [See Shepherdson (1990)].

A more complex example of how banks and MNCs may benefit from the market is in the trading of Brazilian Deposit Facility Agreement (DFA) deposits [Swaps - The Newsletter of New Financial Instruments, January 1989 p.9]. There are two types of transaction here. In the first, payments on maturing loans (to both public and private sector entities) are paid in Cruzados to the Brazilian Central Bank, Banco Central under the terms of the DFA. Banco Central converts these payments into Dollars and credits them to a Deposit Account in the name of the foreign lender. Portions of these deposits, which increase over time as loans mature, are traded on the Secondary Market. Their value to MNCs is their eligibility for the Brazilian debt-equity program (suspended at the time of writing).

The other form of transaction occurs when the Brazilian debtor opts to make the due payment in Cruzados (less a discount) into a non-resident account which can then be sold to the local subsidiary of an MNC. The MNC parent reimburses the bank lender in Dollars (at a price above the Secondary Market price) in these "Informal Conversions". Hence the MNC effectively receives cruzados at a lower exchange rate than it would
Figure 2.4: Brazilian DFA Trading

Original Bank Lender

Cash payment for DFA or Cruzado Account

Multi-national Corporation

Debtor

Dollar interest payments made under DFA

Banco Central

Or Cruzado equivalent less discount (Informal Conversion)

Non-resident Cruzado Account
otherwise be able to obtain, and the bank receives a better price than in the Secondary Market. Figure 2.4 illustrates both types of transaction.

Several debtor countries themselves have been active in the market, repurchasing their own debt. This activity is distinct from organised, officially sanctioned repurchase arrangements, such as those under the auspices of the Brady Initiative by the Philippines and Chile\textsuperscript{14}, which were priced by tender. Although the prevailing market price was a key determinant of creditors' tender bids, the purchases which resulted cannot be described as genuine market transactions. They are more accurately described as "Market-based Debt Reduction", which is examined in Chapters Six and Seven.

As stated in note 13, debtor repurchases are forbidden in most of the original loan documentation, but according to the Financial Times (19 December 1989) banks now turn a blind eye to the practice, which is usually carried out by agents acting on behalf of the debtors. The banks tacit acceptance of rule-breaking by the debtors can be traced to their increasing desire to reduce the overall size of their LDC debt

\begin{footnote}
14. Chile repurchased loans with a face value of $139.8m at an average weighted price of 58.25 cents (Financial Times, 24 November 1989). Its Market price was then about 62 cents, so the buyback discount was greater than the Market discount. Presumably banks which sold their debt at this price believed that had they tried to sell in the Market they would have pushed the price to below 58.25 cents. The low buyback price partly explains the poor response - Chile had $333m available for buybacks (Financial Times, 13 September 1989). Good economic prospects also encouraged banks to hold onto Chilean debt in the hope or receiving full repayment in time. The Philippines buyback was larger, with $1.312bn face value of debt bought at a price of 50 cents, virtually equal to the Market price. The unstable political situation contributed to the high value of bids, with $1.88bn worth of debt being submitted (Financial Times, 30 November 1989).
\end{footnote}
portfolios, and to the increased levels of provisions which enable them to do this with relatively little pain.

Numerous variations on the above themes are conducted in the Secondary Market, with banks seeking to add value by devising new techniques using their corporate finance skills together with debt trading in order to fulfil clients needs.

2.8. Conclusion

This chapter has described the development of the Secondary Market from its birth in 1983 up to mid-1990, in the contexts of securitisation and the market development process generally. It may be concluded that the market is perhaps mid-way between Stages Two and Three of development. The market has some Stage Three features, such as market-making, derivative instruments and no physical location, but it lacks other features such as a regulatory body or any system of centralised reporting of transactions. The US Federal Reserve has announced\(^\text{15}\), however, its intention to explore possible regulatory arrangements for the market, in concert with interested parties in other countries in which trading takes place. The implementation of formal regulation, which is discussed in Chapter Eight in the context of further research possibilities, would undoubtedly take the market a step closer to the first rank of developed financial markets, from which it is currently excluded. There can be no doubt, however, that the Secondary Market is a genuine market.

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Secondary Market price and volume trends have been examined in this chapter, and an estimate of the price elasticity of demand for debt has been made. Various trading techniques have been described, and the benefits to the parties involved have been elucidated. The next chapter concentrates on the institutional aspects of the Market and details the results of a survey of many of the major players.
Table 2.1: Bond Issues (excluding Floating Rate Notes) and Syndicated Lending, 1980-89

<table>
<thead>
<tr>
<th>Year</th>
<th>Bond Issues</th>
<th>Syndicated credits</th>
<th>LDCs' percentage of new syndicated credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>35.2</td>
<td>81.6</td>
<td>31.9</td>
</tr>
<tr>
<td>1981</td>
<td>45.2</td>
<td>134.8</td>
<td>26.4</td>
</tr>
<tr>
<td>1982</td>
<td>74.0</td>
<td>90.8</td>
<td>35.7</td>
</tr>
<tr>
<td>1983</td>
<td>74.0</td>
<td>38.1</td>
<td>22.8</td>
</tr>
<tr>
<td>1984</td>
<td>104.5</td>
<td>30.1</td>
<td>23.8</td>
</tr>
<tr>
<td>1985</td>
<td>164.5</td>
<td>19.0</td>
<td>20.7</td>
</tr>
<tr>
<td>1986</td>
<td>221.5</td>
<td>29.8</td>
<td>15.1</td>
</tr>
<tr>
<td>1987</td>
<td>258.9</td>
<td>88.8</td>
<td>10.4</td>
</tr>
<tr>
<td>1988</td>
<td>226.4</td>
<td>99.4</td>
<td>9.4</td>
</tr>
<tr>
<td>1989</td>
<td>258.9</td>
<td>148.4</td>
<td>16.1</td>
</tr>
</tbody>
</table>

Table 2.2: Secondary Market Transactions Value, 1984-90

<table>
<thead>
<tr>
<th>Year</th>
<th>Estimates, Sbn</th>
<th>Mean, Sbn</th>
<th>Published Source (Ultimate Source, if known)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1984:</td>
<td>2</td>
<td>1.5</td>
<td>Andrews, 1988</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td></td>
<td>Weinert, 1987</td>
</tr>
<tr>
<td>1985:</td>
<td>3</td>
<td>3.0</td>
<td>Weinert, 1987</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td></td>
<td>Purcell and Canavan, 1989 (Salomon Brothers)</td>
</tr>
<tr>
<td>1986:</td>
<td>5-8</td>
<td></td>
<td>Celarier, 1987</td>
</tr>
<tr>
<td></td>
<td>8-10</td>
<td></td>
<td>McDougall, 1987</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td></td>
<td>Weinert, 1987</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>7.4</td>
<td>Purcell and Canavan, 1989 (Salomon Brothers)</td>
</tr>
<tr>
<td>1987:</td>
<td>20</td>
<td></td>
<td>Sheriff, 1988</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td></td>
<td>Andrews, 1988</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>11.8</td>
<td>Purcell and Canavan, 1989 (Salomon Brothers)</td>
</tr>
<tr>
<td>1988:</td>
<td>40</td>
<td></td>
<td>Harvey, 1988 (Libra Bank plc)</td>
</tr>
<tr>
<td></td>
<td>40</td>
<td></td>
<td>Sheriff, 1988</td>
</tr>
<tr>
<td></td>
<td>36.5</td>
<td></td>
<td>Shepherdson, 1989 (Survey)</td>
</tr>
<tr>
<td></td>
<td>40-60</td>
<td></td>
<td>Purcell and Canavan, 1989 (Salomon Brothers)</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>43.3</td>
<td>Financial Times, 19 December 1989.</td>
</tr>
<tr>
<td>1990:</td>
<td>75-100</td>
<td>N/A</td>
<td>Risk, March 1991 (J P Morgan)</td>
</tr>
</tbody>
</table>
Table 2.3: Impact of First Major Round of Provisioning, 1987

<table>
<thead>
<tr>
<th>Bank</th>
<th>Total assets 1987 ($bn)</th>
<th>Net profit, first half 1987 ($m)</th>
<th>Second 1,2 Q provisions ($m)</th>
<th>Total provisions, loans 30 Jun. ($m)</th>
<th>As % of loans, 30 June</th>
<th>Non-performing loans, 30 June ($m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>US:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Citicorp</td>
<td>194.4</td>
<td>-2321</td>
<td>3403</td>
<td>4900</td>
<td>3.68</td>
<td>6300</td>
</tr>
<tr>
<td>Chase Man’n.</td>
<td>98.9</td>
<td>-1300</td>
<td>1730</td>
<td>2700</td>
<td>4.00</td>
<td>4600</td>
</tr>
<tr>
<td>Bk.of America</td>
<td>97.0</td>
<td>-1070</td>
<td>1337</td>
<td>3262</td>
<td>4.91</td>
<td>5123</td>
</tr>
<tr>
<td>Chemical</td>
<td>78.4</td>
<td>-1000</td>
<td>1200</td>
<td>2100</td>
<td>4.15</td>
<td>2962</td>
</tr>
<tr>
<td>J P Morgan</td>
<td>74.7</td>
<td>-360</td>
<td>875</td>
<td>1762</td>
<td>5.35</td>
<td>1734</td>
</tr>
<tr>
<td>Man.Han.</td>
<td>73.8</td>
<td>-1292</td>
<td>1834</td>
<td>2700</td>
<td>4.88</td>
<td>3450</td>
</tr>
<tr>
<td>Sec.Pacific</td>
<td>64.7</td>
<td>-174</td>
<td>592</td>
<td>1263</td>
<td>2.77</td>
<td>1893</td>
</tr>
<tr>
<td>Bankers Trust</td>
<td>54.7</td>
<td>-429</td>
<td>750</td>
<td>1295</td>
<td>5.10</td>
<td>1279</td>
</tr>
<tr>
<td>First I’state</td>
<td>51.8</td>
<td>-366</td>
<td>795</td>
<td>1223</td>
<td>3.65</td>
<td>1675</td>
</tr>
<tr>
<td>Wells Fargo</td>
<td>44.7</td>
<td>-215</td>
<td>73</td>
<td>1289</td>
<td>3.50</td>
<td>1374</td>
</tr>
<tr>
<td>First Chicago</td>
<td>41.7</td>
<td>-633</td>
<td>655</td>
<td>1381</td>
<td>2.40</td>
<td>1296</td>
</tr>
<tr>
<td>First Republic</td>
<td>34.4</td>
<td>-303</td>
<td>384</td>
<td>1122</td>
<td>4.50</td>
<td>2424</td>
</tr>
<tr>
<td>Cont.Illinois</td>
<td>33.4</td>
<td>-434</td>
<td>510</td>
<td>966</td>
<td>5.02</td>
<td>894</td>
</tr>
<tr>
<td>Mellon</td>
<td>33.2</td>
<td>-626</td>
<td>533</td>
<td>989</td>
<td>4.20</td>
<td>1570</td>
</tr>
<tr>
<td>Bk.of Boston</td>
<td>30.5</td>
<td>-13</td>
<td>325</td>
<td>718</td>
<td>3.18</td>
<td>918</td>
</tr>
<tr>
<td>First B.System</td>
<td>28.4</td>
<td>-47</td>
<td>188</td>
<td>511</td>
<td>3.70</td>
<td>619</td>
</tr>
<tr>
<td>PNC Financial</td>
<td>28.2</td>
<td>87</td>
<td>135</td>
<td>387</td>
<td>2.41</td>
<td>313</td>
</tr>
<tr>
<td>Suntrust Banks</td>
<td>25.6</td>
<td>141</td>
<td>39</td>
<td>279</td>
<td>1.57</td>
<td>203</td>
</tr>
<tr>
<td>NCB</td>
<td>24.6</td>
<td>108</td>
<td>36</td>
<td>248</td>
<td>1.50</td>
<td>295</td>
</tr>
<tr>
<td>First Union</td>
<td>24.5</td>
<td>139</td>
<td>42</td>
<td>269</td>
<td>1.90</td>
<td>195</td>
</tr>
<tr>
<td>Marine Midland</td>
<td>24.4</td>
<td>-259</td>
<td>428</td>
<td>680</td>
<td>3.50</td>
<td>761</td>
</tr>
<tr>
<td>Irving Bank</td>
<td>24.2</td>
<td>-113</td>
<td>241</td>
<td>450</td>
<td>3.05</td>
<td>495</td>
</tr>
<tr>
<td>MCorp</td>
<td>22.2</td>
<td>-125</td>
<td>118</td>
<td>449</td>
<td>3.29</td>
<td>1114</td>
</tr>
<tr>
<td><strong>TOTAL</strong>:</td>
<td><strong>22575</strong></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**UK:**

<table>
<thead>
<tr>
<th>Bank</th>
<th>Total assets 1987 ($bn)</th>
<th>Net profit, first half 1987 ($m)</th>
<th>Second 1,2 Q provisions ($m)</th>
<th>Total provisions, loans 30 Jun. ($m)</th>
<th>As % of loans, 30 June</th>
<th>Non-performing loans, 30 June ($m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nat.West.</td>
<td>138.9</td>
<td>258</td>
<td>908</td>
<td>2525</td>
<td>3.0</td>
<td>873³</td>
</tr>
<tr>
<td>Barclays</td>
<td>134.7</td>
<td>-109</td>
<td>1202</td>
<td>2916</td>
<td>n/a/a</td>
<td>n/a/a</td>
</tr>
<tr>
<td>Midland</td>
<td>82.3</td>
<td>-839</td>
<td>1686</td>
<td>3090</td>
<td>5.5</td>
<td>n/a/a</td>
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<tr>
<td>Lloyds</td>
<td>77.8</td>
<td>-831</td>
<td>1766</td>
<td>3001</td>
<td>n/a/a</td>
<td>n/a/a</td>
</tr>
<tr>
<td>Std.Chartered</td>
<td>n/a/a</td>
<td>-438</td>
<td>810</td>
<td>n/a/a</td>
<td>n/a/a</td>
<td>n/a/a</td>
</tr>
</tbody>
</table>

**TOTAL: 22575**

**Notes:**

1. Total domestic and international, including special LDC provisions.
3. As at 31 December 1986.

3.1. Introduction

As explained in Chapter Two, the Secondary Market has developed over the last seven years from the one-off deals of 1983 into a worldwide market for bank loans to public and private sector entities in many LDCs. During this period it has become an important mechanism for the management of bank portfolios as well as being the primary source of paper for conversion to equity. It has also provided the debtors with an explicit short-term valuation of their debt, which they have used either as a partial justification for the non-payment of interest (e.g., Argentina) or as a pricing reference point for buybacks of debt (e.g., Bolivia, Chile, the Philippines).

Despite the increasing importance of the market, analysis has thus far been confined to three specific areas:

- Its role in debt-equity swap deals and other forms of market-based-debt reduction (see Chapters Six and Seven).
- The mechanics of particular types of transaction (See Chapter Two)

1. Much of the material in this chapter appeared in Shepherdson (1989). Acknowledgement is made to National Westminster Bank plc for permission to reproduce the material here.
Attempts to explain and predict price changes (see for example Purcell and Orlanski, (1988), Portes and Cohen (1990), and Dicks and Singh (1991). These papers are reviewed in Chapter Five.)

The aim of the survey detailed in this chapter was to investigate several other, broader aspects of the market, and to find the extent to which there is agreement on certain issues between participants.

3.2. Survey Objectives

The survey was designed to generate both numerical data and market opinion on the nature, structure and operations of the Secondary Market. Numerical data was sought in order to estimate the following parameters:

- Total market turnover for 1988.
- The breakdown of total (Dollar) deal value by purpose of deal, i.e., the percentage of total deal value due to debt-equity swaps, portfolio diversification/consolidation, exposure reduction, speculation (position-taking for profit) and other motives as specified by the respondents.
- The mean value of deals in each of the above categories.
- The structure of the operations of each of the respondents, i.e., the percentage of their total deal value due to each of the categories of transaction, and the date at which the institutions began to perform these transactions.

Subjective responses were required to a broad range of questions which aimed to investigate the workings of the market, with respect to:
- The extent to which weekly turnover is subject to fluctuation.
- The "rigidity" of prices and their responsiveness to new information.
- The number of regular market players.
- The (then) current degree of market liquidity and the perceived trend.
- The activities of non-financial companies (e.g., MNCs) in the market.
- The documentation of transactions and the potential benefits from the standardisation of documentation.
- The future development of the market.
- The chronology of typical deals.

A copy of the questionnaire is reproduced in Appendix II.

Note that respondents to the questionnaire were promised complete confidentiality (indeed several institutions reiterated their wish for anonymity in covering letters with their completed questionnaires) so all quotations in this chapter are unattributed.

3.3. Coverage of the Survey

In December 1988 Risk magazine published a directory of all institutions involved in LDC debt management. As this list consisted of only 46
institutions it was possible to send a questionnaire to every one. Hence the survey coverage was the whole population\(^2\).

3.4. **Pre-testing of the Questionnaire**

It is obvious from the small population size that a pilot survey was not possible. Some pre-testing of the questionnaire, however, was performed. Each question on the original draft questionnaire was discussed in detail with traders at Midland Montagu, an active player in the market. The relevance of each question, the wording of the questions and the structure of the questionnaire were discussed. As a result, several questions were rewritten to resolve potential ambiguities and the order of the questions was changed.

3.5. **Survey Respondents**

The questionnaires were sent in January 1989, and by April a total of 17 replies had been received. Of these, 14 were from position-taking principals and three were from pure brokers. According to Risk, the total number of position-takers in the market at that time was 44, so by including the two other institutions mentioned in footnote 2, the 14 replies constituted a third of the position-takers. The mean answers to the numerical questions are calculated using only the replies from position-takers, because there is no reason to suppose that pure brokers

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2. I was advised by personal contacts within the market that two institutions not listed by Risk were active in various ways in the market. These institutions were contacted, but neither provided usable answers to the numerical questions, though some of their subjective comments are quoted in the text. Their inclusion in the survey meant that the population totalled 48 institutions.
will be aware of the purpose for which their client wishes to acquire a particular portion of debt. Indeed, one broker commented to this effect.

Commercial and Investment banks in London, New York, Paris, and Brazil replied to the survey. The total asset size of the respondents ranged from under $2bn to over $150bn. The respondents' exposure to LDCs differed widely. Whilst not all were prepared to reveal their figures, at least two had zero exposure. The others had exposure between $30m and $7bn.

As indicated above, respondents were asked to classify themselves as principals (who deal on their own account) or brokers (who perform either a purely introductory role in return for a fee or take positions for short periods) or both. The apparent illogicality of holding an asset which has fallen in price almost continuously over the last three years was explained by one broker thus: "...in order to earn interest on the debt we hold it...typically we will hold debt for up to one month."

As has been noted elsewhere (for example see Institutional Investor, October 1987 p.100) the receipt of a single interest payment on debt held for a short period will result in an annualised yield far in excess of that available on high-risk corporate securities ("junk bonds"). However, the uncertainty surrounding the interest payments of many debtors and the inability of creditors to seek and enforce legal redress for non-payment means that this is a risky strategy, but one which has
been made relatively more attractive by falling fees for pure brokerage. Positions are usually taken for a maximum of one or two months, though one institution claimed to take positions for up to a year. Two other respondents said they take positions for up to six months. Generally, the larger market players pursue a more aggressive strategy in this respect, holding positions for longer than the smaller institutions. They also have fewer simultaneously (or almost simultaneously) closed deals, up to 20%, compared to 80% or more for the less aggressive banks.

3.6. Market Size and potential for Future Growth

Estimates of the total market turnover (at face value) in 1988 varied widely, partly because much of the traded debt passes from bank to bank without reaching a non-bank final end-user. Such "chains" may legitimately be counted as separate transactions, but problems arise if two (or more in cases where a broker sources debt for say, a debt-equity swap, from several other banks) institutions count the same deal as being their own, because double or multiple counting will result. The higher turnover estimates probably include a considerable degree of double counting. One institution declined to suggest a figure on these grounds.

Of the thirteen institutions which did provide an estimate, the range

3. Brokerage fees have fallen from 0.5-1% in 1987 (The Banker, November 1987 p.122) to 0.125% or less in 1989 (Financial Times, 11 January 1989).
of answers was large, from $15bn to $55bn. The sample mean, \( \bar{x} \) (using the mid-points for the two survey respondents which gave a range of values) was $36.5bn and the median $40bn. The modal estimate, also $40bn, was given by six respondents. The sample standard deviation, \( s \), was $10.92bn. Taking \( s \) as an estimate of the population standard deviation, \( \sigma \), then the estimated standard error, \( s \), of the sample mean can be calculated thus:

\[
\hat{s} = \sqrt{\left(\frac{s^2}{n}\right)\left(\frac{(N-n)}{(N-1)}\right)} \\
= \sqrt{\left(\frac{10.92}{13}\right)\left(\frac{46-13}{46-1}\right)} \\
= 0.78
\]

Where \( N \) is the population size and \( n \) is the sample size. The factor \( \sqrt{\left(\frac{(N-n)}{(n-1)}\right)} \) is the finite population correction (fpc), which adjusts the estimated standard error to take account of populations which are relatively small compared to the sample. With relatively large populations the fpc approaches unity and can thus be ignored, but in this case it is equal to 0.856 and must be used\(^4\).

If it is assumed that the sample distribution is normal, then the 95% confidence interval for the total Market turnover in 1988 is given by:

\[
\bar{x} \pm 1.96s = 36.5 \pm 1.53
\]

i.e., between $35.0bn and $38.1bn. Similarly, the 90% confidence interval is between $35.2bn and $37.8bn.

\(^4\) See Moser (1971) for further details.
The level of activity in the market varies enormously throughout the year, with wide fluctuations even on a week-to-week basis. Only nine respondents were prepared to estimate average weekly turnover, most of them giving a wide range of figures. Most estimates ranged from between $50m to $800m, though one respondent claimed that turnover has reached $2-3bn in particularly busy weeks. Almost all respondents pointed out that their estimates are subject to extreme fluctuation:

- "Market turnover is influenced by reporting dates of banks (quarter ends) and by holiday periods in Latin America and lending countries."
- "The trading tends to be very seasonal with peaks around Christmas and troughs in the summer holiday months."
- "In 1988 June, November and December were strong, whereas July and August were weak."

Other respondents commented more generally that weekly trading volume "fluctuates violently". All of these observations are subject to the caveat that increased activity can occur at any time, depending upon the prevailing market conditions and sentiment.

The major players in the market, the largest of which account for several billion Dollars turnover each were generally agreed to be NMB, Libra Bank\(^5\), JP Morgan, Citibank, Bankers Trust, Salomon Brothers, Merrill Lynch and Standard Chartered Bank.

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5. Libra Bank was wound up in late 1990, because its owners (it was a consortium bank) were unwilling to provide the new capital needed because of the extra provisions required on its exposure under the new Bank of England matrix. Making the provisions would have
The exact number of institutions operating in the market at any given time is difficult to ascertain. The market is one in which not all participants operate continuously in all areas; some banks choose to specialise in only a small number of countries and obligors so the number of institutions active in each country's debt varies widely. The average estimate of survey respondents was that overall approximately 50 institutions are currently active in the market ranging in size from individuals acting as brokers to "Money Center" (sic) banks. One respondent said that "Approximately 150 institutions will have dealt regularly in some form or another within the LDC debt market." Whilst this observation may be accurate it does not indicate the number of those institutions which form the framework of the market. However, the acknowledged major players who replied to the questionnaire estimated the number of regular participants to be approximately 50. Only a small number of these act as pure brokers, and most of these are based in New York. These observations agree roughly with the number of institutions listed in the Risk directory.

Most of the respondents deal regularly with only a small number of institutions; there would appear to be a clear "loyalty" element in the choice of counterparty. Of course, such "loyalty" may be partly, or even primarily, financially-based. Only the largest participants claimed to deal regularly with all other active institutions.

Reduced Libra's capital ratios below the minimum standards agreed by the BIS.

6. It is not inconceivable that some of the estimates made in response to this question could have been based upon the Risk directory and accompanying article!
others the number of dealing partners depends largely on their own level of activity within the market. On average the smaller players said they deal regularly with approximately 25 banks each, though the figure for one (small) institution was as low as five.

The market grew rapidly in terms of numbers of participants as well as turnover in 1988, with respondents' estimates for the number of new players averaging 10, "mainly brokers". As detailed in note 4, fees for brokerage have fallen as a result of the increased competition from these new entrants. Several factors combine to make the participants rather less certain about their expectations for the short-term future of some of their number, including:

- Low prices have made cash sales of debt less attractive, despite the perceived benefits of reducing exposure. Most banks no longer urgently need to cut their exposure: "...if prices are too low banks may decide not to sell."
- The lack of active debt-equity swap schemes.
- Large-scale cash sales by major US banks are still effectively prevented by strict accounting rules.
- Some banks will pull out having sufficiently reduced their exposure or completed the restructuring of their portfolios.

Indeed, Security Pacific announced its withdrawal from the market in April 1989 for these reasons.

Most of the respondents expected a shakeout in the market during 1989 and 1990, with up to 20% (i.e., about 10) of the 1988 market participants leaving the market. A number of respondents remarked that...
new entrants were attracted by the obvious buoyancy of the market in 1988 ("1988 was a very successful year for all participants") but that the "very slow start" to 1989 could lead to a suspension of new entries and "...some brokers will disappear." The larger institutions (in terms of their activity in the market) were noticeably more pessimistic about the future, particularly with regard to the continued dearth of debt-equity opportunities: "...if Latin America cannot create or resuscitate debt conversion schemes then I expect there to be some fall-out - maybe 10-20%.

In fact, as the Financial Times reported on 19 December 1989, the market picked up in volume terms from its poor start to the year, and overall volume rose by between 20% and 60%. However, the prediction of some of the respondents to the questionnaire was proved correct, in that "...(some) dealers have been tempted away from the increasingly risky trading business, having decided that corporate finance business in developing countries is safer and more profitable."

3.7. Purpose and Magnitude of Deals

Respondents were asked to break down the total market turnover into the following categories:

- Debt-equity swaps.
- Portfolio diversification (increasing the number of risks in the portfolio).
- Portfolio consolidation (decreasing the number of risks in the portfolio).
- Cash sales of debt to reduce overall exposure.
- Speculation (Position taking for potential capital/interest gain).

The problem with such categorisation is that, for example, a particular deal may represent an exposure reduction sale for one bank but a speculative purchase by another. Hence the main purpose of this question was to discover the volume of debt being purchased for debt-equity swaps compared to interbank deals. It should be noted that "consolidation" refers to reductions in the number of borrowers from a particular country as well as lowering the total number of countries to which a bank is exposed. One respondent considered portfolio consolidation deals to be rare generally, but that compared to inter-country portfolio consolidation "...there are more deals driven by a desire to consolidate within a particular country e.g., out of a variety of private sector debts in Mexico into United Mexican States."

Eleven respondents estimated the percentage of total market turnover due to purchases for debt-equity swaps with replies ranging from 10% to 50%. However, the majority (seven) of the estimates were between 20% and 30%, with the sample mean being 24.1% (sample standard deviation s= 10.91). Estimating the sample standard error as in 3.6 above:

\[ s = \sqrt{(10.91/11) \cdot (((46-11)/(46-1)) \cdot (46-1))} \]
\[ = 0.88 \]

Hence the 95% confidence interval for the percentage of trading value due to debt-equity swaps is 22.5% to 25.8%. The 90% interval is 22.7% to 25.5%.
Taking the mean $36.5bn estimate for total market turnover and the 24.1% sample mean estimate of debt-equity transactions suggests that the face value of the debt bought for debt-equity swap purposes in 1988 was approximately $8.8bn, with $28.7bn being traded between banks. Respondents estimated that an average 21.5% of total deal value, i.e., $7.8bn, was due to position-taking for profit. The remaining $19.9bn (50.4%) of market turnover consists of portfolio management trading by banks either diversifying, consolidating, or reducing the size of their portfolios. The respondents' individual breakdowns of deals by purpose reflected the overall pattern but there were some clear differences. Of the three banks prepared to reveal the percentage of their own deals which were position-taking for profit, one bank quoted 80%, whilst the other two quoted 10% and 15%. Some institutions clearly specialise in debt-equity deals, with up to 80% of deal value being due to this compared to a mean of only 28.9%. It is difficult to draw firm conclusions about the average size of deal for different types of institution because many of the respondents were reluctant to reveal their own figures. However it is clear that some institutions regard the market purely as a means of reducing their exposure after which they will have little further use for it on a regular basis.

As one would expect, the less risky transactions, such as purchases for debt-equity swaps where the bank is usually acting on behalf of a client company tend to be larger, whilst risky position-taking transactions are smaller. On average, purchases for debt-equity transactions were said to be worth approximately $13.5m each, with speculative deals worth
$3.9m each. As expected, portfolio management deals lie in between these and are worth an average of approximately $7.0m each. Within the last category of transactions, cash sales to reduce exposure were for an average $8.5m, but as two respondents made estimates considerably larger than the modal figure of $5m (given by five of the 10 respondents to this question) the true mean is probably less than $8.5m. Of course, exceptional individual deals may be worth far more than this. Also, the average deal value varies between countries and borrowers, depending upon the liquidity of the market for a particular type of debt and the relative riskiness of different types of debt: "(Our) average Resolution 63 [informal conversions - see 2.7.3.] debt conversion size is about $100 000 whereas formal debt/equity deals in Brazil average about $5m in terms of volume per deal."

3.8. Liquidity of the Market

The degree of liquidity of a market may be defined as the ease with which a counterparty may be found for any proposed transaction at any time. The more liquid the market, the easier a seller will be able to find a buyer and vice-versa. Note that the liquidity of a market is not fixed; even those markets which are generally considered exceptionally liquid, such as the UK Stock Exchange, have experienced periods of falling liquidity. This last occurred in the crash in October 1987 when market makers, who are obliged to continuously quote two-way prices and to deal at those prices, apparently did not answer telephone calls. The liquidity across a particular market at a given time will also vary -
some stocks will be more liquid than others. This is particularly true in the Secondary Market.

The question of liquidity was one which provoked a particularly diverse range of responses. Of the 12 institutions which addressed the question, three said that liquidity generally was rising, two said it was static and seven said it was falling. Most of the respondents pointed out that liquidity is volatile and varies considerably between countries as well as between public and private sector obligors within countries: "Right now liquidity is reducing. Two months ago it was increasing. Liquidity is volatile."

Whilst 1988 was regarded as a good year with rising liquidity, the early part of 1989 was characterised by a rapid fall. The suspension of the Brazilian debt-equity auctions in January 1989 was cited by several institutions as causing particular problems, and one major player stated that: "Liquidity is directly linked to demand for usage in conversion to equity." This view was reinforced by another opinion from a major trader: "In the cases where an ongoing demand is removed (e.g., cancellation/suspension of debt-equity programs) there is always a liquidity squeeze."

Liquidity in particular countries depends upon many factors as well as those mentioned, not least of which is a country's total outstanding bank debt: "The countries which are most affected by a lack of liquidity tend to be the countries with less external debt outstanding - for example, African countries like Zaire and Gabon, also Romania, Uruguay,
Bolivia, Costa Rica." The major Latin American debtors have a much greater absolute amount of debt and a higher proportion of bank debt than the smaller African debtors and this contributes to the far higher liquidity of the former's debt. For example, 69% ($76bn) of Brazil's $110bn total external debt as at December 1988 was owed to commercial banks, compared with only 41% ($9bn) of Nigeria's $22bn total external debt (World Bank, 1988 and BIS/OECD, 1989). Within Latin America the most liquid markets were considered to be those of Argentina, Brazil, Mexico, and Venezuela, with Nicaragua, Peru, and Bolivia being particularly illiquid. The latter group all trade (if at all) at or under 10% of face value.

The market in even the most liquid debt, however, does not compare to the liquidity of, say, a developed stock market. A calculation of the total number of deals 7 performed in 1988 illustrates this: The average size of all transactions, weighted by proportion of total market turnover is approximately $7.9m. With total market turnover estimated at $36.5bn, then there were roughly 4600 deals in 1988. Whilst this estimate cannot be considered accurate, it is probably of the correct order, and indicates that very few trades are performed in certain specific types of debt. Taking this, the variability of the liquidity of the market and its apparent sensitivity to changes to debt-equity schemes into account, it is impossible to predict long-term liquidity trends with any degree of certainty. The predictions by the survey respondents reinforce this view - the market made an unexpected recovery

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7. The definition of a "deal" is itself ambiguous, with short-term position-taking blurring the distinction between matched and non-matched deals.
in volume terms in 1989, as discussed in Chapter 2 and 3.6 above, helped by further provisionings by major creditors.

3.9. Price Rigidity and Market Response to "Shocks"

The market's reaction (as described by the market participants) to changes in debt-equity swap schemes has already been mentioned, but of course these changes are not the only external "shocks" to affect the market.

Respondents were asked to comment upon the relative rigidity (or "stickiness") of the prices of Latin American debtors, i.e., their relative sensitivity to shocks. Within the general downward trend in prices, (see figure 2.1) there are marked differences in price rigidity. Stable prices are most evident with the extremely low-priced debt of countries such as Peru, and the higher-priced countries such as Chile. In the former case there is little scope for further price falls (the mid-price of Peruvian debt as at 28 September 1989 was 5.0c according to Salomon Brothers' "Indicative Prices for LDC Loans") and no reason for price rises, given the very weak state of the economy and the degree of political instability. In Chile however, the successful debt-equity programme ensured firm prices with a decline of only approximately 10% between February 1987 and September 1989, compared to a fall of 61% over the same period for Brazil.
Respondents associated more volatile prices generally with the more liquid debt, (Chile being the obvious exception) so the markets for Mexico, Brazil, Argentina and Venezuela were cited as having the least rigid prices. These opinions are borne out by Table 3.1.

The speed with which prices react to shocks was also considered by the respondents. Several institutions, including the major players considered that as the market anticipates many events before they occur, so "when news is published most of the prices have reacted already." However this is not always the case. In the two weeks after the widely anticipated Brazilian moratorium was declared on 21 February 1987 its mid-price fell by 5.25c. It fell by a further 1.75c in the following fortnight as the market sought to establish a new equilibrium level (Salomon Brothers, 9 and 25 March 1989).

Many respondents believe that changes in debt-equity programmes are the most important factors determining changes in price whilst "Overall economic news does not generally influence prices immediately." Opinions such as these are important from the point of view of market efficiency, discussed in Chapter Four. In an efficient market one would not expect such statements to withstand empirical testing, because any changes in economic performance will affect the likelihood of a country paying interest. This in turn will thus change the expected return from the debt of that country, which will in turn cause the price to move.

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Other factors which are believed to influence price changes include changes in parallel exchange rates and debt restructuring requests from debtors. Several institutions stated that relevant events which had not been anticipated in advance would cause "immediate" or "almost immediate" changes in price, as one would expect in an efficient market.

3.10. Non-bank Involvement in the Secondary Market

Non-bank involvement is essentially confined to the acquisition of debt for debt-equity swaps. Most respondents believed that non-banks would usually deal through their own bank(s) in the first instance, only "very rarely" approaching selling banks directly and "never" approaching brokers directly. An alternative (or complementary) approach to using their own bank would be to contact banks with a presence in the country where the investment is to be made. Several respondents considered local presence a key factor, because of the necessity to "...deal with the local regulations". Generally, the choice of bank depends upon "price, professionalism, reliability and, above all, relationship."

Of course, not all debt for debt-equity is sourced directly from the market because in some countries (e.g., Brazil (see Chapter Two)) MNCs have subsidiaries which can make use of "blocked funds" (debt repayments which may not be remitted out of the country) to fund investment:

"...Non-financial companies buy debt primarily through investment banks and commercial banks with trading capabilities, with the exception of transactions contemplated by multinationals and/or large indigenous "names" seeking a partnership arrangement (conversion of debt, with a put [issue] of the resultant shares
This was one of the few questions upon which there was almost universal agreement. Clearly even the largest multi-national corporations are wary of direct approaches to sellers, such is the lack of knowledge of the market and the concomitant danger of ill-considered dealing.

3.11. Standardisation of Documentation

The methods of transfer of loans explained in Chapter Two (assignment and novation) generate considerable paperwork. In the early days of the market each transaction would require new documentation, but as it developed the differences between institutions' documentation narrowed, as one would expect. In 1988, Chase Manhattan suggested a standard form of documentation for the more straightforward assignments. In early 1989 LDC Debt Report (13 February, p.2) reported that Libra Bank, one the largest Market players, had become the first supporter of the Chase documentation. Chase were reported as being optimistic about the prospects for general acceptance of their forms. The purpose of Part III, Question 1 of the questionnaire (See Appendix II) was to investigate the extent to which this standard form had been accepted, and if market participants believed it would lead to faster expansion of the market.

Several respondents said they used their own standard documentation, which they would modify for particular transactions as necessary: "We use fairly standard documentation which has to be adapted on a case-by-
case basis to accommodate specific client wishes/requirements." There were, however, conflicting views as to the potential benefits from completely standard documentation, for example:

- "It is not possible to standardise completely, as the loans are not homogeneous."

- "It (documentation) is de facto fairly standard now (documents from the main professionals look the same) so this cannot be considered an obstacle to the expansion of the market."

- "We do not feel that a standard document would necessarily facilitate the growth of the market because each counterparty will still insist on its own idiosyncrasies in side letters etc, and major players are already familiar with each others' documents."

On the other hand:

- "Standard documentation would facilitate faster expansion of the market."

- "Standard documentation could cover 80-90% of credits but there are special cases where special documentation would be needed for each deal."

- "The Chase documentation is a good idea."

As with other aspects of the market, there is clear disagreement and confusion between participants. The result of the replies to this question indicate, however, that the impact of full standardisation of documentation would be marginal. It seems extremely unlikely that a market player would refuse a deal on documentation grounds alone,
especially considering that most institutions appear to use similar documents anyway.

3.12. Chronology of a "Typical" Deal

Whilst the details of every particular deal are different, several respondents were able to outline the development of a "typical" (i.e., straightforward) transaction. Most of the descriptions were variations on the same theme, so only one of the responses is reproduced in full in Appendix III.

3.13. Conclusion

The lack of accurate information on the structure and size of the Secondary Market in LDC debt was clearly demonstrated by this survey. There was a wide range of opinion on questions requiring subjective assessment of market trends, but the numerical questions also generated answers which disagreed with each other to a considerable extent. It must be concluded that at least some market participants do not really know the size of their market, its structure, and the relative importance of different types of transaction. This lack of knowledge helps explain why some dealers have left the market - unanticipated losses are an unavoidable consequence of imperfect information when taking positions. One major player acknowledged this problem, suggesting that "the (lack of) up-to-date recording of transactions by
international agents now constitutes one of the problems to be dealt with."

The future prospects of the Secondary Market were changed dramatically by the announcement in March 1989 of the Brady Initiative (discussed in detail in Chapter 7). Most of the survey replies had been received by this time, but one major player commented on the possible implications for the market: "The Brady Plan, if it ever works, will change the Secondary Market and will, I believe, encourage buybacks provided tax and accounting issues can be resolved."
Table 3.1: Volatility of Selected Debt Prices as Measured by Coefficient of Variation (Sample Standard Deviation/Sample Mean), 1988/First Half 1989

<table>
<thead>
<tr>
<th>Country</th>
<th>Coefficient of Variation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>0.236</td>
</tr>
<tr>
<td>Brazil</td>
<td>0.185</td>
</tr>
<tr>
<td>Mexico</td>
<td>0.120</td>
</tr>
<tr>
<td>Venezuela</td>
<td>0.190</td>
</tr>
<tr>
<td>Chile</td>
<td>0.034</td>
</tr>
</tbody>
</table>

CHAPTER FOUR

THE EFFICIENT MARKETS HYPOTHESIS AND THE SECONDARY MARKET

4.1. Introduction

The degree of efficiency (however defined) of the Secondary Market is of some importance to policymakers and institutions involved in the "Debt Crisis". As market-based debt reduction proceeds slowly under the auspices of the Brady Initiative, the efficiency with which the market prices debts of different countries acquires an increasing relevance. If the market is found to be mis-pricing debts then perhaps some other way of calculating buy-back discounts, bond swap "exchange rates" and debt-equity swap prices needs to be developed.

The Efficient Markets Hypothesis (EMH) is, however, a subject area of considerable theoretical and empirical disagreement. There appear to be two schools of thought which exist in parallel, neither seeming to acknowledge the existence of the other except in the particular instances described below.

Of the many important EMH papers, the landmark works are Fama (1970, and 1976), LeRoy (1973 and 1989) and LeRoy and Porter (1981). The theoretical exposition of the Random Walk Model (RWM) and empirical methodologies described by Fama in his 1976 paper have been followed, almost slavishly and unquestioningly by many subsequent authors, including some very recent ones. This group of "Unreconstructed Random Walkers" is discussed in sections 4.3 and 4.4 below.
The second school of thought is characterised by work on tests of the Martingale Model (MM) described in 4.6 below. As well as the work by LeRoy, this school includes several important papers by Shiller (for example 1979, 1981a, 1981b). These and other MM school authors refer only to Fama in their papers, and completely ignore the empirical work of many of the authors of the Unreconstructed RW school. Similarly, with only one exception the Random Walkers refer to none of the works which LeRoy in his 1989 survey considers to be the major contributions to the literature.

