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Canada's Nascent High-Yield Market

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Abstract

The domestic public market for non-investment grade corporate bonds was born in 1996. Central to the development of the Canadian public high-yield market has been the secular decline of inflation that underpinned strong returns on corporate bonds, and thus stimulated demand for high-yield corporate bonds as investors shifted out of bank deposits into mutual funds. Balancing the demand for high yielding corporate bonds was supply coming from firms like Rogers Communications Inc. The forces of globalization and the convergence have created a dynamic and competitive environment in the communication and media, and the telephone industries. These industries have had to borrow heavily to finance large capital expenditures. Net losses, even negative cashflows, and rapid growth provide the reasons many of these firm are rated below investment grade. Augmenting these forces has been the decline of government borrowing.

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In memory of
Lillian Sophia Hartzheim
September 29, 1930 to December 16, 1993

Lillian, my mother, had an insatiable appetite
for learning and knowledge and has inspired me throughout my life and
particularly in my scholastic endeavours.

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CHAPTER ONE

Introduction

The Canadian fixed income market is experiencing a historic transformation. Two significant changes have occurred in the latter half of the 1990s. First, the supply of corporate bonds for the first time in decades exceeded the supply of government bonds, and all levels of government in Canada have dramatically reduced their borrowing requirements as the federal and most provincial governments are now posting budget surpluses. Central to this development has been an effort to control spending to eliminate budget deficits and strong revenue growth. While government borrowing has declined, corporate borrowing has increased dramatically. Net new corporate bonds placed in Canada in 1996 more than doubled the amount issued the previous year and almost doubled again the following year. Second, and, more noteworthy than the increased supply of corporate bonds is the composition of new bonds issued in the domestic public bond market. The first ever high-yield bond issue was sold into the Canadian public market in February 1996 by Rogers Communications.[1] This watershed deal marked the birth of the Canadian public high-yield market. The significance of the issue by Rogers is that previously Canadian companies that were considered more of a credit risk typically had to rely on less flexible bank loans or sell their bonds in the United States. Alternately since 1986 some firms have been able to sell lower rated debt in the Canadian private market; such issues are referred to as private placements.[2] In contrast to the nascent public high-yield market, the private market for lower credits is vibrant, and many of Canada's risk averse institutional investors are active in private placements because they can better influence the spread and terms of the deal. Unfortunately, there is little data available from the private debt market.[3]

In 1996 three firms sold a total of $308 million in non-investment grade bonds in the public market representing just 3.7% of the total corporate bonds placed in Canada. The following year, the volume of new issue high-yield bonds rose to $2.1 billion and the proportion of the total market increased to 15.5% of the domestic market. The dramatic change in the domestic market lagged the birth of the high-yield market in the U.S., which began in 1977. The risk averse nature of Canadian institutional investors is the most commonly cited factor that has impeded the development of the domestic market. Key institutional investors such as insurance companies and pension funds are restricted from purchasing bonds rated below investment grade. Also impeding the growth of domestic high-yield market has been strong and competitive banks in Canada that have provided competitively priced loans to firms reducing the need for marketable securities. Another impediment is the lack of a liquid secondary market for high-yield bonds, which is the key necessary condition for the development of a primary market for junk bonds. A secondary market for junk bonds tends to be established over time as former investment grade bonds are downgraded to junk status. These former investment grade bonds are known as *fallen angels*. In part, the lack of a liquid secondary market is the result of a small population base and a strong U.S. financial market which has historically received about half of all corporate bonds issued by Canadian companies, thus reducing the number of potential fallen angels.

The factors cited in the financial press as influential in the development of a high-yield market are low inflation, low interest rates, changing corporate spreads, a reduced supply of government bonds and the growth in mutual funds. The purpose of this paper is to determine what caused the birth of the nascent public high-yield market in 1996.

It appears, however, that there has been no academic research focussing on recent bond market changes. The bulk of the literature discussing the nascent market is found in the financial press. The lack of analyses of the growth in Canadian high-yield is in contrast to the significant research that is available on the U.S. experience. Although there is considerable U.S. research, the literature does not provide a theoretical foundation for a model to analyze the change in the Canadian bond market. This paper is an attempt help fill the apparent research gap. Hence, to explain the recent change a model of demand and supply for corporate bonds is developed. This paper is, therefore, intended to make a significant original contribution to the understanding of the recent evolution of the domestic fixed income market. Throughout this study the focus is on the total corporate bonds issued in Canada rather than isolating non-investment grade. The reason for this focus is that there are only three years of data available and volume of new non-investment grade bonds is very low. The data restriction is apparent from visual inspection of chart 3.0 in chapter three. Because of the data restrictions the conclusion with respect to the growth in high-yield issues is inferred from the results of analyzing the total corporate bond market.

Two separate, but relevant branches of economic theory are reviewed to develop a model of the demand for and supply of corporate bonds to test the significance of the hypothesized variables. Modern portfolio theory and the corporate capital structure literature provide the framework for the analysis Portfolio theory provides a basis for the analysis of demand-side influences. This branch of economic study identifies asset return and risk as the salient factors affecting demand when wealth is assumed exogenous.

The qualitative analysis of demand-side influences in chapter four suggest that low inflation, falling interest rates and the strong performance of marketable bonds were the key factors driving the massive portfolio shift from bank deposits to mutual fund investments. The shift favoured corporate bonds and money market securities over government bonds and equities.

Corporate capital structure theory identifies a bias toward debt to finance corporate strategies, and that changes in pre-tax corporate profits, capital investment, particularly in tangible assets will influence a firm's decision to issue bonds. Also identified as salient influences are the cost of capital, and expectations with respect to fiscal and monetary policies. The qualitative analysis of various supply variables suggest that the relative decline of borrowing costs, decreased government borrowing, increased corporate earnings, and investment led to an increase supply of net new bonds placed in Canada.

The econometric analysis in chapter six provides support for reduced government borrowing, the return on high-yield bonds, and corporate investment as significant explanatory variables. Corporate investment is identified as the most important explanatory variable. Support for the return on high-yield bonds implicitly supports the hypothesis that falling interest rates and low inflation have played vital roles. That is because strong bond returns of previously issued bonds are driven by low inflation and falling interest rates. However, direct support for interest rates was not found. Surprisingly, the spread between triple-B rated corporate bonds and long-term Government of Canada and U.S. high-yield bonds as explanatory variables failed to confirm the hypothesis that changing spreads have been influential. As well, mutual funds assets are rejected as an important factor in the growth of the overall corporate bond market. This result, however, does not invalidate the hypothesis that the growth in mutual funds assisted the development of the domestic public high-yield market. In fact, while the whole demand-side analysis may be contrary to mainstream financial economic thinking, growth in, and acceptance of mutual funds appears as a critical impetus for the new high-yield market.

The industry analysis presented in chapter seven asserts that globalization and the digital revolution have created a dynamic environment for businesses directly related or linked to technological change. The communication and media, and the telephone industries have been profoundly affected by the convergence of electronic media. These factors have created strong growth and increased competition in formerly regulated areas, and created the need for large capital investment. These two industries accounted for 62% of all high-yield corporate bonds placed in the domestic public market between 1996 and 1998, and at the forefront has been the Rogers group. Brief analysis of Rogers financial highlights show that the firm has invested heavily in capital assets, a similar finding was made for other telecommunications companies. Another common thread through these firms is that they have not been very profitable because of huge capital investments and low revenues. Not only have some of these firms posted net losses, but many have had negative cashflow. Poor earnings, fast growth, and a dynamic environment are why the bonds issued from these industries tend to be rated below investment grade. The findings of poor earnings and heavy capital investment is consistent with the empirical finding in chapter six that business investment is the most important determinant of the supply of corporate bonds.

This study concludes that the secular decline of inflation, and increasing corporate investment have driven the overall bond market, including the development of the nascent high-yield market. Particularly important to the nascent market has been the massive shift from bank deposits to mutual funds and rapid technological change.