This chapter reviews the EMH literature in some detail, paying particular attention to LeRoy's 1989 survey and the criticisms of Fama therein. These date back to LeRoy's 1976 comment which may be thought of as the point of departure for the MM school. The empirical work of both schools is discussed, as are the merits of their theoretical underpinnings. It is concluded that the MM and the later Rational Expectations/Expected value theory models are far more satisfying to the economist than the RW, but that the limited degree to which the former may be investigated in the Secondary Market means that the statistical tests which can be performed here are little different from those used by the RW school. The interpretation of the results and the conclusions drawn from them (discussed in Chapter Five) however, will be rather less certain than the Random Walkers would probably suggest.

4.2. What is the EMH?

Ambiguity remains in the literature as to the precise nature of market "efficiency". In the broadest sense, Gibson (1989) defines an efficient capital market in allocative terms, as one which ensures that savings
are directed by the market mechanism to those agents who will generate the highest investment return. This description, which is given in the context of primary market analysis, does not appear at first sight to be closely related to the several characteristics of efficient (secondary) markets that are offered by LeRoy (1989). First, in an efficient market, generally available knowledge that (for example) a firm's profits will rise does not necessarily imply that the firm's stock should be bought now on the secondary market in order to make capital gains (in excess of those which may be available in the market generally). Such supernormal profits can be made only if one is in possession of different relevant information to that which is generally available, and which is thus not "fully reflected" in the share price. Second, at a minimum, the EMH concludes that prices are determined by a market at an equilibrium reached by the actions of perfectly informed rational agents. A more extensive definition would include the assumption that the publicly available information set is large, and finally, LeRoy's limit definition asserts that in efficient markets there are no trading rules capable of generating supernormal profits because no individual agents have comparative informational advantage.

There is a clear link between the idea of primary market allocative efficiency and secondary market pricing efficiency, because, as Gibson argues, the former can be divided into two sub-sectors: operational efficiency and pricing efficiency. The first of these means essentially that market participants do not earn supernormal profits, and the

1. The Secondary Market analogy to this is that generally available knowledge that, for example, a debtor's foreign exchange receipts will rise, thus increasing its ability to service its debts does not imply that the country's debt should be bought now to take advantage of price rises due to this information, because the market will already have taken it into account.
second, which is the more important for the purposes of this discussion, is that "...all information of relevance to the investment as well as a risk premium be included in the price" [Gibson, p.109]. This is clearly a restatement of LeRoy's definition of pricing efficiency, which was given in the context of secondary markets.

The question of efficiency, therefore, may be couched in different terms depending on context, but the principles are the same. The concern of this Chapter is the theory of pricing efficiency in secondary markets, because the primary role of the LDC debt market is, as its usual term of reference suggests, relatively tiny.

4.3. Development of the EMH

Until Kendall's 1953 study, the conventional wisdom was that stock prices, or as in the Secondary Market debt prices, fluctuate around the "intrinsic" or "fundamental" value of a stock, defined as the present value of expected future income (dividend) flows. With this model, which may be called the Fundamental Value Model (FVM), if the current market price of the stock is below that indicated by "fundamental analysis" then the investor (or speculator, depending upon one's view of stock markets) should buy; if the price is above that indicated then he should sell. Hence the securities analyst's role is to assess the fundamental value of stocks, by looking at the factors which are believed to affect future profits and hence future dividends.

Unfortunately, the undoubted conceptual attractiveness of the FVM was not reflected in the early empirical evidence: Cowles (1933) analysed the results of following the predictions of 24 stock market investor...
newsletters, 16 other "financial services" companies and the recommendations of the Editor of the Wall Street Journal (who was apparently regarded as a stock market guru in the first quarter of this century). He also examined the investment record of 20 fire insurance companies on the grounds that "the investment policies of these companies are based on the accumulated knowledge of successive boards of directors whose judgement might be presumed, over the years, to have been well above that of the average investor" (p.313). Cowles did not explicitly refer to the FVM; his aim was to investigate the existence (or otherwise) of "skilled" investors who could consistently outperform the market. It may be assumed, however, that the advisors and investors whose predictions and actions were tested were devotees of fundamental analysis (as are most present day securities' analysts).

Cowles' results were almost uniformly disappointing in the sense that he found no evidence of "skill" in the investment records of any of the groups listed above. The stock market newsletters had the worst record, with "...some evidence... to indicate that the least successful records [of their recommendations] are worse than what could reasonably be attributed to chance" (p.324). On average, following the recommendations of the newsletters would have led to an annual underperformance of four percent compared to a random portfolio. The financial services and fire insurance companies also underperformed, by 1.43% and 1.20% respectively per year. Within the average figures there were some successful companies, but Cowles concluded that "tests of the best individual records failed to demonstrate that they exhibited skill, and indicated that they more probably were the results of chance" (p.324).
It must be noted that Cowles' methods were not exact, primarily because many of the newsletters and other publications gave ambiguous advice. Despite this he found strong evidence that fundamental analysis did not work.

Working (1934) was the first to link the idea that stock price changes might resemble "...the characteristics of series of cumulated random numbers", or a Random Walk. Working's paper was not primarily a study of stock prices and his discussion of them is brief, so it is impossible to know how far his thinking had developed at this time. He did not explicitly compare the "random" series he generated for the paper with actual stock price series; rather he noted the existence of a school of thought amongst stock price analysts which placed great store on the idea of "formations" or patterns in price series. He then suggested that if comparison of actual price series and random series revealed that the frequency and clarity of the formations in the actual prices were similar to those he had observed in the random series, then the formations would be "...without forecasting significance" i.e., a Random Walk specification of stock prices would be more accurate.

Upon further investigation, however, Working cast doubt upon the otherwise simple story outlined above. As stated above, his prime interest was not stock prices so his inquiry into the resemblance of his "cumulated random number" series to such prices was extremely limited: he gave an unlabelled graph of one of his series to a "close student of stock price behaviour" and asked him if the series was the time path of a stock price or not! He answered negatively, on the grounds that the series was "too jagged"!
Working thus recognised that his random series could not fully describe stock prices and suggested that:

"Generally in time series a combination of characteristics is reflected, and circumstances must determine whether the series shall be treated as though it possessed only its dominant characteristic, or treated in such a way as to take account of all its significant characteristics." (p.16).

Working's paper was thus not ground-breaking in terms of its analysis; its value was in suggesting a link between the patterns exhibited by cumulated random numbers and stock prices. Working also appears to have appreciated on an intuitive level that a RW model would not fully describe stock price movements satisfactorily. In this respect at least he was 40 years ahead of his time!

The first empirical work in support of Working's observations did not appear for another 20 years, in Kendall's 1953 paper. Kendall examined 22 price series, 19 of which were UK stock prices (individual sectors and indices) and three of which were commodity prices (wheat (two series) and cotton). With respect to the wheat prices, Kendall found no autocorrelation and stated that:

"The series looks like a 'wandering' one, almost as if once a week the Demon of Chance drew a random number from a symmetrical population of fixed dispersion and added it to the current price to determine next week's price" (p.15).

He concluded that the best estimate of the change in price over the relevant interval (one week in this case) "...is that there is no change" (p.18). Hence although Kendall couched his discussion in terms of randomness, he explicitly suggested (though without naming it) the Martingale Model (MM) discussed in section 4.6 below, that is, if:

\[ E(\Delta P_t | \Theta_t) = 0 \] (a Fair Game) (4.1)
Where $E$ is the expectations operator at time $t$, $P_t$ is the price of a security at time $t$ and $\mathcal{F}_t$ is the information set. Then:

$$E(P_{t+1} | \mathcal{F}_t) = P_t \quad \text{(a Martingale)} \quad (4.2)$$

For the stock prices, Kendall found similar results and concluded that "Such serial correlation as is present in these series is so weak as to dispose at once of any possibility of being able to use them for prediction" (p. 18). Kendall did find some serial correlation in cotton prices, but concluded that this only provided a warning against making generalisations about agricultural commodity prices rather than asset prices as a whole. However, this final conclusion was subject to later scrutiny by Alexander (1961) who found (as did Working (1960) who published first) that Kendall's cotton price series was different from the other prices he had used, and that this invalidated his conclusions about their behaviour. Specifically, the cotton prices were monthly averages of weekly observations, rather than the weekly prices which constituted the other series. As Working and Alexander found, even if the original weekly data (as used by Kendall) follows a RW, by taking monthly averages of such data spurious serial correlations of the type reported by Kendall are generated. This finding meant that Kendall's exception to his "no serial correlation" results disappeared, leaving a set of entirely consistent results.

Alexander (1961) questioned the use of actual (i.e., not averaged) weekly series on the grounds that one might expect stock prices to have two components, a smooth long-term underlying trend and a short-term cycle of "action and reaction" due to profit-taking activity in the market. If this were the case, Alexander postulated that profit-taking would reduce the serial correlation for short differencing intervals by
pushing prices against their trend (as one would expect profit-taking to do). If serial correlations are calculated over successively longer differencing periods (up to 16 weeks) then the short-term cycles should decrease and the long-term trend dominate, resulting in increasing serial correlations for the longer differencing intervals. In fact, Alexander found very little evidence for this hypothesis (he calculated his serial correlation co-efficients from Kendall's results) and thus concluded that "Kendall's data do seem to confirm the random walk hypothesis".

The final part of Alexander's (1961) paper has attracted the most attention in subsequent reviews of EMH literature, for in it he describes the use of filter tests with stock market price data. Such tests are more accurately described as a simulation of a purely mechanical trading system. If such a system is successful, that is, would generate a higher return to the investor than a policy of Buy and Hold for the same stock(s) over the same period, then "...it furnishes evidence that stock price changes could not have been generated by a Random Walk." Alexander's description of the operation of Filter Tests and the rationale behind them provides a lesson in clarity:

"The most vivid way to illustrate the operation of the filter is to translate it into a rule of speculative market action. Thus, corresponding to a 5% filter we might have the rule: if the market moves up 5% go long and stay long until it moves down 5% at which time sell and go short until it again moves up 5%. Ignore moves of less than 5%. The more stringent the filter, the fewer losses are made, but also the smaller the gain from any move that exceeds the filter size." (p.22).

Hence larger filters have greater reliability in markets where there are exploitable trends, but as Alexander points out, more potential profit is lost in identifying the trends with larger filters. Of course, in
markets which perform genuine trendless RWs one would expect filters of all sizes to produce zero profits on average.

Alexander applied filters of various sizes to the Dow Jones and the Standard & Poor's stock market indices over the period 1897 to 1959. He found that small to medium filters (roughly 5-20%) yielded profits, with the smaller filters generating large profits which would have easily outperformed Buy and Hold. For example, the average annual profit before transactions costs over the period 1897-1914 using a 5% filter was 20.5%, compared to 3.2% with Buy and Hold. With a 20% filter the profit had fallen to 7.8%, and with a 25% filter it was 2.6% per year.

Alexander concluded that the results of his filter tests showed that "...there are trends in stock market prices, once the (price) 'move' is taken as the unit under study rather than the week or month." The last part of this sentence gives Alexander's explanation for his results: he agreed that performing serial correlation tests over fixed time intervals such as a week or a month gave good evidence for Random Walks, but argued that filter tests differed from the serial correlation coefficients in that the former use price moves of a fixed size (or greater) as the test base, rather than fixed time periods. Alexander argued that his findings of non-randomness "in the move dimension" was wholly consistent with the RW over time. He was sufficiently confident of his results to state at the end of his article that "The riddle has been solved."

Alexander's results, however, were subject to criticism on several grounds, some of which he considered reasonable and others which he did not. He replied at length in his 1964 paper. The first criticism
concerned the application of the filter tests to stock indices rather than individual stock prices, on the grounds that "'you can't buy the averages'". Alexander dismissed this, stating that such objections were both "erroneous and irrelevant" because there is nothing to prevent investors (especially institutions) from buying the stocks which comprise the averages.

A further criticism was that an investor would not be able to deal at the prices quoted because the acts of purchase or sale would cause a change in the prices, thus invalidating the prices used in Alexander's calculations. Whilst Alexander acknowledged the validity of this argument, he disputed its relevance, stating that it was only appropriate if one intended to use the filter system to trade, as opposed to using it "to argue from." A more convincing rebuttal would have been that the criticism is, for all practical purposes, only relevant to the large investor who will purchase stocks in sufficient quantity to induce price changes. It seems unlikely that the purchase of a few hundred shares by a retail investor will have a measurable impact upon the price of a stock which has a daily trading volume of several million shares. Of course, it would be different if large numbers of investors were using the same filter system with the same start date.

In the Secondary Market for LDC debt, however, this criticism is one which must be addressed. It has already been stated (see Chapters 2 and 3) that compared to developed stock markets, the Secondary Market has low volume and liquidity. In such circumstances, it may be reasonable to postulate that many purchases, especially of debt which is not frequently traded, will have an appreciable effect on prices with the
result that the prices quoted by Salomon Brothers "Indicative Prices for LDC Bank Loans" cease to apply. To allow for this, the filter tests described in Chapter 5 use prices which have been adjusted upwards by 0.5% in the case of bid prices and downward by the same percentage for offer prices.

The third criticism of Alexander's technique led him to recalculate the filter tests in their entirety. It was pointed out by Mandelbrot (1966) that the original tests were biased in favour of profitability, because Alexander used daily closing prices rather than a continuous series of prices. If he had used the latter, there would have been more transactions than he actually calculated, due to intraday highs and lows exceeding the "trigger" points for trading on days when the closing prices remained within the trigger points. Alexander accepted that each one of the "new" deals arising from this would have resulted in a loss, because the price moves which triggered them must have been reversed on the same day in order to keep the closing price within the trigger points. Such losses would only be partially compensated by increased profits on the already profitable deals which would have been triggered earlier by the intraday highs/lows.

After recalculating the original filters to take account of this problem, Alexander was forced to conclude that the profitability of the filters was dramatically reduced, and in some cases losses arose where previously there were profits. Alexander still questioned whether the RW hypothesis could be applied in the price move dimension as well as the time dimension, but he admitted that the prospect of big profits due to non-random price changes in the price move dimension was illusory.
It seems necessary again to make the distinction between retail investors and market professionals when considering the question of bias. Most retail investors do not spend their entire day in contact with their broker or watching the stock price pages on teletext services. They are more likely to base their buy and sell decisions on the prices they see quoted in their morning newspaper. These prices are of course the previous day’s closing prices. If the investor decides to deal after seeing those prices it would be rational for him to do so as soon as possible, in which case he will receive (unless there are exceptional circumstances) a price which approximates to that quoted in the newspaper. Hence for the small investor the use of closing prices may be regarded as probably the closest proxy to the prices at which deals could realistically be performed. For the market professional with all-day access to prices this is not the case and the day’s high/low prices would be more realistic. In the Secondary Market, there is no continuous price quotation system and the only regular prices which can be used are the fortnightly closing prices produced by Salomon Brothers Inc (and other firms such as Merrill Lynch).

The spectral analysis of Granger and Morgenstern (1963) lent further support to the RW model. It should be noted however, that these results had been anticipated at the turn of the Century in the PhD thesis of Bachelier (1900), which examined the market in French Government Bond futures and options.

According to LeRoy, these papers, though it was not realised by their authors at the time, assumed the validity of the Martingale Model (MM). This appeared in the efficient markets context after Samuelson (1965), when LeRoy argues it replaced the RW which until then had predominated.
However, LeRoy’s assertion that the RW was "jettisoned" in favour of the MM is overstatement of the case - many papers after 1965 used the methods suggested by Fama (1965) which deal exclusively with testing the EMH in terms of the RW. Note though that LeRoy does acknowledge (rather ambiguously) that the MM model presented in Samuelson (1965) did take time to achieve its pre-eminent position. Strangely, he does not cite in the text nor reference Fama’s (1965) paper, which is still quoted as a matter of course in many of the steady stream of papers which have sought to present the EMH solely or partly in terms of the RW tests suggested therein, usually in the investigation of stock market prices in developing countries.

4.4 Fama and the REM

The REM may be stated formally [Fama (1970) p.386]:

\[ f(r_{j,t+1} | \Phi_t) = f(r_{j,t+1}) \]  \hspace{1cm} (4.3)

Where \( r \) is the return \(^2\) on security \( j \), and \( \Phi_t \) is the information set reflected in prices. Equation (4.3) states that successive one period returns are independent and that successive returns are identically distributed. The probability density distribution \( f \) must be the same for all time \( t \). The REM may be expressed more simply, in terms of prices:

\[ P_{j,t} = P_{j,t-1} + \epsilon_t \]  \hspace{1cm} (4.4)

\(^2\) It is well known that under continuous compounding the yield or return on a security over any particular period is given by the difference in the natural logarithm of prices over that period. See Fama ((1965), p.45) for a simple proof. Using natural logarithms also removes the problem that absolute price changes are to some extent dependent upon the actual price level of the stock. Hence returns are used in empirical analysis but many discussions are expressed in terms of prices.
Where $P_t$ is the price of security $j$ at time $t$, and $\epsilon_t$ is white noise. Qualitatively, these definitions of the RWM were said by Fama (1970) to mean that "...the current price of a security 'fully reflects' available information." (p.386).

Further to (4.3) and (4.4) the characteristics of white noise are:

$$E(\epsilon_t) = 0$$  \hspace{1cm} (4.5)

that is, the expected value of $\epsilon_t$ is zero.

And

$$E(\epsilon_t^2) = \sigma^2$$ \hspace{1cm} (4.6)

that is, $\epsilon_t$ has a constant variance.

And

$$E(\epsilon_t \epsilon_s) = 0$$ \hspace{1cm} (4.7)

that is, there is zero autocorrelation between $\epsilon_t$s.

Unreconstructed Random Walkers include, for example, Barnes (1986) who examined the Kuala Lumpur Stock Exchange and couched his (brief) theoretical discussion entirely in the terms used in Fama (1970). Indeed, Barnes cites none of the references which LeRoy refers considers to be the major theoretical works. The same may be said of Brown and Easton (1989) who studied the London market in 3% Consols from 1821-1860; Hwang and Finn (1983) where the Stock Exchange of Singapore was examined; Gandhi, Saunders and Woodward (1980) who investigated the Kuwait stock market (the authors quoted Samuelson (1965) but do not appear to have recognised its significance); and Dawson (1984) who

3. Fama attributes this statement originally to Roberts (1959).
looked at the trend in "efficiency" on the Hong Kong Stock Exchange and whose theoretical discussion did not extend beyond a repetition of Fama's (1970) definitions of "Strong form", "Semi-strong form" and "Weak form" efficiency (see below).

Cooper's (1982) examination of 36 stock markets, stating in his introduction that "Many [recent] studies, although certainly not all, lend further weight to the validity of the Random Walk Hypothesis" is slightly different. This paper, unlike the others cited above explicitly recognises that the EMH and the RW Hypothesis are not the same: "...interest in the Random Walk Hypothesis and indeed in the much broader Efficient Markets Hypothesis is still very strong". Cooper then refers briefly to the MM (without actually explaining what it is) but provides no elaboration and does not discuss the MM literature or Leroy's 1976 disagreement with Fama (1970). However, at least the remainder of his paper, unlike Barnes and Brown and Easton does not refer to the RWM and the EMH interchangeably. On the other hand, he does refer to "...testing the validity of the Random Walk Hypothesis as an explanatory model of price behaviour in various speculative markets." It appears to this author that the RWM explains very little.

The three forms of efficient capital markets defined in Fama's 1970 paper are still quoted in some of the literature today (for example see Barnes and Ball and Brown, despite LeRoy's assertion that his 1976 definition replaced it. Fama's definitions were based on the idea that a capital market is efficient if prices "fully reflect" the available information, with the information set being specified in progressively less restrictive ways in the three forms of efficiency:
- **Strong form**: The information set is all relevant information in both public and private hands. Hence "insider information" is included.

- **Semi-strong form**: The information set is all publicly available relevant information.

- **Weak form**: The information set consists only of the sequence of past prices.

According to Fama (1970), tests for the strong form of the Efficient Markets Hypothesis (EMH) involve examining the hypothesis that one investor or group of investors has monopolistic access to some relevant information, and should therefore be able to achieve consistently higher rates of return than those obtained by other non-privileged investors. Jensen (1968, 1969) examined the performance of 115 mutual funds over a period of ten years, from 1955-64 and found good evidence in favour of the strong form of the EMH. The funds consistently failed to outperform the market, and in fact Jensen found that fewer individual firms had returns greater than the market than would be expected by chance. Note however that Fama (1970) points out that tests of this nature are not tests of the strong form of the EMH in the purest sense, because no attempt is made to differentiate between higher returns due to monopolistic access to information and those due to more accurate analysis of the implications of public information.

There are no general statistical tests for semi-strong form efficiency; only analysis of individual events. By examining several events affecting a particular market over time one can acquire sufficient evidence to reject or uphold the semi-strong form of the EMH.
Tests for the semi-strong form of market efficiency are based upon the examination of the effect of "information generating events" (Fama, 1970, p.404) on the price of securities. For example, Fama et al (1969) examined the impact of the announcement of stock "splits" in the New York Stock Exchange (NYSE) in the period 1927-59 and concluded that the EMH was upheld in the sense that "...on average the market makes unbiased dividend forecasts for split securities and these forecasts are fully reflected in the prices of the security by the end of the split month" (Fama et al (1969)). The semi-strong form of the EMH is also supported by other work, such as that of Ball and Brown (1969) in which the effects of earnings announcements were analysed, and Waud's (1970) work on stock price changes following announcements of changes in the discount rate by the US Federal Reserve.

Fama (1970) identified three conditions which are "sufficient" to determine weak form market efficiency, namely that there are no transactions costs, that all available information is costlessly available to all market participants, and that all market participants agree on the implications of the information for the current and future price of the security.

It is not necessary, however, for these sufficiency conditions to be met in practice for a market to be considered efficient. Fama points out that the existence of large transactions costs which may inhibit dealing does not necessarily mean that the prices struck for deals which do occur will not "fully reflect" the available information. In the Secondary Market, the level of transactions costs (in terms of brokers' fees only, there may also be legal and other costs to consider) has fallen as the market has become more competitive, and are now only about...
1/8% or less (Financial Times, 11 January 1989). Fama's second sufficiency condition is also flexible in that the market may be efficient if "sufficient numbers" of participants have ready access to available information. Most of the economic and other (e.g., the conditions for the conversion of debt to equity) information concerning the debtors is easily available from a variety of sources and hence the condition is satisfied. The institutions active in the market may obviously draw different conclusions as to the implications of the information but this "...does not in itself imply market inefficiency unless there are investors who can consistently make better evaluations of available information than are implicit in market prices." (Fama, 1970, p. 388). There is no evidence that this is the case in the Secondary Market in LDC debt.

The vast majority of the empirical work following Fama's methodology is concerned with Weak form efficiency, where the null hypothesis may be described as: "...the series of price changes has no memory, that is, the past cannot be used to predict the future in any meaningful way." (Fama (1965) p. 34).

The initial reaction to the RWM was that it rendered the FVM completely redundant, because it seemed to imply that securities' prices do not obey the laws of Supply and Demand. Roberts (1959) pointed out that this was not necessarily the case: in a market consisting of rational agents, the adjustment of prices (via shifts in supply and demand) to new information would be immediate, as implied by the RWM.

The RWM, however, is not satisfactory in several respects. Firstly, the model essentially says that if prices do not follow a Random Walk, then
there exist unexploited profitable trading strategies. This negative definition adds nothing to the advancement of the Random Walk hypothesis, because the failure to make contradictory observations does not prove that the theory is true. Secondly, if stock prices follow a Random Walk, then the securities analysis industry serves no purpose - rational investors should realise that they cannot outperform the market by following the advice of analysts - yet there are thousands of people earning high salaries from proffering just such advice. Thirdly, and most importantly, the RWM is very restrictive (see 4.5, 4.6, and 4.7 above) and does not purport to describe any equilibrium - usually the cornerstone of economic analysis. As LeRoy (1989) states:

"It was embarrassing for economists to have to shelve the competitive theory of price...when it came to analysing stock market prices, instead making do with informal and qualitative remarks such as if stock prices did not follow random walks there must exist unexploited profit opportunities." (p.1588)

4.5. LeRoy's Critique of Fama

LeRoy argues persuasively that Fama's three definitions of market efficiency should be empirically tested by specifying that returns follow a fair game, with the information set $\Phi_t$ defined as above for the three different types of efficiency. However, Fama explicitly rejected this approach, defining efficiency instead in terms of a variable $y_t$ (the deviation of $P_{t+1}$ from its expected value given the information set $\Phi_t$) following a fair game, i.e.,

$$y_{t+1} = P_{t+1} - E(P_{t+1}|\Phi_t)$$

4. LeRoy himself points out (p.1609) that if, as is actually the case, the number of analysts is large then some of them will generate advice which could be used to outperform the market purely by chance. This does not explain, however, the apparent persistent outperforming of the market by some analysts/firms.
and 
\[ E(y_{t+1} | \Phi_t) = 0 \]  \hspace{1cm} (4.9)

LeRoy has no argument with Fama's statement (1970, p.392) that this model "does not necessarily imply that the serial covariances of one-period returns are zero...the deviation of the return for \( t+1 \) from its conditional expectation itself can depend upon the return observed for \( t \)." Hence in Fama's definition rates of return themselves do not have to be a fair game - if they did, the serial covariances of one period returns would equal zero (as previous returns are always in the information set). The fair game only applies to deviations of prices from their conditional expectation \( E(P_{t+1} | \Phi_t) \).

LeRoy's criticism of Fama (expounded in his 1976 comment) is best explained by demonstration. Taking conditional expectations of (4.9) above gives:

\[ E(y_{t+1} | \Phi_t) = E(P_{t+1} - E(P_{t+1} | \Phi_t) | \Phi_t) \]  \hspace{1cm} (4.10)

Clearly, the RHS of (4.10), the conditional expected value of \( P_{t+1} \) less its conditional expected value) is zero. Hence:

\[ E(y_{t+1} | \Phi_t) = 0 \]  \hspace{1cm} (4.11)

As (4.11) is identical to (4.8), then LeRoy argues that (4.8) and (4.9) are tautologous, and so "On Fama's definition, any capital market is efficient and no empirical evidence can possibly bear on the question of market efficiency." (p.1593).

LeRoy argues that there is a further tautology in Fama's exposition. When Fama describes a group of "expected return theories" (where the
expected return on a security is dependent in some way upon its "risk")
he states that these theories can be expressed generally thus:

$$E(P_{t+1} | \Phi_t) = [1 + E(r_{t+1} | \Phi_t)]P_t$$

(4.12)

However, remember that by definition, rates of return are given by:

$$r_{t+1} = (P_{t+1}/P_t) - 1$$

(4.13)

Applying a conditional expectations operator to (4.13) gives:

$$E(r_{t+1} | \Phi_t) = E[((P_{t+1}/P_t) - 1) | \Phi_t]$$

Multiplying through by $E(P_t | \Phi_t)$ and adding $E(P_t | \Phi_t)$ to both sides gives:

$$E(P_{t+1} | \Phi_t) = E[(r_{t+1}P_t) | \Phi_t] + E(P_t | \Phi_t)$$

which may be rearranged to give:

$$E(P_{t+1} | \Phi_t) = P_t[E(r_{t+1} | \Phi_t) + 1]$$

(4.14)

Note that (4.14) is identical to (4.12) and so Fama's general statement of "expected return theories" is nothing more than a rearrangement of the definition of the conditional expectation of returns, thus adding nothing to the theory of efficient markets.

To describe the behaviour of prices which "fully reflect" information Fama further suggested the "submartingale model", where (ignoring dividends):

$$E(P_{t+1} | \Phi_t) \geq P_t$$

(4.15)

That is, conditional expected returns are non-negative. If prices do follow a submartingale, then Fama (1970) argues that:
"...trading rules based only on the information in \( \Phi_t \) cannot have greater expected returns than a policy of always buying and holding the security during the future period in question" (p.386).

LeRoy (1989) takes issue with this statement arguing that:

"No support was given for this claim, and it is easy to produce examples of economies in which the prices of all primitive securities follow submartingales, but in which there exist trading rules which outperform Buy and Hold in terms of expected returns" (p.1593).

Unfortunately LeRoy chooses not to cite any examples, which is remarkable given the depth of his coverage of the rest of the literature. He does, however, produce a stronger refutation of Fama's argument in terms of the Capital Asset Pricing Model (CAPM)\(^5\), which implies that returns do not necessarily have to follow a submartingale. In particular a stock whose return covaries negatively with the market index may well be included in the portfolio of a risk averse investor, even if, as is perfectly possible, it offers a negative expected return, in order to provide some degree of insurance against falls in the prices of those stocks whose returns covary positively with the market index.

LeRoy criticises Fama's discussion of empirical results as containing ambiguities, as in his theoretical discussion. His principal objection is that Fama associates empirically determined near-zero autocorrelation coefficients with market efficiency. This would be perfectly acceptable with a fair game (of prices) definition of market efficiency, but as Fama had already explicitly rejected this (see above) then his interpretation of the evidence conflicted with his theoretical

\(^5\) The CAPM is due originally to Sharpe (1964), Lintner (1965a, b), and Mossin (1966).
discussion. For this reason LeRoy is scathing on the question of Fama's explanations of apparent inefficiency revealed by papers such as Niederhoffer and Osborne (1966):

"Generally, the implication of Fama's discussion of Niederhoffer and Osborne seems to be that markets are to be interpreted as efficient either if price changes are serially independent or if they are serially dependent but if a convincing explanation can be found for the dependence." (p.1594)

Niederhoffer and Osborne examined intraday prices as recorded by the "tickertape" for six of the stocks (then) comprising the Dow Jones Industrial Average, and drew four main conclusions. Firstly, there was a "general tendency" for price reversals (price rise immediately followed by a price fall or vice-versa) to occur between trades. Secondly, reversals were more concentrated at integer price levels (because investors' limit orders to brokers are more concentrated at such levels). Thirdly, well-informed operators are aware of these tendencies and can position themselves to make profits. Fourthly, Niederhoffer and Osborne found that after two price changes in the same direction, the chance of a further change in the same direction is greater than the chance of a change in the opposite direction. These results contradict the RW, but LeRoy argues that Fama was trying to explain Niederhoffer and Osborne's results in the context of the Fair Game, in which "...departures from the fair game per se [which Niederhoffer and Osborne had apparently found] are identified with inefficiency." As stated above, Fama had accepted the fair game (zero autocorrelation between successive price changes) as constituting efficiency, but then had attempted to rationalise a glaring observed departure from it in order to preserve his position.

Fama's conclusion to his 1970 paper was that the vast bulk of the evidence supported the idea of capital market efficiency,
notwithstanding his apparent confusion over what he meant by the term. LeRoy concedes that this confusion still persists, to the extent that "the term efficient capital markets is seen to have several possible meanings" (p.1595).

After explicitly denying in his 1976b reply the existence of any tautologies in his original work Fama redefined the EMH in 1976a, and even LeRoy acknowledged the new version to be a great improvement, as it cleared up some of the previous ambiguities. The new statement defined efficient markets as those in which all relevant information is taken into account in the determination of prices, and those which (act as if) they have rational expectations (RE). The RE model states that market agents use all available information in their calculation of the model, the parameters of which are known to them. With this new definition, Fama pointed out that efficiency may only be tested in the context of some model of market equilibrium.

LeRoy's criticism of the new definition centred on the problem of defining "the market": "One can speak unambiguously of the market only if all agents have the same information, in which case market information is satisfied trivially." (p.1595). Whilst acknowledging the problems of definition, LeRoy follows what he considers to be the convention, by defining an efficient market as one in which the MM and RE apply.

4.6. Martingale Models

LeRoy argues that Samuelson (1965) introduced the MM into the EMH and thus resolved most of the problems of the RWM, not least of which was
the theoreticians' desire to see the hypothesis given a firm equilibrium-based grounding. According to LeRoy (p.1588) Samuelson's paper is the most important paper in the EMH literature "...because of its role in effecting [the] shift from the Random Walk to the Martingale Model."

A stochastic process $P_t$ is a martingale if:

$$E(P_{t+1}|\Phi_t) = P_t \quad (4.16)$$

i.e., the expected value of the price of a security $j$ in the period $t+1$ is the price of that security in period $t$. The best prediction of the price in period $t+1$ is $P_t$. The change in $P_t$, $\Delta P_t = P_t - P_{t-1}$ is a fair game if:

$$E(\Delta P_t|\Phi_t) = 0 \quad (4.17)$$

Hence $P_t$ can only be a martingale if $\Delta P_t$ is a fair game (if the expected value of $\Delta P_t$ is zero, then the expected value of $P_{t+1}$ is $P_t$). The MM is also only valid if all dividends are re-invested. This is assumed in the discussion. It is worth quoting at length Samuelson's illuminating explanation of the significance of his theoretical result and the difference between his work and the RWM:

"They [wheat futures prices] will turn out, on the average, to have no upward or downward drift anywhere!...This means that there is no way of making an expected profit by extrapolating past changes in the futures price, by chart or any other esoteric devices of magic or mathematics. The market quotation...already contains in itself all that can be known about the future ...The theorem does not imply that the sequence of [prices] perform a Brownian motion. It does not imply that $[\Delta P_t]$ is statistically independent of $[\Delta P_{t+1}, \Delta P_{t-1}]$; it implies only that given knowledge of $[\Delta P_t]$ the Pearsonian correlation coefficient between the two D's will be zero. It is a source of comfort to the economist...that wheat prices should not perform a Brownian Random Walk. A Brownian walk, like the walk of a drunken sailor, wanders infinitely far, listing with the wind. Surely, economic law tells us that the price of wheat...cannot drift sky-high or ground-low. It does have a rendezvous with its destiny of supply and demand" (p.44).
Note, however, that in the context of the Secondary Market it is possible for the "rendezvous" of price with supply and demand to be "ground-low", or at least very near indeed to it. A country which is perceived by market participants to be unable to make any repayments in the foreseeable future nor to be able to reach agreement with its creditors as to debt restructuring will have debt of near-zero market value. Countries such as Peru, Zaire and Honduras have all traded for long periods at prices of less that five cents per Dollar of face value. Similarly, in the context of stock markets, prices can fall to zero if a quoted company is revealed to be insolvent.

The differences between the MM and the RWM can be explained in terms of equations (4.5), (4.6) and (4.7) above. Equations (4.5) and (4.7) are true for both RWs and MMs. Equation (4.6), however, is true only for RWs; that is, the RW requires constant variances \( \sigma^2 \) whereas the MM allows successive conditional variances of prices to be positively autocorrelated i.e., \( E(V(DP_t)) \neq \sigma^2 \). As Dryden (1969) succinctly explained, "...random walks are martingales, but martingales are not necessarily random walks." LeRoy (1989) uses this to illustrate how the MM can be used to explain the observed periods of calm followed by turbulence in securities markets whilst the RW cannot.

Most empirical tests of the MM try to investigate whether or not there is a variable(s) in the information set \( \Phi_t \) which is a predictor of future price changes. If so, then \( E(DP_t | \Phi_t) \neq 0 \) so \( DP_t \) is not a fair game and hence by definition the martingale model of \( P_t \) is violated. The problem with simple tests of the MM is that the results are ambiguous: do they mean that the market is inefficient or do they mean
that the chosen variable is not in agents' information sets and is thus not relevant. Fortunately, this problem is overcome with the variance bounds tests discussed in 4.8, which are valid for any specification of the agents' information set. Unfortunately, as will become apparent, these tests may not be performed on Secondary Market prices as there is insufficient data.

4.7. Reconciling the Martingale Model and the Fundamental Value Model

The apparently unbreachable gulf between the FVM and other models which developed as the RWM was in ascendancy was reconciled by Samuelson (1973), who proved that:

\[ P_t = \sum_{i=1}^{\infty} (1+q)^{-i} E_t(d_{t+1}) \]  \hspace{1cm} (4.18)

Where \( d \) is dividends, and \( q \) is the discount rate. This result states that prices are equal to the expected discounted cash flow which arises due to holding of the security. This differs from the original fundamentalist view that prices fluctuate around the expected discounted cash flow; and implies that there is no way of earning supernormal profits from trading, and that future returns are unpredictable, as in the MM. So the FVM is rehabilitated in a different form; one which explains why despite the importance of fundamentals, securities analysis in an attempt to make supernormal profits is still a "redundant" occupation. As explained below, however, fundamentals analysis is an essential part of the EMH. The MM may be considered as an extreme version of the original FVM, where all the fluctuations around the expected discounted cash flow which exist in the FVM have been traded away. LeRoy (1989) explains this by assuming that there is a large number of traders, all conducting fundamentals analysis and all reaching
the same conclusion as to the fundamental value of particular stocks. Hence these traders deal until the price reaches their collective idea of the fundamental value.

The MM requires that agents have common and constant time preferences and are risk-neutral. The risk-neutrality assumption is important, and implies that funds will gravitate to the highest absolute return. Equilibrium thus requires that the return on stocks is equal to the interest rate, which in the model outlined above is equal to the discount rate \( q \) and so returns follow a fair game as required. Thus the risk-neutrality assumption implies the MM, but not the RW because risk-neutrality is consistent with non-zero autocorrelation in conditional variances, i.e., \(|E(V(DP_t)V(DP_{t-1}))| \geq 0\) (because with risk-neutrality no-one cares if there are non-zero autocorrelations). This is not applicable to the RW, in which conditional variances are constant.

According to Leroy, the result of Samuelson's paper was that analysts realised that many of the tests for the RW were in fact tests for the less restrictive MM, or the even weaker specification that rates of return are uncorrelated.

4.8 Variance Bounds and Mean Reversion

4.8.1 Introduction

Leroy's 1989 assertion that since 1970 "...most of the evidence [of the EMH] has been contradictive rather than supportive" (p.1595) rests primarily on empirical evidence which suggests that the actual stock
price movements are more volatile than would be expected if the EMH were valid. These results were first reported by LeRoy and Porter (1981) and Shiller (1979 and 1981), in papers which developed variance bounds tests.

4.8.2 Variance Bounds Tests

Let

\[ x_t = \sum_{i=1}^{\infty} (1+q)^{-i} e_{t+i} \]  \hspace{1cm} (4.19)

Where \( q \) is the discount rate and \( e \) is the unexpected component of the one-period return on stock, i.e.,

\[ e_{t+i} = P_{t+i} + d_{t+i} - E_{t+i-1}(P_{t+i} + d_{t+i}) \]  \hspace{1cm} (4.20)

Then define:

\[ P^*_t = P_t + x_t \]  \hspace{1cm} (4.21)

Hence \( P^*_t \) is the price one would expect if dividends were perfectly forecastable. Shiller called this price the "Ex-post Rational Price".

Taking conditional expectations of (4.21) gives:

\[ P_t = E(P^*_t | \Phi_t) \]  \hspace{1cm} (4.22)

Given that from (4.21) above, \( P^*_t \) is a forecast of \( P_t \), then the actual value of \( P^*_t \) is a sum of \( P_t \) and the forecast error \( x_t \). With optimal forecasting, the forecast errors are by definition not autocorrelated, so variances may be expressed thus:

\[ V(P^*_t) = V(P_t) + V(x_t) \]  \hspace{1cm} (4.23)

As variances cannot, by definition, be negative, then:
\[ V(P_t) \geq V(P_t^*) \]  \hspace{2cm} (4.24)

That is, \( V(P_t^*) \) is an upper bound for \( V(P_t) \). If this can be rejected in empirical tests, then the MM is rejected for any specification of \( \Phi_t \). This unambiguous result may be compared with the earlier tests which may imply either that one may reject efficiency, or alternatively that the variable used in the test is not included in \( \Phi_t \).

The lower bound for \( V(P_t) \) is found by considering an information set \( H_t \), that contains less information than \( \Phi_t \). Let \( P_t \) be the price of the stock given this information set. Then:

\[
P_t - \mathbb{E}(P_t^*|H_t) \]  \hspace{2cm} (4.25)

\( P_t \) may be considered as the opposite of \( P_t^* \): The latter is the price which would prevail if agents had perfect information and will thus be the upper bound for \( P_t \), whilst the former is the price which would prevail if agents have less information than they actually do, so it is a lower bound for \( P_t \). LeRoy proves this by using the Rule of Iterated Expectations to show that:

\[
\hat{P}_t = \mathbb{E}([P_t^*|H_t]) \]  \hspace{2cm} (4.26)

Substituting \( P_t \) for \( E(P_t^*|\Phi_t) \) gives:

\[
\hat{P}_t = \mathbb{E}(P_t|H_t) \]  \hspace{2cm} (4.27)

Repeating the method used to derive (4.24) above yields:

\[
V(\hat{P}_t) \leq V(P_t) \]  \hspace{2cm} (4.28)

That is, \( V(\hat{P}_t) \) is a lower bound for \( V(P_t) \).