This paper is organized as follows: chapter two reviews the U.S. experience with junk bonds to help understand the Canadian experience; chapter three then reviews what has happened in the domestic bond market over the past decade; chapter four reviews portfolio theory to develop a model of demand, and presents a qualitative analysis of key demand variables; chapter five reviews the corporate capital structure literature and specifies a model of supply, and then analyses key supply influences; chapter six presents a quantitative analysis using the models of supply and demand developed in chapters four and five; a brief industry analysis is undertook in chapter seven, and the conclusion is presented in chapter eight.

CHAPTER TWO

Junk Bonds in the United States

2.0 Introduction

This chapter reviews the development of the high-yield market in the United States, focussing on the impetus that led to the emergence of a primary market for non-investment grade bonds. The review of the literature discussing the U.S. high-yield market concludes that the primary determinants were uncertain inflation and volatile interest rates. Augmenting these forces were economic growth, corporate restructuring, and advancing information technologies. These forces combined to stimulate supply by providing a more flexible and potentially more prudent method of borrowing that provided firms with greater certainty and reduced risk. In addition, the superior performance of junk bonds in an environment of uncertain inflation and volatile interest rates compared to investment grade bonds encouraged greater demand for more high-yield bonds.

2.1 The Experience in the United States with Junk Bonds

Original issue high-yield bonds have been around since the early 1900s, when John Moody first published bond ratings. Junk bonds in the prewar period were a significant source of corporate funds, accounting for 17 percent of total rated, publicly issued straight corporate debt between 1909 and 1943. However, for about thirty years after World War II the high-yield debt market was primarily a market for fallen angels (Perry et.al., 1990). In the post-war period the bulk of corporate financing was done through short term bank loans. Direct access to the capital market for corporate borrowers was limited to large well-known corporations with strong credit ratings. The creation of an original issue high-yield market in the late 1970s allowed firms with lower credit ratings to substitute bonds for bank financing. Loeys (1986), Taggart (1986), and Melnik and Plaut (1990) have all stated that high-yield bonds represent a substitute for bank loans and private placements. This substitution to direct financing and away from intermediaries added to the trend of disintermediation (Jensen, 1986). The substitution away from bank finance to direct finance began several years earlier when investment grade firms began bypassing banks for their short term financing needs, resulting in the emergence of a market for commercial paper. The advent of direct financing provided more options and greater flexibility for firms that required external funds. Also, direct financing allowed debt with longer maturities to be issued than was commonly available through bank loans, and in many situations direct financing decreased actual or effective debt costs. While bank loans and junk bonds are close substitutes, both sources of financing grew rapidly during the 1980s (Benveniste et al, 1993). Disintermediation, however, has not been confined to corporate bonds and commercial paper; banks have been promoting the repackaging of mortgages, student loans, and consumer loans to issue directly into the credit market (Rosengren, 1991).

Presumably it is reasonable to assume that corporate America has always had a preference for flexible and inexpensive methods of financing and that risk averse investors prefer high risk adjusted returns to low adjusted returns. Therefore, it is natural to ask what happened in the late 1970s and early 1980s that led to the emergence of a primary market for low grade corporate bonds?

Yago (1990) asserts that the junk bond revolution began when investors realized that on a risk adjusted basis junk bonds could be an excellent investment, and that junk bonds outperformed investment grade bonds over time. Blume and Keim (1990) conclude that from 1977 to 1987 the realized returns on a portfolio of lower-grade bonds exceeded those of high-grade bonds and had a lower variance of those returns. Their conclusion is supported by Altman (1990). These studies and others show that junk bonds are not necessarily junk and confirm the conclusion of Hickman's (1958) landmark study. In contrast to the large amount of research that states non-investment grade bonds provide better risk adjusted returns than investment grade bonds, Klarman and Lowenstein (1990) suggest that the junk bond market has boomed in part because of the dissemination of potentially misleading information concerning the riskiness of junk bonds, and they further note that the junk bond mutual fund business is driven by the appearance of earnings rather than by substance. It is, however, not clear how retail and institutional investors were fooled into investing money where the gains are illusory. For Klarman and Lowenstein (1990) they believe that the "jury is still out". That is, they believe that junk bonds have not been tested through an entire business cycle. However, the United States experienced two recessions between 1977 and 1987, the period covered by the Blume and Keim (1990) analysis. The first recession began in February 1980 and lasted six months until July 1980, and the second began in August 1981 and lasted 17 months until December 1982, the longest since the 1950s. In spite of these two recessions, the volume of new issue junk bonds continued to grow and reached $34.2 billion in 1986, up from $952 million in 1977.

In addition to doing well through two recessions, the junk market demonstrated surprisingly strong resiliency in the face of adversity. High-yield debt flourished in spite of the massive LTV Steel bankruptcy in 1986 and the insider trading scandal of the same year that led to the indictment of Ivan Boesky, who was closely tied to Michael Milken (Ma, et. al., 1990). The following year the U.S. financial markets crashed on October. The Dow Jones Industrial Average fell 23% on October 19th whereas the Morgan Stanley High-Yield Composite's dollar price fell only 2% and rebounded much quicker than equities (Fridson, 1994). Perhaps potentially the most damaging to the junk bond market was the indictment of Michael Milken, the "Junk Bond King", in September 1988 and the subsequent bankruptcy of investment bank Drexel Burnham Lambert in February 1990. The collapse of Drexel precedes the beginning of the 1990-92 recession by several months. Table 2.0 shows that new junk bond issues fell 97% in 1990 from the previous year. The market, however, quickly rebounded to set a record issuance of $39.6 billion in 1992.

Melnik and Plaut (1990) develope a model to show that the disintermediation of lower credits can be attributed to asymmetric information and regulation, and assert that increasing regulatory costs reduced the banks' comparative advantage in financing higher risk borrowers. They suggest that such a comparative advantage may stem from low cost source of funds, deposits, and an informational advantage developed over time by maintaining a close business relationship. Different banking relationships can dramatically affect the development of corporate bond markets. For example, consider the relationship between companies and banks in Germany and Japan. In these countries banks are allowed to own significant equity stakes in client firms and, as a result of very close relationships, these countries have significantly smaller corporate bond markets than the U.S. or Canada. In contrast, there are severe restrictions on the ownership of non-financial companies in the U.S. and Canada. More stringent ownership rules in North America have resulted in corporate bond markets that are much more important sources of financial capital than in all other countries (Blommestein, 1995).

Loeys (1990) argues that technological improvements in data manipulation and telecommunications have greatly reduced the costs of obtaining and processing information to monitor an issuer. Therefore, reduced cost and increased access to information has weakened the informational advantage long enjoyed by the banks to attenuate adverse selection. Hence, as the threat of adverse selection is attenuated, lower credits can enter the corporate bond market (Berlin et. al, 1988).

Jefferis (1991) attributes the rapid expansion of the high-yield debt market to three factors. The first is the overall growth of the economy, which contributed significantly to the rapid expansion of both equity and debt during the 1980s. The second is that the introduction of high-yield bonds is part of the process of disintermediation whereby companies seek more efficient and diverse methods of financing by acquiring financial capital directly from the market rather than through an intermediary such as a bank. The last factor is the Tax Reform Act of 1986, which reduced the after-tax cost of debt and is argued to have induced leveraged restructuring that led the high-yield market to more than double between 1985 and 1986. This third influence conforms with Miller (1986), who asserts that the major impulses to successful financial innovation have come from regulation and taxes. Hence, firms attempt to re-optimize in the face of a dynamic economy. While the 1986 Tax Reform Act could not have provided the original impetus of the junk market, it is likely that the change in tax law contributed to building its momentum.

An analysis by Taggart (1990), however, indicates that the effect of tax factors at the corporate level has been ambiguous. The large increase in original issue bonds in 1986 may have been at least partly demand driven rather than strictly supply driven as the tax reform hypothesis suggests. In 1986, the public became more involved in junk bonds through mutual funds, thereby increasing demand for low grade corporate bonds. Mutual funds in the U.S. expanded dramatically from $135 billion in 1980 to $1.6 trillion in 1994, with the number of funds to select from growing to 3,848 from 564 (Gadziala 1995).