Now let \( \hat{x}_t = P_t^* - \hat{P}_t \). As (4.23) is still true with \( \hat{P}_t \) and \( \hat{x}_t \)

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replacing $P_t$ and $x_t$, then from (4.28):

$$V(\hat{x}_t) \geq V(x_t) \tag{4.29}$$

Taking variances of (4.19) above:

$$V(x_t) = V \left( \sum_{i=1}^{\infty} (1+q)^{-1} e_{t+i} \right)$$

If we assume $V(e_t)$ is constant, then:

$$V(x_t) = V(e_t) \sum_{i=1}^{\infty} (1+q)^{-1} e_{t+i}$$

which is a simple geometric progression and which gives:

$$V(x_t) = \frac{V(e_t)}{2q+q^2} \tag{4.30}$$

From (4.30) it is clear that the variance of the forecast error, $V(x_t)$ depends only upon the variance of the unexpected component of dividends $V(e_t)$ and the discount factor $q$. Taking this into account means that (4.29) implies:

$$V(\hat{e}_t) \geq V(e_t) \tag{4.31}$$

So, a larger information set implies a lower variance of returns, i.e., lower price volatility, and vice-versa. This is because with the larger information set actual dividends are less of a "surprise" than with the smaller information set so price volatility is lower: prices make smaller adjustments for smaller unexpected components of dividends.
4.8.3 Bounds and Orthogonality Tests

From the above discussion it should be clear that if one can place bounds upon the agents' information sets then one has placed bounds on the variance of prices and returns. If we choose perfect information as the upper information bound then it has been shown that $V(P_t^*)$ is the upper bound for $V(P_t)$, and that the lower bound for $V(e_t)$ is zero. The lower bound for the information set is the set of past prices, which, it will be recalled, is the information set used by Fama in his definition of weak form efficiency. This implies that $V(P_{t-1})$ is the lower bound for $V(P_t)$ and that $V(e_t)$ is the upper bound for $V(e_t)$. Of these four bounds, LeRoy and Porter investigated the first and last.

In the bounds tests, $V(P_t^*)$ was estimated by regressing prices and dividends respectively onto their own and the other's lagged values, and using an estimated discount factor. The estimate of $V(P_t)$ implied by the model was then compared with the upper bound $V(P_t^*)$. The inequality (4.24) above was violated by the result of this comparison, thus implying rejection of the MM.

The orthogonality tests involved estimating $V(P_t^*)$, $V(P_t)$ and $V(X_t)$ from the bivariate model described above, then testing the null hypothesis:

$$H_0: V(P_t) = V(P_t^*) - V(e_t) \frac{e_t}{2q+q^2}$$

with

$$H_1: V(P_t) > V(P_t^*) - V(e_t) \frac{e_t}{2q+q^2}$$

(4.32) (4.33)
Again LeRoy and Porter rejected the MM. Shiller (1979 and 1981) obtained similar results, and argued strongly that these results implied market inefficiency. LeRoy and Porter, however, were reluctant to draw such strong conclusions and considered the results to be an anomaly that required explanation:

"We are unable to resolve [the] differences between our results in which market efficiency is rejected with the standard results in which the opposite conclusion is reached." (p.573).

In the event, doubts were cast upon the original tests by Flavin (1983) who showed that with small samples there was a bias against accepting efficiency, because the estimates of $V(P_t^*)$ and $V(P_t)$ were biased downwards, with the bias on the former being larger. Kleidon (1986) showed that the bias problem could persist with large samples if dividends have unit roots. Marsh and Merton (1983) argue that if dividends are non-stationary, but that for example they follow a RW, then the volatility tests employed by Shiller will find excess volatility in all samples.

Methods were found to circumvent these problems, and the "Second Generation" variance bounds tests are surveyed in West (1988). For example, Mankiw, Romer and Shapiro (1985) suggested:

Let $P_t^0$ be any naive forecast of $P_t^*$, i.e., any function of investors' information, no matter how inaccurate. Then:

$$P_t^* - P_t = (P_t^* - P_t) + (P_t^0 - P_t)$$

If $P_t$ is an optimal estimator of $P_t^*$ then $P_t^* - P_t$ is uncorrelated with the information set and is therefore uncorrelated with $P_t^0 - P_t$.  

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Squaring both sides of (4.34) and taking expectations conditional upon the information available prior to the start of the sample period:

\[ E(P_0 - P_0^*)^2 = E(P_0 - P_0^*)^2 + E(P_0 - P_0^* + P_0^* - P_0^*)^2 \]  (4.35)

Therefore:

\[ E(P_0 - P_0^*)^2 \geq E(P_0 - P_0^* + P_0^* - P_0^*)^2 \]  (4.36)

and

\[ E(P_0 - P_0^*)^2 \geq E(P_0 - P_0^* + P_0^* - P_0^*)^2 \]  (4.37)

Taking expectations conditional on information available before period \( t \) removes the problem of non-stationarity. Equation (4.36) states that the market price is a better forecast of the ex-post rational price than the naive forecast, and (4.37) states that the ex-post rational price is more volatile around the naive forecast than is the market price.

Mankiw, Romer and Shapiro rejected the inequalities (4.36) and (4.37), finding that the naive forecast price is a better forecast of the ex-post rational price than the market price, and that the volatility of the market price around the naive forecast is greater than that of the ex-post rational price. This evidence again contradicted the early work reviewed in Fama (1970). How can daily or weekly returns be uncorrelated, as this work indicated, if there is excess volatility? The answer lies in the fundamental difference between the tests reviewed by Fama and the variance bounds tests. The early tests examine the orthogonality of returns over short intervals (days, weeks) but the latter examine a smooth average of several years' past and future returns. Remembering from section 4.8.2. above that:

\[ x_t = \sum_{i=1}^{\infty} (1+\eta)^{-i} e_{t+i} \]  (4.19)
and  
\[ P_t^* = P_t + x_t \]  
(4.21)

Then  
\[ P_t^* = P_t + \sum_{i=1}^{\infty} (1+q)^{-i} e_{t+i} \]  
(4.38)

Hence the variance bounds restriction means that some weighted average of past returns \( P_t \) must be uncorrelated with a different weighted average of future returns. If there is found empirically to be excess volatility, i.e., \( V(P_t) > V(P_t^*) \) then the weighted averages are negatively correlated (if not, then \( V(P_t) \) cannot exceed \( V(P_t^*) \) as required). The different intervals used for the early serial correlation tests and the variance bounds tests means that their results are not directly comparable.

Fama and French (1988) investigated the validity of this explanation by estimating the correlation between average returns over the interval from \( t-T \) to \( t \) \( (r_{t-T},r_t) \) with various values of \( T \). They found that with \( T=1 \) (year), there was near-zero correlation. With \( T \) between three and five, they found that about 35% of the variation in the return over the interval \( t \) to \( t+T \) \( (r_{t},r_{t+T}) \) is explained by \( r_{t-T},r_t \), with negative correlation as expected. With \( T\geq10 \), correlation is zero again. Fama and French explained their results thus:

"This pattern is consistent with the hypothesis that stock prices have a slowly decaying stationary component. The negative autocorrelation of returns generated by a slowly decaying component of prices is weak at the short return horizons common in empirical work, but it becomes stronger as the return horizon increases. Eventually, however, random-walk components begin to dominate the variation of returns, and long horizon autocorrelations move back toward 0.0" (p.66).

Fama thus refuses to let the RW die. LeRoy (1989) however, argues that the results of Fama and French are good corroboration for the variance
bounds tests, because the partial forecastability of the five year returns they found is "...exactly what the variance bounds violations would lead one to expect." However, the verdict was not unanimous: Kim, Nelson and Startz (1988) disagreed with Fama and French, having found negative autocorrelations of returns in samples which included data from the 1930s. They could find no evidence of such autocorrelations in samples after the Second World War, though it should be noted that Fama and French discovered this in their paper and specifically cited the possibility that stock prices since then have not had the stationary components necessary to produce the U-shaped pattern:

"Autocorrelations for periods after 1940 are closer to 0.0, and they do not show the U-shaped pattern of the overall period... Stationary price components may be less important after 1940, or perhaps prices no longer have such temporary components" (p.266).

Bulkley and Tonks (1989) replicated the original Shiller volatility tests using UK stock prices, arguing that the criticisms of Kleidon and Flavin are not sufficiently strong to overturn the extremely strong evidence of excess volatility found in the US, and in any case they were unable to reject the stationarity assumption for the data. Bulkley and Tonks made their own criticisms of the variance bounds tests (first and second generation) however, arguing that in effect they test the strong form of the rational expectations efficient markets model (not to be confused with Fama's definitions of weak, semi-strong and strong form efficient markets). This model makes the extreme assumption that agents know the true model generating the data set. The weak form rational expectations efficient markets hypothesis, however, assumes that agents use an estimated model, thus avoiding the potential problems of the strong form model. These are that agents may not use the correct form or may mis-specify the true model, or that even if the specification is
correct, with a finite data set estimated coefficients will not converge completely to the true model.

To test the weak form model, Bulkley and Tonks modified the calculation of expectations of the ex-post rational price (see 4.8.2 above) by using only the data available up to the date upon which the expectation is formed. As a result of this, the new ex-post rational prices tracked the actual prices much more closely than the ex-post rational price calculated using the standard method employed by Shiller, and the volatility of the new ex-post rational price compared to the actual market price was far less than that of the Shiller method price. The latter observation was borne out by the formal tests, in which Bulkley and Tonks found that the conventional bounds tests inequalities were easily violated, but that the inequality for the weak-form rational expectations efficient markets was satisfied. Bulkley and Tonks presented further evidence in the form of tests of a trading rule in which stocks were bought when the market was K% below the expectation of the weak form ex-post rational price and sold for bonds when K% above it. They found an after-tax excess return from the trading rule compared to Buy and Hold of 1.6% per year. They regarded this as good evidence of violations of the weak form rational expectations efficient markets hypothesis as applied to UK stock prices. This result was reconciled with the inability of rejection of the weak form variance bounds inequalities by stating that:

"...satisfaction of this revised variance bound is a necessary but not sufficient condition to reject the excess volatility thesis...although stock prices satisfied the amended variance bound, they are still sufficiently volatile that agents who were constrained to estimate the structural model, and choose parameters of a trading rule using only currently available data, could make average excess profits of 1.6% per annum" (p.1097).
Bulkley and Tonks's paper presents compelling arguments for the use of their weak form rational expectations efficient markets tests in place of the original and second generation variance bounds tests.

4.8.4. Non-Martingale Models

Samuelson's (1965) exposition of the MM assumed risk-neutral agents. Given that in reality, risk aversion is the norm, it should be no surprise when risk-neutral MMs are rejected empirically.

With risk averse agents, returns do not follow a fair game: if risk covaries over time (i.e., large (small) price changes - positive or negative - are likely to be followed by further large (small) price changes) then risk averse agents will only be prepared to hold an asset if expected returns vary to compensate them for this changing risk. In this case one would expect returns to be partly forecastable, because if the current information $\Phi_t$ implies high risk agents will only hold the asset, LeRoy (1989) argues, if $\Phi_t$ also implies high returns.

Theoretical work confirmed that the MM only holds under risk-neutrality. LeRoy's 1973 paper concluded that "...when the expected rate of return on stock is explained in terms of the portfolio optimisation of risk-averse investors rather than simply taken as given, the martingale property fails." This conclusion did not prevent LeRoy from developing the variance bounds tests with Porter, but later work with LaCivita (1981) found that the higher the degree of risk aversion, the higher the volatility in prices. This led them to the conclusion that the variance bounds are only valid in the case of low risk aversion, and that the
tests are thus inappropriate methods of testing for volatility in the absence of corrections for risk aversion. LeRoy and LaCivita then addressed the question of the degree of observed volatility and acknowledged that the violations of variance bounds were so great that they may not necessarily be due only to risk aversion. The obvious next step would be to recalculate variance bounds tests with a risk aversion adjustment, but as the authors point out such adjustments are invariably flawed because they are calculated from the asset prices themselves and as a consequence:

"...it seems to us that if consistent methods are used the conclusion can only be that the estimated degree of risk aversion will inevitably be sufficient to account for the estimated volatility of asset prices. If the reverse conclusion is obtained, our presumption would be that some misspecification or econometric problem had biased the comparison, not that asset prices are too volatile to be consistent with measured risk aversion" (p.546).

The importance of risk aversion for variance bounds tests is thus an unresolved issue. The key to the use of the tests and justification of the conclusions drawn from their results was provided by LeRoy (1973) with the statement that "...if capital markets are efficient, rates of return will follow a martingale distribution as a fair approximation even in the presence of risk aversion." (my italics).

Note that Bulkley and Tonks (1989) do not refer at all to the problems of risk aversion in their theoretical discussion; they appear content to accept the validity of variance bounds tests (notwithstanding their modifications) under any degree of risk aversion.
4.8.5 Other Evidence

The apparent success of some "tipsters" (or investment newsletters, as they prefer to be called) is difficult to reconcile with the EMH. However, it must be remembered that if there are many tipsters then some will achieve high returns by chance. The Wall Street Journal reported on 19 March 1990 that of 18 bond newsletters, only one outperformed the Shearson Lehman Treasury Bond Index in 1989.

The work of French and Roll (1986) suggested that the trading process itself generates volatility. They investigated the "Wednesday Effect" and found that price volatility between Tuesdays and Thursdays on the NYSE in 1968 when the exchange was closed on Wednesdays was lower than other two day periods.

The existence of high volumes of market trading is contrary to the concept of efficiency, because rational agents will not trade securities based purely on interpretation of their own (asymmetric) information. LeRoy (1989) states (p.1611) that "the majority of trades appear to reflect belief on the part of each investor that he can outwit other investors, which is inconsistent with common knowledge of rationality." The problem of excessive trading volume is avoided by calling it "noise trading" [Black (1986)] thus "...avoiding the I-word, thereby sanitising irrationality and rendering it palatable to many analysts who in other settings would not be receptive to such a specification." (p.1612).

A conceptually appealing argument is that if price changes are due to changes in fundamentals as in the EMH then it should be possible to show
that actual price changes are explainable by fundamentals. Unfortunately there is little evidence for this. Roll (1988) showed that only about 30% of the changes in the prices of individual stocks could be explained, even using data such as industry averages and market price indices as explanatory variables.

Finally the stock market crashes on "Black Monday" (19 October 1987) cannot be explained by fundamentals, because, according to LeRoy (1989) there was a complete absence of such data on that day.

4.8. Conclusion

The EMH literature is vast and complex. It is virtually impossible to draw definitive conclusions, as there are so few areas in which there is complete agreement amongst researchers.

The EMH has evolved from its simple RW beginnings into a complex joint hypothesis. According to LeRoy and LaCivita (1981) EMH tests "...are joint tests of the assumptions of (1) stationarity (2) rational expectations, and (3) an "expected-value model." The value of the empirical tests of these assumptions has been questioned by LeRoy (1989), who concluded that "...the effort to generalize the martingale model to allow for risk aversion has not succeeded empirically so far."

Other researchers, such as Bulkley and Tonks (1989) have implicitly disagreed with this conclusion by pressing on with the development of what may be characterised "third generation" variance bounds tests. As was the case with earlier EMH work, as the theory moves on there are still those who will seek to refine earlier work or, as appears to be the case with the Unreconstructed Random Walkers, will continue to use
methods and theoretical arguments which have been strongly criticised in later work.

Where does this leave the Secondary Market in relation to the EMH? The major problem is the lack of data. Even if one were to ignore the problems due to risk aversion in the variance bounds tests, they could not be performed on Secondary Market data. Specifically, there is no data on the timing and amount of actual, as opposed to scheduled interest payments, necessary for the calculation of ex-post rational prices. Other techniques such as spectral analysis are also inapplicable in the Secondary Market, again due to the lack of data.

The exclusion of the more sophisticated techniques (though as has been explained greater sophistication does not necessarily mean greater validity) means that in the Secondary Market the only tests which may be performed are those originally used by the Random Walkers. Their low power means that the results must be subject to close scrutiny. As has been discussed, these tests are probably more accurately described as tests of the MM or the even weaker hypothesis that returns are uncorrelated. Given LeRoy's 1989 limit definition that in efficient markets there are no trading rules which can consistently outperform Buy and Hold, and Lehman's (1990) association of profitable trading strategies with inefficient markets it seems reasonable to test a trading system in the Secondary Market. It should be noted, however, that the trading systems used by Bulkley and Tonks (1989) and Lehman (1990) are different to the method described in Chapter Five.

6. Granger and Hatanaka (1964) pointed out that "The amount of data required before it becomes sensible to attempt to estimate a spectrum would seem to be greater than about 100." As detailed in Chapter Five, only 59 continuous data points were available when the numerical analysis was performed.
5.1. Introduction

This chapter presents the results of several statistical tests performed on Secondary Market price data. The first group of tests, comprising autocorrelation coefficient estimates, runs tests and filter tests are those mooted by Fama (1965) as tests of the Random Walk Model (RWM) (later characterized as the "Weak form" of capital market efficiency). As was discussed in Chapter Four, however, Fama's specification of market efficiency has been shown to be flawed and hence his association of these tests (except the filter tests) with market efficiency or otherwise can no longer be considered correct. As was also noted in Chapter Four, this has not prevented several subsequent authors, for example, Hwang and Finn (1983), Barnes (1986), Brown and Easton (1989), and Gandhi, Saunders and Woodward (1980), from following Fama's methods and drawing conclusions from the results in the manner he indicated.

The "Fama approach" must therefore be treated with some degree of scepticism. LeRoy (1989) argues that the tests for the RWM proposed by Fama (and others) "...were in fact tests of the weaker martingale model, or, for example, the still weaker specification that rates of return are uncorrelated." (p.1592). This explains why the conclusions of the Random Walkers (i.e., that world capital markets are mostly "efficient") are disputed by the proponents of the far more sophisticated variance bounds tests. The results of the filter tests, however, may be more
conclusive. It will be remembered from Chapter Four that LeRoy's limit
definition of an efficient capital market is one in which there are no
profitable trading rules. Hence markets in which there are significant
non-zero autocorrelation coefficients are not necessarily inefficient,
but if it can be demonstrated that there are also profitable trading
rules in such markets then the stronger conclusion, of market
inefficiency, may be warranted.

The statistical techniques used are described in the relevant sections
below. Throughout this chapter lower case letter symbols refer to
natural logarithms. For example, $P_t$ is the price in cents at time $t$ of
a "portion" of debt (i.e., that part of the original loan which is being
traded; the size of the portion is of course agreed between the trading
counterparties), whilst $p_t$ is the natural logarithm of that price.

5.2. Review of Other Research

Almost all of the reported research performed using secondary market
price data has concerned the determination of prices - specifically, the
extent to which prices levels and changes in price can be related to
country-specific macroeconomic data. Although this is not the direct
concern of this thesis, the more important papers are reviewed below for
completeness.

The earliest examinations of secondary market price data in relation to
macroeconomic performance were Sachs and Huizinga (1987) and Purcell and
Orlanski (1988). The former used data from 28 countries and found that

1. The authors were employees of Salomon Brothers Inc and were thus
   in a unique position regarding access to market data at the
earlier stages of its development.
84% of the variation in debt prices could be explained by four variables: the debt:GNP ratio, real economic growth, a dummy for whether interest payments were suspended, and another dummy for whether US banks had been forced to make provisions by their regulators. Unsurprisingly, they found that prices were negatively correlated with the first and third variables, and positively with the second and fourth.

Purcell and Orlanski (1988)\textsuperscript{2} found by simple multiple regression that several variables (net debt to exports ratio, per capita income, and three dummy variables representing whether a country had rescheduled its commercial bank debt, whether its interest payments were up to date, and whether it had a debt:equity swap programme) could be used to explain an implausibly high 98% of the variation in prices over time. It should be noted that this paper was intended for use by investors and traders in the Secondary Market and not as a piece of rigorous academic research. In particular, the data set used was small, from the first quarter of 1986 to the first quarter of 1988, a period when even the market's most ardent supporters would not ascribe complete accuracy to price quotations.

Cohen and Portes (1990) used a longer data set, from March 1986 to November 1989 (N=45) and concentrating on those countries whose debt markets they considered liquid, namely Argentina, Brazil, Chile, Mexico, Poland, Venezuela and Yugoslavia, they found by multiple regression that the weighted\textsuperscript{3} average price, $S_e$, of these countries' debts was explainable ($R^2 = 0.80$) by the level of interest rates (Dollar Libor).\textsuperscript{2}

The authors were employees of Salomon Brothers Inc were thus in a unique position regarding access to market data at the earlier stages of its development.

3. The weights were derived from each countries proportion of the total stock of debt.
\[ r_t, \text{ and a dummy variable, } CITI_t, \text{ taking the value of one after the} \]

Citicorp-led provisioning round in 1987 and zero before. The equation generated by this regression \((\ln S_t = 5.99 - 0.96\ln r_t - 0.20\text{CITI}_t)\) has a sufficiently low Durbin-Watson statistic to suggest significant first order serial correlation. This was recognised by the authors, who added a lagged dependent variable \(s_{t-1}\) which eliminated the problem. As Dicks and Singh (1991) point out, however, the effect of adding the lagged dependent variable is to reduce dramatically the co-efficients of \(\ln r_t\) and \(\ln\text{CITI}_t\), to 0.06 and 0.03 respectively. In other words, the new equation is, in effect, a simple time series model in which the only non-trivial determinant of the price at time \(t\) is the price at time \(t-1\). No underlying economic data is relevant in this model.

Taking advantage of the increasing data set, Dicks and Singh develop the first two stage cointegration model of prices. An excellent introduction to co-integration may be found in Hendry (1986). Briefly, cointegration models consist of a long-run or "levels" equation, the residuals from which are then used (lagged) in the estimation of the short-run "change" equation. A cointegration model depends, however, on each term in the long-run equation having the same order of integration, that is, each variable must be stationary after being differenced the same number of times. Dicks and Singh found that this did not apply to Cohen and Portes' model, so it did not form a "cointegrating vector" and should be rejected.

Dicks and Singh subsequently used the debtor countries' Bank of England's provisioning matrix scores and their three main components ("A" factors "attempt to gauge a borrower's inability or unwillingness to meet its obligations, whether at the due date or thereafter", "B"
factors "indicate a borrower's current difficulties in meeting its obligations; and "C" factors provide evidence of the likelihood of repayment difficulties either now or in the future") as explanatory variables. They developed a long-run, cointegrating vector which added A and C scores (B factors were found not to be significant), to the interest rate and CITI term (the lagged price term used by Cohen and Portes was of course dropped). Interestingly, the negative coefficient of the "A" factors implies that there are circumstances when a rescheduling or debt restructuring could lead to a higher price. Such circumstances are described in Chapter Five in the context of Krugman's (1989) Debt Relief Laffer Curve.

The short-run model derived from the long-run equation explained 41% of single time period price changes\(^4\), with a standard error of 0.075, less than half the 0.17 reported by Cohen and Portes's equation without the lagged price term and well under the 0.14 of the model with it. Dicks and Singh's work conclude that "...not only is it possible to find a role for 'economic' terms in explaining secondary market prices, but they appear to do so fairly well".

A serious problem has been identified, however, with all of the research carried out on secondary market prices and economic data. As Claessens, Diwan and Srinivas (1990) point out, "...debt traded in the Secondary Market is not homogeneous." Apparently similar instruments, such as parcels of bank debt owed by one country, may have, for example, different coupons, maturities, and obligor names. In addition, some

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4. Although, interestingly, only C scores from the Bank of England matrix, unlagged and lagged one and three periods were significant. Perhaps financial markets do look forward!
debt may be perceived as more likely to benefit from future restructuring, thereby conferring a price premium. Since the development of the Brady Initiative (See Chapter Six), there have been new instruments created carrying different value "enhancements", such as third party capital repayment guarantees. Claessens, Diwan and Srinivas argue that only by stripping out the value of these enhancements and developing a standardised price for each country's debt can meaningful analysis in relation to price determination, be performed. Note that the tests described in this chapter are time series tests which make no attempt to link economic data with prices, and which are therefore unaffected by the problem discussed here, unless, as seems unlikely, Salomon Brothers were inconsistent over time in their choice of benchmark instrument for each individual country. Cross-sectional consistency is irrelevant for the tests reported here.

It is implied in the authors' conclusion that the deviations in price from the underlying (that which is "justified" by economic data) value of debt instruments caused by differences in the instruments could explain the contradictions in the results of other authors. For example, Boehmer and Megginson (1990) found, in sharp contrast to Cohen and Portes, that interest rates have no significant effect on prices. By developing a stripped price series for each debtor, Claessens, Diwan and Srinivas have provided data with which future researchers, using cointegration techniques (which may show that the early simple regression models such as those of Purcell and Orlanski do not represent stable long run models even with the more reliable data set) may be able to find the definitive model of debt prices. At the present time, there is no such model.
5.3. The Data Set

As detailed in Chapter Two, by March 1986 the Secondary Market had attained sufficient liquidity for Salomon Brothers Inc to produce a fortnightly publication, "Indicative Prices For Less Developed Country Bank Loans". Unfortunately, continuous price data from this source is available only from February 1987, because of a break in publication between 2 December 1986 and 20 February 1987. However, by using data from the latter date until 8 June 1989 inclusive, a total of N=59 observations are available for each country. The analysis in this chapter is based upon the mid-price ([bid-offer]/2) of the debt of all LDCs for which Salomon Brothers continuously quoted an indicative price over this period.

5.3.1. Accuracy of Quoted Prices

The Salomon prices are quoted in cents per US Dollar face value of debt, with the bid and offer prices for the more liquid debts (see Appendix II) each being quoted to within 0.25 cents per Dollar. Note that the debts of most African debtors are traded far less than those of most of the Latin American countries and this is reflected in their indicative prices, which are given by Salomon Brothers to within one cent per Dollar. This does not necessarily imply inaccuracy in the prices, it is more an indication that a trader may not be able to perform the transaction he wishes to make in the debt of certain countries at certain times. Provided that actual deals are performed at prices which are "efficient", the relative lack of liquidity in particular debt markets is irrelevant.
It should be noted that the degree of accuracy in the prices quoted for the more liquid debts compares favourably to those quoted in the financial media for corporate equities, which are used in the bulk of the Efficient Markets Hypothesis (EMH) literature as the primary data source. The fact that Salomon Brothers may not always be prepared to deal at the quoted Secondary Market prices for every debt does not necessarily mean that the prices are not accurate; there are several legitimate reasons for declining to trade in particular debts at certain times. For example, the list is only produced once per fortnight, and is thus quickly out of date. This does not affect the validity of using the list as a data source, provided that the prices were accurate at the time of publication. One would not expect an equities market-maker to deal at the price quoted in yesterday's newspaper. Also, as the market is unregulated there is no compulsion to make markets in any particular country's debts or any specific type of, unlike for example, in the UK Stock Exchange which imposes such conditions on market-makers. If an institution does not wish to change its current holdings of a particular country's obligations through dealing for any reason, it cannot be compelled to do so. Finally, the prices used in equity price analysis must be considered also indicative to some degree, because they would not apply to unusually large or small transactions.

In order to enhance their reputation it is in Salomon Brothers' interest to indicate prices as accurately as possible. Of course, this does not preclude their traders quoting different prices at the telephone to other dealers in order to test the strength or otherwise of demand, but these "prices" will not be recorded on the "Indicative Prices" list.
5.3.3. Logarithmic Transformation of Data

In the serial correlation and $\beta$ coefficient estimates detailed in this chapter, the natural logarithms of prices and the first difference of the logarithms of prices are used in preference to the absolute values. This is because (1) the absolute values of price changes are partly dependent upon the prevailing price level, but taking natural logarithms eliminates this effect [Moore, 1964], and (2) it may be shown easily (for example see Fama (1965)) that the change in the natural logarithm of prices over any given period is the yield (under continuous compounding) of a security.

5.3.4. Treatment of Accrued Interest

Accrued interest does not affect the quoted price of debt in the Secondary Market. Although the price of a debt obviously depends upon whether a debtor is expected to pay interest or not, any accrued interest is due on a pro-rata basis to the buyer or seller of debt. The buyer will refund the seller the interest due to him when the interest payment from the debtor is received. This method of interest refunds is completely different to the operation of bond markets, where interest is payable to the holder of a bond on the due date with the holder having no obligation to any previous holders. This means that for an institution taking a long position in the Secondary Market there will be a funding "pickup", i.e., interest earned over the period in which the position is outstanding. Conversely, with short positions there is a funding loss because the institution will have to pay interest to the buyer until it acquires the debt necessary to close the position.
5.3.5. Price Spreads

The prices quoted by Salomon Brothers are two-way bid and offer prices at the end of each fortnightly period. The spreads of prices, i.e., the difference between the bid and offer prices of the debt vary, depending upon the relative liquidity of the debt compared to other countries, the size of the deal, and the degree of homogeneity of the debt for a particular country. As stated above, the traded debt is owed to commercial banks by a variety of public and private sector borrowers. The perceived relative risks of these borrowers, the eligibility of the debt for conversion to equity (if at all) and the various conditions applicable under the original loan documentation and subsequent reschedulings (if any) will determine the exact price of a particular portion of debt at given levels of supply and demand. By comparison, the prices of company stocks quoted in the financial press relate to identical shares or classes of shares, and the exact price of any deal should depend only on the size of the transaction.

5.4. Test Results

5.4.1. Autocorrelation Tests

The autocorrelation coefficients, \( r_k \) (for lags \( k = 1-17 \) inclusive) of the first difference in the logarithm of prices were estimated for each country.
Table 5.1 details the coefficient at lag 1 ($r_1$), the empirically estimated standard error at lag 1 ($\hat{\sigma}$), the maximum autocorrelation coefficient ($r_{max}$) and the lag at which it occurs, and the number of lags which are significantly different from zero, i.e., $r_k$ greater than two standard errors where the standard error is given by:

$$\sigma_k = \sqrt{\frac{1}{N}(1+2\sum_{i=1}^{k-1} r_i)}$$  \hspace{1cm} \text{(5.1)}

Note that some RWM studies, such as that of Gandhi et al (1980) calculate autocorrelation coefficients by performing the regression:

$$D_{pt} = \alpha + \beta D_{pt-1}$$  \hspace{1cm} \text{(5.2)}

The estimated value $\hat{\beta}$ is identical to the autocorrelation coefficients calculated here except for a degrees of freedom correction.

Table 5.1 shows that most of the autocorrelation coefficients are not significantly different from zero, indicating that there is no persistence in price changes over time. Seven countries, however, do exhibit significantly non-zero coefficients. Three of the seven have significant values at lag 1: Brazil (0.386), Chile (0.311), and the Philippines (0.455). The other four countries vary, with Algeria's only significant value (0.438) at lag 4, Honduras's (-0.387) at lag 4, Mexico's (0.338) at lag 4 and Yugoslavia's (0.424) at lag 5. With the exception of Honduras, all the significant lags (and a large majority of the $r_{max}$ values) are positive. This indicates that for the countries with significant values, there is some evidence of positive autocorrelation, i.e., a tendency for price changes in one direction to be followed, after the appropriate lag, with further price changes in the same direction.
For trading purposes, significant autocorrelation coefficients at lag 1 are of the most interest to traders because they imply some degree of persistence in price changes which in theory could be exploited, permitting the trader to persistently beat the market in the four countries which exhibited this property. Also, there is no plausible intuitive explanation for significant coefficients at other lags and it is likely that they are due to random errors. Note that studies of stock markets [notably Cooper (1982)] have also found significant autocorrelations at lags other than one. However, the analysis of these results alone is not sufficient to draw firm conclusions, and further tests were performed to try to identify any possible misclassification.

5.4.2. Runs Tests

Runs Tests are non-parametric; they examine the number of sequences or "runs" of price changes (plus, minus, or no change) of the debt compared with the expected number from serially independent (random) price changes. The mean number of runs, $E(r)$ expected from a set of $N$ price changes is given by:

$$E(r) = \frac{[N(N+1) - \sum_{i=1}^{3} n_1^2]}{N}$$  \hspace{1cm} (5.3)

The variance is given by:

$$\text{Var}(r) = \frac{\sum_{i=1}^{3} n_1^2 (\sum_{i=1}^{3} n_1^2 + N(N+1)) - 2N\sum_{i=1}^{3} n_1^3 - N^3}{N^2(N-1)}$$  \hspace{1cm} (5.4)

Where $n_1$, $n_2$, $n_3$ are the total number of observed runs of positive, negative and zero price changes.

The test statistic, $Z$, is calculated by:
\[ Z = \frac{r - E(r) \pm 0.5}{\sqrt{\text{var}(r)}} \] (5.5)

Where \( r \) is the actual number of runs in the series. The distribution of \( Z \) is \( \text{N}(0,1) \) and hence the 10\% significance level (two-tailed test) is \( \pm 1.64 \) and the 5\% level is \( \pm 1.96 \). Note that when calculating the \( Z \) statistic Cooper (1982) makes an adjustment of -0.5 or +0.5 if \( r > E(r) \) or \( r < E(r) \) respectively. This is because a sequence of runs is discrete, but the normal distribution is continuous. Gandhi et al (1980) make no adjustment so for the sake of completeness both the adjusted and unadjusted \( Z \)-statistics are included here. The adjustment makes a difference in only three cases. The unadjusted \( Z \)-scores of Honduras and Mexico are significant at the 10\% level, but on an adjusted basis they are insignificant at this level. The \( Z \)-score of Yugoslavia was significant at 5\% on an unadjusted basis but this was reduced to significance only at the 10\% level when adjusted. Table 5.2 presents the results of the runs tests.

These results show that at the 5\% level (both adjusted and unadjusted) the sequence of price changes of the debt of Brazil, Chile, Ecuador, Panama, the Philippines and Venezuela were significantly different from a random series.

Whilst the degree of significance is not particularly high compared to those calculated for certain undeveloped stock markets, (Gandhi et al, 1980; Cooper, 1982) the results do indicate a degree of dependence for some of those countries which also had significant serial correlation coefficients in the previous test, namely Brazil, Chile, the Philippines and Venezuela. The \( Z \)-scores of these countries are negative, indicating that the actual number of runs observed, \( r \), was significantly less than...
the expected number of runs, E(r). This implies that price changes of the same sign are likely to follow each other in the markets for these countries' debts, as the positive autocorrelation coefficients in the previous test indicated. The other countries which had significant serial correlation coefficients have insignificant Z-score in this test, whilst Ecuador, Panama, Romania, and Senegal which had insignificant serial correlation coefficients all have significant Z-scores. These results illustrate the need, due to the low power of the individual tests, to perform several tests to obtain reliable overall results.

Dryden (1970) found some significant Z-scores in his analysis of UK share prices, but concluded that as the average difference between the actual and expected number of runs was only 10%, "there would seem, therefore, little reason for rejecting the simple random walk hypothesis". However, the percentage differences between the actual and expected number of runs for those countries with significant Z-scores and significant values for r₁ in the previous test are considerably larger than 10%, as Table 5.2 shows. At the extreme, both the Philippines and Venezuela had over 30% fewer runs than expected, whilst Brazil and Chile had 20.58% and 19.95% fewer respectively. Hence some of the debt in the Secondary Market appears to display far greater randomness than that apparently found in stock markets (notwithstanding the criticisms of many of the RW stock market analyses). This means that one could perhaps expect filter tests to show greater profitability in the Secondary Market than they have been shown to generate in stock markets.

A further analysis of runs tests data can be performed, by breaking down the total actual number of runs (A) into the expected number of each
type of run. The total actual number of runs is used rather than the total expected number of runs as the latter would tend to generate expected numbers of runs of each sign greater than the actual number (Fama, 1965).

The probability of obtaining a positive price change, \( P(+) \), in a sequence of \( N \) observed price changes is given by:

\[
P(+) = \frac{n_1}{N}
\]

Hence the probability of a run of positive price changes, \( P(\text{run}) \) is:

\[
P(\text{run}) = N \frac{P(+) [1 - P(+)]}{E(r)}
\]

So, the expected number of positive runs, \( E(\text{run}) \) from the actual total number of runs is:

\[
E(\text{run}) = R \frac{P(\text{run})}{E(r)}
\]

and

\[
E = E(\text{run}) + E(\text{-run}) + E(0 \text{ run})
\]

Where \( E(\text{- run}) \) and \( E(0 \text{ run}) \) are calculated similarly (Fama, 1965).

Table 5.3 shows that four countries (Brazil, Chile, the Philippines and Venezuela) have at least one absolute difference, \( |A-E| \), greater than twice the mean absolute difference for that particular type of run. This is not the case with any of the other countries (except "No change" runs for Costa Rica) including those which had significant Z-scores in the basic Runs Test. Note that the first three of these countries have significantly non-zero autocorrelation coefficients at lag 1 and significantly non-random sequences of runs in the basic runs test.

The evidence of the Runs Tests thus appears to confirm the results of the autocorrelation test for Brazil, Chile, and the Philippines, and appears to strongly contradict the results of that test for Algeria, the
Dominican Republic, Venezuela and Yugoslavia. The basic runs test implies that the prices of the debt of Ecuador, Panama, and Senegal behave in a non-random fashion, but further analysis of the types of runs cast doubt on this.

The apparently strong evidence of the runs tests must not be taken as conclusive alone. As Fama (1965, p.80) states: "...runs tests are much too rigid in their approach... In particular, a run is terminated whenever there is a change in sign in the sequence of price changes, regardless of the size of the price change." There is good evidence, however, from the Serial Correlation and Runs tests of exploitable dependence in the price changes of four countries' debts.

5.5. The Application of Filter Systems to the Secondary Market

The operation of a filter system is fairly straightforward. When a filter system is applied to positively serially correlated prices, as may be the case with some of the debts traded in the Secondary Market, a price rise of the required magnitude, $x\%$, will trigger a purchase of a unit of the debt. The size of the unit obviously does not affect the percentage yield obtained from the system.

The debt is then held until the price falls by $x\%$ from the high achieved since the purchase. This prevents a gradual reduction in the trader's capital by consecutive falls of less than $x\%$, none of which would individually trigger a sale of the debt. When a cumulative price fall of the necessary size is observed, the trader will sell his holding and immediately go short. This new position will be maintained until a
cumulative price rise of $\geq x\%$ is noted, when the short position will be closed and a long position taken again.

5.5.1. Time Constraints on Filter Systems

When operating a "pure" filter rule trading system the trader is continually switching between long and short positions - he is never without a position in the market. However this is not always the case when there is a limit on the duration of positions as discussed above. The replies to the survey detailed in Chapter Three and subsequent conversations with Secondary Market traders led to the conclusion that positions with a maximum duration of one month would be appropriate for testing filter systems in the market. So, if a position is outstanding after one month then the trader must terminate the position at the current price. In this situation the next price change is measured from the mid-price at which the position was closed.

This assumption means that in the Secondary Market the basic filter rule strategy of continually switching from short to long positions frequently does not hold. For example during a sequence of price falls over a six-month period followed by a sharp rise, a trader with no constraints on the duration of his original short position would merely hold that position until the price rose in the seventh month. However with the time limit in operation the trader would have to close the position at the end of each month, then either take a new short position if the last price fall was greater than $x\%$, or wait until such a cumulative price change occurred. Hence the trader may take up consecutive identical positions, a situation which cannot arise in unconstrained filter systems.

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If the final position in the full system is left open it is excluded from the yield calculations as the profit/loss from the position is indeterminate.

Now, according to Dryden (1969) the daily rate of return, \( r \), for any transaction is given by:

\[
p_0(1 + r)^N = p_0 + I \tag{5.9}
\]

where \( p_0 \) (cents) is the initial price of the transaction, \( I \) is \( p_1 - p_0 \) for long transactions and \( p_0 - p_1 \) for short transactions where \( p_1 \) is the closing price, and \( N \) is the duration of the position in trading days (that is, excluding weekends).

This formulation, however, ignores the cost of funding an open position. Academic literature on filter tests has ignored funding costs, presumably because the sum of the durations of individual positions in a pure filter system is equal to the period for which a stock is assumed to be held under the Buy and hold strategy (because the trader is always holding a position). Hence the funding costs of the filter system and Buy and hold are of the same order and can be ignored in comparative calculations. With the time-constrained filter system used here, however, this assumption is no longer valid because there are periods when no position is held, so the sum of the durations of individual positions is less than the duration of the Buy and hold position.

Consider the question of the funding cost of a long position. If the debtor is currently paying interest on its debts then an institution holding a long position will receive interest on the full face value of
the debt for the duration of the position and will thus have a negative funding cost, \( F \), because the cost of the capital used to purchase the debt will be less than the interest paid by the debtor as the debt is bought for considerably less than its face value. The funding gain (in Dollars) on a single unit of debt is given by:

\[
F = \text{funding of purchase price} - \text{interest received on debt}
\]

\[
= \frac{100[(1-d)\text{ifn} - \text{irn}]}{360}
\] (5.10)

where \( \text{ir} \) is the interest rate (expressed as a fraction) paid on the loan, \( \text{if} \) is the rate at which the bank funds its position, \( d \) is the discount (expressed as a fraction) to face value at which the debt is traded, and \( n \) is the number of days (including weekends) for which the position is open. It is assumed there are 360 days in a year for the purpose of interest calculations.

Recalling that the price at which the debt is purchased is denoted as \( p_0 \) cents, it is obvious that:

\[
p_0 = 100(1-d)
\]

\[
\therefore \quad \frac{p_0}{100} = 1-d
\] (5.11)

Substituting (5.11) into (5.10) gives:

\[
F = \frac{n(p_0\text{if} - 100\text{ir})}{360}
\] (5.12)

The original form of the yield calculation can now be amended by substituting for \( I \) and \( F \):
which gives

\[ r = \frac{N}{N} \left\{ \frac{P_1}{P_0} \cdot \frac{n(p_0i_f - 100i_r)}{360p_0} \right\} - 1 \]

If the debtor is not currently paying interest then the bank will incur an immediate funding loss because there will be no compensating payment to cover the cost of funding the purchase price of the debt. However, when a debtor country receives New Money it will be used to bring interest payments up to date, so the funding loss will be made good. Hence equation (5.13) can also be used for a debtor who is not paying interest.

If an institution takes a short position it will have to pay interest to the buyer of the debt until it acquires the debt necessary to close the position. Hence the funding cost in this case is the interest earned on the funds received from the buyer less the interest which the bank must pay to that buyer. As the latter is calculated on the face value of the debt, this cost may be considerable. For a single unit of debt:

\[ F = \frac{100n[i_r - (1-d)i_f]}{360} \]

Replacing (1-d) with \( P_0/100 \) and substituting into the original form of the yield equation gives:

\[ r = \frac{N}{N} \left\{ \frac{2}{P_0} \cdot \frac{n(100i_r - P_0i_f)}{360p_0} \right\} - 1 \]

(5.15)
Even if the debtor is not currently paying interest it is prudent to include the cost of refunding interest to the buyer of the debt on the assumption that the interest due will eventually be paid.

Now, if the application of the filter system indicates that a total of \( T \) transactions with individual rates of return \( r_1, r_2, \ldots, r_T \) are necessary then the overall rate of return, \( r_0 \), can be calculated from:

\[
(1 + r_0)^S - \prod_{i=1}^{T} (1 + r_i)^{N_i}
\]

(5.16)

where \( S \) is the sum of the \( N_i \)s. Assuming a trading year of 260 days, then multiplying \( r_0 \) by 260 gives the annualised yield from the transactions. This rate is then compared with the rate, \( r_{bh} \), achieved using Buy and hold, calculated thus:

\[
P_b(1 + r_{bh})^B - P_S
\]

(5.17)

where \( P_b \) is the initial price of the first transaction, \( P_S \) is the closing price of the final completed transaction and \( B \) is the number of trading days between these two prices. As before the rate thus calculated is annualised to facilitate meaningful comparison.

5.5.2. Implications of Inclusion of Funding Costs

Although the inclusion of estimated funding costs in filter tests makes the assessment of filter profitability more realistic, the assumptions required to calculate funding costs may introduce a new bias against profitability. In the case of a short position, the funding cost is the difference between the interest earned on the sale proceeds and the contractual interest on the debt, which is due to be paid by the short
position-taker to the purchaser. The latter sum, however, is likely to be significantly less than the contractual interest due (especially in present value terms), because of the rescheduling of interest payments. Indeed this must be the case when debt trades at a discount, because the existence of a market discount reflects the expectation that interest payments will not be paid in accordance with the original schedule. So, in the case of a short position, the funding cost calculation used here will bias the calculation against profitability.

Conversely, in the case of long positions, where the position-taker is assumed to receive full contractual interest on the debt he holds, the bias in the filter tests presented here is in favour of profitability. Note also that the exclusion of any explicit allowance for the risks of liability for New Money whilst holding a long position increases further the profitability bias.

In a market where, over time, prices fluctuate about a mean value (such as the markets in the debts of creditworthy governments), the biases identified above could be assumed to be roughly equal and opposite. (In the long term, the New Money risk is small compared to the interest cost component of the bias.) In the LDC debt markets, however, especially in the period investigated in this study, such an assumption is invalid because, as was described in Chapter Two, prices have tended to trend downwards. Accordingly, the filter tests will generate more short positions, which are biased against recording profitability, than long ones, which are biased in favour of profitability. The net bias in the filter tests described in this chapter is therefore against profitability.
5.5.3 Filter Sizes and Price Adjustments

For the fortnightly data, filters ranging in size from 4% to 10% were used in order to identify the best performing size of filter for each country and to see if there was any systematic link between filter size and performance in all countries. Filters as low as 0.1% have been tested in work on stock markets, but such small price changes are not accurately recorded in the data used here and so using smaller filters could give seriously misleading results.

To allow for transactions costs and the indicative nature of the prices, the offer prices quoted were adjusted upward by 0.5% and the bid prices adjusted downward by 0.5%. Whilst this is obviously not accurate given that transactions costs differ widely depending upon the type of deal, the legal complexity, whether or not a broker is used as well as several other factors, it is hoped that such adjustments are at least of the correct order.

5.6 Filter Test Results

5.6.1 Filter Performance Compared to Buy and Hold

A BASIC computer program (listed in Appendix IV) was written to perform the filter tests, with the filter sizes being specified by the user. The program includes the values of Dollar Libor over the relevant period, so that reasonably accurate funding costs and interest receipts could be accounted for. A margin of 1% over Libor was assumed for each debt over the whole period. Whilst this is not accurate for all
countries, it is a close approximation for most and is certainly of the correct order for the others.

Filters of $\%$ and 1-10% inclusive were tested. Table 5.4 presents the results of all the filter tests performed, as well as the relevant Buy and hold rate of return for comparative purposes. All countries except Bolivia, Costa Rica, the Dominican Republic, Honduras, Jamaica, Nigeria, Peru, Senegal and Zaire had at least one filter size which generated a return in excess of Buy and hold. This result alone is not sufficient to draw any conclusions, so further analysis is necessary. It is reasonable to assume that where only one or two filter sizes beat Buy and hold that the result is due to random errors, whilst we are interested in systematic out-performance. This means that the results for Algeria and Mexico may be discounted, as in both cases only one filter size, 10% for Algeria and 1% for Mexico, out-performed Buy and hold. For most of the other countries there were at least five filters which out-performed Buy and hold, with Yugoslavia being the exception, with four. In most cases, the filters which out-performed Buy and hold are grouped together; for example for Argentina the filters from $\%$ to 5% inclusive beat Buy and hold and with Poland the filters from 5% to 10% inclusive were successful. For Ecuador, the Cote d'Ivoire and the Philippines, all the filters beat Buy and hold. The only countries which did not conform to the pattern were Chile, where the successful filters were the 3-10% excluding the 5%, and Panama where the 4-2% and 5-6% filters inclusive beat Buy and hold. These gaps in the sequences, however, are probably not significant given that in both cases the unsuccessful filters were only marginally so and that the filter technique cannot be exact due to the approximations made. This
"bunching" or "sequencing" of successful filters is evidence of systematic out-performance.

It is useful next to compare these initial filter test results with the evidence of the autocorrelation coefficients and the runs tests. The three countries which had significant non-zero autocorrelation coefficients at lag one and which had strong evidence of non-randomness in the runs tests were Brazil, Chile and the Philippines. The filters tests applied to these three countries generated evidence of systematic out-performance of Buy and hold. The basic runs tests also implied non-randomness for Ecuador, Panama and Senegal, none of which had significant non-zero autocorrelation coefficients. However, the filter tests for these three countries indicated outperformance of Buy and hold by all filter sizes for Ecuador, five outperforming filters for Panama, but none for Senegal. Using LeRoy's limit definition of inefficiency (i.e., the existence of a successful trading system) this seems to imply that the basic runs test result for Senegal was subject to a Type I error, but that the insignificant autocorrelation coefficients for Ecuador and Panama constitute a Type II error.

So far we have defined "outperformance" as merely beating Buy and hold, with no regard for the actual return which is generated by the filter in question. From a practical point of view there is little point in operating a filter system which generates losses even if does beat Buy and hold. In such markets an institution holding the debt would be better advised to sell it at the first opportunity and to reinvest the proceeds in the money markets! So, now consider the countries where the filter beat Buy and hold and also generated a positive return. The relevant countries are now Brazil, Chile, Colombia, Ecuador, Morocco,
the Philippines, Poland, Uruguay and Venezuela. Of these, Ecuador has only one filter (7%) which meets the new extended definition of "successful" and thus can probably be ignored. The other countries, however, have at least four successful filters and all are in unbroken sequences.

For Brazil, the successful filters are 4.6% inclusive, with profits ranging from 7.0% (4% filter) to 33.1% (3% filter). With a Buy and hold return of -30.8% the filter system is a good bet. The profits for Chile (6-10% filters inclusive are successful) are smaller, ranging from 2.3% for the 6% and 7% filters, up to 16.4% for the 8% and 9% filters. The Buy and hold return was -1.0% so there would probably be little difference in reality between Buy and hold and a filter system with Chile if one considers the unavoidable approximations made in the system. The principal explanation of the relatively poor performance of the filters in the Chilean debt market is that the debt has had a considerably more stable price in the market than the other countries examined here, with a fall of only 11.4% between January 1987 and June 1989 compared to a 55.9% reduction for Brazil. This means that there were fewer potentially profitable transactions in Chilean debt during this period - for example, the 2% filter generated 18 transactions compared to 23 for Brazil. Note that each purchase and subsequent sale counts as one transaction.

In the case of Colombia, the 5-10% filters inclusive outperformed Buy and hold, with a maximum return of 34.6% reached by the 10% filter compared to a Buy and hold return of -15.7%. The Buy and hold return, for Morocco, at -16.0% is similar to Colombia's, but its filters are
more profitable with successes from the 3-10% filters inclusive, and a maximum return of 43.3% with the 7-10% filters inclusive.

Of all the countries examined, the filter system as applied to the Philippines generated the greatest profits. All the filters except the 4% generated profits, ranging from 10.7% for the 1% filter to 90.4% for the 6%, compared to a Buy and hold return of -12.9%. In Poland's case, the 5.4% Buy and hold return was beaten and a profit achieved by the 5-10% filters inclusive. The best return was 49.9% from the 5% filter, with all of the others returning 29.0%. With Uruguay, the filters from 3-10% inclusive were successful, generating profits from 2.0% for the 3% filter to 29.0% for the 6-10% filters inclusive, compared to -6.7% for Buy and hold. Finally, the Venezuelan filters from 4-3% inclusive generated profits from 14.2% (3% filter) to 17.7% (4% filter) compared to a Buy and hold return of -25.4%.

5.6.2. Number and Distribution of Successful Filters

Table 5.5 breaks down the overall returns for the eight countries for which the filter system generated sequences of transactions which beat Buy and hold and which generated absolute profits into the total number of transactions and the number of individual transactions in the sequence which generated a profit or a loss. As the table shows, in many cases there were more loss-making transactions than profitable ones. However, on average the profitable transactions offset the losses to such an extent that an overall profit was generated.

The actual numbers of transactions are important to any institution which may consider using a filter or other such system for trading. For
all of the countries except Brazil, the Philippines and Venezuela, there were fewer than ten transactions generated over the whole two-and-a-half years examined. Indeed, for most of the filter sizes for the other countries there were three or less transactions. Whilst this may be acceptable for small operations, a bank which wishes to establish a significant presence in the market cannot afford to be so selective. This means that for practical purposes a filter system will not be of use except in the cases of Brazil, the Philippines and Venezuela. The only way to operate a filter system for the other countries would involve recording price data on a daily basis and examining it in the same way as the fortnightly data in this chapter was analysed, and then applying the filter system in the market. The problem with this method would be that the only way to obtain accurate price data on a daily basis is to record the price at which deals are actually struck, which is most unlikely to be practical. The only other way would be to contact one of the major players in the market on a daily basis. However, one would not know if the price quoted was accurate and would obtain for actual deals, or if the market-maker was merely "testing the water" and would not necessarily deal at that price.

An institution which did decide to operate a filter system for any country would be faced with the problem of choosing the size of filter to use. There is no guarantee that the best performing filter over a previous period will be the most successful over a subsequent period. Table 5.6 lists the frequency with which each filter size was the best absolute performer for each country, including those for which the filter did not beat Buy and hold. The fractions arise because several countries had joint best performing filters. For example, for Bolivia
the 5-9% filters inclusive were the best performing, so each is awarded 0.2 "points".

Given the dearth of transactions for 10% filters, which have the greatest number of best performing filters, it would seem reasonable to choose the 5% or 6% filter size.

As well as the problems discussed above, the user of filter tests must also consider the following caveats:

- The results obtained are only valid over fairly long periods, say a couple of years at least. As is shown above, many of the individual deals triggered by the filters would have generated losses, which the institution must be prepared to carry if the rules are to work in the long run.

- The risk of incurring a liability for New Honey must be considered by the trader.

- Price data must be continually re-analysed as it becomes available in order to check that the relevant markets remain inefficient.

In practice, it seems most unlikely that filter trading rules have been used to any great extent in the LDC debt market, at least during the period examined here. The markets has trended downwards almost continuously, which should in theory tempt market operators to try to go short. This would be a self-fulfilling process, because as market operators tried to go short but found no buyers (because everyone wants to sell), they would become more convinced that short positions were appropriate and would therefore offer the debt even more cheaply, and so on. Yet the data shows the existence of apparently profitable filter
rules based on short position-taking. This suggests either that the markets genuinely lacked the necessary liquidity to facilitate aggressive shorting, or that market participants believed this to be the case. No trader, however sure he is of the logic behind a particular position, will take that position if he thinks it likely that he will be unable to unwind it when he chooses.

5.7. Conclusion

It is difficult to draw firm conclusions from the results of the tests performed in this chapter. If we were to follow the interpretation of the results of the autocorrelation coefficients, runs tests and filter tests advocated by Fama, then we could draw the unambiguous conclusion that the markets in the debts of Brazil, Chile and the Philippines are inefficient. We have argued in the previous chapter, however, that Fama's interpretation of these tests is flawed and that, with the exception of the filter tests, they are not appropriate as tests of "efficiency". As LeRoy (1989) observes:

"In the limit, the doctrine of capital market efficiency contains the assertion that individuals do not in fact have different comparative advantages in information acquisition. In such a world there are no profitable trading rules." (p.1584).

Assuming that "profitable" in the above statement means a higher return than Buy and hold and not necessarily an absolute cash profit, then if we take the filter system examined in this chapter as a starting point, 13 of the 24 countries under consideration have an inefficient market in their debt. This result contradicts the earlier tests, where there were far fewer significant results, and is all the more remarkable in the
light of the bias against profitability inherent in the tests used here and described in section 5.5.2 above.

It is noticeable, however, that there was marked consistency across the tests, with Brazil, Chile and the Philippines having significant autocorrelation coefficients, significant runs test scores, as well as beating Buy and hold in the filter system. As well as this test result consistency, these countries' debt markets are characterised by relatively high liquidity and large information flows. Conversely, other countries, such as Peru, with a relatively illiquid market and limited information flows, exhibit no signs of inefficiency or tradeable mis-pricing. This would appear to confound the conventional wisdom that although liquidity is not necessarily essential for efficiency, it helps.

A possible explanation for this centres on the availability of information, the regulatory constraints applied to market participants. Most of the countries with illiquid markets in their debt are small, and in often there is little "hard" news available upon which market participants can base their pricing judgements. Accordingly, in a given time period market participants receive relatively few price-changing pieces of information, and hence these markets exhibit lower price volatility. Contrast this with the vast quantity of news, often conflicting, that emerges on a daily basis from countries such as Brazil. It seems inevitable that not all market participants will interpret a single piece of information in the same way, if indeed they are all working from the same sources. This confusion could easily result in short-term mis-pricing. Additionally, differences in the levels of provisioning, accounting treatments, and even the political
environment across countries, may have prevented banks from performing profitable trades which, in an unregulated environment, they would have chosen to execute. This is more likely to be true of the more liquid debt markets because, by definition, the banks' holdings of these debts are larger. Hence the balance sheet consequences of (say) selling a portion of debt from a large holding, below its book value, would be much larger than trading in debt where the total holding is small. If this explanation is correct, then future researchers using more recent price data should find fewer exploitable trading opportunities because banks have now made much larger provisions and their ability to trade is therefore larger. Note, however, that even though this explanation seems reasonable, it is not complete. It does not explain how, for example, Mexico's debt market - the largest of all - had no exploitable trading opportunities over the period examined.

Whether the application of the filter system would result in consistent profits in reality would depend upon any overall drift in prices and the level of transactions costs in the market. The situation is further complicated because of the heterogeneous nature of the debt. It is possible that trading rules which could be profitable in one type of debt would not work for another type of debt of the same country. The relatively small sample size must also be borne in mind.

It may be then, that if the filter system is a reliable indicator of efficiency, then these results confirm the low power of the other tests. They did not consistently give significant results for the other countries which the filter system identified as "inefficient". If this interpretation of the results is correct, it may help reconcile the differences between the variance bounds tests on stock market data,
which seem to indicate excess volatility in prices, and the earlier RW studies which mostly indicated "efficiency". Most of the RW studies rely on autocorrelation coefficients and runs tests or spectral analysis. If the first two of these tests have low power, as our results seems to imply, it is not surprising that they regularly indicated "efficiency". Perhaps the followers of the RWM should turn their attention to trading systems again.

Finally, the results reported in this chapter suggest that great care must be taken in choosing the prices or "exchange rates" at which loan/bond swaps take place. It may be that these prices are not appropriate as indicators of relative economic strength.
Table 5.1: Autocorrelation Coefficients

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<tr>
<th>Country</th>
<th>N</th>
<th>$r_1$</th>
<th>$\sigma_l$</th>
<th>$r_{max}$</th>
<th>at lag no.</th>
<th>No. of significantly non-zero coefficients</th>
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<td>Algeria</td>
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** Significant at the 5% level.
* Significant at the 10% level.
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Table 5.5: Transactions Analysis for Profitable Filters

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N/A - Not Applicable as filter failed to outperform Buy and Hold and/or did not generate a profit.
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"In a sense, the Brady Initiative was born out of the secondary market in bank loans." [Financial Times, 19 December 1989]

6.1. Introduction

This chapter sets out some of the recent developments in the theory of market-based debt reduction. It then goes on to examine the ideas and implications of the Brady Initiative in the light of this discussion, and a more general discussion of the political economy of the Initiative is also presented. This Chapter thus provides the background to and the framework of the case studies presented in Chapter Seven.

6.2. Market-Based Debt Reduction in Theory: A Cure for Debtors' Ills?

In the context of the LDC debt crisis, "debt reduction" is defined by Sachs (1990) as "a restructuring of the debt contract which leads to a reduction in the present value of payments due". Our interest here is primarily in "market-based" debt reduction, in which the reduction of the present value of payments due is effected through either direct market purchases of portions of the debt stock, or various exchanges of portions of debt for new instruments, with the exchange rates between the loans and the new instruments determined with reference to the market value of the pre-existing stock of debt. Alternatively, the
exchange of loans for new instruments may be on a one-for-one (par) basis, as was the case with one of the elements of the Mexican Brady deal (see Chapter Seven for details), in which case the reduction in the present value of the payments due is achieved by the new instruments carrying a lower rate of interest than applied to the loans.

One of the earliest, most influential and lucid papers to consider the implications of the (then) new ideas of market-based debt reduction was Krugman (1988). It is worth reviewing this paper in some detail because of the importance of the conclusions stemming from it.

Before considering the implications of market-based debt reduction, Krugman debunked several common fallacies surrounding the previous strategy for the management of problem debtors by commercial creditors, that is, involuntary lending under terms agreed by a committee of the leading creditors.

Firstly, consider the oft-repeated view that a distinction must be made between solvency (the expected ability to be able to repay the stock of debt eventually) and liquidity (the current ability to service the debt). The conventional argument runs that if a country is considered solvent but lacks liquidity, involuntary lending can be beneficial to creditors (because it can enhance their chance of eventual repayment) and to the debtors (because it can allow them to continue to function normally and thus to earn the liquid funds with which to repay the debt). If, however, a country is known to be solvent, then rational banks should be prepared to lend on a purely voluntary basis, thus curing the liquidity problem. This obviously was not happening. Clearly, then, countries which require involuntary lending are insolvent
to the extent that "...the expected present value of repayment is less than the debt already outstanding" (p. 4.) The reason why creditors can still be persuaded to lend more in such circumstances is essentially negative - if the creditors do not lend, they definitely cannot be fully repaid, but if they do lend, they might be repaid sometime in the future. Provided that by lending more they can increase their chance of overall repayment such that the expected value of future repayments rises by more than the nominal increase in their exposure, it is in a creditors' interest to lend.

A logical extension of the above argument reveals why another commonly held view, that the existence of the Secondary Market in which loans trade at a discount means that any new lending would be against the interests of a creditor, can also be fallacious. Provided that the market discount is closely related to the creditor's view of the probability of expected repayment and can be reduced by new lending in the same way and to the same effect as described above, then new lending can benefit an existing creditor. The existence of a discount (implied or explicit in the form of a Secondary Market price) means, however, that there is no incentive for anyone other than an existing creditor to lend, because a new creditor by definition has no existing stock of claims on the country whose chance of full repayment can be improved. In these circumstances, any new loans will immediately be worth less than their nominal value and it would therefore be irrational to grant them.

There is, however, a potential flaw in this argument. If a bank is operating under severe capital constraints, it may not be able to lend even to debtors which it considers solvent and to which it would like to lend. This situation is of course referred to as a "credit crunch" and
there is considerable anecdotal support for the view that this was the situation in the United States' recession. Under such conditions it cannot be held that the lack of new lending to a debtor means that, per se, it is insolvent. It should be pointed out, however, that this problem was not an issue at the time Krugman's paper was published (May 1988) and does not detract from the central arguments.

The rationale for any form of debt reduction (rather than the reduction of the servicing burden) is, in Krugman's view, a simple one. He argues that if the debt of a country is so great that it is unlikely to be able to repay it, then the debt has the same effect on that country as do extremely high marginal tax rates on individual's - they act as a disincentive to economic performance. Why should a country seek to improve its economy if, for the foreseeable future, the benefits from better performance will accrue almost entirely to foreigners? Krugman also argues that "...the burden of the national debt will fall on domestic residents through taxation, and importantly through taxation of capital; so the overhang of debt acts as a disincentive to investment."

The implication of the idea that a larger stock of debt means a lower probability of repayment is that reduction in that stock can increase that probability (to such an extent that the total repayment is greater than it would otherwise have been). This is the reverse of the earlier argument that creditors may be able to improve their expected repayment by increasing their lending and thus the country's stock of debt. Squaring this circle is not difficult: there clearly must be a point where the stock of debt is such that a marginal increase in it will neither increase nor reduce the expected payments. At any stock of debt above this, the expected repayment is lower and is reduced further by
Figure 6.1 - Debt Relief Laffer curve
additions to the debt (because of the disincentive effect of excessive debt); at any level of debt below it the expected repayment is also reduced (because of the increased probability of repayment is not sufficient to offset the fact that the new stock of debt is lower). Clearly, graphical representation of the above results in a curve as shown in Figure 6.1. The turning point of the curve is the optimum position from the point of view of the creditor seeking to maximise repayment. Krugman refers to this curve as the Debt Relief Laffer Curve (DRLC). Where the DRLC touches the 45 degree line on the graph this indicates that the stock of debt is low enough that full repayment is expected (that is, the expected value of repayments is equal to the stock of debt). At other points on the curve, the slope of a ray drawn from the origin to the curve indicates the approximate theoretical Secondary Market price.

Although Krugman does not point it out, a brief examination of the properties of the DRLC reveals that it is possible that by lending more (moving from point A to point B, say) can increase the creditor's expected value of repayment and depress the Secondary Market price at the same time. This is because the increase in the supply of debt to the market is not fully offset by the increased probability of repayment in aggregate. Krugman concentrates on the more important point for our purposes, that by reducing the stock of debt from a point beyond the maximum point of the DRLC, creditors can both increase their expected repayment and push up the Secondary Market price. This is of fundamental importance, because the natural instinct of bankers is not to accept the possibility of less than 100% repayment. Krugman suggested, however, that that was exactly what rational creditors should do, in some circumstances. By collectively reducing the stock of debt,
creditors can increase their expected total repayments. This analysis demonstrates the benefits from joint action, but does not solve the free-rider problem, because any creditor not prepared to offer up debt for cancellation will be left, after the reduction, with the same stock of debt as before, but with a higher expected probability of repayment. There remains an incentive not to participate in the debt reduction. As we argue below, this difficulty was addressed by the Brady Initiative.

While Krugman admits that the practical applicability of the DRLC is limited because for the major debtors it is a matter of opinion as to which side of the curve they are at (though for the small, massively indebted countries there is little doubt), the analysis does show that debt reduction can benefit both debtors and creditors.

The mathematics of the analysis are straightforward. Assume a country has liabilities of $D$ (Krugman's symbols are used), which it would pay in full in the "good" economic state, which has a probability of $P_G$. In the "bad" state, it will pay all it can, using its foreign exchange reserves, $R$, and current account surplus $l$, $F_B$. Hence the expected total repayment $ET$ is given by:

$$ET = P_GD + (1-P_G)(R + F_B) \quad (6.1)$$

Consider a reduction $\delta D$ in the external debt:

$$\delta ET/\delta D = P_G - P_G(D - R - F_B) \quad (6.2)$$

1. Krugman refers only to the trade surplus, but there is no reason why invisible overseas earnings cannot also be used to service debt.
Clearly, from (6.2) above, a reduction in the external debt will increase the total expected repayment if and only if:

\[ P_G - P_G(D - R - F_B) > 0 \]  

(6.3)

The interpretation of condition (6.3) is that for debt reduction to benefit creditors by increasing their expected repayment, it is necessary for the incentive effects of the debt reduction to offset the reduction in the repayments that would be made under the good state (because in the good state all debt is repaid, but of course the stock of debt has been reduced).

On the basis of the above, Krugman argues that for creditors to benefit from the elements of Brady Initiative agreements the debtor must be on the right of its DRLC. Although we are more concerned here with debtors, it is worth pointing out that this means that buybacks and securitisation (swaps of loans for bonds, of various kinds, as discussed in detail in Chapter Seven) are not significantly different from the previous strategy of committee-based new syndicated lending. If the debtor country is not on the right of its DRLC, such elaborate schemes are pointless.

This conclusion does of course assume that creditors use this logic when deciding on their actions - it may be that buybacks (or other forms of debt reduction) are to be preferred for other reasons. For example, it could be that a bank would difficult to justify to its shareholders new lending that would increase its exposure, whatever the academic arguments may indicate to the contrary. It may also be politically necessary for banks to be seen to be doing something to speed the
resolution of the debt problem, even if in practice this is not the case.

The final issue discussed by Krugman is the question of the benefits (or otherwise) of debt-equity swaps. Although debt-equity swaps are not included in the Brady Initiative deals agreed so far, (and nor are they likely to be because their nature is such that they are usually agreements between only one creditor and counterparty in the debtor country, rather than collective agreements like the Brady deals) it is worth considering Krugman's analysis because he concentrates on the implications of debt-equity for debtors rather than creditors, and also because a general commitment to debt-equity has been a feature of Brady discussions.

In fact, Krugman is scathing on the question of the effects of debt-equity, for several reasons. Firstly, he argues that they provide no new capital, as the funds are provided in the first instance by the cancellation of some of the country's existing debt. Secondly, the existence of debt-equity can lead to the problem of "round-tripping", whereby the investor who has swapped debt for equity then sells the equity and repatriates the proceeds. In this instance the net effect of the swap is that the country's foreign exchange reserves have been used to finance a buyback (because the investor will sell the proceeds of the sale of the equity for foreign currency)². Thirdly, there is the well-

². Though note that in any swap that is not additional to investment that would have been made anyway, the debt-equity swap will always represent a net foreign exchange cost in terms of foreign exchange revenue foregone. This is because the investor would, in the absence of the swap, have bought the debtor country's domestic currency from the Central Bank in exchange for foreign domestic currency. With the swap, he merely presents some of the country's pre-existing foreign currency debt to the Central Bank in exchange for domestic currency.
known argument that debt-equity swaps may be inflationary because they require the issuance of domestic currency to the investor in exchange for the debt he presents to the authorities. To the extent that this increase in the domestic money supply is not sterilised by the issuance of new domestic debt (which may aggravate the budgetary problems of many debtor countries and which effectively means that external debt is replaced with (often more expensive) domestic debt), then the swap can be inflationary. Krugman does concede that debt-equity swaps can affect the timing of the repayment of external debt, because equity investments will almost always take longer to generate a return to the investor than does loan investment, but he argues that this is only relevant in cases where the investment is genuinely additional.

Krugman's conclusions are, for the most part, unsupportive of market-based debt-reduction:

"...market-based debt reduction cannot serve as an alternative to the orthodox strategy of rescheduling and concerted lending. Schemes that benefit the debtor at the expense of the creditor - such as buybacks and securitization for countries not on the wrong side of the DRLC - will be opposed by existing creditors when they become more than marginal. Schemes that benefit the creditors at the expense of the debtor - such as debt-equity swaps that fail to capture the secondary discount, while allowing firms to make investments they would have made in any case - will be opposed by the debtors as their effects become clear." (pp27-8.)

There are two counter-arguments points to be made against these conclusions. The first has already been made - that banks (and governments) which face strong public opinion are under intense pressure to be seen to be acting, even if their actions are not necessarily optimal. Secondly, Krugman dismisses the inability of ascertaining definitely if a country is on the right of its DRLC and thus if any form of mutually beneficial debt reduction is possible. In the defence of
the Brady Initiative one could argue that at least those who devised it made an implicit assumption that the countries concerned are in this position, and so it could be mutually beneficial. To have not attempted to tackle the problem simply because there was no way of answering the question regarding positions on the DRLC seems to constitute unnecessary defeatism, but it does seem to be Krugman's implicit conclusion.

Some other authors, however, are even less convinced of the value of market-based debt reduction than Krugman. For example, Bulow and Rogoff (1990) argue that "the basic problem is that the value to a highly indebted country of retiring a marginal dollar of its debt is generally far less than its market [that is, its average] price." In other words, if a debtor cannot reduce its stock of debt to levels that it would be able to repay, then "...all that will happen is that the price of its remaining debt will rise." Hence "...the basic conclusion [is] that open-market buybacks dissipate resources. This conclusion generalises to all forms of open-market repurchases including debt-for-equity swaps". It is essential to note that Bulow and Rogoff are concerned here with the process of unofficial or "piecemeal" market-based debt reduction, rather than the Brady Initiative approach involving the vast bulk of a countries' bank debts. As they point out, the problem with the piecemeal approach, where the debtor deals directly with one (or a group) of creditors is that the cost to the debtor of reducing the debt at the margin (the market price) is higher than the benefit accruing to the debtor as a result of the debt reduction. There is a further difficulty with piecemeal debt reduction, because creditors know that the price of the debt will be higher after a limited buyback than before. So creditors who participate in, for example, limited buybacks not only surrender their hope of complete repayment (that is, they lose
their option value on the old debt), they also see the price of the debt rising after they have sold it. This problem is insoluble in the context of piecemeal debt reduction; it can only be addressed by comprehensive schemes which remove the ability of certain creditors to free-ride. One of the aims of the Brady Initiative was to achieve this by requiring agreement from all creditors, before the multilateral resources necessary to execute the deal would be provided.

The key implication of Bulow and Rogoff’s assessment is that private creditors should not benefit from officially-inspired debt reduction schemes, and that, although they would be free to do so, "...we suspect that few debtors would divert substantial resources to debt reduction." As a result, "...most of the private debt would be left hanging."

The pessimistic views set out so far are not, however, universally shared. Helpman (1989), for example, argues that "...debtors gain from debt reduction. Creditors lose when debt reduction depresses investment. But creditors may lose or gain when debt relief stimulates investment." It is important to note before discussing Helpman’s results in detail that the mechanism through which debt reduction may depress investment is as follows. Debt reduction will increase the Secondary Market price of debt, thereby making inward investment through the medium of debt-equity swaps more expensive. Debt reduction may therefore be considered as a tax on inward investment, which will reduce the value of such investment. Assuming that investment generates income

Indeed, they argue that official involvement in negotiations has been counter-productive: "Far from speeding compromise, the presence of official creditors has tended to ossify the negotiating position of the banks and countries."
with which to service debt, lower investment may lead to lower debt service payments to creditors.

Helpman begins his analysis with a brief review of Dooley (1988), in which it is argued that the anticipation of market-based debt reduction will raise the market price of the debt, making the debt reduction less effective than it would otherwise have been. Accordingly, the existing market price should not be used as a basis for assessments of market-based debt reduction. Helpman goes on to argue that (as in the limiting case of debt forgiveness tending towards the entire stock of debt) the price of debt would tend towards full face value, that is, the market discount would tend to zero. So, for countries with debt trading at a large discount, if market-based debt forgiveness is on a "sufficiently high" scale, then that debt reduction would confer "...huge capital gains to the creditors with relatively little debt relief to the debtor". Helpman argues, however, that the implicit assumption which allows this conclusion, that there is no investment effect from debt reduction, is invalid: "...the response of investment to debt reduction has important effects on secondary market values."

A reduction in the stock of debt increases the current return to holders of equities in a debtor country's companies. This is because a smaller stock of debt implies a lower tax burden, which increases the immediate post-tax return on equities. This is described by Helpman as the income effect of a reduction in the stock of debt. The substitution effect arises because part of the total return from equities is in the form of a capital gain, to be realised at some future time. Accordingly, the

4. Helpman quotes the case of Peru, with debt (then) trading at around 20 cents per Dollar of face value, i.e., a discount of 80%).

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relative value of the future capital gain falls when the stock of debt falls and current tax rates are reduced.

The net effect of a reduction in the debt stock thus depends on whether the income or substitution effect dominates. Where equity investors in aggregate are relatively risk averse, the positive income effect resulting from a reduction in the stock of debt will be larger than the negative substitution effect, because risk averse investors prefer current income to uncertain future capital gains. The opposite applies where investors are not risk averse. In the former case, then, investors prefer current consumption instead of supplying companies with further funds for investment, that is, the investment funds supply curve shifts upward to the left. The demand curve shifts down at the same time because the relative value to risk-averse firms of increasing their stock of investment is reduced by the lowering of current tax rates following debt reduction.

So, according to Helpman, in a world with no capital mobility or with binding quantitative restrictions on capital movements (which may well be a reasonably close approximation to the real world situation faced by LDC debtors!), debt reduction will depress investment if investors are relatively risk averse, and will increase investment if they are not.

Creditors will generally prefer equilibria with higher investment, because greater investment implies a better chance of total repayment and a higher repayment per unit of debt even if total repayment is not achieved. As debtors will also prefer equilibria with higher investment, there is no conflict between debtors and creditors.

Accordingly, it is in the interests of both debtors and creditors to co-
operate to achieve an equilibrium with higher investment. The problem arises in the case of relatively risk averse investors and very limited capital mobility, in which case debt reduction leads to a fall in investment. The creditors will not therefore voluntarily reduce the stock of debt because they will be worse off: the value of their claims on the country is reduced, and the chance of repayment of the remainder also falls. The debtor, on the other hand, will still prefer the debt reduction despite the fall in investment, because the benefits from lower debt will be greater.

Helpman thus concludes debtors do gain from debt reduction, but that creditors may or may not benefit depending upon circumstance. Clearly, then, in the absence of coercion, debt reduction will only take place in cases where creditors believe that they will benefit. As is argued in 6.3 below, many creditors would argue that the Brady Initiative is a hybrid in that it is ostensibly voluntary but is, in some cases, de facto compulsory. In other words, debt reduction is taking place under circumstances in which all banks would not necessarily participate voluntarily.

The basic conclusions of Froot (1988) are in accord with those of Helpman. From the point of view of the debtor, debt reduction is generally beneficial, unless the cost in terms of current resources used in order to provide incentives is greater than the reduction in debt servicing costs and the gain from increased investment. (Such incentives include, for example, the purchase by Mexico of US Treasury bonds to guarantee the principal repayment of new instruments created under its Brady deal. See Chapter Seven for full details.)
For the creditor, Froot argues that provided there is a positive investment effect (of the sort described by Helpman), then debt reduction which stimulates investment will leave the creditor better off. This does not mean that such debt reduction alone would be optimal (from the creditors' perspective); Froot goes on to argue that an optimal debt relief package also requires the provision of new money.

Essentially, Froot reaches this conclusion as a result of his belief that the main constraint on LDCs' investment has not recently been the debt overhang and its resulting disincentive problem, but an acute lack of liquidity. In support of this conclusion, he argues that between 1982 and the publication of his paper in 1988, aggregate investment in LDCs fell by a total of 5% of GNP, which he argues is "...almost exactly equal to the increase in the non-interest external surplus (which roughly measures that reduction in liquidity). In the meantime, the [stock of] debt has grown only slowly." Accordingly, Froot argues that debt reduction is most efficient if concentrated in those countries with the severest liquidity problems.

The problem with this conclusion is that, by definition, countries with the most severe liquidity problems are those which can least afford to devote current resources to the funding of debt relief incentives to creditors. In this case, then, Froot argues that the optimal arrangement is for creditor to forgive less debt, but to provide additional liquidity in order to induce a greater investment effect. In Froot's analysis, it is entirely possible that no-one will benefit from debt reduction. Such situations would arise if the current resources cost to the debtor exceeds the debt service and investment gains, and if
the creditor forgives debt but does not provide additional liquidity.

As a result of this possibility, Froot concludes that:

"...in order to evaluate their [market-based debt reduction schemes] benefits, proponents will have to pay more attention to the source of debt relief resources and to the severity of liquidity constraints. Even if potent investment-incentive effects are present in LDCs, they are not enough to make any manner of debt reduction best. (p.3)

The discussion of the Brady Initiative (see 6.3 below and Chapter Seven) will make it apparent that Froot's ideas were to some extent incorporated into the formulation of the Initiative.

6.3. Market-based Debt Reduction in Practice: A Critique of The Brady Initiative

6.3.1. Introduction

The ultimate goal of the Brady Initiative, which was launched on 10 March 1989, is to restore creditworthiness to LDC debtors by a combination of debt and debt servicing reduction, coupled with structural economic reform and the pursuit of sound economic policies. The Brady Initiative is distinguished from its predecessor, the Baker Plan (see 6.3.2. below), by its explicit support for debt reduction, which had previously been anathema to the US administration. It was envisaged that debt reduction would take place through comprehensive market-based mechanisms, specifically loan/bond swaps and buybacks. The hope was that by reducing the burden of debt it would be possible to restore capital market creditworthiness to LDCs and, implicitly at least, to the US banking system.
A further attribute of the Brady Initiative is its flexibility. The deals which have been agreed so far have all featured a "menu" of at least two options. There is no reason why future deals may not incorporate all of the options devised thus far as well as those to be developed in the future. The options which were offered in the first few deals are:

- One-for-one loan/bond swap, creating fixed-interest "par" bonds with the same face value as the original loans
- A loan/bond swap at a discount to face value, paying market interest rates. Hence the face value of these "discount" bonds is less than value of the original loans.
- A cash buyback of loans by the debtor at a discount to face value
- Subscription to New Money.
- Rescheduling of interest arrears.

The loan for bond swaps are "enhanced" by the provision of interest payment guarantees and redemption collateralisation, provided by funds from combinations of the debtor's reserves and official multilateral and bilateral sources such as the IMF and the Japanese Exim Bank respectively.

Specific criticisms of particular deals struck under the Brady Initiative, such as the degree of political interference in the Mexican deal, and the over-optimistic assumptions of the amount of New Money that banks would be willing to provide are discussed Chapter Seven, but the aim of this section is to provide a more wide-ranging discussion of the Initiative. Before this discussion, it is useful briefly to summarise the previous US initiative, the Baker Plan.
6.3.2 The Baker Plan

The Baker Plan (named after the then US Treasury Secretary, James Baker), was launched at the 1985 World Bank/IMF meeting and was the first major initiative in reaction to the Debt Crisis. The key elements of the Plan were (1) commitments by debtor countries to make further structural adjustments to improve their economies, (2) new lending by creditors where this was justified by economic reform ($20bn over three years was suggested); and (3) increased involvement of the IMF and the World Bank, with the latter in particular sharply to increase its lending. The Plan was never intended to form a global solution to the debt problem, and only 15 middle-income countries were envisaged as benefiting from it. The so-called "Baker 15" are shown in Table 6.1.

Agreements were reached with Mexico, Argentina, Chile, Venezuela, and the Philippines, but the unilateral suspension of interest payments to the banks by Brazil caused considerable resentment on the part of the banks and, in the words of the TCSC, was a "serious setback" to the Baker Initiative. By mid-1987, after the first major round of provisioning by the commercial banks, the Baker Plan had ceased to make progress. During the currency of the Plan, the total external debt of the Baker 15 rose from $413bn to $478.5bn (TCSC, 1990).

6.3.3 Launch of the Brady Initiative
The Brady Initiative was launched in a speech to the Bretton Woods Committee on 10 March 1989. The speech, which was more detailed than some critics have suggested, began with a brief review of the debt situation and the action taken since it began. Brady argued that the fundamental aim of the 1985 Baker Plan, that the debtors should solve their problems through economic growth and structural reform "...still makes sense" but that "...now, almost four years later we again take stock." Brady praised the efforts of debtors in reforming their economies, and argued that the existing strategy was successful to the extent that it had prevented the collapse of the international financial system, as well as facilitating a fall in the outstanding debt stock of "...some $24bn in the past two years through voluntary debt reduction techniques." Most of this debt reduction was due to debt-equity swap activity, though there had been buybacks, either openly (by Bolivia for example) or by debtors acting through agents in the Secondary Market. Brazil is thought to have bought back some $17bn of its debt using this and other methods during 1988 and 19895.

Hence the concept of voluntary debt reduction was not alien to the debtors or the banks when Brady announced his Initiative; indeed the Institute for International Finance (IIF) (which is funded by the banks) conceded the need for debt reduction for heavily-indebted middle-income countries in its report "The Way Forward for Middle-Income Countries" in January 1989. The distinguishing feature of the Brady Initiative was that Brady spelled out the possibility and desirability of new techniques of comprehensive (involving all bank creditors together) debt reduction with multilateral support (through the IMF and the World Bank)

for such techniques. The essential point of the multilateral support was to give the banks something (limited-term guarantees of interest, or principal, payment) in return for their surrendering their hopes of full repayment.