Table 2.0 Non-Investment Grade New Issue Activity, 1977-94 (Par Value $Millions)

Year	Amount	% Change	Number of Issues	% Change	Average Issue Size
1977	952	-	25	-	38.08
1978	1,464	54%	50	100%	29.28
1979	1,241	-15%	40	-20%	31.03
1980	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1981	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1982	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1983	7,614	199%	88	110%	86.52
1984	14,688	93%	132	50%	111.27
1985	14,568	-1%	177	34%	82.31
1986	34,189	135%	223	26%	153.31
1987	28,576	-16%	176	-21%	162.36
1988	27,671	-3%	157	-11%	176.25
1989	24,906	-10%	116	-26%	214.71
1990	682	-97%	6	-95%	113.67
1991	10,081	1378%	43	617%	234.44
1992	39,586	293%	236	449%	167.74
1993	55,900	41%	314	33%	178.03
1994	34,755	-38%	179	-43%	194.16
Total	302,296		2,076		

Source: High Yield Handbook, January 1995, CS First Boston Corp. Shaded rows denotes recession in all or a portion of the year.

It has been pointed out by Merton (1991) that the primary function of the financial system is to facilitate the allocation and deployment of scarce economic resources, both spatially and temporally in an uncertain environment. Thus, to improve the efficiency of the allocation and deployment process, many financial innovations have occurred to transfer risk, to share risk, and to generally mitigate uncertainty. The breakdown of the Bretton Woods fixed exchange rate system created substantial uncertainty for importers and exporters. To attenuate foreign exchange risk, a forward market for currency developed in the early 1970s and future contracts appeared in May 1972. Interest rates in the late 1960s and early 1970s were very volatile. In late 1979 Paul Volker was appointed chairman of the U.S. Federal Reserve. Subsequent to his appointment, the Federal Reserve abandoned targeting interest rates and adopted the ill-fated monetarist approach, which exacerbated interest rate volatility. Interest rate volatility led to the development of a forward and a futures market for interest rates. The first futures contracts on U.S. dollar interest rates began trading in October 1975. Futures on U.S. Treasury bills started trading in January 1976, and futures on U.S. Treasury bonds began trading in August 1977.

Taggart (1988) notes two critical factors that have motivated the resurgence of original issue junk bonds which conform to Merton's (1991) notion of the primary function of the financial system. He asserts that the same forces that led to the growth in forward and futures contracts provided the impetus for the emergence of original issue junk bonds. That is, highly uncertain inflation and interest rate volatility are responsible for the resurgence of high-yield debt. Perry and Taggart (1990) add that increased global competition was a crucial influence in prompting fundamental changes in the overall capital market environment, including the emergence of junk bonds.

Increasing global competition underpinned the first two factors. Pressures from increased competition generated substantial capital market activity in the form of mergers, acquisitions, and divestitures. To facilitate corporate restructuring and aid competitive viability, firms required financing. Growing competitive pressures and changing inflation rates contributed to sharp fluctuations in the availability of internal funds relative to total financing needs, and firms found themselves moving in and out of the capital markets more frequently (Perry et al, 1990). It is interesting to note that from the mid-1940s to the mid-1980s the correlation coefficient between gross internal funds and total debt both as a proportion of total sources of funds has been close to minus one (Taggart, 1986).[4] And between 1975 and 1979 gross internal funds fell precipitously, thus firms relied heavily on debt finance. Under these conditions it was critical that firms reduce both implicit and explicit financing costs.

Investors and banks were hurt by the unexpected inflation of the 1970s, and midway through the decade real long-rates on U.S. Treasuries turned negative. The monetarist policy of Paul Volker in 1979 dramatically increased the risk of holding fixed income securities. Ibbotson (1985) notes that the implementation of Volker's new monetary policy resulted in the doubling of the standard deviations of returns on fixed income securities. In such an environment junk bonds can provide investors with some solace. Because lower credits have larger coupons than high investment grade bonds, they have shorter durations, making junk bonds less sensitive to swings in interest rates.[5] The muted sensitivity is one aspect that makes junk bonds attractive to investors during a period of volatile interest rates. Perry and Taggart (1990) also note that the performance achieved by Keystone's B4 Fund, a pioneer high-yield fund, enhanced the attraction of lower credit bonds. Blume and Keim (1990) concluded that over eleven years, from January 1977 through December 1987, the realized returns on a portfolio of junk bonds exceeded those of high-grade bonds. Hence, it appears that the strong performance of non-investment grade bonds stimulated demand for lower rated corporate debt.

In addition to increased uncertainty, demand for junk bonds was stimulated by a change in the institutional regulatory climate. In 1973 the Employment Retirement Income Security Act (ERISA) that governs pension funds essentially replaced the "Prudent Man"[6] rule with the "Prudent Expert" rule. This revision effectively allowed portfolio managers more discretion to invest in line with Modern Portfolio Theory rather than strictly on a security-by-security basis, as the Prudent Man rule required. Therefore, since the passage of ERISA, institutional investors have been increasingly willing to consider investments that have been previously considered highly speculative (Blume et. al., 1990).

On the supply side were firms trying to cope within this new economic environment. When inflation is unexpectedly high, the real profit of lenders is reduced and the real cost of borrowing is reduced, favouring the borrower. That is, the recipient of the fixed obligation is worse off while the party that makes the fixed contractual payments is better off. Similarly, if inflation is less than expected the distribution of gains and losses is reversed. It is this type of environment that cause households and firms to seek ways to reduce the uncertainty.

Because of the increased inflation uncertainty financial institutions became less willing to make fixed-rate loans. Beginning in 1973 and 1974, banks moved to floating-rate loans to mitigate their interest rate risk. The move to floating rates shifted the risk of unexpected inflation to the borrower and significantly increased uncertainty and risk for firms borrowing from banks (Rawls et. al., 1988). Thus firms seeking to escape the increased uncertainty associated with bank debt sought an alternate means of financing. Junk bonds were an obvious choice because they offered fixed-rate funding over longer terms to maturity than bank debt. In addition, bonds provide greater flexibility through fewer restrictive covenants and more liberal call provisions than available with bank loans or private placements. One way this benefited the issuer is that bondholders have less flexibility to accelerate the bankruptcy process (Perry et. al., 1988). Moreover, by issuing junk bonds corporations could avoid costly and dilutive common stock offerings. Through the combination of lower capital costs, greater flexibility and the greater certainty of a fixed-rate, issuers could more effectively respond to dynamic markets and deploy their assets more swiftly toward new objectives in an effort to maximize profits (Yago, 1990).

The difficulty with firms issuing public debt was that the bond market was not open to below investment grade firms, and a stigma associated with underwriting junk bonds partly explains why until 1977 investment banks would not underwrite lower credits. The risk aversion attached to lower credits did not seem to be wholly warranted because with thorough due diligence investment banks, investors, and issuers could all benefit. It would seem that the capital markets were not complete, because about 95% of all U.S. companies ranked below-investment grade. Hence, apparent opportunities for profit and improved efficiency were unexploited. However, as demand increased for high-yield bonds and supply was limited to fallen angels, an environment for investment banks to underwrite junk grade bonds was created. Underwriting junk bonds could be highly profitable because while the underwriting spread for investment grade issue is only one percent or less, the spread on lower credits was typically between three and four percent. Therefore, effectively for the first time investment banking firms allowed firms with lower ratings to access the public capital markets (Blume, et. al., 1990).

The first investment bank to get involved was Lehman Brothers, when in March 1977 they underwrote three single-B rated issues. Drexel Burnham Lambert followed in April, underwriting a $30 million issue for Texas International, Inc. (Willson et. al., 1996). Although it was not Drexel who moved first, it was they who seized the opportunity and "..almost single-handedly developed the market for original-issue junk bonds." (Benveniste, et. al., 1993, p.105). From 1977 through to their bankruptcy in February 1990 Drexel convincingly led and dominated the primary and secondary market for junk bonds. In 1988 Drexel claimed 42.8% of the market for junk bonds, up from 40% in 1987. The second largest share of the junk bond market was held by First Boston with 14.1%, and Morgan Stanley placed third with an 11.3% market share (Kaletsky, 1989). Total new high-yield issues in 1988 accounted for 23.07% of the total corporate bonds issued, up from 3.95% in 1977, giving Drexel almost 10% of the entire corporate bond market (Fridson, 1994).