Brady explicitly stated that the aim of the Initiative was to "...encourage debt and debt service reduction on a voluntary basis, while recognizing the importance of continued new lending." He exhorted debtors to continue to follow sound economic policies "...which can better encourage new investment flows, strengthen domestic savings, and promote the return of flight capital."

The banks were then urged to waive the sharing and negative pledge clauses\(^6\) in loan documentation for performing debtors in order to free banks to negotiate with the debtors as they wished. Brady also argued that "...banks will remain interested in providing new money, especially if creditworthiness improves over the three year period [for which the proposed waivers would operate]."

Brady emphasised that the role of the World Bank and the IMF was primarily to "...promote sound policies in the debtor countries through advice and financial support. With steady performance under IMF and World Bank programs, these institutions can catalyse new financing."

(my italics). This was nothing new, but then Brady set out how these institutions could act in the next stage of the process:

"...to support and encourage debtor and commercial bank efforts to debt and debt service burdens, the IMF and World Bank could provide funding, as part of their policy-based lending programs,

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6. These clauses ensure equal treatment for all creditors and prevent banks from negotiating separately with the debtor.
could be a real problem if deals did not "...differentiate on the basis of performance ... To cancel all the debt in the world, but not to change the policies which created it, would be risk without reward."

Conable argued that relief under the Brady Initiative must be available to all debtors who pursue appropriate economic policies, perhaps in the (correct) belief that delay in the implementation of the Initiative could lead to unrest in those debtor countries, such as Venezuela, which believed they had followed appropriate policies and should thus be among the first to benefit. In fact, the timescale for implementation was far longer than envisaged and thus the twin problems of excessive expectation and the desire to move quickly were exacerbated. Perhaps in an attempt to dampen immediate expectations, Conable pointed out that there is little point in debt reduction if the response it elicits from the financial markets is simply a refusal to provide voluntary new financing.

The final general point made by Conable concerned the problem addressed earlier in this chapter: debt reduction under the Brady Initiative must be sufficient "...to make a real difference in the yearly burden of debt service."

Conable then set out his belief that Mexico should be the first recipient of creditor largesse under the Brady initiative. He justified this proposal by arguing that Mexico had reformed its economy and that this should be rewarded with a debt reduction program. He did not state the generally held belief in the financial community that on grounds of economic performance one could argue that Venezuela or Colombia were
more deserving cases, but neither have the advantage of a physical attachment to the US.

It must be noted that Conable went further than Brady in his suggestions for new debt reduction mechanisms, by specifically proposing the elements of the eventual Mexican deal. He suggested that for Mexico banks could swap "...current loans for long-term bonds at a discount", take "...exit bonds [par bonds] at below market interest rates with whatever added attractions will make them exciting", participate in a debt-equity swap program, and provide New Money, all with the "...strong support from multilateral agencies." However, it may be argued that more important than the mechanisms of the Mexican debt reduction was an indication of its intended scale. Both Brady and Conable gave no indication of this, nor did they intimate (publicly, at least) how much support could be forthcoming from the IMF and the World Bank. They also did not address the issue of how any discounts to face value would be set. There was a precedent for this with the Mexican "Morgan Bond" in 1988 where the discount was set by competitive tender but there was no indication as to whether this method was considered appropriate under changed circumstances.

6.3.4. Reaction to the Brady Initiative

The initial reaction to the Brady Initiative seems to have been largely determined, from the debtors' point of view, by their perceived likelihood of immediately benefiting from it. For example, the Financial Times of 13 March 1989 reported that the Venezuelan President thought it was a "very timid step which does not meet the basic aspirations of our people", whilst the Mexican Finance Minister said it
was "particularly positive for its change of emphasis that grants priority to the reduction of debt and debt service rather than to additional indebtedness, as has occurred in the past." Such sentiments were only to be expected, given that the Minister was to meet Brady that day to begin negotiations. Brazil, on the other hand, took the middle ground as a country which knew it could benefit from Brady in the medium-term but which also knew that its short-term prospects for debt relief were poor because of its lack of sound economic management. A Brazilian debt negotiator was quoted as saying that the Brady Initiative was "...a positive development and a useful evolution in the right direction."

The reaction of developed countries was generally positive, but the enthusiasm of Japan was easily explained by its subsequent involvement in providing funds for enhancements. The European Community also reacted positively, stating that "...voluntary debt reduction or debt service reduction on a case-by-case basis can play an important role [in the solution of the debt problem]" (FT 15 March 1989).

Bank reaction was mixed. In public, immediate response came from the American bank J.P. Morgan, whose Chairman stated that the bank welcomed US Government "...support for market-based debt reduction and, we hope, substantial voluntary reduction of debt and debt service burdens for countries demonstrating a commitment to structural economic adjustment." As a major US bank which also arranged the 1988 Mexican debt-bond swap, such a reaction from Morgan was not a surprise.

Privately, banks were not as optimistic, and there was a degree of scepticism. More indicative of the general mood was the statement made
by an anonymous US bank official who, according to the FT of 13 March 1989, stated that "Brady has opened Pandora's Box. The US has admitted that the debtors cannot pay, but has no adequate answer. Unless something happens very quickly, it is an open invitation to default."

Further worries were expressed as to the amount of enhancement the IMF and World Bank would be able to provide, as well as the potential moral hazard problem which could arise if Brady was seen to reward countries with a poorer record than those which it did not.

As the dust settled and the implications of the Brady proposals became clearer, bank criticism became more open. The chief negotiator for Citicorp, William Rhodes, argued that excessive debt reduction may be incompatible with the requirement for New Money, on the grounds that banks which reduced their exposure through loan/bond swaps would not then wish to increase it (FT, 15 March 1989). This point was made before any deals had been struck, whereupon it became apparent that banks had opted for either an exit route, via in the Mexican case the par or discount bonds, or for lending New Money in the hope of recovering their losses as Mexico grows out of its reduced debt burden. For example, in the Mexican case, UK banks generally preferred the exit bonds, whilst many American banks with local presence in Mexico lent New Money.

Japanese banks, with some $80bn exposure were concerned that the enthusiasm of their Government might not be reflected in the banks' ability to participate in discounted loan/bond swaps, because of the accounting regulations which limited their provisions to 15%, far less than in other countries. Such low provisions would imply large one-off losses as swaps took place. As the FT succinctly described their

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position on 17 March 1989, "...while the Japanese Government wants to expand its influence in international financial affairs, Japanese banks want to make sure this influence is not bought with their money." In response to these worries the Ministry of Finance announced that it would consider proposals to aid banks seeking to participate in Brady deals.

More fundamental criticism of the US approach surfaced in the month following Brady's speech, with the UK and Dutch Governments rejecting the use of IMF and World Bank funds to guarantee interest payments to commercial banks. The more cynical pointed out that Brady was a useful diversion from the problem of high Dollar interest rates due to the USA's domestic budget deficit and which hampered the efforts of debtor nations - every one percentage point rise then cost LDC debtors $5bn per year\(^8\) - to a greater extent than any debt relief which the commercial banks could be expected to provide.

European officials were also concerned that expectations had been raised too high and too rapidly, and that the US had not attempted to reduce such expectations by quantifying the amount of relief which was likely to materialise.

Later criticism was based on specific areas of difficulty (set out in 6.3.5 to 6.3.8 below) as well as the more general contention, discussed earlier in this chapter, and applied to the Brady Initiative by Bulow and Rogoff (op cit), that market-based debt reduction may not be of great value to debtors.

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6.3.5. The Moral Hazard Problem

The moral hazard problem caused by countries relaxing their economic policies in the belief that they are near the top of the Brady queue is evidenced by Brazil's buying back of its debt whilst refusing to pay interest in 1988/9. The non-payment pushed down the price of the debt, enabling Brazil to repurchase it at prices well below those would have obtained had interest been current. The reserves used to purchase the debt were, of course, available to make interest payments had Brazil not considered that greater benefits would arise from repurchase. The cash cost to Brazil of the purchase of $17bn of its debt at an average price of approximately 28 cents per Dollar is only $4.76bn. This compares to the annual interest cost alone on the repurchased debt of approximately $1.7bn. Brazil would recover its expenditure in less than three years in present value terms, and of course it reduces its debt stock for future capital repayment.

The activities of Brazil may be contrasted with those of Chile, which is often cited as a model debtor, having never rescheduled interest payments. Chile opted to buyback its debt openly, and in November 1989 invited banks to tender. Chile was prepared to spend up to $330m on the buyback under its 1987 restructuring agreement (in 1988 it purchased $299m worth of debt for $167m - an average price of 55.8 cents). The response from the banks, however, was poor, with the holders of only $139.8m of debt tendering at or below the minimum accepted price of 59 cents. This again illustrates the moral hazard problem - the best

9. Though principal repayments were rescheduled in each year between 1985 and 1988.
performing debtors cannot repurchase as much of their debt because firstly the price is higher, and secondly because banks are unwilling to sell the debt in the belief that good economic performance will continue, thus enhancing their prospects of ultimate recovery.

6.3.6. The Cost of Debt Relief and the Availability of Official Support

A common criticism of the Brady Initiative is that insufficient official multilateral or bilateral support is available to provide debt relief on the necessary scale. For example, Kenen (1990) argues that "...it [the Brady Initiative] does not provide enough resources to generate the deep debt reductions that debtors need to solve their problems". The British parliamentary Treasury and Civil Service Committee (1990) calculated that a maximum of $28.5bn will be available to support debt reduction, comprising $24bn from the IMF and the World Bank, and $4.5bn from Japan. The Committee also noted that "Lending by both the World Bank and IMF for debt reduction purposes is only in part over and above the lending that they would do anyway in the absence of the Brady initiative. Thus their lending for debt reduction competes with lending for other purposes." (p.xxi).

It is useful, therefore, to estimate the cost of providing the debt relief agreed under the Brady Initiative for Mexico, the Philippines and Costa Rica. These figures, illustrated in Table 6.2, may give some indication as to the amount of support necessary to provide similar levels of debt relief for other debtors.
The weighted average official support per Dollar of annual debt service relief is $4.66; in other words, support only translates into one-for-one relief after 4.66 years. If this level of support obtains for future deals, then by using the Treasury and Civil Service Committee’s estimate of $28.5bn (less the $6.56bn used so far) of the total official support available we can estimate the maximum potential annual debt service relief - ignoring the funds necessary to finance any New Money - at $4.71bn. This represents just under 10% of the total interest due from the debt burdened countries in 1990.

6.3.7. The Provision of New Money and the Free Rider Problem.

A key feature of the Brady Initiative is the simultaneous provision by the commercial banks of New Money and debt reduction. Indeed, in his verbal evidence to the TCSC on 24 January 1990 Sir Jeremy Morse said that "...a Brady-type package will not work without some new money. You need some new money to pay for the enhancements to make the debt reduction package work as well as to carry on and this was totally overlooked."

Unfortunately, the New Money question is one which caused problems for both the banks and the debtors. Notwithstanding Krugman’s Laffer Curve arguments (see section 6.2 above), the fact that both Mexico and the Philippines raised less New Money than they had hoped (see Chapter Seven) indicates that the prospect of increasing exposure whilst at the same time having to increase provisions on existing debt was not an attractive one for the banks. The exchange of existing debt for bonds or tendering for a cash buyback was seen by the majority of banks as an

far more attractive option. In the former case, the collateral offered
by the debtors (using the funds provided by multilateral sources) was
especially the carrot offered to banks to surrender their aim of 100% recovery of the original debt. In other words, banks surrendered their
"option value" (the value derived from a non-zero probability of eventual full repayment) in return for the collateral, which was only available with new bonds.

From the debtor point of view, as David Lomax pointed out in his written evidence to the TCSC, "A New Money policy is based on the idea that a country has only liquidity problems. New Money will therefore tide it over until it achieves creditworthiness. If a country is not fully creditworthy, then adding on new debt simply makes the problem worse." As we have seen, however, Krugman (1989) disagrees with this in principle, arguing that "...in a world where there is still some inflation it is possible for nominal debt to grow yet for a country to become more creditworthy over time". The problem in LDCs, however, is that the theory has not been borne out in practice, principally because the rate of growth of debt has easily outstripped its rate of devaluation by inflation: the nominal debt of the debt burdened countries more than doubled between 1980 and 1990\(^\text{12}\), compared to total US inflation of less than 60% over the same period. Increased indebtedness has not been associated with increased creditworthiness.

Lomax goes on to argue that debt reduction with the aim of reducing the interest burden to sustainable levels is the only way to restore creditworthiness "within a short timescale", and that taking new money

will only serve to lengthen that timescale or indeed to prevent a return to voluntary financing completely.

The reluctance of all but a few banks to countenance new lending to LDCs means that the debtors will probably have little choice but to take debt or debt service reduction rather than significant amounts of new money. Only those banks which have local interests will be interested in new money, especially as the economies of some of the largest debtors, notably Brazil, continue to deteriorate. The argument for banks to lend new money as they gradually increase provisions against their earlier loans seems ever weaker. As Krugman (op cit) points out:

"The gains from concerted lending [i.e., involuntary new money organised through committee negotiations] are collective. Looked at in isolation, each new loan is made at a loss. Thus nobody who is not already a creditor of the problem country will be willing to lend, and even existing creditors will lack an individual incentive to lend." (p.6.).

Thus one aspect of the free-rider problem, only now eased by the structure of the Brady deals thus far agreed, is defined.

Another facet of the free-rider problem is advanced by Sachs (1990) who argues that:

"...debt reduction...[needs] to overcome an inherent free-rider problem. Even when it is in the collective interests of the banks to reduce the debt, each individual bank is still tempted to insist on full repayment of its own claims, while free riding on concessions made to the debtor by other banks." (p.21).

Sachs claims (with, as Chapter Seven concludes, excessive gloom), that the implication of this free-rider problem is that voluntary debt
reduction schemes, such as the Brady Initiative are "doomed to failure".¹³

6.3.8. Other Views of the Brady Initiative

A key result of the Brady Initiative is that bank lending is replaced by (in the case of buybacks) official lending, or (in the case of rolling interest guarantees) official contingent liabilities. Obviously, lending and guarantees are ultimately financed by taxpayers in the countries which contribute to the funding of the multilateral institutions. The structure of LDC debts has been shifting towards official (bilateral and multilateral) lending and away from bank lending over recent years, principally due to bank debt reduction¹⁴.

This process will continue as further Brady deals are agreed. Official concern has been expressed at this shift, on the grounds that the transfer of risk from the commercial banks is both undesirable and unnecessary at this stage in the debt situation. When questioned on this by the Treasury and Civil Service Committee, Mr Nigel Wicks, Second Permanent Secretary (Finance) to the UK Treasury said: "It is a shift which I think some of us in Government mindful of the taxpayers'¹³

¹³. In Sachs' view, the only way to make debt reduction work is through some form of institutional body, which would assess the necessary amount of debt reduction required for individual debtors, to be achieved by reducing the current, floating market rates on the debt to fixed, sub-market levels (4% is suggested), and principal would be rescheduled (but there would be no reduction in the principal ultimately due). The new body, which Sachs calls the International Debt Facility (IDF) would then provide guarantees to the banks on the new, lower interest payments. He argues that the cost of those guarantees which would ultimately be called in at around $30bn, but other authors such as Bulow and Rogoff argue that this figure is far too low.

interests are slightly concerned about. I do not think many of us will want it to continue." This view implies that the British (and other Governments) may resist any expansion of the funding available for the Brady - and any future - initiatives.

The TCSC Report also points out that Brady deals may restrict future lending to countries for trade and project finance (as well as support from the IMF and other institutions) because lenders for these purposes will not accept subordinated debt from their debtors. This means that debtors must maintain a "cushion" of subordinated debt held by commercial banks. Swaps of loans for bonds under the Brady Initiative, however, reduce that cushion by replacing subordinated debt with bonds and thus may reduce future availability of finance for these countries.

The projections set out in Chapter Seven show, however, that it is possible for those countries which have agreed Brady deals to reach comfortable debt servicing positions, provided their recent export performance is maintained and that US interest rates fall. The problems of other major debtors, especially Argentina and Brazil, do not appear so favourable. It should be noted, however, that these countries are far wealthier, with much more vibrant economies, than other debtors in Latin America, such as Peru, and they are in no danger of social or economic collapse. In their cases, the debt is more of a restraint than a prison. (By mid-1992 both countries were close to agreeing Brady deals.)

Without further economic and political reforms and the accompanying increase in confidence, the return of flight capital and the increase in foreign direct investment, both of which would measurably ease the debt servicing burden will not occur. According to the Institute for
International Finance (1990), the official reserves of capital importing LDCs as at end 1985 were some $150bn, whilst the total liabilities of these countries was estimated at $500bn.

6.4. Conclusion

In the first instance, the Brady Initiative has provided a means of degrees of managed default to certain debtors. Intentional managed default has been granted to the Philippines and Costa Rica through officially supported buybacks; unintentional (and much less managed) default has been granted to those countries such as Brazil. Brazil's dismal economic performance has driven down the market price of her debt thus facilitating "under the counter" repurchases at low prices, whilst at the same time maximising the benefit which may be accorded to her from official support in a Brady deal. This arises because if a fixed level of official support is available for a deal, the biggest debt service savings accrue through buybacks at low prices, as with Costa Rica.

Managed default under the Brady auspices is not necessarily bad for the banks; as Krugman (op cit) has pointed out, orderly default (or debt reduction) may well result in creditors receiving higher eventual repayments than if the debtor is left to struggle with his existing burden.

The problem, however, is that it appears that the Brady Initiative has helped create the situation whereby bad economic performance is rewarded, and moral hazard is ever-present. This could not have been the intention. With limited resources and the desire not to increase
the transfer of risk from banks to Governments beyond the levels already agreed, the debt situation may now be entering another phase: stalemate. It is no longer a "crisis" for the vast majority of banks - most regard LDC debtors as a problem which, if not quite behind them, is at least level and moving in the right direction. Mr William Rhodes, the chief debt negotiator for Citicorp, argues that the conclusion of deals for Argentina and Brazil "...will signal the phase-out of the debt saga among the major economies of Latin America."15

Yet from the point of view of those debtors, both inside and outside Latin America, which have not benefited from Brady deals, things are different. For many of them, the debt situation remains at best difficult. Years of economic mismanagement have left a legacy which will endure long after the politicians responsible are forgotten. The Brady Initiative has provided a significant measure of relief to a several countries, but the majority of debtors which are not close friends of, or are strategically useful to the US have much less no chance of receiving Brady-inspired largesse. The debt problem has undoubtedly been eased by the Brady Initiative, but the relief is not universal.

Table 6.2: The Cost of Official Support for Debt Relief

<table>
<thead>
<tr>
<th>Country</th>
<th>Annual Interest payment reduction, $m</th>
<th>Reduction as a percentage of previous year's interest payments</th>
<th>Official Support, $m</th>
<th>Support per $ of annual relief</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mexico</td>
<td>1178</td>
<td>11.9</td>
<td>5800</td>
<td>4.92</td>
</tr>
<tr>
<td>Philippines</td>
<td>129</td>
<td>4.6</td>
<td>656</td>
<td>5.07</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>98</td>
<td>24.5</td>
<td>103</td>
<td>1.05</td>
</tr>
</tbody>
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Note: Interest payments are calculated using 1989 average Libor of 9.1%. New Money is ignored. Figures are not exact due to rounding.
<table>
<thead>
<tr>
<th>Country</th>
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<tbody>
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<td>Argentina</td>
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<td>Bolivia</td>
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<td>Yugoslavia</td>
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CHAPTER SEVEN

THE BRADY INITIATIVE: CASE STUDIES

7.1. Introduction

This chapter presents an analysis of the implications of the Brady Initiative for the first three countries to sign deals structured under the Initiative: Mexico, the Philippines, and Costa Rica. The methodology is set out in section 7.2, with the results discussed in each of the next three sub-sections. Note that deals have also been signed by Venezuela, Uruguay, Nigeria, Argentina, and Morocco, and according to the World Bank, several others are under discussion. These later deals were all generally similar in structure to that of Mexico, but some have offered slightly more flexibility. In the case of Venezuela, for example, individual banks were allowed to negotiate separately with the country, bypassing the usual committee arrangement.

7.2. Methodology

The calculations in this chapter were mostly performed by a BASIC computer program (listed in Appendix V). The program uses base data (input by the user) on the stock of commercial debt, recent export performance, and the structure of the agreed Brady deal to generate projections of the likely effect of the deal on the debtor's stock of debt and its debt servicing capacity.
The program allows the user to specify any combination of up to four separate elements of a Brady agreement: par value swaps of existing loans for bonds (referred to hereafter as par bond swaps), discounted swaps of existing loans for bonds (referred to hereafter as discount bond swaps), the organised purchase of a country's debt from the market (referred to hereafter as buybacks), and the provision of New Money.\(^1\)

The program uses the information on the structure of the Brady deal and user-input assumptions about interest rates and export growth to generate one of the key indicators of debt servicing ability, the Interest Servicing Ratio (ISR), which is the ratio of annual interest payments (in US Dollars) due to the US Dollar value of exports of goods and services. By varying these assumptions the user can perform sensitivity analysis, generating a variety of scenarios under which debt servicing ability can be examined.

The long-term aim of the Brady Initiative is to restore market creditworthiness to the debtors. There is no generally accepted means of quantifying "creditworthiness", so most banks have in-house country risk analysts who use a variety of methods to assess the economic and political risks of lending to particular countries (Nagy, 1984). The country risk analyst will examine several indicators of economic performance including, especially in the case of LDCs, the external debts of the country. In addition to the total debt outstanding the analyst is concerned with the structure of the debts, including the split between official and private creditors, the timing of capital repayments, and the ISR (actual and projected). Whilst no single

\(^1\) Other options have since been devised, but were not known when the program was written.
accounting ratio is a perfect indicator of the ability of a country to service its debts, the ISR is often cited as the key figure. Lomax (1990) has suggested that: "A criterion of creditworthiness would be that the ratio of interest payments to exports should be reduced to 20 per cent, or, say to 15 per cent." This was accepted by the British House of Commons Treasury and Civil Service (TCSC) Select Committee which reported on the debt issue in March 1990.

Accordingly, the program generates ISR projections in an attempt to investigate whether or not the debt reduction deals under the Brady Initiative may enable a country to reduce its interest payments to 20% or less of its exports. Note that a ratio above 20% does not necessarily mean that a country is on the verge of economic collapse or that its debt burden is unsustainable; it is more an indication that over the medium to long term, debt servicing costs will place a heavy burden on the country. The consequences of this may be a domestic deflation coupled with devaluation to attempt to reduce imports and increase export earnings. In the final analysis it is the effect of these policies on the citizens of the debtor nation which is most important.

Conversely, a ratio of below 20% or even 15% does not necessarily imply that banks will be willing to lend. After their recent experiences in LDC lending it seems likely that banks will require far more stringent creditworthiness criteria to be met than in the past. Even if a country satisfies these criteria, it is unlikely that banks will resume sovereign syndicated lending for balance of payments support. Instead they will prefer to lend for specific projects where there are tangible assets and quantifiable cash-flows with which the loan may be serviced.
In summary, the ISR is a useful indicator of creditworthiness but should be examined in relation to other data, both quantitative and qualitative.

7.3. Mexico

It was no surprise to the financial community that Mexico was chosen to be the first country to benefit under the Brady Initiative. The proximity of the country to the USA, its large debts and attempts at economic reform made it the obvious choice. This does not mean that the banks were willing to support a Brady deal for Mexico, merely that they recognised that there was little they could do to avoid it. The banks were subjected to considerable pressure from the US administration, which was keen to record a foreign policy "success" for the new President, George Bush. The result of this was that from the banks' point of view, the deal was "voluntary" only in the loosest sense of the word. In their joint memorandum to the House of Commons Select Committee, Sir Jeremy Morse (Chairman of Lloyds Bank) and Sir Kit McMahon (then Chairman of Midland Bank) stated that: "...it is regrettable that the political interference of the US authorities in the negotiations between the Bank Advisory Committee and Mexico reached unacceptable levels." When questioned further about this in person Sir Jeremy Morse said that in retrospect the word "unacceptable" was perhaps too strong, but that "...[members of the committee] were approached, pressurised and divided [by US officials] - actually the integrity of the committee was divided by seeing different ones of them [the committee members] separately... [this] put very severe strains on the process." Sir Kit McMahon added that "...they [US officials] were
coaching the Mexicans...[during the discussions] the Mexican phantoms would disappear for nine or ten hours while a lot of discussions were held in Washington and Mexico City."

7.3.1. The Deal and its Effect on Mexico's External Debt

Mexico's base debt position (and the structure of its debts after the completion of its Brady deal) as at 31 December 1989 is set out in Table 7.1.

The deal agreed under the Brady Initiative covered $48.5bn of the medium term bank debt and was signed on 4 February 1990. Banks were offered three options:

- Conversion of loans on a one-for-one basis into 30-year fixed rate 6.25% "par" bonds. Holders of 46% of the eligible debt chose this option, so $22.31bn of par bonds were created.

- Conversion into 30-year Libor plus 13/16% bonds at a discount of 35% to the nominal value of the loans swapped. Holders of 41% of the eligible debt chose this option, so $19.885bn was swapped into discount bonds, of which $12.925bn were created.

- Subscription to New Money equivalent to 25% of existing exposure and paying Libor plus 13/16%. The New Money is to be paid in three tranches, with 52% of New Money commitment in 1990 and then 24% of commitment in 1991 and 1992. The holders of 13% of eligible debt chose this option, so a total of $1.576bn New Money was committed.

Note that the reduction in the total gross debt is only approximately $1.2bn. The reduction in the net debt is, however, greater than this,
because, provided it does not default on its interest payments, Mexico will be able to earn interest on some of the funds provided by the IMF and the Japanese Exim Bank. These funds totalled $5.8bn, but $3.55bn (see below) is used to purchase zero coupon US Treasuries, leaving net bank debt reduced by $1.2bn + $5.8bn - $3.55bn - $3.45bn (generating an interest saving of some $313m per year).

Of course, the reduction in the *market rate equivalent* debt (i.e., the nominal value of debt which at market interest rates would require the same interest payments as Mexico's mix of market and below-market interest rate debt) is greater still. The annual interest charge on the 6.25% par bonds is $1.394bn. This value of interest payments accruing at Libor (assumed 9%) plus 13/16% would be generated by debt with a face value of 1.394/9.8125% = $14.20bn, making the reduction in market rate equivalent debt due to the par bonds $22.31bn - $14.20bn = $8.11bn. The discount bonds represent a reduction in market rate equivalent debt of $19.885bn - $12.925bn - $6.96bn. These two figures must be added to the reduction in net debt due to the interest earning capacity of the IMF/Japanese Exim Bank funds less the cash cost of the US Treasuries $5.8bn - $3.55bn - $2.25bn. This gives a reduction in market rate equivalent debt of approximately $17.3bn.

In 1988, the latest year for which data is available at the time of writing, the value of Mexican merchandise exports was $20.7bn. Other goods, services and income (unspecified) were valued at $11.2bn. Hence the total value of Mexican exports in 1988 was $31.9bn\(^2\). In order to estimate this figure for 1989, I have assumed that merchandise exports remained static (as they did in 1988) and that the value of other goods,

services and income rose by 20.9%, as in 1988. This implies that the total value of Mexican exports in 1989 was $34.1bn.

7.3.2. Official Support for the Mexican Deal

The interest payment guarantees on the new bonds are funded by the IMF, the Japanese Exim Bank, and Mexico's own reserves (thus incurring an opportunity cost), a total of $7bn. It was initially hoped that these funds would be sufficient to provide interest guarantees on the bonds for at least 18 and possibly up to 24 months, as well as collateralising the capital repayments in 30 years. Unfortunately, more banks than expected chose the loan/bond swap options, thus reducing the period for which interest guarantees could be provided. The capital repayments are collateralized by Mexico's purchase for cash of $35bn\(^3\) zero coupon US Treasury bonds. Note that as the total face value of par and discount bonds issued was $35.235bn the redemption of the US Treasuries left $235m shortfall. The Mexican Government covered this shortfall by investing some of the $7bn before the agreement was signed, with the remainder coming from its own reserves.

Now, the US Treasury bonds were issued at an effective rate of 7.925%\(^4\), so the cash cost to Mexico was:

\[
\frac{35000}{1.07925^{30}} = \$3551m
\]

Subtracting this figure from the total $7bn available leaves Mexico with $3449m to provide interest payment guarantees. The total annual

interest cost for the par and discount bonds (with Libor at the 1989 average of 9.1%) is:

Par: $22.31bn @ 6.25% = 1394
Discount: $12.925bn @ 9.108125% = 1279

Hence Mexico guaranteed the interest payments for 3449 years = 15 months, 2673 rather less than had originally been promised. The short guarantee contributed to the fall in price of the new bonds when they began trading on the Secondary Market.

The ISR projections given below take into account the cost of providing the guarantees. Specifically, the $3.55bn used to purchase the US Treasuries earns no interest whilst being funded at market interest rates. The remainder is assumed to earn deposit interest and to be funded by Mexico at approximately equal interest rates and is thus ignored in the calculations.

7.3.3. Mexico's Interest Service Ratio Projections, 1990-93

To calculate the base interest payments figure (for 1989) I assume that all bank borrowing (including short-term) is charged at six-month Dollar Libor plus 13/16%. This rate also applies to all borrowings from International Financial Institutions (IFIs) except the IMF, and to all multilateral and bilateral borrowing, some $25.3bn in total. The $5.2bn IMF borrowing is charged at a percentage of the Special Drawing Rights (SDR) rate which varies weekly. This rate is a weighted average of the short-term interest rates in the US, Germany, Japan, France and the UK. The weights are such that for our purposes the rate may be considered as
approximately equal to Libor. Average Libor in 1989 was 9.1%. Hence the total interest paid by Mexico in 1989 is estimated as shown in table 7.2. The $9.90bn total compares with a US Treasury forecast of $9.6bn made in July 1989.

An immediate reduction in interest payments after the deal arises from the issue of the par and discount bonds in exchange for bank loans. The annual interest saving from these bonds compared to the original bank loans is approximately $1.47bn with Libor of 9% ($820m from the par bonds and $650m from the discount bonds). Over the period 1990-92, however, bank debt will rise as the New Money provided under the agreement is disbursed. The projections also take into account the cost to Mexico of funding the purchase of US Treasuries as discussed above.

Table 7.3 projects forward Mexico's interest payments as a percentage of her exports for the years 1990 to 1993. Each table covers combinations of interest rates and export growth so that a wide range of possible outcomes is shown.

Mexico's ISR did not fall below 20% in the immediate aftermath of the deal. In 1990 as a whole, however, a 20% ISR would be possible with interest rates of up to 7.6%, provided that export growth is sufficient. Growth of more than 10% would be required if Libor was at this high level. Only very low interest rates would be able to offset stagnant exports. In 1991 the interest payment burden rises as interest is paid on the disbursed New Money, but there are clearly many more favourable combinations of export growth and interest rates capable of generating

the desired interest/exports ratio. Libor in excess of 8.6% would prevent Mexico achieving the 20% ratio by 1991 unless export growth remained at 14% for a second successive year.

The total interest burden should reach its steady state for a given level of Libor in 1992 after the final tranche of New Money is paid. In this year, as the table shows, the 20% ISR can be reached at any level of interest rates shown provided exports grow quickly enough. There are still many unfavourable combinations, however, and export growth of 6% per year to 1992 would not be sufficient if interest rates were to remain much above 7.6%.

By 1993 the static (for a given Libor) interest payments mean that relatively low export growth (as low as 2% with Libor at 7.1%) can generate a sub-20% ISR ratio. If, however, Libor were to remain at its 1989 average of 9.1% then compound export growth of at least 8% would be required to bring the ISR to below 20%.

What chance does Mexico have of meeting the required export growth targets? From 1980 to 1988, Mexico achieved compound average annual export growth of 7.9%. If this were to continue, Mexico could achieve the 20% ISR very quickly indeed. In 1991 and 1992 continued export growth of 8% per year would require Libor of approximately 8.1% or less and 8.6% or less respectively if the desired ISR is to be reached. By 1993, the 20% ratio may be achieved with 8% compound annual export growth if Libor is approximately 9.6% or less. Note, however, that Mexican export performance will have to be little short of spectacular if it is to reach the more demanding target of a 15% ISR even by 1993.
On the basis of past performance, the export growth targets required to reduce the ISR to less than 20% do not appear excessively difficult. The structure of the Brady deal agreed for Mexico could therefore be enough, even in a fairly short period, to restore the country's interest servicing ability to acceptable - though still high compared to developed countries - levels.

Despite its ultimately optimistic conclusion, however, this analysis does illustrate a perceived flaw of the deal agreed - it is not of sufficient scale to give the debtor a reasonable chance of attaining a tolerable level of debt service in the immediate aftermath of the deal. Admittedly, in the Mexican case, the reduction in debt service costs from $9.90bn in 1989 to a projected $8.80bn in 1990 did offer some much-needed "breathing space". The sensitivity of the ISR to interest rates (which arises because the bulk of Mexican debt after the deal is still at floating rates) means that even if Mexico does achieve the required export growth, a sustained fall in the ISR requires that US Dollar interest rates, over which Mexico has no control, must fall and remain low. Even by 1993, a one percentage point rise in Libor increases the ISR by between 1.6 and 1.8 percentage points. In contrast, a one percentage point rise in exports reduces the ratio by rather less than one percentage point.

7.4. The Philippines

The Philippines was the second country to benefit under the Brady Initiative, with a deal signed in February 1990. The agreement itself, however, was far simpler and involved fewer elements than the Mexican deal.
The Philippines' deal, which was signed on 28 February 1990, consists of only two elements, a buyback and New Money. The buyback was of $1.312bn face value of debt at a price of 50 cents per Dollar, approximately equal to the Secondary Market price when the purchase took place, in January 1990 (the February signing covered the New Money). The buyback was financed by funds from the IMF, the World Bank and Japan. Some of the funds were lent under an IMF Structural Adjustment Facility and thus the reduction in Total External Debt (TED) was not the full $1.312bn. Unfortunately, as stated above, the precise figure does not appear to have been made public at the time of writing. In any event, the servicing cost of the IMF and World Bank debt will be considerably less than that of the bank debt which it replaces.

The buyback was organised on a bidding system, whereby banks tendered their debt at a price acceptable to them. In total, the Philippines received bids covering $1.83bn from 156 banks. They accepted the bids from 140 of these banks. Note that the debt tendered was not homogeneous, and that the Philippines rejected some types of debt which were tendered. For example, according to the evidence given by Oxfam to the TCSC (p.54, 1990) the Philippines rejected offers of the debt incurred to finance the building of a nuclear power station which will almost certainly never be operational.

The New Money element of the deal consists of two tranches totalling $712.5m to be provided by 82 banks (FT, 1 March 1990). As late as the end of October 1989 the FT reported that the Philippines expected to
raise over $1bn New Money: "...[the President of the Philippines National Bank] said an informal survey showed the fresh funds would total at least $1bn, mainly from the US and Japan." In the event, the coup attempt in December 1989 seems to have persuaded many banks, including all the Japanese Trust banks, to opt for the buyback.

The first tranche of the New Money is $427.5m (60%) disbursed in the first quarter of 1990, with the second tranche of $285m following a year later.

Debt-equity swaps and other forms of debt reduction have led to some confusion as to the Total External Debt (TED) of the Philippines, and to the relative sizes of its components. According to the World Debt Tables 1989-90, the TED at the end of 1989 was $29.5bn, including $9.7bn owed to commercial banks. The IIF forecast of 17 November 1989 agrees with these figures. The Financial Times, however, reported on 26 February 1990 that the TED was $26.9bn, with the reduction being due almost entirely to a reduction in medium-term bank debt.

On 1 March 1990 the Financial Times reported that the total medium-term bank debt at end 1989 was approximately $5bn, down from $7bn at end 1988. The IIF reported that total medium and long-term bank debt at end 1988 was $9.1bn, implying that if the Financial Times figure of $7bn medium-term debt was correct, then long-term bank debt stood at $2.1bn at end 1988.

The end-1989 IIF figure for medium and long-term bank debt is $8.6bn. Making the not unreasonable assumption that only medium-term debt was affected by debt reduction schemes between 1989 and 1990, then by
subtracting the $2.1bn long-term debt, a figure of $6.5bn for medium-term debt is attained. According to the FT, the true medium-term bank debt at the end of 1989 was approximately $5bn, so the IIF figure of total medium/long-term bank debt appears to be $1.5bn too high. Replacing the IIF estimate of medium/long-term debt with that from the FT and recalculate the TED then a compromise figure of $28.7bn is reached, in between the World Bank/IIF figure of $29.5bn and the FT figure of $26.9bn and comprised as shown in Table 7.4.

Note that the gross TED rose immediately after the deal. This is because the debt reduction due to the buyback is offset by the increase in IMF, World Bank and Japanese debt used to fund it, whilst there is an increase in bank debt of $712.5bn under the New Money Agreement. Therefore the TED figure in the table represents a maximum figure.

7.4.2. Official Support for the Philippines' Deal

The Philippines' deal was supported by the IMF, the World Bank and the Japanese Exim Bank. As there were no bond swaps in the deal, the official funds were used solely to finance the buyback, at a cost of $656m.

7.4.3. The Philippines' Interest Service Ratio Projections, 1990-93

The IIF estimated the Philippines' total 1989 interest payments at $2420m. Despite the problems involved in assessing the true total debt

8. The exact increase in borrowing from these sources to finance the buyback has not been made public, so I have taken the side of caution and assumed that all of the $656m used in the buyback has to be funded.
of the Philippines and hence its exact interest burden, this figure is the most up-to-date available, and has been used as the base for the calculations. The Philippines achieved total exports of merchandise, other goods, services and other income (as defined by the IMF) of $11.1bn in 1988. From 1979-1988, annual average compound growth rate in exports of 6.1%9 was achieved. Assuming this continued into 1989 would give an estimate of total exports of $11.32bn. This figure may in fact be pessimistic, however, as growth of 17.8% was achieved in 1988. This suggests that using the average over the previous decade may result in too low a starting point for the sensitivity analysis. Accordingly, 10% growth for 1989 has been assumed, giving an estimate for 1989 exports of $12.21bn. This gives an initial ISR of 19.8%, which falls to 19.1% immediately after the deal as the total interest burden fall by $87m. So, even in the immediate aftermath of the deal, the Philippines' ISR fell, unlike Mexico's, below 20%.

The main problem with projecting the Philippines' ISR is that it is difficult to calculate exactly the exact effect of the buyback on total interest payments, because the split between the sources of funds for the buyback has not been made public. I have assumed the funding cost of the buyback to be zero (i.e., it is treated as though it were funded from bilateral aid) whereas in fact there is some funding required. The sum involved should be small, however, and will not affect the sensitivity calculations except perhaps at the margin.

Table 7.5 gives the projected ISR for the Philippines for 1990-93 inclusive. As all of the projections suggest the ISR will fall be below 20% over the period in question, the outlined figures for each year are

those below 15% which, as discussed above, represents an alternative, more difficult to achieve (from the debt restructuring point of view) maximum sustained ISR which an LDC may be expected to bear. Given the much more favourable immediate post-deal situation, it is obvious that the Philippines has many more favourable possible sub-15% scenarios than Mexico. At relatively low Libor, say 7.6% or less, the Philippines could achieve an ISR of less than 15% even with no export growth. With higher interest rates, say 8.6%, compound average annual export growth of only 4% per year would bring the ISR to this level by 1992. If the Philippines manages to generate export growth at only the same compound rate as in the previous decade, 6.1%, then a 15% ISR could be achieved as early as 1990 provided Dollar Libor falls to an average of 8.1% or less. Of course, if at higher interest rates, the prospects are not as bright.

The immediate outlook for the Philippines in the wake of the Brady Initiative is thus bright, both in absolute terms and in comparison to Mexico. This is due in part to the Philippines' better position pre-Brady, with an ISR below 20% in 1989, compared to Mexico's estimated 29.0%. If the political situation does not deteriorate to the extent that economic performance is seriously hindered, then by the country has a very good chance of quickly reducing its servicing burden to below 15%. The effects of the earthquake in the northern part of the Philippines in July 1990, however, and the eruption of the Mount Pinatubo volcano in 1991, may result in poorer economic performance as funds are diverted to finance reconstruction.
7.4.4. Comparison Between the Philippines Deal and the Mexico Deal

The deal agreed by the Philippines illustrates one of the key elements of the Brady Initiative: flexibility. As is demonstrated by the other examples discussed in this chapter, none of the deals agreed so far are identical in structure. The purpose of the flexibility is to allow each country and its creditor banks to reach a settlement which best serves both parties, without the negotiations being constrained by a fixed agenda.

From the banks' point of view, perhaps more important than the minutiae of the deal is the fact that the deal agreed for the Philippines was a genuinely voluntary agreement. This is in sharp contrast to the Mexican deal where, as discussed above, political interference was "unacceptable". The banks were eager to make it clear that there was no such interference in the Philippine deal, and that they were willing participants.

This does not mean, however, that had the banks been offered a buyback at a higher price, more of them would not have taken it instead of providing New Money. The actions of the banks are governed by their perception of the quality of assets involved, which explains why relatively little New Money was agreed in both cases. In Mexico, especially for banks which have no local presence, the discount and par bonds were considered better assets than the New Money, principally because they had interest guarantees which the New Money did not, whilst the worsening political situation in the Philippines made the known value of the cash offered in the buyback a better asset than the prospect of new lending.
7.5. Costa Rica

The Brady deal arranged for Costa Rica was agreed in principle in late October 1989. As in the Mexican case, there is little doubt that the Brady Initiative was used as a tool of US foreign policy, giving support to an American ally. According to the IIF, Costa Rica's TED is only $4.71bn, of which $1.4bn is medium/long-term bank debt. Such a small debtor would not appear an immediate candidate for debt relief, were it not a close Central American ally of the US. It is most unlikely that the Brady Initiative will be applied to other small debtors in the foreseeable future.

The Costa Rican deal was at the time unique in another respect, in that the country was in arrears on its bank interest payments, by an estimated $325m10 when the deal was agreed. Previously it was thought that arrears would prevent the agreement of a deal with any debtor. Indeed, after the Costa Rican agreement banks were keen to point out that larger debtors with arrears (such as Brazil and Argentina) could not now expect to receive such favourable treatment. Argentina's arrears11 alone were roughly the same size as Costa Rica's TED by the end of 1989.

7.5.1. The Deal and its Effect on Costa Rica's External Debt

The Costa Rican deal comprises three elements. Banks were offered a buyback, expected to be at a price similar to the Secondary Market price

(then 20 cents per Dollar). Debt which was not tendered for the buyback would be converted into par bonds with a 6.25% fixed coupon (as with the Mexican par bonds). The existence of interest arrears meant that a new element had to be devised: Costa Rica agreed to make a 20% immediate cash payment towards the arrears, with the remainder rescheduled over 15 years with no grace period at a margin of 13/16% over Libor.

Hence the terms agreed for the interest arrears are much tougher from the debtor's point of view than those applied to the rest of the debt — clearly as a signal to other debtors that building up arrears could not be considered a soft option.

As an incentive for banks to offer more of their debt for buyback, those which tendered more than 60% of their exposure received bonds with a shorter maturity (20 years with ten years' grace on capital repayments compared to 25 years with 15 years' grace) than other banks; and a one-year interest guarantee on the bonds, which was not available to banks which tendered less than 60%. In addition, they also benefit from a three-year interest guarantee on their 15-year, Libor plus 13/16% back interest bonds, which again is not available for banks which tendered less than 60% of their debt for the buyback.

The final details of the take-up of the options were agreed in May 1990, with signing of the agreement commencing on the 6th. Banks holding 98% of the $1.5bn debt eligible under the agreement agreed to participate, so a total of approximately $1.47bn was covered. Banks holding 65% ($956m) of this debt agreed to the buyback at 16 cents per Dollar face value. Including the interest accrued on this debt, a total of $1169m was bought back. The remaining $514m was split between those banks.
which tendered more than 60% of their exposure and thus receive better terms as detailed above, and those which tendered less than 60%. The former group represented 17% ($250m) of the eligible debt and the latter 18%\(^\text{12}\) ($265m).

The effect of the deal on the structure of Costa Rica's external debt is shown in Table 7.6.

As the table shows, the agreement reduces the gross external debt burden by approximately 21% ($1.01bn), though the effective reduction in debt is greater than this because of the soft interest terms on the par bonds. Using the same method described for Mexico, the reduction in market rate equivalent debt due to the creation of the par bond is $0.187bn. To this is added the reduction due to the buyback (including interest arrears)

\[ - $0.187bn + [0.65 \times (1.47 + (0.98 \times 0.335))] \]

\[ = $1.356bn \]

Finally, the reduction in market rate equivalent debt is calculated by subtracting the debt incurred to the IMF and the World Bank to finance the buyback, giving $1.356 - $0.183 = $1.173bn. This is some 16% higher than the nominal reduction in the TED and is probably over-cautious because the (undisclosed) cost of servicing the IMF and World Bank debt will be less than if it were commercial debt, thus reducing its effective value and increasing the fall in the market rate equivalent debt of Costa Rica.

7.5.2. Costa Rica's Interest Service Ratio Projections, 1990-93

Assuming the usual margin of 13/16% over Libor at the 1989 average of 9.1% for all bank debt (ignoring interest arrears) and all other debt except IMF, which is charged at the SDR rate (approximated here to Libor), then the total interest paid due from Costa Rica in 1989 was approximately $436m. The IIF, however, estimates total interest payments at only $375m\(^{13}\). The difference is due almost entirely to the IIF estimate that the average interest rate payable on its external debt by Costa Rica in 1989 was 8.0%, compared to Libor of 9.1% and Libor plus margin (13/16%) of 9.9125%. The lending below market rate is presumably direct US lending on concessionary terms. This conjecture is evidenced by the fact that on IIF figures, bilateral debt accounted for almost 24% of TED compared to, for example, 13% of TED for Brazil and only 10% for Venezuela, both of whom paid an average of 9.9%\(^{14}\) on their external debt in 1989. Given this evidence and the fact that the average interest rate paid by Costa Rica has been below Libor by an average of 1.1% between 1983 and 1989\(^{15}\), I have calculated all projections on the basis of Libor plus margin for all non-restructured bank debt and private creditors, and Libor minus 1.1% on all official debt (excluding the IMF debt which is calculated at Libor). This method brings the estimate for 1989 interest payments, assuming no arrears, to $397.6m.

Costa Rica’s exports of merchandise plus other goods, services and income reached $1.95bn in 1989. Combining this with the estimated interest payment total of $397.6m gives an estimated 1989 ISR of 20.4%.

\(^{13}\) The World Bank estimate, taken from the World Debt Tables 1989-90, is even lower, at $300m. There appears to be no simple explanation for this, so I have used the IIF figures in the discussion on the grounds that they were released on 30 January 1990, two months after the World Bank figures were produced.

\(^{14}\) Source: IIF Country Database, 6 March 1990 and 29 October 1989.

\(^{15}\) Source: IIF Country Database, 30 January 1990.
Costa Rica's record of arrears on interest payments makes the ISR measure a less valuable tool for analysis. For example, arrears of only $100m, an insignificant sum in the context of the debt situation, would reduce Costa Rica's ISR from the theoretical figure given above by almost five percentage points.

Table 7.7 presents Costa Rica's projected ISR for 1990-93, giving the usual scenarios of Libor ranging from 6.1% to 9.6%, and compound annual export growth from 0% to 14%. As the table shows, on the ISR measure, Costa Rica has few problems. This is due to the initial position and to the structure of the deal. Unlike Mexico and the Philippines there is no New Money in the Costa Rican deal, so the interest charge does not rise after the initial fall due to the deal. In fact, at 9.1% Libor the immediate effect of the deal is to reduce the interest bill from $397.6m to $300.0m (a cut of 24.5%) and, assuming unchanged exports, the ISR from 22.7% to 17.1%.

As the table indicates, only disastrous export performance or sustained high Dollar interest rates over the next few years will prevent Costa Rica from maintaining its ISR below 15%.

7.6 Conclusion

The sensitivity analysis presented in this chapter is, on the whole, encouraging for the debtors. There will clearly continue to be some degree of debt servicing discomfort in the immediate aftermath of the Brady deals, especially in Mexico, but over the next few years only modest export performance should be enough to restore ISRs to acceptable levels. In the case of Costa Rica, there should be very few problems.
Perhaps the one of the most important conclusion to be drawn from the analysis is just how dramatic a rise in the ISR can be caused by higher Dollar interest rates. The weakness of the US economy has resulted in exceptionally low US interest rates for some time now, but this will not always be the case. Sensitivity to market interest rates is an unavoidable consequence of choosing market borrowing as a source of funds. Even in the wake of successful Brady deals, debtors are not in complete control of their own destinies.
Table 7.1: Mexico's External Debt

<table>
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<th></th>
<th>Pre-Brady, $bn</th>
<th>Post-Brady, $bn</th>
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<tbody>
<tr>
<td><strong>Medium/long-term bank debt</strong></td>
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<td><strong>Discount bonds</strong></td>
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<tr>
<td><strong>IBRD</strong></td>
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<tr>
<td><strong>Other multilateral debts</strong></td>
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<td>34.4</td>
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<tr>
<td><strong>Other private creditors</strong></td>
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<td>1.9</td>
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<td></td>
<td><strong>100.3</strong></td>
<td><strong>99.1</strong></td>
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<td></td>
<td><strong>9.90</strong></td>
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Table 7.3: Projections of Mexico's Interest/Exports Ratio to 1993

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### Table 7.4: The Philippines' External Debt

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<td><strong>Total External Debt</strong></td>
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<td><strong>28.74</strong></td>
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Table 7.5: Projections of the Philippines’ Interest/Exports Ratio to 1993

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<td>2  10.1 11.3 12.5 13.7 14.9 16.0 17.2 18.4</td>
</tr>
<tr>
<td>Growth, %</td>
<td>4  9.3 10.4 11.5 12.6 13.7 14.8 15.9 17.0</td>
</tr>
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<td>6  8.5 9.5 10.5 11.6 12.7 13.6 14.7 15.7</td>
</tr>
<tr>
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<td>8  7.6 8.6 9.6 10.6 11.6 12.6 13.6 14.6</td>
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<td>10 6.8 7.8 8.8 9.7 10.7 11.6 12.5 13.5</td>
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<tr>
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<td>12 6.8 6.8 7.7 8.6 9.5 10.5 11.4 12.4</td>
</tr>
<tr>
<td></td>
<td>14 4.9 5.8 6.7 7.6 8.6 9.5 10.4 11.3</td>
</tr>
<tr>
<td>1993</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.1 6.6 7.1 7.6 8.1 8.6 9.1 9.6</td>
</tr>
<tr>
<td>Annual</td>
<td>0  11.3 12.5 13.7 14.9 16.2 17.4 18.6 19.9</td>
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<tr>
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<td>2  10.1 11.1 12.2 13.3 14.5 15.6 16.7 17.9</td>
</tr>
<tr>
<td>Growth, %</td>
<td>4  8.6 9.7 10.8 11.9 12.9 14.0 15.1 16.1</td>
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<td>6  7.6 8.6 9.6 10.6 11.6 12.5 13.5 14.5</td>
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<td>8  6.7 7.6 8.5 9.4 10.3 11.2 12.1 13.0</td>
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<td></td>
<td>10 5.9 16.7 17.5 8.4 9.2 10.0 10.8 11.7</td>
</tr>
<tr>
<td></td>
<td>12 5.3 6.0 6.7 7.5 8.1 8.9 9.4 10.5</td>
</tr>
<tr>
<td></td>
<td>14 4.7 5.3 6.0 6.7 7.2 7.9 8.5 9.5</td>
</tr>
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</table>
Table 7.6: Costa Rica's External Debt

<table>
<thead>
<tr>
<th></th>
<th>Pre-Brady, $bn</th>
<th>Post-Brady, $bn</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medium/long-term bank debt</td>
<td>1.50</td>
<td>0.03</td>
</tr>
<tr>
<td>Interest arrears on bank debt</td>
<td>0.33</td>
<td>-</td>
</tr>
<tr>
<td>Short-term bank debt</td>
<td>0.40</td>
<td>0.40</td>
</tr>
<tr>
<td></td>
<td>2.23</td>
<td>0.43</td>
</tr>
<tr>
<td>15-year back interest bonds:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-year guarantee</td>
<td>-</td>
<td>0.04</td>
</tr>
<tr>
<td>No guarantee</td>
<td>-</td>
<td>0.05</td>
</tr>
<tr>
<td>20-year par bonds</td>
<td>-</td>
<td>0.25</td>
</tr>
<tr>
<td>25-year par bonds</td>
<td>-</td>
<td>0.26</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.60</td>
</tr>
<tr>
<td>IMF</td>
<td>0.03</td>
<td>0.08</td>
</tr>
<tr>
<td>IBRD</td>
<td>0.44</td>
<td>0.49</td>
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<tr>
<td>Other multilateral debt</td>
<td>0.57</td>
<td>0.57</td>
</tr>
<tr>
<td></td>
<td>1.04</td>
<td>1.14</td>
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<tr>
<td>Other bilateral debt</td>
<td>1.12</td>
<td>1.21</td>
</tr>
<tr>
<td>Interest arrears</td>
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<td>0.08</td>
</tr>
<tr>
<td></td>
<td>1.20</td>
<td>1.29</td>
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<tr>
<td>Other private creditors</td>
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<td>0.42</td>
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<tr>
<td>Total External Debt</td>
<td>4.89</td>
<td>3.88</td>
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</table>

Table 7.7: Projections of Costa Rica's Interest/Exports Ratio to 1993

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<th>Year</th>
<th>Libor, %</th>
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<tr>
<td></td>
<td>6.1 6.6 7.1 7.6 8.1 8.6 9.1 9.6</td>
</tr>
<tr>
<td>1990</td>
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<tr>
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<td>4 11.2 12.1 13.0 13.8 14.7 15.6 16.5 17.3</td>
</tr>
<tr>
<td>Growth, %</td>
<td>6 10.9 11.8 12.7 13.6 14.4 15.3 16.1 17.0</td>
</tr>
<tr>
<td></td>
<td>8 10.7 11.6 12.5 13.3 14.2 15.0 15.8 16.7</td>
</tr>
<tr>
<td></td>
<td>10 10.4 11.3 12.2 13.1 13.9 14.7 15.6 16.4</td>
</tr>
<tr>
<td></td>
<td>12 10.2 11.1 12.0 12.8 13.6 14.4 15.3 16.1</td>
</tr>
<tr>
<td></td>
<td>14 10.0 10.9 11.7 12.6 13.4 14.1 15.0 15.8</td>
</tr>
<tr>
<td>1991</td>
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<tr>
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<td></td>
</tr>
<tr>
<td>Annual</td>
<td>0 11.7 12.6 13.5 14.4 15.3 16.2 17.1 18.0</td>
</tr>
<tr>
<td>Export</td>
<td>4 10.8 11.7 12.5 13.3 14.1 15.0 15.8 16.7</td>
</tr>
<tr>
<td>Growth, %</td>
<td>6 10.4 11.2 12.0 12.8 13.6 14.4 15.2 16.0</td>
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<tr>
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<td>8 10.1 10.8 11.6 12.3 13.1 13.9 14.7 15.5</td>
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<td>10 9.8 10.4 11.1 11.9 12.6 13.4 14.2 14.9</td>
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<td>12 9.4 10.0 10.7 11.5 12.1 12.9 13.7 14.5</td>
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<td></td>
</tr>
<tr>
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<td>0 11.7 12.6 13.5 14.4 15.3 16.2 17.1 18.0</td>
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<tr>
<td>Export</td>
<td>4 10.4 11.2 12.0 12.8 13.6 14.4 15.2 16.0</td>
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<tr>
<td>Growth, %</td>
<td>6 10.1 10.7 11.3 12.1 12.8 12.2 14.4 15.1</td>
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<tr>
<td></td>
<td>8 9.3 10.0 10.7 11.4 12.1 12.9 13.6 14.3</td>
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<td>10 8.7 9.4 10.1 10.8 11.5 12.2 12.9 13.5</td>
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<td>14 7.7 8.5 9.1 9.7 10.4 11.1 11.8 11.8</td>
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<tr>
<td>Annual</td>
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<tr>
<td>Export</td>
<td>4 9.9 10.7 11.5 12.3 13.1 13.9 14.6 15.4</td>
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<tr>
<td>Growth, %</td>
<td>6 9.4 10.0 10.7 11.4 12.1 12.8 13.6 14.3</td>
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<td>8 8.6 9.2 9.9 10.6 11.2 11.9 12.6 13.3</td>
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<td>10 8.0 8.6 9.2 9.8 10.4 11.1 11.7 12.3</td>
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<tr>
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<td>14 7.5 7.8 8.2 8.5 9.0 9.6 10.0 12.5</td>
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CHAPTER EIGHT

CONCLUSIONS AND SUGGESTIONS FOR FURTHER RESEARCH

This thesis has described the rationale for, and the development and activities of one of the most important aspects of the LDC debt crisis, the Secondary Market in LDC debt. It has investigated the efficiency of the market and has demonstrated the ways in which market valuations have been used to price the options offered in debt reduction accords structured under the auspices of the 1989 Brady Initiative. Several further issues are raised by the research described herein, and these are discussed below.

The structure of LDC debts and the nature of the syndicated credit system, through which most of the loans were originally made, generated the ideal conditions for the development of a debt market. The realisation that the initial debt repayment schedules would not be met meant that banks were left with portfolios radically different in terms of expected cashflow than had been previously supposed.

Accordingly, the development of the Secondary Market, which facilitated the restructuring of banks' debt portfolios independently of any restructuring of the debts themselves, is one of the most significant steps in the chronology of the "Debt Crisis". Its importance also lies in three other main areas.
First, after the massive debt provisioning by the commercial banks in 1987 (and subsequently), the existence of the market provided an exit route for those smaller creditors who had no desire to be involved in the protracted negotiations necessary to devise restructuring or reduction accords, thereby reducing the number of creditors involved and making the process quicker.

Second, the ability of banks to divest themselves of unwanted portfolios of LDC debt has made it easier for individual banks to improve market perceptions of their own creditworthiness.

Third, the development of the Secondary Market in bank debt provided a means, or at least a starting point for negotiations, for the determination of appropriate ratios for loan-for-bond swaps and other debt reduction instruments. Market valuations have not always proved to be favourable to banks' immediate interests in attempting to extract higher swap ratios from debtors!

The market has developed from ad hoc individual transactions into the multi-billion dollar financial market that exists today. Indeed, using the ideas proposed by Goodhart (1989) and developed in Chapter Two, it may be thought of as having reached the transition phase between "Stage II" and "Stage III" in the market development process, with only the lack of a recognised regulatory body and fully standardised documentation preventing it from achieving the latter classification.

The market has continued to mature since the survey detailed in Chapter Three was conducted. Recent innovations have included the commencement of limited screen-based trading with on-line price quotation, and the
development of options trading. This further evidence of a market that is developing rapidly, taking advantage of technological advances made feasible by economies of scale as the market expands. Further developments may well include limited futures trading, thereby enhancing the range of hedging and position-taking opportunities.

As these developments appear, however, the dangers inherent in an unregulated market will become more apparent. The American authorities have explicitly recognised this problem, with the Federal Reserve having announced its intention to review market practices\(^1\). Several regulatory questions are posed by the existence and structure of the Secondary Market. They are probably the most important, and certainly the most immediately pressing issues raised by this thesis that require further research and which have significant policy implications.

First, the geographical spread of the market, with most activity taking place in London and New York, suggests that, in order to be effective, there is a requirement for close co-operation between national regulatory authorities, perhaps even to the extent of the formation of a joint regulatory authority. Indeed, the Federal Reserve is reported\(^2\) to be consulting with other non-American regulatory bodies, presumably including the Bank of England. The framework within such a regulatory body would work, with respect to national business laws and practices needs to be investigated.

\(^1\) Reuter reported that the Federal Reserve's intentions were announced to a closed seminar of debt traders in New York on 16 December 1991.

\(^2\) Source: Reuter. See Note 1 for details.
Second, the remit of any regulatory body or bodies is also of key importance. The desire of the Federal Reserve appears to be, as well as ensuring honest and fair trading practices, that the debt trading and corporate financing arms of banks are kept apart - the familiar concept of "Chinese Walls". This should ensure that, for example, there is no collusion between the two, resulting in a corporate finance customer being used to assist unwittingly in the restructuring of the debt trading book. The first aim of any regulation should be, however, to generate confidence in the fairness of the trading system, especially in the light of the failings of the administration of debt trading uncovered by the Federal Reserve\(^3\), and the comments made by a debt trader to Reuter\(^4\): "[The market is]...in its cowboy state."

Continued development and apparently increasing sophistication of markets does not, however, necessarily imply greater market efficiency. There has been significant disagreement between economists as to what exactly is meant by the term "efficient" when applied to capital markets. This thesis has assessed the literature in some depth, but data limitations have prevented the use of some of the newer tests for market efficiency, namely variance bounds tests (the case for which is argued so convincingly in several papers reviewed in Chapter Four). Nonetheless, the consistency of the results in the tests that were performed is striking, and raises interesting questions about the nature of developing markets. The test results suggested that thin, illiquid markets may, in contrast to prior expectations, exhibit far stronger characteristics of efficiency than other, much more liquid markets. Although this conclusion is not watertight, because the largest market

---

3. Source: Reuter. See Note 1 for details.
4. Source: Reuter. See Note 1 for details.
of all, Mexico, appeared efficient, it still needs explaining. The relative lack of information flows concerning the smaller countries is probably part of the explanation - with few price-moving pieces of information the price will not, ceteris paribus, move, but other constraints (essentially, insufficient provisioning) also probably contributed to the inability of market participants to take advantage of apparently exploitable opportunities.

Although the tests of trading systems, set out in Chapter Five, show that over the period examined, supernormal profits could have been made in several debt markets, it may well be the case that it would be impossible to operate such systems in practice. Although the market in the debt of some apparently inefficient markets, say, Morocco, is liquid compared to that of efficient ones such as Peru, the Moroccan market is probably still sufficiently small to make shorting the market a practical impossibility. Such a transaction requires a counterparty, but with few active traders such a counterparty may not exist at a particular time. In other words, despite apparent profitability, filter systems remain risky in illiquid markets.

The efficiency or otherwise of the Secondary Market is of more than academic interest, because the existence of a functioning market provided part of the rationale for the Brady Initiative. Given that one of the aims of the Initiative is to "capture" the true value of the debt through discounted exchanges of the original stock of debt for new, different types of obligations (the various bond options), the market has provided at least a starting point for negotiations as to the appropriate "exchange rate" between the old and the new instruments. The lack of liquidity of some of the markets, however, means that their
usefulness in this respect is very limited. It is not reasonable to expect all creditors to accept the pricing "decisions" of an illiquid market in which many of them play no part.

The analysis of the implications of the Brady Initiative, set out in Chapter Seven, suggest that, in general, it has made a major contribution to the easing of the debt problem for some countries. It is not, however, a panacea - although to be fair to those who devised it, it was not intended to be. Although agreement in principle has now been reached with Brazil, the timescale involved (the Initiative was launched in March 1989) is perhaps the clearest indication of the distance that still has to be travelled to resolve the debt situation.


SAalomON BROTHERS INC "Indicative Prices for LDC Loans". All issues, (fortnightly) February 1987 to June 1989.


Appendix I - Typical Debt-Equity Swap Transaction

Creditor
Bank A

2

Creditor
Bank B

3

Broker

MNC's
bank

5

Creditor
Bank C

1,4

Debtor

Investing
Corporation

6

MNC's local
subsidiary

7
SECONDARY MARKETS QUESTIONNAIRE

PART I

1. Please give your estimate for the total market turnover in 1988. Please list any particular institution(s) which you expect to account for a significant part of this total.

2. Please give your estimate of the average total weekly market turnover. To what extent is this figure subject to fluctuation?

3. Please give your estimate for the percentage of total deal value made for the purposes of:

   (i) Debt-equity swaps
   (ii) Portfolio diversification
   (iii) Portfolio consolidation
   (iv) Cash sales purely to reduce exposure
   (v) Speculation
   (vi) Other (please specify)

4. Please give your estimate for the average size of deal made for the purposes of:

   (i) Debt-equity swaps
   (ii) Portfolio diversification
   (iii) Portfolio consolidation
   (iv) Cash sales purely to reduce exposure
   (v) Speculation
   (vi) Other (please specify)
5. (a) Please give your estimate for the total number of institutions operating in the market in both New York and London on a regular basis. How many of these institutions act purely as brokers?

(b) How many different institutions do you deal with on a regular basis (if different from (a))?

(c) Is the number of participants in the market growing, falling or static? If the market size is changing, how many institutions do you expect to enter/leave the market in the next 18 months?

(d) How many institutions joined the market as regular participants during 1988?

6. (a) How quickly do prices move in response to external shocks e.g., the publication of new information about a particular country?
6. (b) In the experience of your institution, does the degree of rigidity in price vary between countries? If so, please rank the major Latin American debtors in order of price rigidity beginning with the country with the most rigid price. Please indicate if there are any major debtors whose loans you do not trade.

7. Is the degree of liquidity in the market increasing, falling or remaining static? Which countries, if any, are particularly affected by a lack of liquidity?
8. When non-financial companies buy debt to use in debt-equity swaps, do they deal through brokers or directly with selling banks or a mixture of both? If both, in what proportion? What factors do you believe would influence their decision for a particular deal?
SECONDER MARKETS QUESTIONNAIRE

PART II

1. When did your institution first begin to operate in the market?

2. Do you act exclusively as a broker or principal, or both?

3. Please indicate:
   (a) When you first began to use the market for the following purposes; and
   (b) The percentage of your total deal value due to each of them:

<table>
<thead>
<tr>
<th>(i)</th>
<th>Debt-equity swaps</th>
<th>Month/Year</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>(ii)</td>
<td>Portfolio diversification</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(iii)</td>
<td>Portfolio consolidation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(iv)</td>
<td>Sales to reduce overall exposure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(v)</td>
<td>Speculation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(vi)</td>
<td>Other (please specify)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. How long does your institution hold debt between buying and selling? What proportion of deals are closed simultaneously on both the buying and selling sides? Please answer as fully as possible.
1. Does your institution use a standard form of documentation for secondary market deals? If not, why? In your opinion, would standard documentation facilitate more rapid expansion of the market?

2. Please give your opinion as to how you expect the market to develop over the next 18 months, with particular reference to:
   - Size of the market
   - Liquidity
   - The relative importance of Part II, 3.(i) - (vi).
3. How do you believe the market would be affected by the committed, large scale entrance of major Japanese banks?

4. Please outline below the mechanics involved in the execution of a typical deal for your institution. Finally, is there any other information you have which you think may be of use to me?

Please continue overleaf if necessary.
Appendix III - Chronology of a Typical Secondary Market Deal

1. Marketing and negotiation of transaction.

2. Actual discussion on a firm basis and agreement on a price over the telephone.

3. Same day or overnight telefax confirmation.

4. Preparation of documentation and dispatching by fax (Takes between two days and two weeks. Standard closing is two weeks.)