It was Michael Milken who was the driving force at Drexel and in the overall junk bond market. The intellectual underpinnings of Milken's interest in low-grade bonds is traced to his days at Berkeley when he studied the landmark analysis of sub-investment grade and unrated bonds, *"Corporate Bond Quality and Investor Experience"* by W. Braddock Hickman (1958). It was Milken's unwavering belief in the superior risk adjusted returns of junk bonds and his tenacity that effectively created a channel through which changing economic forces could be accommodated.

By 1977 Drexel had a well established junk bond trading operation headed by Milken. Having an already successful trading operation in fallen angels was Drexel's advantage over Lehman Brothers and others. As well, Drexel did not have a well established investment grade client base to potentially offend by delving further into the high-yield market. One of the biggest hurdles to clear in developing a new market is the lack of liquidity. Because Drexel had already developed a network of investors and an expertise in secondary markets this hurdle was effectively cleared (Perry, et. al., 1988). Drexel was a very aggressive market-maker and committed vast amounts of the firm's capital. In fact, it is believed that at their peak they had as much as $3 billion in inventory by maintaining a massive inventory of junk bonds, and actively trading made them an important source of liquidity (Reich, 1986). So much so, that Drexel was generally considered the primary source of junk bond prices on Wall Street. Furthermore, they secured the confidence of investors by virtually guaranteeing the *ex-post* price for some of the clients. For example, when Flight Transportation went bankrupt less than one month after Drexel underwrote the issue, they bought out preferred clients at the issue price and even paid accrued interest. To gain perspective on Drexel's capital commitment, just prior to the firm seeking protection under Chapter 11 of the bankruptcy law it was believed that Drexel's inventory was worth between $1.5 to $2 billion; approximately 1% of the entire junk market (Benveniste, et. al. 1993), and Fred Joseph (1990), former CEO of Drexel, notes that in 1988 Drexel's capital was in excess of $2 billion.

2.2 Summary

As noted, Miller (1986) argues that "the major impulses to successful financial innovations have come from regulation and taxes." Hence, it is likely that changes to ERISA helped provide additional demand to help facilitate the innovation, or rather the resurgence, of non-investment grade corporate bonds. Also helping to stimulate demand from retail and institutional investors was the performance of high-yield bonds as an asset class in an environment of uncertain inflation and volatile interest rates. The same environment made junk bonds more attractive as a source of financial capital. Thus, the desire of firms and households to mitigate the costs and risks imposed by uncertain inflation and volatile interest rates appears as the most convincing explanation for the growth of junk bonds, and a dynamic period in general for the capital markets. Moreover, this explanation accords well with Merton's (1991) definition of the primary function of the financial system. Augmenting the main forces were increased global competition, corporate restructuring, and advancing computer and information technology to reduce the threat of adverse selection, changes in tax laws, economic growth, and the general maturation of the capital markets that led to the trend of disintermediation.

CHAPTER THREE

The Canadian High-yield Market

3.0 Introduction

Since 1996 Canadian companies have been issuing record amounts of bonds, and during the same time that the supply of government bonds has fallen precipitously. Not only has the activity in the domestic bond market been exceptionally strong, but firms that have historically had to borrow from chartered banks or from investors in the United States have since February 1996 been increasingly able to issue high-yield bonds in the domestic market. The watershed issue of junk bonds by Rogers Communications was a long time in the making. Since the late 1980s, Canadian companies have been placing high-yield bonds in the U.S., but attempts to sell non-investment grade bonds in the Canadian public market were rebuffed by conservative institutional investors who only purchased investment grade corporate bonds, or if they did buy lower credit bonds it was via private placement where they could better influence the terms of the deal. The recession that began in 1990 caused the junk bond market in the U.S. to come to a halt and eliminated the momentum that was slowly building in Canada. As the North American economies recovered, momentum began building, particularly when interest rates on bank deposits fell steeply, resulting in Canadians shifting their savings from bank deposits to mutual funds. This portfolio shift was instrumental in the creation of a domestic market for high-yield bonds because the rapidly expanding mutual funds industry resulted in a new potential buyer for Canadian non-investment grade bonds. The first high-yield mutual fund was founded in 1993 and several more appeared in 1994, initially these funds invested in U.S. dollar denominated bonds. At the same time the demand for bonds was being stimulated by falling interests rates, supply was being stimulated by low interest rates and changing spreads. These forces culminated in 1996 with the birth of Canada's own high-yield bond market.

3.1 The Canadian Experience with High-yield Bonds

The booming junk bond market in the U.S. in the 1980s availed itself to few Canadian corporations. Canadian issuers that accessed the bond market in the U.S. had no choice but to denominate their bonds in U.S. dollars. Denominating bonds in U.S. dollars works well for firms that derive sufficient revenue in U.S. dollars to match their U.S. dollar fixed obligations, but for companies that obtain most of their revenues in Canadian dollars, borrowing in the U.S. market exposes them to currency risk and/or costly derivative hedges. However, because yields on Canadian corporate bonds have been historically greater than similar credits in the U.S., the difference can be enough at times to make it less expensive for Canadian firms to issue their bonds in the U.S. The usual positive spread between Canadian corporates and U.S. corporates turned negative in 1996 and 1997, making it cheaper for Canadian firms to sell their bonds domestically (see Chart 5.5 in Chapter Five).

Financial TrustCo Capital Ltd marketed U.S. dollar denominated junk bonds in the United States in 1984 and 1985, and Horshams Corp. raised US$536.5 million in 1988 (Reguly, 1988e). In addition, in 1988 Canadian real estate developer Robert Campeau raised US$750 million in the U.S. junk bond market to help finance the US$6.6 billion takeover of Federated Department Stores Ltd. (Reguly, 1988d). The Campeau Corporation's deal did not expose the firm to exchange rate risk because the debt would be serviced by its U.S. operations. It is interesting to note that there was enough interest by Canadian firms in issuing non-investment grade bonds that Drexel Burnham Lambert Inc. had wanted to establish a Canadian subsidiary in Toronto as early as 1986. However, Drexel could not go forward with its plan until after ownership rules for brokerages in the Bank Act were changed in June 1987. By May 1988 Drexel had gained the approval from the Department of Finance and was waiting for approval from the Ontario Securities Commission to open the doors in January 1989 (Whyte, 1988). However, on December 21, 1988 Drexel agreed to plead guilty to criminal charges and to pay US$650 million in fines and several months later sought protection from creditors and ultimately declared bankruptcy (Reuters, 1988). Consequently, the doors to their Canadian subsidiary were never opened. However, in January 1989 they did market a US$50 million issue for Galactic Gold Inc., a Vancouver based mining firm (Reguly, 1989a).

In the first half of February 1989 Merrill Lynch Canada underwrote a C$40 million junk bond issue for Beatrice Foods Inc., through parent Onex Foods Canada Inc.. The senior subordinated notes were sold via private placement to undisclosed buyers who were considered to be the country's most conservative and experienced term lenders.[7] Merrill Lynch said it agreed to make a market (provide liquidity) in the securities so that investors would be able to trade their holdings. Through this private placement Onex became the first Canadian corporation to issue high-yield securities to Canadian investors (Critchley, et al. 1989a),. Though the doors to public issuance were still shut. The state of the domestic public bond market was summarized in 1989 by Robert Kilimnik (former Assistant Vice-President, Corporate Loans at Mutual Life of Canada, who was responsible for the entire Canadian private placement, corporate lending, and private equity operation) when he stated that:

> For a Canadian corporation to access the Canadian public bond market, it must be investment grade, i.e., at least a BBB credit or stronger. Generally, transactions require a minimum $50 million size. Hence, the public bond market is not a realistic source of financing for most Canadian corporations (Kilimnik, 1989, p.19).

To help meet the needs of mid-sized Canadian corporations frozen out of the capital markets, Paul Lowenstein, chairman of merchant bank Canadian Corporate Funding Ltd. (CCFL), announced in June 1989 that he intended to create a junk bond fund. Furthermore, the fund would encourage the growth of the subordinated debt market, and "[t]hat will mark the beginning of a high yield market in Canada," said Mr. Lowenstein. Burns Fry and TD Securities were working with CCFL to make-a-market in the issues to provide liquidity. The fund was originally proposed to be $250 million, but because of problems in the U.S. market for junk bonds and the slowing economy, only $157 million was actually raised (Critchley, et al. 1989b).