5. Payment and signature arrangements.

6. Sending of notices to the parties concerned on the value date.

7. Filing.
5 KEY OFF:CLS
7 DEAL =0: TOTTRAD=0
10 PRINT "input country name": INPUT"", CN$
15 Y = LEN(CN$)-4
20 PRINT "input filter size (%)": INPUT"", FS
25 POSITION$="closed"
30 OPEN "I", #2, CN$
35 IF YNS="y" OR YNS="Y" THEN 50
40 DIM M(59), B(59), O(59), BP(59), SP(59), PROFIT(59), R(59), NTRAD(59), NINT(59), BS$(59)
50 FOR D=1 TO 59: C= D-1
51 IF D <= 3 THEN INTF = .061875: INTR = .071875
52 IF D =4 THEN INTF = .065: INTR = .075
53 IF D >=10 THEN INTF = .0725: INTR = .085625
55 IF D =22 THEN INTR = .08125: INTR = .08125
56 IF D =35 THEN INTF = .07625: INTR = .08625
57 IF D =41 THEN INTR = .08375: INTR = .09375
58 IF D =48 THEN INTR = .095: INTR = .105
60 INPUT 112, M(D), B(D), O(D)
65 IF D=59 THEN GOSUB 1000
67 IF D=59 THEN 2500
70 IF POSITIONS$="closed" THEN 110
80 IF D-AT >=2 THEN GOSUB 1000
90 IF POSITIONS$="open" THEN 140
110 IF D>1 AND M(D) = M(C)*(1+(FS/100)) THEN GOSUB 220
120 IF D>1 AND M(D) <= M(C)-(M(C)*(FS/100)) THEN GOSUB 260
130 GOTO 200
140 IF D>1 AND BS$(DEAL)="long" AND M(D) = M(C) AND M(D) = M(C)*(1+(FS/100)) THEN GOSUB 1000
150 IF D>1 AND BS$(DEAL)="long" AND M(D) <= M(C)-(M(C)*(FS/100)) THEN GOSUB 260
155 IF D>1 AND BS$(DEAL)="long" AND M(D) = M(C)-(M(C)*(FS/100)) THEN 200
170 IF D>1 AND BS$(DEAL)="short" AND M(D) = M(C)*(1+(FS/100)) THEN GOSUB 1000
180 IF D>1 AND BS$(DEAL)="short" AND M(D) <= M(C)*(1+(FS/100)) THEN GOSUB 260
185 IF D>1 AND BS$(DEAL)="short" AND M(D) = M(C)*(1+(FS/100)) THEN 200
200 NEXT D
220 REM
230 DEAL=DEAL + 1
240 BS$(DEAL)="long":POSITIONS$="open":AT = D:BP(DEAL)=O(D)*1.005
250 RETURN
260 REM
270 DEAL=DEAL + 1
280 BS$(DEAL)="short":POSITIONS$="open":AT=D:SP(DEAL)=B(D)-(B(D)*.005)
290 RETURN
1000 REM*****calculate return*****
1100 POSITIONS$="closed"
1150 IF D-AT =2 THEN NINT(DEAL)=28
1155 IF D-AT =2 THEN NTRAD(DEAL) =20
1160 IF D-AT =1 THEN NINT(DEAL) =14
1163 IF D-AT =1 THEN NTRAD(DEAL) =10
1165 AT=0
1200 IF BS$(DEAL)="long" THEN 1400
1250 BP(DEAL) = O(D) *1.005
1325 R(DEAL)= 2-(BP(DEAL)/SP(DEAL)) -((NINT(DEAL)*((100*INTR) -(SP(DEAL)*INTF))/360*SP(DEAL)))
1350 R(DEAL) = R(DEAL)*((1/NTRAD(DEAL)) -1
1360 TOTTRAD=TOTTRAD + NTRAD(DEAL)
1375 RETURN
1400 REM******return calcs for long deal******
1425 SP(DEAL) = B(D) -B(D)*.005
1455 R(DEAL) = (SP(DEAL)/BP(DEAL)) - ((NINT*(BP(DEAL)*INTF) - (100*INTR)) / (36
O*BP(DEAL))
1456 R(DEAL) = R(DEAL)^(1/NTRAD(DEAL)) - 1
1470 TOTTRAD = TOTTRAD + NTRAD(DEAL)
1500 RETURN
2500 REM********output of results********
2600 REM*******ovrat = overall rate of return********
2625 TOTRAT = 1
2650 FOR COUNT = 1 TO DEAL
2675 R(COUNT) = (R(COUNT) + 1)^(NTRAD(COUNT))
2700 TOTRAT = TOTRAT * R(COUNT)
2750 NEXT COUNT
2800 ROOT = TOTRAT^(1/TOTTRAD)
2850 OVRAT = (ROOT - 1) * 26000
3000 REM********Resu1ts Output********
3025 CLS
3050 PRINT "Country: ";LEFT$(CN$, Y)
3090 PRINT "Filter Size: ";FS;"I"
3095 PRINT "Position No. Type of Position Open Price Close Price Return"
3175 PRINT "
3200 FOR RESULT = 1 TO DEAL
3205 IF RESULT = 16 THEN INPUT "", XYZ
3207 IF RESULT = 16 THEN CLS
3210 PS = RESULT + 5
3215 IF RESULT > 15 THEN PS = RESULT - 15
3250 IF BS$(RESULT) = "long" THEN 4000
3300 LOCATE PS, 9:PRINT RESULT:LOCATE PS, 25:PRINT BS$(RESULT)
3350 SP(RESULT) = SP(RESULT) * 100: SP(RESULT) = INT(SP(RESULT)) + SP(RESULT) / 100: IF SP(RESULT) = INT(SP(RESULT)) THEN LOCATE PS, 43 - LEN(STR$(SP(RESULT))): PRINT SP(RESULT): LOCATE PS, 43: PRINT ".00": GOTO 3450
3400 IF (SP(RESULT) * 10) = INT(SP(RESULT) * 10) THEN LOCATE PS, 45: PRINT (STR$(SP(RESULT))): PRINT SP(RESULT): LOCATE PS, 45: PRINT "0": GOTO 3450
3425 LOCATE PS, 46: PRINT STR$(SP(RESULT))
3450 BP(RESULT) = BP(RESULT) * 100: BP(RESULT) = INT(BP(RESULT)) + BP(RESULT) / 100: IF BP(RESULT) = INT(BP(RESULT)) THEN LOCATE PS, 59 - LEN(STR$(BP(RESULT))): PRINT BP(RESULT): LOCATE PS, 59: PRINT ".00": GOTO 3600
3500 IF (BP(RESULT) * 10) = INT(BP(RESULT) * 10) THEN LOCATE PS, 61: PRINT (STR$(BP(RESULT))): PRINT BP(RESULT)
3550 LOCATE PS, 62: PRINT STR$(BP(RESULT))
3600 IF R(RESULT) >= 1 THEN LOCATE PS, 68: PRINT R(RESULT)
3650 IF R(RESULT) < 1 THEN LOCATE PS, 69: PRINT R(RESULT): LOCATE PS, 77: PRINT "": LOCATE PS, 69: PRINT "0"
3800 REM
3950 GOTO 5000
4000 LOCATE PS, 9: PRINT RESULT: LOCATE PS, 25: PRINT BS$(RESULT)
4050 BP(RESULT) = BP(RESULT) * 100: BP(RESULT) = INT(BP(RESULT)) + BP(RESULT) / 100: IF BP(RESULT) = INT(BP(RESULT)) THEN LOCATE PS, 38 - LEN(STR$(BP(RESULT))): PR INT BP(RESULT): LOCATE PS, 38: PRINT ".00": GOTO 4200
4100 IF (BP(RESULT) * 10) = INT(BP(RESULT) * 10) THEN LOCATE PS, 45: PRINT (STR$(BP(RESULT))): PRINT BP(RESULT)
4150 LOCATE PS, 46: PRINT STR$(BP(RESULT))
4200 SP(RESULT) = SP(RESULT) * 100: SP(RESULT) = INT(SP(RESULT)) + SP(RESULT) / 100: IF SP(RESULT) = INT(SP(RESULT)) THEN LOCATE PS, 59 - LEN(STR$(SP(RESULT))): PRINT SP(RESULT): LOCATE PS, 59: PRINT ".00": GOTO 4350
4250 IF (SP(RESULT) * 10) = INT(SP(RESULT) * 10) THEN LOCATE PS, 61: PRINT (STR$(SP(RESULT))): PRINT SP(RESULT)
4300 LOCATE PS, 62: PRINT STR$(SP(RESULT))
4350 IF R(RESULT) >= 1 THEN LOCATE PS, 68: PRINT R(RESULT)
4400 IF R(RESULT) < 1 THEN LOCATE PS, 69: PRINT R(RESULT): LOCATE PS, 77: PRINT "": LOCATE PS, 69: PRINT "0"
4500 REM
5000 NEXT RESULT
5050 LOCATE PS+2, 42: PRINT "Overall rate of return = ": IF OVRAT < 0 THEN LOCATE PS+2, 67: PRINT OVRAT; "%
5100 LOCATE PS+2, 42: PRINT "Overall rate of return = ": IF OVRAT > 0 THEN LOCATE PS+2, 67: PRINT OVRAT; "%
5150 REM********Calculation of the Buy and Hold return********
5175 B(59) = B(59) - (.005*B(59)): O(1) = O(1) * 1.005
5180 NINTBH=726:NTRADBH=590:INTFBH = 7.973517E-02:INTRBH = 8.973518E-02
5200 RBH = (B(59)/O(1)) - ((NINTBH*((O(1)*INTFBH) - (100*INTRBH))) / (360*O(1)))
5250 RBH = RBH^(1/NTRADBH) -1
5300 RBH=RBH*26000
5500 LOCATE PS+4, 45: PRINT "Buy and Hold return = ": IF RBH < 0 THEN LOCATE PS+4, 67: PRINT RBH; "%
5550 IF RBH > 0 THEN LOCATE PS+4, 67: PRINT RBH; "%
6000 INPUT ", XYZ
6050 CLS: PRINT "Do you want to do another?": INPUT ", YN$
6100 IF YN$= "n" OR YN$= "N" THEN END
6150 IF YN$= "y" OR YN$= "Y" THEN 6300
6200 BEEP: PRINT "Error. Please try again (y/n)": INPUT ", YN$: GOTO 6100
6300 CLOSE: REM", #2: REM, CN$
6350 GOTO 5
10 KEY OFF
20 CLS
30 PRINT "PROGRAM OPTIONS"
40 LOCATE 9, 20: PRINT "1. Full analysis"
50 LOCATE 11, 20: PRINT "2. Bank analysis only"
60 LOCATE 13, 20: PRINT "3. Country analysis only"
70 LOCATE 5, 1: PRINT "Enter the number of one of the options listed below"
80 IF OC <> INT(OC) OR OC < 1 OR OC > 3 THEN BEEP: LOCATE 5, 1: PRINT "Error. Please input 1, 2, or 3 and press the 'Enter' key"
90 IF OC = 3 THEN 820
100 IF OC = 3 THEN 820
110 CLS
120 PRINT "BANK EXPOSURE DETAILS"
130 LOCATE 3, 1: INPUT "Enter name of country", C$
140 LOCATE 5, 50: INPUT "Enter bank's total exposure ($m) to ", C$
150 LOCATE 7, 50: INPUT "Enter bank's MT exposure ($m)"
160 LOCATE 9, 50: INPUT "Enter bank's bond exposure ($m)"
170 LOCATE 11, 50: INPUT "Enter bank's other exposure ($m)"
180 GOSUB 9440
190 IF E$ = "y" OR E$ = "Y" THEN 250
200 CLS: PRINT "RE-ENTER DATA": GOTO 130
210 CLS: PRINT "DETAILS OF BANK'S PROVISIONS AGAINST EXPOSURE TO "
220 PRINT "Enter provisions (%) against MT exposure"
230 LOCATE 4, 73: INPUT "", MP
240 PRINT "Enter provisions (%) against bond exposure"
250 LOCATE 6, 73: INPUT "", BP
260 PRINT "Enter provisions (%) against other exposure"
270 LOCATE 8, 73: INPUT "", OP
280 GOSUB 9440
290 IF E$ = "y" OR E$ = "Y" THEN 350
300 CLS: PRINT "RE-ENTER DATA": GOTO 260
310 CLS: PRINT "ELEMENTS OF DEAL"
320 PRINT "Enter the face value ($m) of the loans to be swapped": LOCATE 6, 73: INPUT "", O1L
330 IF O1L = 0 THEN 670
340 LOCATE 8, 73: INPUT "Input the rate of interest payable on the bonds": LOCATE 10, 73: INPUT "", F1R2
350 LOCATE 12, 1: PRINT "When are the bonds due for repayment (year)": LOCATE 12, 73: INPUT "", RD1
360 LOCATE 14, 1: PRINT "Enter the rate at which provisions will be made against the new bonds": LOCATE 14, 73: INPUT "", O1P
370 LOCATE 16, 1: PRINT "Enter the rate at tax relief will be given on the provisions": LOCATE 16, 73: INPUT "", TGR1
380 GOSUB 9440
390 IF E$ = "y" OR E$ = "Y" THEN 480
400 GOSUB 10330
410 LOCATE 12, 1: PRINT "When are the bonds due for repayment (year)": LOCATE 12, 73: INPUT "", RD1
420 LOCATE 14, 1: PRINT "Enter the rate at which provisions will be made against the new bonds": LOCATE 14, 73: INPUT "", O1P
430 LOCATE 16, 1: PRINT "Enter the rate at tax relief will be given on the provisions": LOCATE 16, 73: INPUT "", TGR1
440 GOSUB 9440
450 IF E$ = "y" OR E$ = "Y" THEN 480
460 LOCATE 8, 73: INPUT "Input the rate of interest payable on the bonds": LOCATE 8, 73: INPUT "", F1R2
470 LOCATE 10, 1: PRINT "Will this rate change over the lifetime of the bond (y/n)"
480 GOSUB 10330
490 IF RIC$ = "n" OR RIC$ = "N" THEN 610
550 IF RIC$="y" OR RIC$="Y" THEN 570
560 LOCATE 10,1:BEEP:PRINT"Error. Please enter y or n"
600 GOTO 540
570 LOCATE 12,1:PRINT"Enter the year of the change in interest rate":LOCATE 12,3:INPUT"",RIC$:GOTO 540
580 LOCATE 14,1:PRINT "Enter the new rate of interest":LOCATE 14,73:INPUT":FIR22
590 IF RIC$="y" OR RIC$="Y" THEN T=16:GOTO 620
600 GOTO 620
610 T=12
620 LOCATE T,1:PRINT"When are the bonds due for repayment (year) ?":LOCATE T,73:INPUT"",RD2
630 LOCATE T+2,1:PRINT"Enter the tax rate (%) applicable to profits from the bond"": LOCATE T+2,73:INPUT"",TCR2
640 GOSUB 9440
650 IF E$="y" OR E$="Y" THEN 670
660 IF E$="n" THEN CLS:PRINT "RE-ENTER DATA":FIR22=0:GOTO 490
670 CLS:PRINT"ELEMENTS OF DEAL"
680 PRINT:PRINT"Option 3: New Money":GOSUB 9490
690 IF TANM-O THEN 710
700 GOSUB 10190
710 REM********Buyback
720 CLS:PRINT "ELEMENTS OF THE PROPOSED DEAL"
730 PRINT:PRINT"Option 4: Debt buyback"
740 LOCATE 6,1:PRINT"Please enter the amount of debt ($m) to be tendered for buy back":LOCATE 6,73:INPUT"",04L:IF 04L=0 THEN 790
750 LOCATE 8,1:PRINT"Enter the price (cents) at which the debt will be bought back":LOCATE 8,73:INPUT"",BBP
760 GOSUB 9440
770 IF E$="y" OR E$="Y" THEN 790
780 CLS:PRINT"RE-ENTER DATA":GOTO 730
790 CLS:PRINT"INTEREST AND DISCOUNT RATE ESTIMATES":LOCATE 4,1:PRINT"Enter estimate for average Libor over the period of the analysis":LOCATE 4,73:INPUT"",LP
800 LOCATE 6,1:PRINT "Enter the discount rate to be used in NPV calculations":LOCATE 6,73:INPUT"",DCFR
810 IF OC=2 THEN 1490
820 REM********Position of debtor
830 CLS
840 PRINT"CURRENT POSITION OF DEBTOR: ":C$
850 LOCATE 3,1: PRINT"Enter the latest estimate ($m) of total external debt"
860 LOCATE 5,1:PRINT"Enter the latest estimate ($m) of external bank debt"
870 LOCATE 7,1: PRINT"Enter the"":CFY-1:"interest cost ($m) on bank debt"
880 LOCATE 9,1: PRINT"Enter the"":CFY-1:"interest cost ($m) on non-bank debt"
890 LOCATE 11,1: PRINT"Enter the value of"":CFY-1:"exports ($m)"
900 ELX=ELX
910 LOCATE 13,1: PRINT"Enter the the expected future growth rate (%) for exports"
920 GOSUB 9440
930 IF E$="y" OR E$="Y" THEN 960
940 CLS:PRINT "RE-ENTER DATA"
950 GOTO 850
960 REM********Details of take-up of Options********
970 CLS
980 PRINT"TAKE-UP OF OPTIONS"
990 LOCATE 3,1:PRINT"Enter the total take-up (face value, $m) of Option 1":LOCATE E 3,72:INPUT"",TU1
1000 LOCATE 5,1:PRINT"Enter the total take-up ($m) of Option 2":LOCATE E 5,72:INPUT"",TU2
1010 LOCATE 7,1:PRINT"Enter the total amount ($m) of New Money (Option 3)":LOCATE E 7,72:INPUT"",TU3
1020 IF TU3 = 0 THEN 1120
1030 IF OC < 3 THEN 1060
1040 LOCATE 9,1:PRINT"Enter the margin over Libor payable on the New Money": LOCATE 9,72:INPUT"", FLR3$
1050 GOSUB 9580
1060 LOCATE 11,1:PRINT"How many tranches of New Money will be made available ?": LOCATE 11,72:INPUT"",TR
1070 IF TR <= INT(TR) THEN 1100
1080 IF TR < 1 THEN 1110
1090 GOTO 1120
1100 LOCATE 11,1:BEEP:PRINT"Error. There must be a whole number of tranches. Please re-input ":LOCATE 11,72:INPUT"",TR: GOTO 1070
1110 LOCATE 11,1:BEEP:PRINT"Error. There must be at least one tranche. Please re-input ":LOCATE 11,72:INPUT"",TR: GOTO 1070
1120 LOCATE 13,1:PRINT"Enter the total take-up (face value $m of debt tendered) of Option 4":LOCATE 13,72:INPUT"",TU4
1130 GOSUB 9440
1140 IF E$="y" OR E$="Y" THEN 1160
1150 CLS:PRINT"RE-ENTER DATA":GOTO 990
1160 IF TU3=0 THEN 1180
1170 GOSUB 10590
1180 IF TU1<0 THEN 1200
1190 IF TU1=0 AND OIL=0 THEN 1280
1200 IF OIL=0 THEN 1220
1210 GOTO 1280
1220 CLS:PRINT"OPTION 1: Discount bonds"
1230 LOCATE 4,1:PRINT"Enter the discount (%) at which the bonds will be swapped ":LOCATE 4,73:INPUT"",D
1240 GOSUB 10330
1250 GOSUB 9440
1260 IF E$="y" OR E$="Y" THEN 1280
1270 CLS:PRINT"RE-ENTER DATA":GOTO 1230
1280 IF TU2<0 THEN 1300
1290 IF TU2=0 AND O2L=0 THEN 1440
1300 IF O2L=0 THEN 1320
1310 GOTO 1440
1320 CLS
1330 PRINT"OPTION 2: Par bonds"
1340 LOCATE 6,1:PRINT "Enter the fixed rate (%) payable on the bonds":LOCATE 6,73:INPUT "",FIR2
1350 LOCATE 8,1:PRINT "Will this rate increase over the life of the bond (y/n) ":LOCATE 8,73:INPUT "",RIC$
1360 IF RIC$="n" OR RIC$="N" THEN 1410
1370 IF RIC$="y" OR RIC$="Y" THEN 1390
1380 LOCATE 8,1:BEEP:PRINT"Error. Please enter y or n":LOCATE 8,73:INPUT"",RIC$
1390 GOTO 1360
1400 LOCATE 10,1:PRINT "Enter the year of the increase":LOCATE 10,73:INPUT"",YRIC
1410 LOCATE 12,1:PRINT "Enter the new interest rate":LOCATE 12,73:INPUT "",FIR22
1420 IF E$="y" OR E$="Y" THEN 1440
1430 CLS:PRINT"RE-ENTER DATA":GOTO 1330
1440 IF TU4=0 OR OC=1 THEN 1470
1450 CLS:PRINT"OPTION 3: Buyback"
1460 LOCATE 4,1:PRINT"Enter the price (cents) at the debt will be bought back":LOCATE 4,73:INPUT"",BBP
1470 IF OC = 1 THEN 1490
1480 CLS:PRINT "INTEREST RATE ESTIMATE":LOCATE 4,1:PRINT"Enter your estimate for average Libor over the period of the analysis":LOCATE 4,73:INPUT"",LP
1490 IF OC = 3 THEN 7150
1500 IF O1L=0 THEN 1530
1510 AF=0 : AF3=0
1520 GOTO 1670
1530 REM********Calculations of effect on bank P&L and B/S
1540 REM********P&L
1550 REM********Immediate P&L effect of discount swap
1560 REM********NPV of total expected funding loss
1570 LB1 = RD1-1989
1580 AF1=0
1590 FOR FL = 1 TO LB1
1600 LET AF1= AF1+(1/(1+(DCF/100))^FL))
1610 NEXT FL
1620 LET AF2=((D/100)/(LP/100)+(FLR/100))-(LP/100)
1630 LET AF3 = 01L*AF2: REM********Annual expected funding loss
1640 LET AF = 01L*AF2: REM********AF = NPV of total expected funding loss
1650 IF NMEDP=D THEN CL1=0: GOTO 1670
1660 LET CL1=(MP-D)/(100)*01L:REM********Immediate capital loss on discount swap
1670 IF 02L=0 THEN 1970
1680 ABCD = 999:REM********tells computer when doing par bond calcs that it must return to this section - see line 28590
1690 GOTO 5880
1700 AF21 = 0
1710 FOR FL2 = 0 TO LB2
1720 LET AF21= AF21+ (1/(1+(DCF/100))^FL2)
1730 NEXT FL2
1740 AF22 =0
1750 IF YRIC>O AND SCEN<>10 THEN 1800
1760 LET AF22 = (((FIR2/100) - (LP/100))02L)*AF21)
1770 IF PCP>0 THEN AF22=PCP
1780 IF NMEDP=0 THEN 1970
1790 GOTO 1830
1800 LET AF22 = (((FIR2/100) - (LP/100))02L)*AF21*((YRIC-CFY)/(RD2-CFY))
1810 LET AF22 = AF22+ (((FIR2/100) - (LP/100))02L)*AF21*(((RD2-YRIC)/(RD2-CFY)))
1820 IF IFPCP>0 THEN AF22=PCP
1830 NETPPB1= (((FIR2/100)*02L) - (LP/100)*02L) + ((MP/100)*02L)*AF22) + ((LP/100)*AF22) + ((AF22/(RD2-CFY))
1840 IF IFPS"n" OR IFPS"n" THEN NETPPB1=NETPPB1-(LP/100)*AF22)
1850 IF PARL =0 THEN 1910
1860 IF YRIC>O AND PARL+CFY>-YRIC THEN 1890
1870 NETPPB1= (((FIR2/100)*02L) - (LP/100)*02L) + (AF22/(RD2-CFY)) + ((AF22-(AF22*(PARL/(RD2-CFY)))*(LP/100))
1880 GOTO 1900
1890 NETPPB1= (((FIR2/100)*02L) - (LP/100)*02L) + (AF22/(RD2-CFY)) + ((AF22-(AF22*(PARL/(RD2-CFY))))*(LP/100))
1900 IF IFPS"n" OR IFPS"n" THEN NETPPB1=NETPPB1- ((AF22-(AF22*(PARL/(RD2-CFY))))*(LP/100))
1910 IF IFPS"n" OR IFPS"n" THEN 1930
1920 NETPPB1 = NETPPB1 *(1/(1+(DCF/100))"PARL))>:GOTO 1940
1930 NETPPB1 = NETPPB1*(1-(TCR2/100)) *1/1+(DCF/100))"PARL))
1940 IF PARL = 0 THEN NETPPB1 = NETPPB1
1950 NETPPB2 =NETPPB2 + NETPPB1
1960 NEXT PARL
1970 IF TANM <>0 THEN 2000:REM********Effect due to New Money
1980 HIC=0:HIR=0:HP=0:NPVHIC=0:NPVHIR=0:NPVPN=0
1990 GOTO 2210
2000 IF TDY(1)<CFY THEN 2030:REM********if first tranche not in current year, then immediate hit (hic) =0
2010 LET B=2: LET HIC = ((NMIC(B)*(NMPIC/100)) * (1-(TCR3/100))):HIC=HIC-*1
2020 GOTO 2040
2030 HIC=0:LET B= 1
2040 NPVHIC=0
2050 NPVHIC = NPVHIC + ((NMIC(B) *(NMPIC/100)*(1-(TCR3/100)))/((1+(DCF/100))
2060 B =B+1: IF B <> (TR+1) THEN 2050
2070 IF TDY(1)<CFY THEN 2100:REM********If first tranche not in current year, then immediate hit (hir) =0
2080
INT".00": GOTO 2590
2570 IF (NETPPB2*10) = INT(NETPPB2*10) THEN LOCATE 11,70-LEN(STR$(NETPPB2)): PRINT NETPPB2: LOCATE 11,70: PRINT"0": GOTO 2590
2580 LOCATE 11,71-LEN(STR$(NETPPB2)): PRINT NETPPB2
2590 REM
2600 REM********Details of effect of buyback********
2610 REM********bbcl - capital loss due to buyback********
2620 BBCL - (100-BBP-MP)/100 *04L*-1
2630 BBCL=BBCL*100: BBCL=INT(BBCL): BBCL-INT(BBCL)/100: IF BBCL=INT(BBCL) THEN LOCATE 12,45-LEN(STR$(BBCL)): PRINT BBCL:LOCATE 12,45: PRINT"O": GOTO 2660
2640 IF (BBCL*10)- INT(BBCL*10) THEN LOCATE 12,46-LEN(STR$(BBCL)): PRINT BBCL:
2650 LOCATE 12,47-LEN(STR$(BBCL)): PRINT BBCL
2660 LOCATE 12,48-LEN(STR$(BBCL)): PRINT BBCL
2670 LOCATE 14,1:PRINT"DEBT BUYBACK: Capital loss"
2680 HIC=HIC*100: HIC=INT(HIC): HIC-HIC/100: IF HIC=INT(HIC) THEN LOCATE 15,45-LEN(STR$(HIC)): PRINT HIC:LOCATE 15,45: PRINT"O": GOTO 2710
2690 IF (HIC*10)- INT(HIC*10) THEN LOCATE 15,46-LEN(STR$(HIC)): PRINT HIC:
2700 LOCATE 15,47-LEN(STR$(HIC)): PRINT HIC
2710 LOCATE 15,48-LEN(STR$(HIC)): PRINT HIC
2720 NPVHIC-NPVHIC*-100: NPVHIC-INT(NPVHIC): NPVHIC-NPVHIC/100: IF NPVHIC=INT(NPVHIC) THEN LOCATE 16,68-LEN(STR$(NPVHIC)): PRINT NPVHIC:LOCATE 16,68: PRINT"0": GOTO 2750
2730 IF (NPVHIC*10)- INT(NPVHIC*10) THEN LOCATE 16,70-LEN(STR$(NPVHIC)): PRINT NPVHIC:
2740 LOCATE 16,71-LEN(STR$(NPVHIC)): PRINT NPVHIC
2750 LOCATE 16,72-LEN(STR$(NPVHIC)): PRINT NPVHIC
2760 HIR=HIR*100: HIR=INT(HIR): HIR-HIR/100: IF HIR=INT(HIR) THEN LOCATE 17,45-LEN(STR$(HIR)): PRINT HIR:LOCATE 17,45: PRINT"O": GOTO 2790
2770 IF (HIR*10)- INT(HIR*10) THEN LOCATE 17,46-LEN(STR$(HIR)): PRINT HIR:
2780 LOCATE 17,47-LEN(STR$(HIR)): PRINT HIR
2790 LOCATE 17,48-LEN(STR$(HIR)): PRINT HIR
2800 NPVHIR-NPVHIR*-100: NPVHIR-INT(NPVHIR): NPVHIR-NPVHIR/100: IF NPVHIR=INT(NPVHIR) THEN LOCATE 18,68-LEN(STR$(NPVHIR)): PRINT NPVHIR:LOCATE 18,68: PRINT"0": GOTO 2830
2810 IF (NPVHIR*10)- INT(NPVHIR*10) THEN LOCATE 18,70-LEN(STR$(NPVHIR)):PRINT NPVHIR:
2820 LOCATE 18,71-LEN(STR$(NPVHIR)):PRINT NPVHIR
2830 LOCATE 18,72-LEN(STR$(NPVHIR)):PRINT NPVHIR
2840 HP-HP*100: HP=INT(HP): HP-HP/100: IF HP=INT(HP) THEN LOCATE 19,45-LEN(STR$(HP)): PRINT HP:LOCATE 19,45: PRINT"0": GOTO 2870
2850 IF (HP*10)- INT(HP*10) THEN LOCATE 19,46-LEN(STR$(HP)): PRINT HP:
2860 LOCATE 19,47-LEN(STR$(HP)): PRINT HP
2870 LOCATE 19,48-LEN(STR$(HP)): PRINT HP
2880 NPVPN-NPVPN*-100: NPVPN-INT(NPVPN): NPVPN-NPVPN/100: IF NPVPN=INT(NPVPN) THEN LOCATE 20,68-LEN(STR$(NPVPN)): PRINT NPVPN:LOCATE 20,68: PRINT"0": GOTO 2910
2890 IF (NPVPN*10)- INT(NPVPN*10) THEN LOCATE 20,70-LEN(STR$(NPVPN)):PRINT NPVPN:
2900 LOCATE 20,71-LEN(STR$(NPVPN)):PRINT NPVPN
2910 LOCATE 20,72-LEN(STR$(NPVPN)):PRINT NPVPN
2920 TOTAL = CL+AF3+NETPPB+BBCL+HIR+HP
2930 TOTAL=TOTAL*100: TOTAL=INT(TOTAL): TOTAL=TOTAL/100: IF TOTAL=INT(TOTAL) THEN LOCATE 22,45-LEN(STR$(TOTAL)): PRINT TOTAL:LOCATE 22,45: PRINT"0": GOTO 2960
2940 IF (TOTAL*10)- INT(TOTAL*10) THEN LOCATE 22,47-LEN(STR$(TOTAL)): PRINT TOTAL:
2950 LOCATE 22,48-LEN(STR$(TOTAL)): PRINT TOTAL
2960 LOCATE 22,1:PRINT" Total"
2970 LOCATE 21,40:PRINT"
2980 TOTAL2 = AF+ NETPPB2+NPVHIC+NPVHIR+NPVPN: NETPPB2 =0
2990 TOTAL2=TOTAL2*100: TOTAL2=INT(TOTAL2): TOTAL2=TOTAL2/100: IF TOTAL2=INT(TOTAL2) THEN LOCATE 22,68-LEN(STR$(TOTAL2)): PRINT TOTAL2: LOCATE 22,68: PRINT".00": GOTO 3020
3000 IF (TOTAL2*10) - INT(TOTAL2*10) THEN LOCATE 22,68-LEN(STR$(TOTAL2)): PRINT TOTAL2: LOCATE 22,68: PRINT".00": GOTO 3020
3010 LOCATE 22,70-LEN(STR$(TOTAL2)): PRINT TOTAL2: LOCATE 22,70: PRINT"O": GOTO 3020
3020 LOCATE 23,1: PRINT"Shift & PrtSc to print or Enter to continue": LOCATE 23,48: INPUT AONT$
3030 REM********B/S
3040 REM**********Convert % provisions to amounts********
3050 MPl=(MP/100)*ME
3060 BPl=(BP/100)*BE
3070 OPl=(OP/100)*OE
3080 REM********Calculate net O/S of each type********
3090 NETL=ME-MPl
3100 NETB=BE-BPl
3110 NETO=OE-OPl
3120 TOTOS=NETL+NETB+NETO
3130 REM********Put net O/S figures onto screen********
3140 NETL=NETL*100: NETL=INT(NETL): NETL=NETL/100: IF NETL=INT(NETL) THEN LOCATE 4,70-LEN(STR$(NETL)): PRINT NETL: LOCATE 4,70: PRINT".00": GOTO 3430
3150 IF (NETL*10) - INT(NETL*10) THEN LOCATE 4,72-LEN(STR$(NETL)): PRINT NETL: LOCATE 4,72: PRINT"O": GOTO 3430
3160 LOCATE 5,70-LEN(STR$(NETB)): PRINT NETB
3170 IF (NETB*10) - INT(NETB*10) THEN LOCATE 6,52-LEN(STR$(NETB)): PRINT NETB: LOCATE 6,52: PRINT"O": GOTO 3430
3180 LOCATE 6,53-LEN(STR$(OPl)): PRINT OPl
3190 LOCATE 6,34-LEN(STR$(ME)): PRINT ME
3200 LOCATE 5,34-LEN(STR$(BE)): PRINT BE
3210 LOCATE 6,34-LEN(STR$(OE)): PRINT OE
3220 LOCATE 2,1: PRINT"Current Position:
3230 LOCATE 3,27: PRINT"Gross ($m) Provisions ($m) Net ($m)"
3240 IF ME=INT(ME) THEN LOCATE 4,31-LEN(STR$(ME)): PRINT ME: LOCATE 4,31: PRINT".00": GOTO 3140
3250 IF (ME*10) - INT(ME*10) THEN LOCATE 4,33-LEN(STR$(ME)): PRINT ME: LOCATE 4,33: PRINT"O": GOTO 3140
3260 LOCATE 5,34-LEN(STR$(BE)): PRINT BE
3270 IF (BE*10) - INT(BE*10) THEN LOCATE 5,33-LEN(STR$(BE)): PRINT BE: LOCATE 5,33: PRINT"O": GOTO 3200
3280 LOCATE 6,34-LEN(STR$(OE)): PRINT OE
3290 LOCATE 6,34-LEN(STR$(ME)): PRINT ME
3300 LOCATE 5,34-LEN(STR$(BE)): PRINT BE
3310 LOCATE 6,34-LEN(STR$(OE)): PRINT OE
3320 IF MP=INT(MP) THEN LOCATE 4,50-LEN(STR$(MP)): PRINT MP: LOCATE 4,50: PRINT".00": GOTO 3280
3330 IF (MP*10) - INT(MP*10) THEN LOCATE 4,52-LEN(STR$(MP)): PRINT MP: LOCATE 4,52: PRINT".00": GOTO 3340
3340 LOCATE 5,53-LEN(STR$(BP)): PRINT BP
3350 LOCATE 6,53-LEN(STR$(OP)): PRINT OP
3360 LOCATE 2,1: PRINT"CURRENT POSITION"
3370 LOCATE 3,27: PRINT"GROSS PROVISIONS NET"
3380 LOCATE 4,70-LEN(STR$(NETL)): PRINT NETL
3390 LOCATE 5,70-LEN(STR$(NETB)): PRINT NETB
3400 LOCATE 6,70-LEN(STR$(NETO)): PRINT NETO
3410 LOCATE 4,72: PRINT".00": GOTO 3430
3420 LOCATE 4,73: PRINT"Shift & PrtSc to print or Enter to continue": LOCATE 4,48: INPUT AONT$
3440 IF (NETB*10) = INT(NETB*10) THEN LOCATE 5,72-LEN(STR$(NETB)): PRINT NETB:LOCATE 5,72: PRINT"0": GOTO 3460
3450 LOCATE 5,73-LEN(STR$(NETB)): PRINT NETB:LOCATE 5,73: PRINT"0": GOTO 3460
3450 LOCATE 5,72-LEN(STR$(NETB)): PRINT NETB:LOCATE 5,72: PRINT"0": GOTO 3460
3460 IF (NETO*10) = INT(NETO*10) THEN LOCATE 6,72-LEN(STR$(NETO)): PRINT NETO:LOCATE 6,72: PRINT"0": GOTO 3490
3470 IF (TE*10) = INT(TE*10) THEN LOCATE 8,33-LEN(STR$(TE)): PRINT TE:LOCATE 8,33: PRINT"0": GOTO 3730
3480 LOCATE 8,73-LEN(STR$(TE)): PRINT TE:LOCATE 8,73: PRINT"0": GOTO 3730
3490 LOCATE 8,70-LEN(STR$(TOTP)): PRINT TOTP:LOCATE 8,70: PRINT"0": GOTO 3780
3500 LOCATE 8,72-LEN(STR$(TOTP)): PRINT TOTP:LOCATE 8,72: PRINT"0": GOTO 3780
3510 LOCATE 8,74-LEN(STR$(TOTP)): PRINT TOTP:LOCATE 8,74: PRINT"0": GOTO 3780
3520 REM********Put figure for total exposure onto screen
3530 LOCATE 8,1: PRINT"Medium-term loans"
3540 LOCATE 5,1: PRINT"Bonds"
3550 LOCATE 6,1: PRINT"Other"
3560 REM********Put figure for total provisions into top
3570 REM********Calculate figure for total provisions into top
3580 REM********Put figure for gross reduction in MTLs due to discount swap
3590 REM********Calculate figure for gross reduction in MTLs due to discount swap
3600 REM********Calculate increase in gross/net bond exposure due to discount swap
3610 REM********Calculate increase in gross/net bond exposure due to discount swap
3620 REM********Put figure for total exposure onto screen
3630 REM********Put total and top into top
3640 REM********Put total and top into top
3650 REM********Put figure for gross reduction in MTLs due to discount swap
3660 REM********Put figure for gross reduction in MTLs due to discount swap
3670 REM********Calculate increase in gross/net bond exposure due to discount swap
3680 REM********Calculate increase in gross/net bond exposure due to discount swap
3690 REM********Calculate increase in gross/net bond exposure due to discount swap
3700 REM********Calculate increase in gross/net bond exposure due to discount swap
3710 REM********Calculate increase in gross/net bond exposure due to discount swap
3720 REM********Calculate increase in gross/net bond exposure due to discount swap
3730 REM********Calculate increase in gross/net bond exposure due to discount swap
3740 REM********Calculate increase in gross/net bond exposure due to discount swap
3750 REM********Calculate increase in gross/net bond exposure due to discount swap
3760 REM********Calculate increase in gross/net bond exposure due to discount swap
3770 REM********Calculate increase in gross/net bond exposure due to discount swap
3780 REM********Calculate increase in gross/net bond exposure due to discount swap
3790 REM********Calculate increase in gross/net bond exposure due to discount swap
3800 IF OIL<=0 THEN 3820
3810 NRMD=O:GOTO 3830
3820 NRMD=-OIL*:O=(1-(D/100)):NRMD-=NRMD*:1
3830 NRMD=-OIL*:O=(1-(D/100)):NRMD-=NRMD*:1
3840 IF (NRMD*10) = INT(NRMD*10) THEN LOCATE 12,70-LEN(STR$(NRMD)): PRINT NRMD:LOCATE 12,70: PRINT"0": GOTO 3860
3850 LOCATE 12,73-LEN(STR$(NRMD)): PRINT NRMD:LOCATE 12,73: PRINT"0": GOTO 3860
3860 REM********Calculate increase in gross/net bond exposure due to discount swap
3870 REM********Calculate increase in gross/net bond exposure due to discount swap
3880 GIBL = OIL * (1-(D/100))
3890 NIBL = (OIL * (1-(D/100))) * (1-(O1P/100))
3900 GIB1=GIB1*100: GIB1=INT(GIB1): GIB1=GIB1/100: IF GIB1=INT(GIB1) THEN LOCATE 13,31-LEN(STR$(GIB1)): PRINT GIB1:LOCATE 13,31: PRINT“*.00”: GOTO 3940
3910 IF (GIB1*10) = INT(GIB1*10) THEN LOCATE 13,33-LEN(STR$(GIB1)): PRINT GIB1:LOCATE 13,33: PRINT“*.00”: GOTO 3940
3920 IF (GIB1*10) = INT(GIB1*10) THEN LOCATE 13,34-LEN(STR$(GIB1)): PRINT GIB1
3930 REM********Calculate provisions on new bonds
3940 PNB1= 01L *(1-(D/100)) *(O1P/100)
3950 PNB1=INT(PNB1): PNB1=PNB1/100: IF PNB1=INT(PNB1) THEN LOCATE 13,50-LEN(STR$(PNB1)): PRINT PNB1:LOCATE 13,50: PRINT“*.00”: GOTO 3980
3960 IF (PNB1*10) - INT(PNB1*10) THEN LOCATE 13,52-LEN(STR$(PNB1)): PRINT PNB1:LOCATE 13,52: PRINT“*.00”: GOTO 3980
3970 LOCATE 13,53-LEN(STR$(PNB1)): PRINT PNB1
3980 NIB1=NIB1*100: NIB1=INT(NIB1): NIB1=NIB1/100: IF NIB1=INT(NIB1) THEN LOCATE 13,70-LEN(STR$(NIB1)): PRINT NIB1:LOCATE 13,70: PRINT“*.00”: GOTO 4010
3990 IF (NIB1*10) - INT(NIB1*10) THEN LOCATE 13,72-LEN(STR$(NIB1)): PRINT NIB1:LOCATE 13,72: PRINT“*.00”: GOTO 4010
4000 LOCATE 16,31-LEN(STR$(02L2)): PRINT 02L2:LOCATE 16,31: PRINT“*.00": GOTO 4100
4010 LOCATE 16,33-LEN(STR$(02L2)): PRINT 02L2:LOCATE 16,33: PRINT“*.00": GOTO 4100
4020 LOCATE 16,34-LEN(STR$(02L2)): PRINT 02L2
4030 REM********Effect of par bond swap
4040 LOCATE 15,1:PRINT“Effect of Par swap:" 02L2=02L2*100*-1: 02L2=INT(02L2): 02L2=02L2/100: IF 02L2-INT(02L2) THEN LOCATE 16,31-LEN(STR$(02L2)): PRINT 02L2:LOCATE 16,31: PRINT“*.00": GOTO 4100
4050 IF (02L2*10) - INT(02L2*10) THEN LOCATE 16,33-LEN(STR$(02L2)): PRINT 02L2:LOCATE 16,33: PRINT“*.00": GOTO 4100
4060 LOCATE 16,34-LEN(STR$(02L2)): PRINT 02L2
4070 LOCATE 16,35-LEN(STR$(02L2)): PRINT 02L2
4080 LOCATE 16,36-LEN(STR$(02L2)): PRINT 02L2
4090 REM
4100 REM********Calculate provisions on gross reduction in MTLs
4110 PGR2 = 02L *(MP/100)*-1
4120 PGR2=INT(PGR2): PGR2=PGR2/100: IF PGR2=INT(PGR2) THEN LOCATE 16,50-LEN(STR$(PGR2)): PRINT PGR2:LOCATE 16,50: PRINT“*.00": GOTO 4150
4130 IF (PGR2*10) - INT(PGR2*10) THEN LOCATE 16,52-LEN(STR$(PGR2)): PRINT PGR2:LOCATE 16,52: PRINT“*.00": GOTO 4150
4140 LOCATE 16,53-LEN(STR$(PGR2)): PRINT PGR2
4150 REM********Calculate net reduction in MTLs due to par swap (=nrmp)********
4160 IF 02L<>0 THEN 4180
4170 NRMP=0:GOTO 4190
4180 NRMP=02L*-1*(MP/100)*-1
4190 NRMP=INT(NRMP): NRMP=NRMP/100: IF NRMP=INT(NRMP) THEN LOCATE 16,70-LEN(STR$(NRMP)): PRINT NRMP:LOCATE 16,70: PRINT“*.00": GOTO 4220
4200 IF (NRMP*10) - INT(NRMP*10) THEN LOCATE 16,72-LEN(STR$(NRMP)): PRINT NRMP:LOCATE 16,72: PRINT“*.00": GOTO 4220
4210 LOCATE 16,73-LEN(STR$(NRMP)): PRINT NRMP
4220 REM
4230 REM********Calculate increase in gross/net exposure (=gib2/nib2) and provisions (pnb2) due to par swap
4240 GIB2=O2L
4250 PN22=O2L -((O2L*(FIR2/100))/(LP/100))
4260 NIB2=GIB2-PNB2
4270 GIB2=GIB2*100: GIB2=INT(GIB2): GIB2=GIB2/100: IF GIB2=INT(GIB2) THEN LOCATE 17,31-LEN(STR$(GIB2)): PRINT GIB2:LOCATE 17,31: PRINT“*.00": GOTO 4300
4280 IF (GIB2*10) - INT(GIB2*10) THEN LOCATE 17,33-LEN(STR$(GIB2)): PRINT GIB2:LOCATE 17,33: PRINT“*.00": GOTO 4300
4290 LOCATE 17,34-LEN(STR$(GIB2)): PRINT GIB1
4300 REM
4310 REM********Calculate provisions on new bonds =pnb2********
4320 PNB2--=PNB2*100: PNB2=INT(PNB2): PNB2=PNB2/100: IF PNB2=INT(PNB2) THEN LOCATE 17,50-LEN(STR$(PNB2)): PRINT PNB2:LOCATE 17,50: PRINT“*.00": GOTO 4350
4330 IF (PNB2*10) - INT(PNB2*10) THEN LOCATE 17,52-LEN(STR$(PNB2)): PRINT PNB2:LOCATE 17,52: PRINT“*.00": GOTO 4350
4340 LOCATE 17,53-LEN(STR$(PNB2)): PRINT PNB2
4350 NIB2=NIB2*100: NIB2=INT(NIB2): NIB2=NIB2/100: IF NIB2=INT(NIB2) THEN LOCATE
17.70 - LEN (STR$(NIB2)) : PRINT NIB2: LOCATE 17, 70: PRINT ".00": GOTO 4380
4360 IF (NIB2*10) - INT (NIB2*10) THEN LOCATE 17, 72 - LEN (STR$(NIB2)) : PRINT NIB2:
4370 LOCATE 17, 73 - LEN (STR$(NIB2)) : PRINT NIB2
4380 LOCATE 16, 1 : PRINT "Reduction in MTLs"
4390 LOCATE 17, 1 : PRINT "Increase in bonds"
4400 REM
4410 REM
4420 REM********Calculate total provisions on new money (-tpnm) and net increase in exposure due to new money (ninm)********
4430 TPNM = 0
4440 FOR E = 1 TO TR
4450 TPNM = TPNM + (NMPC/100)*NMIC(E) + ((NMPIR/100)*NMIR(E) + (NMPP/100)*NMP(E))
4460 NEXT E
4470 NINM = TANM - TPNM
4480 REM********Put gross/net changes in exposure due to new money onto screen********
4490 TANM = TANM*100: TANM = INT (TANM): TANM = TANM/100: IF TANM-INT(TANM) THEN LOCATE 19, 31 - LEN (STR$(TANM)) : PRINT TANM: LOCATE 19, 31:
4500 IF (TANM*10) - INT (TANM*10) THEN LOCATE 19, 33 - LEN (STR$(TANM)) : PRINT TANM: LOCATE 19, 33:
4510 LOCATE 19, 34 - LEN (STR$(TANM)) : PRINT TANM
4520 REM
4530 TPNM = TPNM*100: TPNM = INT (TPNM): TPNM = TPNM/100: IF TPNM-INT(TPNM) THEN LOCATE 19, 50 - LEN (STR$(TPNM)) : PRINT TPNM: LOCATE 19, 50:
4540 IF (TPNM*10) - INT (TPNM*10) THEN LOCATE 19, 52 - LEN (STR$(TPNM)) : PRINT TPNM: LOCATE 19, 52:
4550 LOCATE 19, 53 - LEN (STR$(TPNM)) : PRINT TPNM
4560 REM
4570 NINM = NINM*100: NINM = INT (NINM): NINM = NINM/100: IF NINM-INT(NINM) THEN LOCATE 19, 70 - LEN (STR$(NINM)) : PRINT NINM: LOCATE 19, 70:
4580 IF (NINM*10) - INT (NINM*10) THEN LOCATE 19, 72 - LEN (STR$(NINM)) : PRINT NINM: LOCATE 19, 72:
4590 LOCATE 19, 73 - LEN (STR$(NINM)) : PRINT NINM
4600 REM
4610 LOCATE 19, 1 : PRINT "New Money exposure rise:"
4620 REM********Effect of buyback********
4630 O4L = O4L*100*1 - O4L - O4L/100: IF O4L=INT(O4L) THEN LOCATE 21, 3 - LEN (STR$(O4L)) : PRINT O4L: LOCATE 21, 31: PRINT ".00": GOTO 4660
4640 IF (O4L*10) - INT (O4L*10) THEN LOCATE 21, 33 - LEN (STR$(O4L)) : PRINT O4L: LOCATE 21, 33:
4650 LOCATE 21, 34 - LEN (STR$(O4L)) : PRINT O4L
4660 PBB = (MP/100) * O4L
4670 PBB = PBB - INT (PBB): PBB = PBB/100: IF PBB=INT(PBB) THEN LOCATE 21, 50 - LEN (STR$(PBB)) : PRINT PBB: LOCATE 21, 50:
4680 IF (PBB*10) - INT (PBB*10) THEN LOCATE 21, 52 - LEN (STR$(PBB)) : PRINT PBB: LOCATE 21, 52:
4690 LOCATE 21, 53 - LEN (STR$(PBB)) : PRINT PBB
4700 NBB = (PBB*1-1) + O4L
4710 NBB = NBB - INT (NBB): NBB = NBB/100: IF NBB=INT(NBB) THEN LOCATE 21, 70 - LEN (STR$(NBB)) : PRINT NBB: LOCATE 21, 70:
4720 IF (NBB*10) - INT (NBB*10) THEN LOCATE 21, 72 - LEN (STR$(NBB)) : PRINT NBB: LOCATE 21, 72:
4730 LOCATE 21, 73 - LEN (STR$(NBB)) : PRINT NBB
4740 LOCATE 21, 1 : PRINT "Buyback exposure fall:"
4750 LOCATE 23, 1 : PRINT "Shift & PrtSc to print or Enter to continue": LOCATE 23, 48: INPUT "", AONT$
4760 REM
4770 REM
4780 CLS: PRINT "EFFECT OF DEAL ON THE B/S (CONTINUED)"
4790 LOCATE 3, 1: PRINT "Position immediately after deal:"
4800 LOCATE 4, 25: PRINT "Gross ($m) Provisions ($m) Net($m)"
4810 LOCATE 6, 1: PRINT "Medium-term loans"
LOCATE 7,1:PRINT"Bonds:" Discount
LOCATE 8,1:PRINT" Par"
LOCATE 9,1:PRINT" Other"
LOCATE 11,1:PRINT"Other"
LOCATE 13,1:PRINT"TOTAL EXPOSURE"
REM********Calculate final total gross mtls(=gmtl), final provisions (pmtl) and final net mtls (nmtl)******
REM********Put gmtl,pmtl, nmtl on screen******
REM********Put figures for gross total, provisions, and net total of discount bonds(gib1, pnb1, nib1) onto screen
REM********Put figures for gross total, provisions, and net total of par bonds(gib2, pnb2, nib2) onto screen******
GO TO 4820

LOCATE 8,66-LEN(STR$(NIB2)): PRINT NIB2
REM
REM
IF BE-INT(BE) THEN LOCATE 9,23-LEN(STR$(BE)): PRINT BE:LOCATE 9,23: PRINT ".00": GOTO 5310
IF (BE*10) - INT(BE*10) THEN LOCATE 9,25-LEN(STR$(BE)): PRINT BE:LOCATE 9,25:
PRINT ".00": GOTO 5310

IF BE-INT(BE) THEN LOCATE 9,23-LEN(STR$(BE)): PRINT BE:LOCATE 9,23:
PRINT ".00": GOTO 5310

IF (BE*10) - INT(BE*10) THEN LOCATE 9,25-LEN(STR$(BE)): PRINT BE:LOCATE 9,25:
PRINT ".00": GOTO 5310

LOCATE 9,26-LEN(STR$(BE)): PRINT BE

IF NETB-INT(NETB) THEN LOCATE 9,63-LEN(STR$(NETB)): PRINT NETB:LOCATE 9,63:
PRINT ".00": GOTO 5370
IF (NETB*10) - INT(NETB*10) THEN LOCATE 9,65-LEN(STR$(NETB)): PRINT NETB:LOCATE 9,65:
PRINT ".00": GOTO 5370

LOCATE 9,66-LEN(STR$(NETB)): PRINT NETB

REM********Calculate total gross bonds, provisions, and net bonds (-tgb, tp
b, tnb)********
TGB - GIB1+ GIB2+ BE
TPB - PNB1+ PNB2+ BP1
TNB - NIB1+ NIB2+ NETB
REM********Put tgb, tpb, tnb on screen
TGB-TGB*100:TGB-INT(TGB):TGB-TGB/100:IF TGB-INT(TGB) THEN LOCATE 10,30-LEN(
STR$(TGB)): PRINT TGB:LOCATE 10,30: PRINT ".00": GOTO 5460
IF (TGB*10) - INT(TGB*10) THEN LOCATE 10,32-LEN(STR$(TGB)): PRINT TGB:LOCATE 10,32:
PRINT ".00": GOTO 5460
LOCATE 10,33-LEN(STR$(TGB)): PRINT TGB

TPB-TPB*100:TPB-INT(TPB):TPB-TPB/100:IF TPB-INT(TPB) THEN LOCATE 10,50-LEN(
STR$(TPB)): PRINT TPB:LOCATE 10,50: PRINT ".00": GOTO 5490
IF (TPB*10) - INT(TPB*10) THEN LOCATE 10,52-LEN(STR$(TPB)): PRINT TPB:LOCATE 10,52:
PRINT ".00": GOTO 5490
LOCATE 10,53-LEN(STR$(TPB)): PRINT TPB

TNB-TNB*100:TNB-INT(TNB):TNB-TNB/100:IF TNB-INT(TNB) THEN LOCATE 10,70-LEN(
STR$(TNB)): PRINT TNB:LOCATE 10,70: PRINT ".00": GOTO 5520
IF (TNB*10) - INT(TNB*10) THEN LOCATE 10,72-LEN(STR$(TNB)): PRINT TNB:LOCATE 10,72:
PRINT ".00": GOTO 5520
LOCATE 10,73-LEN(STR$(TNB)): PRINT TNB

REM********Put figures for other exposure onto screen
REM
IF OE-INT(OE) THEN LOCATE 11,30-LEN(STR$(OE)): PRINT OE:LOCATE 11,30: PRINT ".00": GOTO 5580
IF (OE*10) - INT(OE*10) THEN LOCATE 11,32-LEN(STR$(OE)): PRINT OE:LOCATE 11,32:
PRINT ".00": GOTO 5580
LOCATE 11,33-LEN(STR$(OE)): PRINT OE

IF OP1-INT(OP1) THEN LOCATE 11,50-LEN(STR$(OP1)): PRINT OP1:LOCATE 11,50: PRINT ".00": GOTO 5610
IF (OP1*10) - INT(OP1*10) THEN LOCATE 11,52-LEN(STR$(OP1)): PRINT OP1:LOCATE 11,52:
PRINT ".00": GOTO 5610
LOCATE 11,53-LEN(STR$(OP1)): PRINT OP1