The market for junk bonds started to slide in 1990. The slide was the manifestation of the impending recession and legal difficulties at investment bank Drexel Burnham Lambert. New issue activity in the U.S. fell from US$24.9 billion in 1989 to only US$ 682 million in 1990, but bounced back to US$10 billion in 1991 (see Table 2.0). These micro and macro events did not bode well for the momentum starting to build in the domestic market for high-yield bonds. As evidence of problems in the junk bond market, The Dean Witter American

High-Yield Fund was wound-up in August 1990. The fund was held by Canadian investors, but was managed from New York and invested in U.S. junk bonds. Reasons cited for the fund's demise were that the fund, with a net asset value of only US$1.2 million, was too small to diversify and make a viable instrument and that the fund had lost too much value since its inception in early 1989 (Reguly, 1990).

The U.S. junk bond market rebounded in 1992, new issue activity rose to US$39.8 billion, surpassing the previous record set in 1986 when US$34.2 billion was issued. The North American economies began their recovery in 1993, and U.S. new issue activity that year eclipsed the 1992 record of US$56 billion in new non-investment grade bonds. The strong rebound of the U.S. junk market was in part driven by inflows into high-yield mutual funds. In the first half of 1993 individual investors pumped US$250 million weekly into funds that buy high-yield corporate debt, and was the fastest growing sector among taxable bond mutual funds. Fridson (1994) stated that there was excess demand for high-yield bonds, coming primarily from mutual funds in 1993 even though a record amount of high-yield debt was issued. Excess demand for high-yield bonds caused underwriters to court non-domestic issuers. The popularity of these funds is generally attributable to the returns obtained by high-yield bond funds. For example, the Merrill Lynch 175 High-Yield Index posted a one year return of 18.22% in 1993 versus the 10.06% posted by the S&P 500 Common Stock Index, and between 1980 and 1993 the High-Yield Index posted an average annual return of 14.13% (Fridson, 1994).

Similarly, in Canada mutual fund assets experienced incredible growth through the 1990s. Assets managed by members of the Investment Funds Institute of Canada doubled between 1990 and 1991 to $49.9 billion from $24.9 billion and grew 35% and 70% in the next two years. Growth slowed in 1994 and 1995 to 11% and 15% respectively, but picked up again in 1996 and 1997(see Chart 4.3). As fund assets expanded rapidly, so did the selection of fund companies and types offered. By 1998 The Investment Funds Institute of Canada (IFIC) had 301 member firms managing 1,030 different funds up from 110 and 505 respectively in 1990.

Some of the new mutual fund companies were small firms like Deans Knight Capital Management. This Vancouver based firm began operating in 1992, and established a high-yield bond fund in June 1993. At its inception the fund, managed by Doug Knight, a partner in Deans

Knight Capital Management, invested in U.S. issues. Nevertheless, it provided a potential institutional buyer for Canadian high-yield issues, and expanded the menu of investment products available to Canadian investors who had not had an open-end high-yield fund to invest in since the Dean Witter fund wound up in 1990. In 1994 no less than six new bond funds investing in high-yield debt made their debut. Among them were Midland Walwyn's Atlas Canadian High Yield Bond Fund, the Navigator Canadian Income Fund, and the O'Donnell High Income Bond Fund, all managed by Doug Knight. Investors Group established the Investors Corporate Bond Fund to invest a proportion of its assets in high-yield bonds. In addition, mutual fund companies Trimark and Altamira created new bond funds that would invest in below-investment grade bonds (Grogan-Green, 1994). As in the U.S., it appears that growing demand for assets that performed well was a contributing factor to the growth in supply. For example, in 1994 the Scotia McLeod Universe of BBB Corporate bonds posted an 11.13% return versus the 9.73% return posted by equities in the TSE 300 Index.

With the addition of these new funds and new corporate bond investors the environment became more conducive to growing a domestic market for junk bonds. Although more potential high-yield buyers existed after 1993, the lack of participation by pension funds and life insurance funds had still not been overcome, and a domestic market for high-yield bonds did not yet exist. When Graham Savage, a senior vice-president at Rogers Communications Inc. was asked in 1994 what Canada's capital markets needed, he responded bluntly, "We need a Michael Milken in Canada." (McNish, 1994, p.B1).

Excess demand in the U.S. market for high-yield bonds coupled with the absence of a domestic high-yield market created an opportunity for U.S. investment firms like Merrill Lynch & Co. Inc., Salomon Brothers Inc., and Goldman Sachs & Co. to promote the bonds of Canadian firms to U.S. investors. Canadian investment banks received their wake-up call in 1994 when Merrill Lynch raised C$300 million for Rogers. The issue was sold to U.S. investors and denominated in Canadian dollars. Robert Gemmell, vice-chairman of Merrill Lynch Canada Inc., noted that "[i]t was a watershed deal." Prior to Merrill Lynch marketing this deal in the U.S., Rogers had asked a group of Canadian underwriters to test the domestic market for a junk bond issue, but the investment banks could not find buyers for more than C$50 million and the potential buyers wanted unusually tough financial restrictions on the bonds (McNish,, 1994, p.B1). Following Rogers' successful issue, Sherrit Inc. sold Canadian dollar denominated bonds to U.S. investors. Adding further pressure to Canadian dealers was the Morgan Stanley Group Inc., when it announced in October 1994 that it intended to triple the size of its Canadian bond operations (Ingram, 1994). Although it was becoming increasingly easier for Canadian corporations to issue non-investment grade debt, it was still being issued in the U.S., primarily in U.S. dollars.

To support the development of a domestic high-yield market, Scotia McLeod began building a high-yield index in 1994. The index was operational in the first quarter of 1995, and included bonds rated BBB(High) or lower by at least one credit rating agency. With respect to the inclusion of triple-B rated bonds, Scotia McLeod notes that the Canadian high-yield market is unique because it starts a little higher up the credit curve than in the U.S. and is largely made up of fallen angels. The Canadian market effectively begins in the BBB(High) area because many Canadian institutional investors are unable to buy bonds rated less than single-A (Low) (Irwin et al., 1994).

In 1995 Canadian mutual funds and investment dealers still struggled to create a domestic junk bond market in an effort to bring back some of the corporate finance business lost to U.S. investment banks. By November 1995 Canadian mutual funds had committed less than $300 million to high-yield bonds, and Deans Knight Capital Management was the single biggest institutional player in the Canadian high-yield market with about $125 million of junk bonds under management. Deans Knight was the only Canadian buyer for a US$275 million single-B rated issue by Algoma Steel Inc., buying $3 million of the issue in 1995. Glen Manchester, director of finance for Algoma, stated that Canadian investment dealers unanimously told Algoma no one would want to buy a single-B rated issue. Further, he said he was surprised given that the issue was priced to yield 14.25% , 8% over U.S. Treasury notes.

While mutual funds were taking small portions of issues, three Canadian dealers (CIBC Wood Gundy, Scotia McLeod, and TD Securities) opened high-yield bond desks in New York in an effort to win back business lost to large U.S. investment banks. However, at the end of 1995 only two Toronto dealers were actively making markets in high yield Canadian bonds.

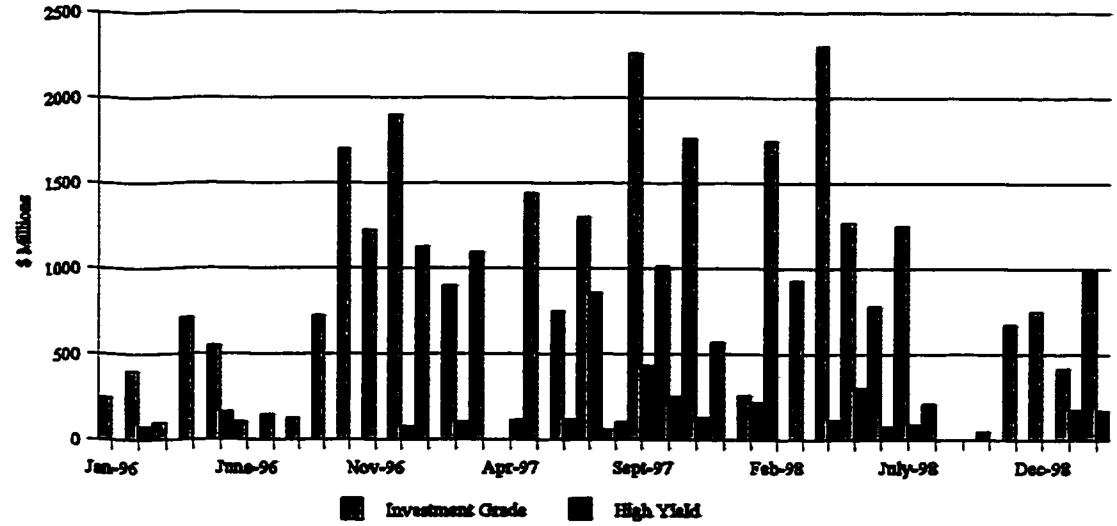
The two were Goldman Sachs Canada and Midland Walwyn. Midland Walwyn stated that progress was made through 1995, citing increased trading volume to $120 million in October 1995 from $3 million in November 1994, when they began actively trading Canadian high-yield bonds (Ip, 1995b). Thus, liquidity improved significantly through this one year period.

February 14th, 1996 marked Rogers Group's 10th issue of high-yield debt since August 1991. The 10 year issue for $C75 million was to be led by Merrill Lynch, rated double-B minus by Standard and Poor's and B2 by Moody's Investor Services, but was scuttled by Rogers because they felt the coupon demand was too high. After the markets closed on February 14th, Scotia McLeod offered to do a bought deal for Rogers. The deal was consummated and became the first junk bond sold in the public market to Canadian investors. Thus, Rogers was again involved in a watershed transaction marking the beginning of the Canadian high-yield bond market. In addition to being the first publicly issued junk bond in Canada, the issue is also notable because the notes were offered to investors on a "non-fixed-price basis." That is, the underwriter, Scotia McLeod, fixed the spread over 10-year Government of Canada bonds. This form of pricing is typically reserved for investment grade issues only (Critchley, 1996b).

In May 1996 Rogers sold C$160 million in junk bonds in the Canadian public market and marked the second ever domestic junk bond issue. Of the three high-yield issues totalling $308 million in new high-yield issues sold in the domestic market during 1996, Rogers accounted for 76%, or $235 million, of the total.

Chart 3.0 below depicts the two Rogers deals in 1996 and shows new high-yield issues were much higher in 1997.[8] In 1997, 15 firms sold $2.1 billion worth of junk bonds in the domestic market and accounted for14.5% of the total new corporate bonds placed in the Canadian public market. The nascent market was much weaker in 1998 because of the Asian crisis which peaked in August and September of that year. As a result of the crisis corporate spread widened considerably and no new high-yield issues were sold after July 1998. Nevertheless, between January 1998 and August 1998 the nascent market more than doubled the 1996 total by issuing $788 million. In the first two months of 1999, however, $344 in non-investment grade bonds were issued in the domestic public market. Hence, in its first 38 months of existence the high-yield market issued $3.5 billion of non-investment grade bonds and accounted for 9.9% of the total $35.4 billion in domestic corporate bonds issued in Canada.

Chart 3.0 Canadian New Issues: Domestic Public Market, 1996 - 1999



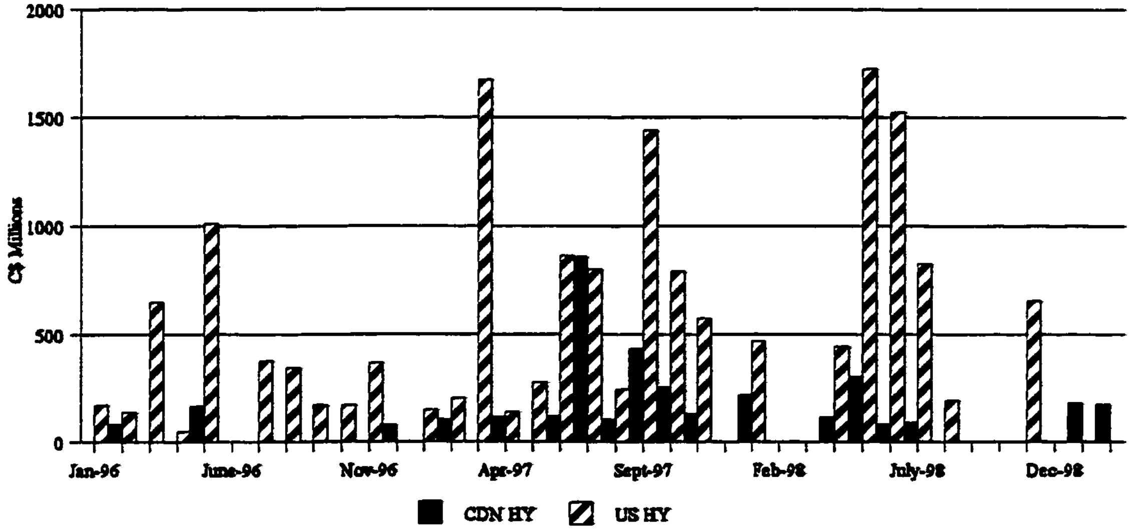
Source: CIBC Wood Gundy

Conversely, of the $37.9 billion of corporate bonds placed in the U.S. market between January 1996 and February 1999, 43.3%, or $16.4 billion, of the total was non-investment issues. Even though firms with lower credit ratings were now able to access the domestic market, the majority of Canadian high-yield was placed with investors in the U.S.

The difference between the Canadian and U.S. markets for high-yield bonds is clear from visual inspection of Chart 3.1, and was the focus of a November 6, 1998 Globe and Mail column by journalist Andrew Willis. Willis reported that while "[t]he junk bond market was hammered during August's flight to quality...a long dry spell for high-yield debt seems to be easing, with MetroNet Communications selling $225-million (U.S.) of 10-year bonds yesterday on the U.S. market", but added that "we are still waiting for the return of the domestic market for high-yield debt denominated in Canadian dollars". The fact that during this period MetroNet had to issue their bonds in the U.S. indicates that the U.S. market for Canadian debt is more mature and vibrant than the domestic market. While the U.S. market receives the majority of Canadian high-yield issues, the majority of investment grade issues are placed with Canadian investors. Between January 1996 and February 1999 the U.S. market absorbed $21.5 billion Canadian investment grade corporate bonds compared to $31.9 billion placed at home.

While the domestic market is still in its infancy, there is evidence that the nascent market is slowly maturing. As previously noted, Canada's first high-yield bond index was developed in 1994 and included issues that formally should be recognized as investment grade. The evolution of the domestic market is illustrated by the June 1998 launch of a new high-yield index by Scotia McLeod. The launch of the Can-Am High Yield Bond Index is significant because its definition of high-yield bonds is aligned with the more traditional definition in the U.S. Issues that are rated triple-B low or higher by Canadian rating agencies are not included in the new index because they are considered investment-grade for Canadian investors. The Can-Am High Yield Bond Index measures the performance of the universe of bonds issued by Canadian corporations rated BB+ or lower by Standard and Poor's and/or rated Ba1 or lower by Moody's.[9]

Chart 3.1 Domestic & U.S. High Yield Issues



Source: CIBC Wood Gundy

3.2 Bond Market Impediments

Canada is a more risk averse nation in comparison to the U.S., and its international reputation is one of a kinder and gentler country. Lipset (1990) suggests that closer links with its European origins have helped preserve an older set of beliefs and more risk averse behaviour in Canada. Whatever the source of the greater aversion to risk, the risk averse nature of many institutional investors is the most frequently cited impediment to the development of a domestic high-yield market. Because the buyers of corporate bonds are mainly institutional investors, particularly in the primary market, their lack of participation poses the single largest barrier. In 1988 Peter Godsoe, then vice-chairman for the Bank of Nova Scotia, said that "Canadian financial institutions who might be buyers would shun junk bonds because they are conservative." (Reguly, 1988e, p.3). As well, Blake Wallace, a vice-president with Murray & Co. Investment Services Ltd., a debt and mortgage boutique and one of the main buyers of high-yield debt in the late 1980s, said "the psychology is different here". He also noted that "we like to say, high-yield subordinate debt" in Canada, and that investors get nervous when they hear the term junk bonds (Baxter, 1989, p.24). Portfolio manager and partner at Mawer Investment Management, Gary Feltham, also observes that key institutional investors such as insurance companies and pension funds and are restricted from purchasing bonds rated below investment grade. Feltham notes that these same institutions can buy equities issued from the same company that sold the bonds they cannot purchase. The fact that these firms can buy the equities, which by definition are riskier than bonds, is ironic (Feltham, 1996).