REM********Calculate overall totals for gross, provisions, and net exposure (-fge, fp
b, fine)
FGE - GMTL + TGB + OE
FP - PMTL + TPB+ OP1
5690 FINE - NMTL + TNB+ NETO
5700 REM
5710 FGE=100*FGE:FGE=INT (FGE):FGE=FGE/100:IF FGE=INT(FGE) THEN LOCATE 13,30-LEN
(STR$(FGE)): PRINT FGE:LOCATE 13,30: PRINT".00": GOTO 5740
5720 IF (FGE*10) = INT(FGE*10) THEN LOCATE 13,32-LEN(STR$(FGE)): PRINT FGE:LOCATE 13,32: PRINT"0": GOTO 5740
5730 LOCATE 13,33-LEN(STR$(FGE)): PRINT FGE
5740 FP=100*FP:FP=INT (FP):FP=FP/100:IF FP=INT(FP) THEN LOCATE 13,30-LEN(STR$(FP)): PRINT FP:LOCATE 13,30: PRINT".00": GOTO 5770
5750 IF (FP*10) = INT(FP*10) THEN LOCATE 13,32-LEN(STR$(FP)): PRINT FP:LOCATE 13,32: PRINT"0": GOTO 5770
5760 LOCATE 13,33-LEN(STR$(FP)): PRINT FP
5770 FINE=100*FINE:FINE=INT (FINE):FINE=FINE/100:IF FINE=INT(FINE) THEN LOCATE 13,30-LEN(STR$(FINE)): PRINT FINE:LOCATE 13,30: PRINT".00": GOTO 5740
5780 IF (FINE*10) = INT(FINE*10) THEN LOCATE 13,32-LEN(STR$(FINE)): PRINT FINE:LOCATE 13,32: PRINT"0": GOTO 5770
5790 LOCATE 13,73-LEN(STR$(FINE)): PRINT FINE
5800 REM
5810 REM********Put underlining on screen for totals
5820 REM
5830 LOCATE 12,27:PRINT" __
5840 IF O4L=0 THEN 5860
5850 LOCATE 16,1:PRINT"The Balance sheet will also show an increase in cash of $m";O4L*(BBP/100);"due to the buyback."
5860 LOCATE 23,1:PRINT"Shift & PrtSc to print or Enter to continue":LOCATE 23,48
5870 REM
5880 REM********Annual P&L and B/S for par bond
5890 REM
5900 IF O2L = 0 THEN 7150
5910 PAREND = RD2-CFY
5920 O2NB=O2L:O2NP=0:REM********Set net bonds and total profit to zero (both running totals)
5930 AREA = O2L - ((O2L*(FIR2/100))/(LP/100))
5940 O2WB = AREA/((100/LP)+1)
5950 O2PROV = AREA
5960 REM********Set up and solve simultaneous equations
5970 SIMA = ((RD2-CFY)^3)/3: SIMB = ((RD2-CFY)^2)/2: SIMC = (RD2-CFY)^2: SIMD = RD2-CFY
5980 COEFFA = (((SIMB*O2WB) - (SIMD*AREA)) / (-1*((SIMA*SIMD) - (SIMC*SIMB)))
5990 COEFFB = (((SIMC*AREA) - (SIMA*O2WB)) / (-1*((SIMA*SIMD) - (SIMC*SIMB)))
6000 TIME = 1
6010 O2IR = (FIR2/100)*O2L:REM********Integrate over time-time(-1) to get exact values for o2wb
6020 LET O2WB = ((COEFFA/3)*((TIME^3)-((TIME-1)^3))) + ((COEFFB/2)*((TIME^2)-((TIME-1)^2)))
6040 O2FC = ((LP/100)*(O2L-O2PROV)):REM********funding cost
6050 LET O2PROV = O2PROV - O2WB
6060 O2GP = ((FIR2/100)*O2L) + O2WB - O2FC
6070 IF O2GP <=O THEN O2TP =0
6080 IF O2GP <=O THEN O2NP = O2GP
6090 IF O2GP <=O THEN 6120
6100 O2TP=O2GP*(TCR2/100)
6110 O2NP=O2GP-O2TP
6120 IF TIME=0 THEN 6140
6130 IF SCEN=0 OR SCEN2>0 THEN TO2NP=0 AND O2PROV=0
6140 TO2NP=TO2NP+O2NP
6150 O2NB=O2L-O2PROV
6160 IF ABCD <> 999 THEN 6220
6170 IF TIME = 1 THEN NETPPB = O2NP
6180 NETPPB = NETPPB2 + (O2NP/((1+(DCFR/100))^TIME))
6190 TIME = TIME + 1: IF TIME = RD2-CFY THEN 6210
6200 GOTO 6010
6210 ABCD = 0: TO2NP = 0: GOTO 1970
CLS
LOCATE 1,1:PRINT"P&L EFFECT OF PAR BOND"
LOCATE 2,1:PRINT"Year:";CFY + (TIME-1)
LOCATE 2,40:PRINT"$m"
LOCATE 4,1:PRINT"Coupon";PRINT"Funding Cost";PRINT"Provisions":LOCATE 8,38:
PRINT"":PRINT"Profit";PRINT"Tax";
LOCATE 11,38:PRINT": PRINT"Net profit":LOCATE 13,38:PRINT"":LOCATE 44-LEN(STR$(02IR»:
PRINT02IR:LOCATE 4,44:PRINT".OO": GOTO 6420
IF (02IR*10) - INT(02IR*10) THEN
LOCATE 4,46-LEN(STR$(02IR»:PRINT02IR:LOCATE 4,46:PRINT"O": GOTO 6420
LOCATE 4,47-LEN(STR$(02IR»:PRINT02IR
LOCATE 5,44-LEN(STR$(02FC»:PRINT02FC:LOCATE 5,44:PRINT".OO": GOTO 6450
IF (02FC*10) - INT(02FC*10) THEN
LOCATE 5,46-LEN(STR$(02FC»:PRINT02FC:LOCATE 5,46:PRINT"O": GOTO 6450
LOCATE 5,47-LEN(STR$(02FC»:PRINT02FC
LOCATE 6,44-LEN(STR$(02GP»:PRINT02GP:LOCATE 6,44:PRINT".OO": GOTO 6510
IF (02GP*10) - INT(02GP*10) THEN
LOCATE 6,46-LEN(STR$(02GP»:PRINT02GP:LOCATE 6,46:PRINT"O": GOTO 6510
LOCATE 6,47-LEN(STR$(02GP»:PRINT02GP
LOCATE 9,44-LEN(STR$(02NP»:PRINT02NP:LOCATE 9,44:PRINT".OO": GOTO 6570
IF (02NP*10) - INT(02NP*10) THEN
LOCATE 9,46-LEN(STR$(02NP»:PRINT02NP:LOCATE 9,46:PRINT"O": GOTO 6570
LOCATE 9,47-LEN(STR$(02NP»:PRINT02NP
LOCATE 12,44-LEN(STR$(02L»:PRINT02L:LOCATE 12,44:PRINT".OO": GOTO 6630
IF (02L*10) - INT(02L*10) THEN
LOCATE 12,46-LEN(STR$(02L»:PRINT02L:LOCATE 12,46:PRINT"O": GOTO 6630
LOCATE 12,47-LEN(STR$(02L»:PRINT02L
LOCATE 16,44-LEN(STR$(02L»:PRINT02L:LOCATE 16,44:PRINT".OO": GOTO 6660
LOCATE 16,47-LEN(STR$(02L»:PRINT02L
LOCATE 17,44-LEN(STR$(02L»:PRINT02L:LOCATE 17,44:PRINT"O": GOTO 6660
LOCATE 17,45-LEN(STR$(02L»:PRINT02L
LOCATE 19,44-LEN(STR$(02L»:PRINT02L:LOCATE 19,44:PRINT".OO": GOTO 6660
6640 IF (O2NB*10) = INT(O2NB*10) THEN LOCATE 19,46-LEN(STR$(O2NB)): PRINT O2NB:LOCATE 19,46: PRINT"0": GOTO 6660
6650 LOCATE 19,47-LEN(STR$(O2NB\$)): PRINT 02NB
6660 T02NP=T02NP*100: T02NP=INT(T02NP): T02NP=T02NP/100: IF T02NP=INT(T02NP) THEN LOCATE 21,46-LEN(STR$(T02NP\$)): PRINT T02NP:LOCATE 21,46: PRINT"0": GOTO 6690
6670 IF (T02NP*10) = INT(T02NP*10) THEN LOCATE 21,46-LEN(STR$(T02NP\$)): PRINT T02NP:LOCATE 21,46: PRINT"0": GOTO 6690
6680 LOCATE 21,47-LEN(STR$(T02NP\$)): PRINT T02NP
6690 LOCATE 23,1:PRINT"Enter year":LOCATE 23,13:INPUT\"",CYEAR
6700 IF CYEAR <CFY OR CYEAR>RD2 THEN BEEP:LOCATE 23,1:PRINT"Error. Year must be between\";CFY;" and\";RD2;". Please try again": LOCATE 23,70:INPUT \"\",CYEAR:GOTO 6790
6800 PAREND = CYEAR-CFY
6810 GOTO 5920
6820 GOTO 5910
6830 CLS:PRINT"DISCOUNTED CASH-FLOW FORECAST FOR THE PAR BOND"
6840 PRINT"Discounted at\";DCFR;"%"
6850 G=10:J=1
6860 LOCATE 3,10:PRINT"Year Net cash-flow"
6870 FOR H= 0 TO (RD2-CFY)
6880 LOCATE 4+J,G-1:PRINT CFY+H
6890 IF H = 0 THEN CF= (((O2L*(FIR2/100))-((O2L-AREA)*(LP/100)))
6900 IF H=0 THEN 6950
6910 WBCF = WBCF + ((COEFFA/3)*((H^3)-((H-1)^3))) + ((COEFFB/2)*((H^2)-((H-1)^2))
6920 CF= (((O2L*(FIR2/100))-((O2L-AREA+WBCF)*(LP/100)))/(1+(DCFR/100))^H)
6930 IF H=(RD2-CFY) THEN CF= (O2L/((1+(DCFR/100))^H))
6940 GOTO 6950
6950 CF=CF*100: CF=INT(CF): CF=CF/100: IF CF=INT(CF) THEN LOCATE 4+J,G+1
6960 IF (CF*10) = INT(CF*10) THEN LOCATE 4+J,G+1-LEN(STR$(CF)) PRINT CF:LOCATE 4+J,G+16: PRINT"0": GOTO 6980
6970 LOCATE 4+J,G+17-LEN(STR$(CF)): PRINT CF
6980 TCFF=TCFF+CF
6990 J=J+1
7000 IF H = 15 THEN LOCATE 3,45:PRINT"Year Net cash-flow"
7010 IF H = 15 THEN J=1
7020 IF H = 15 THEN G=45
7030 NEXT H
7040 IF RD2-CFY<15 THEN 7100
7050 LOCATE 6+J,45:PRINT"TOTAL"
7060 TCFF=TCFF*100: TCFF=INT(TCFF): TCFF=TCFF/100: IF TCFF=INT(TCFF) THEN LOCATE 6+J,59-LEN(STR$(TCFF)): PRINT TCFF:LOCATE 6+J,59: PRINT"0": GOTO 7140
7070 IF (TCFF*10) = INT(TCFF*10) THEN LOCATE 6+J,61-LEN(STR$(TCFF)) PRINT TCFF:LOCATE 6+J,61: PRINT"0": GOTO 7140
7080 LOCATE 6+J,62-LEN(STR$(TCFF)): PRINT TCFF
7090 GOTO 7140
7100 LOCATE 21,9:PRINT"TOTAL"
7110 TCFF=TCFF*100: TCFF=INT(TCFF): TCFF=TCFF/100: IF TCFF=INT(TCFF) THEN LOCATE 21,24-LEN(STR$(TCFF)): PRINT TCFF:LOCATE 21,24: PRINT"0": GOTO 7140
7120 IF (TCFF*10) = INT(TCFF*10) THEN LOCATE 21,26-LEN(STR$(TCFF)) PRINT TCFF:LOCATE 21,26: PRINT"0": GOTO 7140
LOCATE 21,27-LEN(STR$(TCFF)): PRINT TCFF
LOCATE 23,1:PRINT"Shift & PrtSc to print or enter to continue":LOCATE 23,48 :INPUT"",AONT$
REM
REM********Debtor's position********
CLS
IF OC = 2 THEN 8670
PRINT"EFFECT OF DEAL ON DEBTOR"
LOCATE 3,1:PRINT"Current external indebtedness:" LOCATE 4,40: PRINT"$m $m"
TMD<TMD*100: TMD-INT(TMD): TMD=TMD/100: IF TMD-INT(TMD) THEN LOCATE 6,40-LEN(STR$(TMD)): PRINT TMD:LOCATE 6,40: PRINT".00": GOTO 7280
IF (TMD*10) = INT(TMD*10) THEN LOCATE 6,42-LEN(STR$(TMD)): PRINT TMD:LOCATE 6,42: PRINT"O": GOTO 7280
LOCATE 6,43-LEN(STR$(TMD)): PRINT TMD
LOCATE 6,1:PRINT"Bank debt"
LOCATE 7,1:PRINT"Non-bank debt"
LOCATE 8,1:PRINT"TOTAL EXTERNAL DEBT"
LPRINT" 
REM********Take-up of options********
LOCATE 11,1: PRINT"Take-up of options ($m):"
LOCATE 13,1:PRINT"Option 1 (Discount bonds)"
TUI<TUI*100: TUI-INT(TUI): TUI-TUI/100: IF TUI-INT(TUI) THEN LOCATE 13,58-LEN(STR$(TUI)): PRINT TUI:LOCATE 13,58: PRINT".00": GOTO 7460
IF (TUI*10) = INT(TUI*10) THEN LOCATE 13,60-LEN(STR$(TUI)): PRINT TUI:LOCATE 13,60: PRINT"O": GOTO 7460
LOCATE 13+1,61-LEN(STR$(TUI)): PRINT TUI
LOCATE 13,61-LEN(STR$(TUI)): PRINT TUI
LOCATE 14,1:PRINT"Option 2 (Par bonds)"
IF (TU2*10) = INT(TU2*10) THEN LOCATE 14,60-LEN(STR$(TU2)): PRINT TU2:LOCATE 14,60: PRINT"O": GOTO 7500
LOCATE 15,1:PRINT"Option 3 (New money):"
IF TU3 =0 THEN LOCATE 15,57:PRINT*"0.00":GOTO 7700
LOCATE 14,61-LEN(STR$(TU2)): PRINT TU2
LOCATE 15,1:PRINT"Option 3 (New money):"
FOR K- 1 TO TR
CT(K) = CNM(K)*TCT-CTDY+CT(K)
LOCATE 14+K,25:PRINT CTDY(K)
IF TR =1 THEN 7610
CT(K) =CT(K)*100: CT(K)=INT(CT(K)): CT(K)=CT(K)/100: IF CT(K)=INT(CT(K)) THEN LOCATE 14+K,40-LEN(STR$(CT(K))): PRINT CT(K):LOCATE 14+K,40: PRINT".00": GOTO 7640
IF (CT(K)*10) = INT(CT(K)*10) THEN LOCATE 14+K,42-LEN(STR$(CT(K))): PRINT CT(K):LOCATE 14+K,42: PRINT"0": GOTO 7640
LOCATE 14+K,43-LEN(STR$(CT(K))): PRINT CT(K)
GOTO 7640
IF CT(K)*100: CT(K)=INT(CT(K)): CT(K)=CT(K)/100: IF CT(K)=INT(CT(K)) THEN LOCATE 14+K,58-LEN(STR$(CT(K))): PRINT CT(K):LOCATE 14+K,58: PRINT".00": GOTO 7640
GOTO 7640
FOR K=-1 TO TR
CT(K) = CNM(K)*TCT-CTTY+CT(K)
LOCATE 14+K,25:PRINT CTDY(K)
IF TR =1 THEN 7610
CT(K) =CT(K)*100: CT(K)=INT(CT(K)): CT(K)=CT(K)/100: IF CT(K)=INT(CT(K)) THEN LOCATE 14+K,40-LEN(STR$(CT(K))): PRINT CT(K):LOCATE 14+K,40: PRINT".00": GOTO 7640
IF (CT(K)*10) = INT(CT(K)*10) THEN LOCATE 14+K,42-LEN(STR$(CT(K))): PRINT CT(K):LOCATE 14+K,42: PRINT"0": GOTO 7640
LOCATE 14+K,43-LEN(STR$(CT(K))): PRINT CT(K)
GOTO 7640
7640 IF (CT(K) * 10) = INT(CT(K) * 10) THEN LOCATE 14 + K, 60 - LEN(STR$(CT(K))): PRINT C
T(K):LOCATE 14 + K, 60: PRINT "0": GOTO 7640
7630 LOCATE 14 + K, 61 - LEN(STR$(CT(K)): PRINT CT(K)
7650 IF TR = 1 THEN 7700
7660 IF TR > 1 THEN LOCATE 14 + TR, 61 - LEN(STR$(TCT»: PRINT TCT
7670 TCT = TCT * 100: TCT = INT(TCT): TCT = TCT / 100: IF TCT = INT(TCT) THEN LOCATE 14 + K, 58 -
LEN(STR$(TCT)): PRINT TCT:LOCATE 14 + K, 58: PRINT "0": GOTO 7700
7680 IF (TCT * 10) - INT(TCT * 10) THEN LOCATE 14 + K, 60 - LEN(STR$(TCT»: PRINT TCT:LOCATE 14 + K,
7690 LOCATE 14 + K, 61 - LEN(STR$(TCT»: PRINT TCT
7700 TU4 = TU4 * 100: TU4 = INT(TU4): TU4 = TU4 / 100: IF TU4 = INT(TU4) THEN LOCATE 16 + TR, 58 -
LEN(STR$(TU4)): PRINT TU4:LOCATE 16 + TR, 58: PRINT "0": GOTO 7730
7710 IF (TU4 * 10) - INT(TU4 * 10) THEN LOCATE 16 + TR, 60 - LEN(STR$(TU4»: PRINT TU4:LOCATE 16 + TR,
7720 LOCATE 16 + TR, 61 - LEN(STR$(TU4»: PRINT TU4
7730 LOCATE 16 + TR, 1: PRINT "Option 4 (Buyback)"
7740 LOCATE 23, 1: PRINT "Shift & PrtSc to print or Enter to continue":LOCATE 23, 48:
INPUT "", AONT$
7750 REM
7760 REM********Calc DSR
7770 CLS
7780 PRINT "EFFECT OF DEAL ON DEBtor (CONTINUED)"
7790 DSCO=ICBD+ICND:REM********dsco = interest charge on bank and non-bank debt*
7800 DSR = ELX/DSCO
7810 LOCATE 3, 1: PRINT "Estimated values: Exports($m) Interest payable($ m)
ISR" ISR
7820 LOCATE 5, 5: PRINT CFY-1
7830 ELX = ELX * 100: ELX = INT(ELX): ELX = ELX / 100: IF ELX = INT(ELX) THEN LOCATE 5, 28 - LEN(S
TR$(ELX)): PRINT ELX:LOCATE 5, 28: PRINT "0": GOTO 7860
7840 IF (ELX * 10) = INT(ELX * 10) THEN LOCATE 5, 30 - LEN(STR$(ELX»: PRINT ELX:LOCATE 5, 30:
PRINT "0": GOTO 7860
7850 LOCATE 5, 31 - LEN(STR$(ELX»: PRINT ELX
7860 DSCO = DSCO * 100: DSCO = INT(DSCO): DSCO = DSCO / 100: IF DSCO = INT(DSCO) THEN LOCATE 5,
49 - LEN(STR$(DSCO)): PRINT DSCO:LOCATE 5, 49: PRINT "0": GOTO 7890
7870 IF (DSCO * 10) = INT(DSCO * 10) THEN LOCATE 5, 51 - LEN(STR$(DSCO»: PRINT DSCO:LOCATE 5,
7880 LOCATE 5, 52 - LEN(STR$(DSCO»: PRINT DSCO
7890 DSR=DSR*100:DSR=INT(DSR):DSR=DSR/100:IF DSR=INT(DSR) THEN LOCATE 5, 67 - LEN(S
TR$(DSR»:PRINT DSR:LOCATE 5, 67: PRINT "0": GOTO 7930
7900 IF (DSR * 10) = INT(DSR * 10) THEN LOCATE 5, 69 - LEN(STR$(DSR»: PRINT DSR:LOCATE 5,
7910 LOCATE 5, 70 - LEN(STR$(DSR»: PRINT DSR
7920 REM
7930 REM********Calculate subsequent dsrs after deal-ndsr********
7940 NTBD = TMD- TU4 - TU2 - TU1
7950 M=CFY
7960 P=1
7970 IF TU3 = 0 THEN EYISR = 4
7980 IF TU3 <> 0 THEN EYISR = (((CTDY(TR)-CFY)+2)
7990 FOR N - 0 TO EYISR
8000 IF CTDY(F) <> M THEN 8020
8010 NTBD = NTBD + CT(P):P=P+1
8020 ICBDL = ((((LP/100)+(FLR3/100)) * NTBD
8030 IF YRIC>0 AND N+CFY>YRIC THEN 8060
8040 ICBOD = ((FIR2/100) * TU2) + (((LP/100)+(FLR1/100)) * TU1*(1-(D/100)))
8050 GOTO 8070
8060 ICBOD = ((FIR22/100) * TU2) + (((LP/100)+(FLR1/100)) * TU1*(1-(D/100)))
8070 IF SCEN <> 0 OR SCEN2 <> 0 AND SCEN2< 24 THEN ELX1=ELX*((1+(XGROW/100))^(N+1)
8080 ELX1=ELX* ((1+(XGROW/100))^(N+1))
8090 ICBDL = ((((LP/100)+(FLR3/100)) * NTBD
8100 TIC = ICBD1 + ICBOD + ICND
8110 LOCATE 6+N,5:PRINT CFY+N
8120 DSR = ELX1/TIC
8130 ELX1=ELX1*100:ELX1=INT(ELX1):ELX1=ELX1/100:IF ELX1=INT(ELX1) THEN LOCATE 6+N, 28-LEN(STR$(ELX1»:PRINT ELX1:LOCATE 6+N,30:PRINT"0":GOTO 8160
8140 IF (ELX1*10) = INT(ELX1*10) THEN LOCATE 6+N,30-LEN(STR$(ELX1»:PRINT ELX1:
8150 LOCATE 6+N,31-LEN(STR$(ELX1»:PRINT ELX1
8160 DSR=DSR*100: DS=INT(DSR): DSR=DSR/100: IF DSR=INT(DSR) THEN LOCATE 6+N,49-LEN(STR$(DSR»:PRINT DSR:
8170 IF (DSR*10) = INT(DSR*10) THEN LOCATE 6+N,51-LEN(STR$(DSR»:PRINT DSR:
8180 LOCATE 6+N,70-LEN(STR$(DSR»:PRINT DSR
8190 M=M+1
8200 NEXT N
8210 IF N>12 THEN 8280
8220 LOCATE N+8,1:PRINT"Assumptions: Annual export growth of";XGROW;"% per year.
8230 PRINT"Any remaining original bank debt is rescheduled at the New Money margin.";
8240 LOCATE 23,1:PRINT"Shift & PrtSc to print or Enter to continue":LOCATE 23,48:
8250 INPUT"",AONT$:
8260 CLS
8270 PRINT"FINAL EFFECT OF DEAL ON DEBTOR"
8280 LOCATE 3,1:PRINT"Final structure of debts, reached in";CTDY(TR)
8290 REM********Put figures for final o/s bank loans, discount/par bonds and non-
8300 bank debt onto screen********
8310 LOCATE 4,40:PRINT"Sm $rn"
8320 NTBD-NTBD*l00:NTBD-INT(NTBD):NTBD=NTBD/l00: IF NTBD=INT(NTBD) THEN LOCATE 6,58-LEN(STR$(NTBD»:PRINT NTBD:
8330 IF (NTBD*10) = INT(NTBD*10) THEN LOCATE 6,60-LEN(STR$(NTBD»:PRINT NTBD:
8340 LOCATE 6,6l-LEN(STR$(NTBD»:PRINT NTBD
8350 TU2=TU2*100:
8360 LOCATE 7,40:PRINT"Sm $m"
8370 FIBO-NTUl+TU2
8380 FIBD-FIBO*l00: FIBO-INT(FIBO): FIBO=FIBO/l00: IF FIBO=INT(FIBO) THEN LOCATE 9,58-LEN(STR$(FIBO»:PRINT FIBO:
8390 IF (FIBO*10) = INT(FIBO*10) THEN LOCATE 9,60-LEN(STR$(FIBO»:PRINT FIBO:
8400 LOCATE 9,6l-LEN(STR$(FIBO»:PRINT FIBO
8410 NTBD-TNBD*100: TNBD-INT(TNBD): TNBD=TNBD/l00: IF TNBD=INT(TNBD) THEN LOCATE 10,58-LEN(STR$(TNBD»:PRINT TNBD:
8420 IF (TNBD*10) = INT(TNBD*10) THEN LOCATE 10,60-LEN(STR$(TNBD»:PRINT TNBD:
8430 LOCATE 10,6l-LEN(STR$(TNBD»:PRINT TNBD
8440 REM********fibo= final bonds********
8450 FIBO = NTUl+TU2
8460 FIBD-FIBO*100: FIBO-INT(FIBO): FIBO=FIBO/l00: IF FIBO=INT(FIBO) THEN LOCATE 9,58-LEN(STR$(FIBO»:PRINT FIBO:
8470 IF (FIBO*10) = INT(FIBO*10) THEN LOCATE 9,60-PRINT"0":GOTO 8490
8480 LOCATE 9,6l-LEN(STR$(FIBO»:PRINT FIBO
8490 REM********tnbd = non-bank outstanding debt
8500 TNBD -TED -TMD
8510 TNBD-TNBD*100: TNBD-INT(TNBD): TNBD=TNBD/l00: IF TNBD=INT(TNBD) THEN LOCATE 10,58-LEN(STR$(TNBD»:PRINT TNBD:
8520 IF (TNBD*10) = INT(TNBD*10) THEN LOCATE 10,60-LEN(STR$(TNBD»:PRINT TNBD:
8530 LOCATE 10,6l-LEN(STR$(TNBD»:PRINT TNBD
8540 TNBD=TNBD+TNBD*10:TNBD-INT(TNBD): TNBD=TNBD/l00: IF TNBD=INT(TNBD) THEN LOCATE 10,58-LEN(STR$(TNBD»:PRINT TNBD:
8550 IF (TNBD*10) = INT(TNBD*10) THEN LOCATE 10,60-LEN(STR$(TNBD»:PRINT TNBD:
8560 LOCATE 10,6l-LEN(STR$(TNBD»:PRINT TNBD
8570 CLS
8580 PRINT"FINAL EFFECT OF DEAL ON DEBTOR"
8590 LOCATE 3,1:PRINT"Final structure of debts, reached in";CTDY(TR)
8600 REM********Put figures for final o/s bank loans, discount/par bonds and non-
8610 bank debt onto screen********
8540  REM********fitode = final total debt********
8550  FITODE- NTBD + NTU1 + TU2 + TNBD
8560  FITODE=FITODE*100: FITODE=INT(FITODE): FITODE=FITODE/100: IF FITODE=INT(FITODE) THEN LOCATE 12,58-LEN(STR$(FITODE)): PRINT FITODE:LOCATE 12,58: PRINT".00": GOTO 8590
8570  IF (FITODE*10) - INT(FITODE*10) THEN LOCATE 12,60-LEN(STR$(FITODE)): PRINT FITODE:LOCATE 12,60: PRINT": GOTO 8590
8580  LOCATE 12,61-LEN(STR$(FITODE)): PRINT FITODE
8590  LOCATE 6,1:PRINT"Bank debt"
8600  LOCATE 7,1:PRINT"Bonds: Discount"
8610  LOCATE 8,1:PRINT"Par"
8620  LOCATE 10,1:PRINT"Non-bank debt"
8630  LOCATE 11,53: PRINT""
8640  LOCATE 12,1:PRINT"TOTAL"
8650  REM**********r/i structure before/after deal - calc av r/i with given libor etc
8660  LOCATE 23,1:PRINT"Shift & PrtSc to print or Enter to continue":LOCATE 23,48:INPUT"",AONT$
8670  REM
8680  REM********Scenario analysis
8690  CLS:PRINT"SCENARIO ANALYSIS"
8700  SCEN =0:SCEN2 =0
8710  LOCATE 3,1:PRINT"Enter the number corresponding to the first variable you wish to change"
8720  LOCATE 5,8:PRINT"1. Provisions (%) on MT loans
8730  PRINT" 2. Provisions (%) on bonds
8740  PRINT" 3. Provisions (%) on other exposure
8750  PRINT" 4. Face value of loans swapped by bank for discount bonds
8760  PRINT" 5. Discount (%) at which loans are exchanged
8770  PRINT" 6. Margin payable on discount bonds
8780  PRINT" 7 Provisions (%) on discount bonds
8790  PRINT" 8. Redemption date of discount bonds
8800  PRINT" 9. Value of loans swapped by bank for par bonds
8810  PRINT" 10. Interest rate payable on par bonds
8820  PRINT" 11. Not available
8830  PRINT" 12. Redemption date of par bonds
8840  PRINT" 13. New Money (amount and timing)
8850  PRINT" 14. Provisions (%) on new money
8860  PRINT" 15. Margin on new money
8870  PRINT" 16. Libor estimate
8880  PRINT" 17. Discount rate
8890  PRINT" 18. Amount of debt tendered by bank for buyback
8900  PRINT" 0. None of the above, display next page
8910  LOCATE 3,73:INPUT"", SCEN
8920  IF SCEN <0 OR SCEN >18 THEN BEEP:LOCATE 3,1:PRINT"Error. Choice must be between 0 and 16. Please try again":LOCATE 3,73:INPUT"",AONT$
8930  IF SCEN <>0 THEN 9080
8940  CLS
8950  PRINT"SCENARIO ANALYSIS (CONTINUED)"
8960  LOCATE 3,1:PRINT"Enter the number corresponding to the variable you wish to change"
8970  LOCATE 5,8:PRINT"19. Total take-up (face value) of discount bonds
8980  PRINT" 20. Total take-up of par bonds
8990  PRINT" 21. Amount and timing of total New Money
9000  PRINT" 22. Total buyback ($m)
9010  PRINT" 23. Buyback price (cents)
9020  PRINT" 24. Growth rate for exports
9030  PRINT:PRINT" 0. None of the above
9040  LOCATE 3,73:INPUT"", SCEN2
9050  IF SCEN2 = 0 AND SCEN=0 THEN 10880
9060  IF SCEN2 = 0 AND SCEN >0 THEN 1490
9070  IF SCEN2 <19 OR SCEN2 >24 THEN BEEP:LOCATE 3,1:PRINT"Error. Choice must be between 18 and 23. Please try again":LOCATE 3,73:INPUT"
LOCATE 22,1:PRINT"Are these details correct (y/n) ?":LOCATE 22,3

6:INPUT", E$
9450 IF E$="y" OR E$="Y" THEN 9480
9460 IF E$="n" OR E$="N" THEN 9480
9470 BEEP:LOCATE 22,1:PRINT"Error. If the above details are correct press y, if not press n":LOCATE 22,70:INPUT",E$:
9490 RETURN

9500 IF TANM < 0 THEN 9550
9510 IF TANM > 25000 THEN 9560
9520 IF TANM=O THEN RETURN
9530 IF SCEN = 13 THEN 9820
9540 GOTO 9570
9550 LOCATE 6,1: BEEP:PRINT"Error. The amount must be greater than zero. Please re-input":LOCATE 6,73:INPUT",TANM:
9560 LOCATE 6,1: BEEP:PRINT"Error. The amount must be less than $25000m. Please re-input":LOCATE 6,73:INPUT",TANM:
9570 LOCATE 8,1:PRINT"Enter the total amount ($m) of New Money to be provided by the Bank":LOCATE 8,73:INPUT",TANM:
9580 REM ********Error checking routine for margin
9590 IF LEN (FLR3$)=3 THEN 9660
9600 IF LEN (FLR3$)=4 THEN 9730
9610 IF MID$ (FLR3$,3,1) <> "/" THEN 9800
9620 LET FLRI1$=LEFT$ (FLR3$,2)
9630 LET FLRI2$=RIGHT$ (FLR3$,2)
9640 LET FLR3=(VAL(FLRI1$))/(VAL(FLRI2$))
9650 GOTO 9810
9660 IF MID$ (FLR3$,2,1) <> "/" THEN 9800
9670 IF VAL(LEFT$(FLR3$,1)) = 0 THEN 9800
9680 IF VAL(RIGHT$(FLR3$,1)) = 0 THEN 9800
9690 LET FLRI1$=LEFT$ (FLR3$,1)
9700 LET FLRI2$=RIGHT$ (FLR3$,1)
9710 LET FLR3=(VAL(FLRI1$))/(VAL(FLRI2$))
9720 GOTO 9810
9730 IF VAL(LEFT$(FLR3$,1)) = 0 THEN 9800
9740 IF VAL(RIGHT$(FLR3$,2)) = 0 THEN 9800
9750 IF MID$ (FLR3$,2,1) <> "/" THEN 9800
9760 LET FLRI1$=LEFT$ (FLR3$,1)
9770 LET FLRI2$=RIGHT$ (FLR3$,2)
9780 LET FLR3=(VAL(FLRI1$))/(VAL(FLRI2$))
9790 GOTO 9810
9800 BEEP:LOCATE 8,1: PRINT"Error. The margin must be in the form a/b. Please re-input":LOCATE 8,73:INPUT",FLR3$:
9810 IF OC=3 THEN RETURN
9820 IF SCEN =15 THEN RETURN
9830 LOCATE 10,1:PRINT"How many tranches of New Money will be made available ?":LOCATE 10,73:INPUT",TR:
9840 IF TR< INT (TR) THEN 9890
9850 IF TR> 10 THEN 9900
9860 IF TR< 1 THEN 9910
9870 GOTO 9920
9880 CLS:PRINT "RE-ENTER DATA":GOTO 9490
9890 LOCATE 10,1:BEEP:PRINT"Error. There must be a whole number of tranches. Please re-input":LOCATE 10,70:INPUT",TR:
9900 LOCATE 10,1:BEEP:PRINT"Error. There must be fewer than 10 tranches. Please re-input":LOCATE 10,70:INPUT",TR:
9910 LOCATE 10,1:BEEP:PRINT"Error. There must be at least one tranche. Please re-input":LOCATE 10,70:INPUT",TR:
9920 CLS:PRINT"DETAILS OF ADVANCES OF NEW MONEY"
9930 LOCATE 3,18:PRINT "Year Amount($m): int.cap. int.recycling pure new money"
9940 FOR A = 1 TO TR
9950 LOCATE A+4,1:PRINT"Tranche":A
9960 LOCATE A+4,18:INPUT"",TDY(A)
9970 LOCATE A+4,39:INPUT"",NMIC(A)
9980 LOCATE A+4,53:INPUT"",NMIR(A)
9990 LOCATE A+4,67:INPUT"",NMP(A)
10000 IF TDY(A) <1989 THEN 10150
10010 IF TDY(A) >2010 THEN 10150
10020 IF TDY(A) <> INT(TDY(A)) THEN 10150
10030 IF A=TR THEN 10050
10040 NEXT A
10050 FOR B = 1 TO TR
10060 IF B=1 THEN C=0
10070 C = NMIC(B) + NMIR(B) + NMP(B) + C:NMIC = NMIC(B) + NMIC:NMIR = NMIR(B) + NMP
10080 NEXT B
10090 IF C - TM = A THEN 10120
10100 LOCATE 20,1:BEEP:PRINT"Error. The sum of the individual tranches is not equal to the total New Money. Press the Enter key to re-input the tranche details"
10110 LOCATE 21,68: INPUT"",E$: IF E$ = "" THEN CLS:GOTO 9920: REM***Different E$ to the one on the next line******
10120 GOSUB 9440
10130 IF E$ = "y" OR E$ = "Y" THEN 10170
10140 CLS:PRINT"RE-ENTER DATA": GOTO 9930
10150 LOCATE 20,1:BEEP:PRINT "Year must be a whole number between 1989 and 2010. Please re-input whole line"
10160 LOCATE A+4,1:PRINT"
10170 CLS:PRINT"PROVISIONS ON NEW MONEY"
10180 RETURN
10190 CLS:PRINT"PROVISIONS ON NEW MONEY"
10200 LOCATE 6,1:PRINT"Enter the rate at which provisions will be made against the interest capitalisation new money": LOCATE 7,73: INPUT"",NMPIC
10210 IF NMPIC <0 OR NMPIC >100 THEN BEEP:LOCATE 6,1:PRINT"Error. Provisions must be between 0 and 100%. Please re-enter"
10220 LOCATE 9,1:PRINT"Enter the rate at which provisions will be made against the interest recycling new money": LOCATE 10,73: INPUT"",NMPIR
10230 IF NMPIR <0 OR NMPIR >100 THEN BEEP:LOCATE 9,1:PRINT"Error. Provisions must be between 0 and 100%. Please re-enter"
10240 LOCATE 12,1:PRINT"Enter the rate at which provisions will be made against the pure new money": LOCATE 13,73: INPUT"",NMPIC
10250 IF NMPIC <0 OR NMPIC >100 THEN BEEP:LOCATE 12,1:PRINT"Error. Provisions must be between 0 and 100%. Please re-enter"
10260 LOCATE 15,1:PRINT"Enter the rate at which tax relief will be given against the provisions": LOCATE 15,73: INPUT"",TCR3
10270 IF TCR3 <0 OR TCR3 >100 THEN BEEP:LOCATE 15,1:PRINT"Error. Tax rate must be between 0 and 100%. Please re-enter"
10280 GOSUB 9440
10290 IF E$ = "y" THEN RETURN
10300 CLS:PRINT "RE-ENTER DATA": GOTO 10200
10310 RETURN
10320 REM
10330 IF OC=3 THEN S=6:GOTO 10350
10340 S=10
10350 LOCATE S,1:PRINT "Enter the margin over Libor payable on the bonds":LOCATE
S,73:INPUT ",FLR1$
10360 IF LEN (FLR1$)-3 THEN 10430
10370 IF LEN (FLR1$)-4 THEN 10530
10380 IF MID$ (FLR1$,3,1) <> "/" THEN 10570
10390 LET FLRI1$=LEFT$ (FLR1$,2)
10400 LET FLRI2$=RIGHT$ (FLR1$,2)
10410 LET FLR1=(VAL(FLRI1$))/(VAL(FLRI2$))
10420 RETURN
10430 IF LEN (FLR1$,2.1) <> "/" THEN 10570
10440 IF VAL(LEFT$(FLR1$.1» - 0 THEN 10570
10450 IF VAL(RIGHT$(FLR1$.1» - 0 THEN 10570
10460 LET FLRI1$=LEFT$ (FLR1$,1)
10470 LET FLRI2$=RIGHT$ (FLR1$,1)
10480 LET FLR1=(VAL(FLRI1$))/(VAL(FLRI2$))
10490 RETURN
10500 IF VAL(LEFT$(FLR1$.2» - 0 THEN 10570
10510 IF VAL(RIGHT$(FLR1$.2» - 0 THEN 10570
10520 IF MID$ (FLR1$.2.1) <> "/" THEN 10570
10530 LET FLRI1$=LEFT$ (FLR1$,1)
10540 LET FLRI2$=RIGHT$ (FLR1$,2)
10550 LET FLR1=(VAL(FLRI1$))/(VAL(FLRI2$))
10560 RETURN
10570 BEEP:LOCATE S,1:PRINT"Error. The margin must be in the form a/b. Please 
re-input ..":LOCATE S,73:INPUT....FLR1$:
GOTO 10360
10580 RETURN
10590 REM ********Details of tranches of NM
10600 CLS:PRINT"DETAILS OF ADVANCES OF NEW MONEY"
10610 LOCATE 3,18:PRINT "Year Amount ($m)"
10620 FOR A-1 TO TR
10630 LOCATE A+4,1:PRINT"Tranche":A
10640 LOCATE A+4,18:INPUT ",CTDY(A)
10650 LOCATE A+4,34:INPUT ",CNM(A)
10660 IF CTDY(A) <1989 THEN 10830
10670 IF CTDY(A) >2010 THEN 10830
10680 IF CTDY(A) <> INT(CTDY(A)) THEN 10830
10690 IF CNM(A) >10000 THEN 10850
10700 IF CNM(A) <0 THEN 10850
10710 IF A=TR THEN 10730
10720 NEXT A
10730 FOR B=1 TO TR
10740 IF B=1 THEN CC=0
10750 CC= CNM(B) + CC
10760 NEXT B
10770 IF CC =TU3 THEN 10800
10780 LOCATE 20,1:BEEP:PRINT "Error. The sum of the individual tranches is not e 
qual to the total New Money. Press the Enter key to re-input the tranche details 
"
10790 LOCATE 21,68: INPUT ",E$: IF E$="" THEN CLS:GOTO 10600:REM********Different 
E$ to the one on the next line
10800 GOSUB 9440
10810 IF E$ ="y" OR E$="Y" THEN RETURN
10820 CLS:PRINT"RE-ENTER DATA":GOTO 10610
10830 LOCATE 20,1:BEEP: PRINT "Year must be a whole number between 1989 and 2010 
. Please re-input whole line ": LOCATE A+4,1:PRINT 
"
: INPUT ",CNM(A): GOTO 10660
10850 LOCATE 20,1:BEEP: PRINT "Individual amounts must be between 0 and 10bn. P 
lease re-input whole line ": LOCATE A+4,1:PRINT 
"
INPUT ",CNM(A): GOTO 10660
10870 RETURN
CLS:LOCATE 10,1:PRINT"You can quit (q) re-run results (r) or return to Scenario Analysis (s) ?":LOCATE 10,76:INPUT"",QRS$

IF QRS$="q" OR QRS$="Q" THEN 10940
IF QRS$="r" OR QRS$="R" THEN 1490
IF QRS$="s" OR QRS$="S" THEN 8680
BEEP:CLS:LOCATE 10,1:PRINT"Error. Press q & Enter to quit, r & Enter to re-run results, or s & Enter to see Scenario analysis again":LOCATE 11,30:INPUT"",QRS$: GOTO 10890
REM
CLS : END