The aversion to lower credits appears to be incongruent with research that indicates the inclusion of low grade bonds in a diversified portfolio can improve risk adjusted returns. For example, Blume and Keim (1990) found that junk bonds had a positive and significant alpha coefficient, which can be interpreted as the return in excess of that warranted by the beta risk of the investment. In addition, they show that the standard deviation (the most common measure of risk for financial instruments) for monthly returns on U.S. junk bonds between 1982 and 1987 was only 2.32 percent compared to 3.23 for investment grade bonds, 3.64 for long-term government bonds, and 5.20 for equities, indicating that the returns to junk bonds was less volatile, less risky, throughout this period. Similarly, Fridson (1994) states that in the U.S.

between 1985 and 1993 the standard deviation of returns on high-yield bonds was significantly lower than large and small company stocks.

Also hampering the development of the market are incongruent investment criteria that direct some fund companies. For example, the Talvest Foreign Pay Canadian Bond Fund cannot invest in domestic issues rated less than single-A, but the 20% foreign content can be invested in emerging market debt rated single-B or better (Allentuck, 1998)

In addition to the absence of pension funds, there are two notable large funds that are unable to invest in non-investment grade debt. The Alberta Heritage Savings Trust Fund had $8.95 billion invested in fixed income as at March 31, 1998, of which $3.4 billion was in corporate bonds. However, the fund has a quality constraint for fixed income securities and is unable to invest in securities rated lower than triple-B.[10] While the Heritage Trust Fund does invest in triple-B rated debt, the $2.5 billion Millennium Scholarship Fund is restricted from buying bonds rated lower than single-A, and if the term to maturity is more than five years, the bond must be rated at least double-A (Willis,1998b). The 1998 annual report for the Canada Millennium Scholarship Foundation stated $2.6 billion in investments; of that total only $250 million was invested in corporate bonds, and over $2 billion was invested in Government of Canada bonds. As well, most or all pension funds are not active in the high-yield market because it leaves a very large gap to fill; in 1996 Canadian private and public pension funds had $417 billion in assets under management (Harris, 1997). However, because life insurance companies and many mutual funds are merely leery of buying lower credits, they will likely emerge as buyers in the future, once domestic high-yields have a track record of seven years or more .[11] Barry Allan, a vice-president, with Altamira Management Ltd., said that "there aren't enough institutional investors involved in the marketplace in this area today" pointing to insurance companies and pension funds. For the market to grow, he added, you really "...need the entrance of those two sectors. The market is predominantly retail investors through high-yield mutual funds."While in the last few years a few new mutual funds have been created and are buying some high-yield debt, only $300 million was committed to high-yield debt in 1995. The picture is much different in the U.S., where mutual funds were buying about 60% of new high-yield issues in 1995 (Ip, 1995b, p.B13). Thus, the current bulk of Canadian non-investment grade bonds are placed in the U.S.

Slowly, participation appears to be on the rise. In October 1998, Royal & SunAlliance Insurance was recruiting a second-in-command to help run its $2.5 billion fixed-income portfolio. The advertisement for the position indicated that experience analyzing corporate bond credits would be a definite asset. It, therefore, appears that they are gearing up to participate in the nascent market (Willis, 1998c).

There is increasing pressure on institutional investors to consider below-investment grade corporate bonds because lower rated bonds have provided investors with returns on average above that received on government bonds, investment grade corporates, and equities through the 1990s, and on average government bonds and corporate bonds in general have out-performed equities (see Chart 4.5 in Chapter Four). But as the supply of new government issues continues to decline investors will increasingly have to turn to corporate issues to fill their fixed income needs.[12] Thus far, corporate issue have offset the decline in government borrowing.

One of the fundamental differences in the financial services industry between Canada and the United States is the number of banks. In the U.S. there are a large number of small banks whereas in Canada five big banks dominate. The lack of a large number of small banks and other financial institutions limits the number of potential institutional buyers. Therefore, there are fewer potential buyers for non-investment grade debt in Canada. In addition, Canadian banks have been fairly competent at taking care of corporate financial requirements, thereby reducing the need for non-investment grade firms to access the public debt market (Reguly, 1988e). Patrick Farmer, portfolio manager of the Trimark Advantage Bond fund, also cites the strength of domestic banks in corporate lending as an impediment to the development of a high-yield market. As well, Farmer notes that investment banks seem to have been pre-occupied with "flogging" government debt (Grogan-Green, 1994). Not only were the big banks strong, but very aggressive in competing for business loans. The banks were so aggressive that in some instances asset growth and market share appeared to be more important than profitability. Moreover, because senior bank loans were readily available at reasonable rates, it dampened the growth of more costly, yet more prudent, subordinated debt. Subordinated debt is, or can be, more prudential because the terms can be much more flexible and debt maturities can be longer. In addition, subordinated lenders and equity providers tend to take a long-term perspective, and have a higher tolerance for business plans that are not fulfilled to the letter. Nevertheless, many borrowers embraced bank financing regardless of whether it was prudent only to discover that when business plans did not materialize as anticipated, loans could be in technical default or could face acceleration (McKenna et al., 1992).

When the high-yield market first began emerging in the late 1980s, the lack of a secondary market was a big hurdle (Baxter, 1989). An active secondary market is critical to provide the liquidity to facilitate new issue junk bonds. Liquidity is required to allow investors to make portfolio adjustments. The absence of a liquid secondary market is in large part attributable to the small size of the country and the strength of the chartered banks, and partly attributable to the fact that more than half of all net new corporate bonds are placed abroad, (see Chart 5.0) reducing the amount of potential fallen angels to develop a liquid secondary market for non-investment grade bonds. Conversely, when Drexel effectively created the new issue high-yield market in the U.S. in 1977, there was a thriving secondary market, and Drexel was very active in trading fallen angels.

Liquidity is always a hurdle to overcome when creating a corporate bond market because of the finite life of bonds and the lack of homogeneity. Because equities have no maturity date and are more homogeneous, equity markets develop prior to corporate bonds markets. Further, government debt markets develop earlier than a market for corporate credits and are a necessary condition for the development of public bond markets for corporate debt. The hurdle for establishing government bond markets is lower because of the sheer size of government financial requirements and the lessened problem of adverse selection in government debt. Moreover, the threat of default is much less with government issues because they have the power of taxation.

In the late 1980s when the junk bond market was experiencing exceptional growth in the U.S., it was just beginning to catch on in Canada. One of the factors driving the U.S. high-yield market in the late 1980s was corporate restructuring, including mergers and acquisitions. For example, in 1987 bonds issued to finance acquisitions accounted for as much as 67.5% of the value of all junk bonds sold in the U.S., but by 1991 the figure had fallen to 9.6%. Since 1991 the percentage of junk financing used to fund mergers and acquisitions rose steadily to stand at 27% in 1996 (Zuckerman, 1997). Although 27% is high when compared to recent years, it is considerably less than the high levels in the mid-1980s. Commenting on the lack of junk bonds issued by Canadian firms in the late 1980s, Peter Godsoe noted that the bonds have not been required because there has been less corporate restructuring in Canada (Reguly, 1988e). This began changing in the late 1990s. Coinciding with the birth of a domestic market for high-yield debt has been a record amount of mergers and acquisitions in North America through 1996 and 1997. In Canada the value of mergers and acquisitions was $94.7 billion at the end of November 1997, up 26% from the 1996 record year and more than double the amount in 1994. The activity was concentrated in financial services and in the oil and gas sectors. In the U.S. the activity was concentrated in the telecommunications industry (Reguly, 1997), and much of the activity has been driven by corporate strategies in turn driven by economies of scale. Up-front cost on hardware and software can run into the hundreds of millions of dollars, but marginal costs are nil (Willis, 1997d). While there has not been many mergers in the telecommunication industry in Canada, it has been firms from this industry that have been issuing the majority of high-yield bonds. Massive capital investment has been undertaken by firms at the forefront of the digital revolution. A further discussion is presented in chapter seven with respect to digital convergence and globalization, and the industry breakdown of corporate bond issuance between 1996 and 1998.

Like those in Canada, European companies wishing to raise funds via non-investment grade bonds have had to issue their bonds in the U.S. The Europeans do not have a local high-yield market, but pressure is building to create one. The single currency, increasing competition, de-regulation of telecommunications, and low interest rates are stimulating both the demand for and the supply of high-yield bonds and creating an environment to establish a European high-yield market (Economist, 1997).

3.3 Summary

The momentum in the economy and bond market that was lost as a result of the 1990 recession began building again in 1993. Excess demand for high-yield bonds in the U.S. caused American investment dealers to court foreign non-investment grade firms, resulting in more Canadian firms selling their debt to investors in the U.S. through American investment banks. Rogers' first watershed deal selling Canadian dollar denominated junk bonds to U.S. investors was a wake-up call to Canadian dealers to repatriate the underwriting business lost to U.S. dealers. Increased demand for high-yield bonds by Canadian investors is evident by the number of new mutual funds dedicated to purchasing corporate bonds that emerged in 1994. The emergence of new institutional investors in Canada was an important factor in the development of a domestic high-yield market. These new investors helped to fill the void that existed because of the absence of pension funds and life insurance companies in the non-investment corporate debt market. Demand for low grade corporate debt appears to have been driven by falling interest rates on traditional bank and term deposits and by the strong returns posted by high-yield bonds.

Demand-side forces were complemented by heavy capital investment by telecommunication firms that required external financing. Industry changes are being driven by increased global competition, investment in high-technology, and government de-regulation and facilitated by declining government borrowing, and low interest rates and narrow spreads.

Chapter Four

Demand for Corporate Bonds

4.0 Introduction

The previous chapter reviewed the development of the high-yield bond market in Canada in order to examine how the bond market has changed. The purpose of this chapter and the next is to examine the forces that have re-shaped the Canadian bond market. To understand the influence that demand-side factors have had, this chapter reviews portfolio theory to provide the theoretical framework for analysis. Modern Portfolio Theory suggests that risk and return are the primary drivers of asset demand when wealth is assumed exogenous.

The inclusion of a chapter dedicated to the analysis of demand is counter to mainstream financial economics, and thus may be somewhat controversial. The current thinking is that there is always enough demand for a high enough yield. That is, effectively demand is assumed to be perfectly elastic and will accommodate any level of supply if the price is right. However, this does not mean that demand is irrelevant and should be ignored. Because the discussion in chapter three suggests that a change in demand may have played a vital role in the development of the nascent high-yield market, and any analysis of changes in the bond market would be remiss to excluded demand-side influences. While demand may exist for any bond issue if priced correctly, firms are not likely to issue their securities at inordinately low prices. Moreover, if Canadian institutional investor are more risk averse than their American counterparts, then for a given level of risk they will demand a higher risk premium making it less expensive to issue bonds in the U.S. Another indication that changes in demand may have played a prominent role is that it appears that there has not been a lack of supply of high-yield bonds coming from Canadian firms. For example, Rogers watershed issue in February 1996 was their tenth issue since 1991, but the one first placed with Canadian investors. This fact provokes the question, what changed to facilitate the issuance in the Canadian capital market? Perhaps the changing spread between Canada and U.S. bonds can answer the question. However, it is important to recall that there exists institutional barriers in Canada that inhibit the purchase of non-investment grade bonds. As noted in the previous chapter key institutional investors are restricted from purchasing below investment grade bonds. The existence of institutional barriers also highlights an interesting question. That is, has something happened to attenuate this barrier?

Hence given that Canadian firms have been issuing high-yield bonds since the 1980s, but not in Canada, it is critical that all possible influences be assessed to determine what changed in the late 1990s to facilitate the development of a domestic public market for non-investment grade bonds.

The analysis of the key factors reveals that the secular decline of inflation enabled nominal interest rates to fall to historically low levels and generated a lengthy bull market in bonds. These forces drove a massive portfolio shift that began early in the 1990s and strengthened in the latter half of the decade. Canadians switched from poor yielding bank deposits to higher yielding mutual funds. The shift into mutual funds favoured money market securities and corporate bonds. The growth of mutual funds, particularly the creation of speciality high-yield bond funds is believed to have mitigated the institutional barriers. Thus, the analysis supports portfolio theory and the hypothesis that low interest rates, and inflation were critical factors that led to the nascent high-yield bond market in Canada.

Section 4.1 summarizes the Markowitz (1952) and Sharpe (1964) theory of asset allocation and asset demand when wealth is assumed exogenous. The next section highlights the four asset classes that should be considered in the analysis of demand. Section 4.3 presents an overview of inflation and interest rates since the late 1970s. The portfolio shift is discussed in Section 4.4, and the conclusion is presented in section 4.5.

4.1 Portfolio Theory and Asset Demand

Portfolio theory provides the basis for an analysis of the demand for corporate bonds, particularly for the present analysis, because it is the change in portfolio composition that is of interest rather than why people choose to save. That is, it is assumed that households make the asset selection decision independent of both the consumption-investment decision and the investment in non-financial assets. In this way the total amount of wealth to be invested in financial assets is exogenous (Aivazian et al., 1990).

The central thesis of Markowitz (1952) is that investors will not just strive to maximize the expected return for two reasons: because the future is uncertain and because investors are risk averse. He argues that if maximizing return was the sole criterion, then investors would search for the highest yielding asset and put their entire wealth into that asset. For example, most investors realized that although Bre-X had very high potential returns, the risks associated with a junior gold exploration firm in a politically unstable region were just as spectacular. Consequently, only a few brave souls (generally referred to as speculators rather than investors) put their entire wealth into the asset. Most investors realized that the risks were significant and chose to spread their wealth across numerous assets. In fact, Markowitz states, that "[d]iversification is both observed and sensible; a rule of behaviour which does not imply the superiority of diversification must be rejected both as a hypothesis and as a maxim." Hence, he states, "[t]here is a rule which implies both that the investor should diversify and that he should maximize expected return." And, through diversification, "[t]he law of large numbers will insure that the actual yield of the portfolio will be almost the same as the expected yield."

The criteria for optimal portfolio choice involves more than merely maximizing the expected return of a portfolio; it also involves the minimization of the expected variance of that portfolio for a given return. This criterion Markowitz refers to as the *E-V* rule. To fulfill the *E-V* rule, of course, relies on more than just investing in many assets and relying on the law of large numbers. To minimize portfolio variance involves selecting assets that have either zero or, preferably, negative covariance. Hence, portfolio choice is effectively a function of two key variables: expected portfolio return, E, and expected portfolio variance, V. The important correlation coefficients, ρ, between various assets or securities are explicitly captured within the specification of portfolio variance. Markowitz concludes that to facilitate the use of the rule in the selection of securities, statistical techniques should be used and augmented with the "judgement of practical men.", thereby recognizing that there is inherently a subjective quality to portfolio building.

The E-V rule is a tool or methodology that investors follow to increase their wealth and thus increase their welfare, or utility. Therefore, it is the end-of-period wealth, the value of the portfolio at the end of the investment horizon, that investors are interested in. Therefore, the investor utility function can be expressed as follows:

$$U = U(E, V) \qquad 4.0$$

where E denotes expected portfolio return, or more accurately expected end-of-period wealth, and V denotes expected portfolio variance, or more accurately the variance of the investors wealth. The investor is assumed risk averse and utility is increasing in E and decreasing in V. The investor's indifference curves can be illustrated in E - V space (where E is on the vertical axis) which are upward sloping and convex. That is, to entice the investor to bear more risk he must be compensated with additional expected wealth. Moving up and to the left on subsequently higher indifference curves provides greater utility because more wealth is promised for each unit of risk (see Chart 4.0).

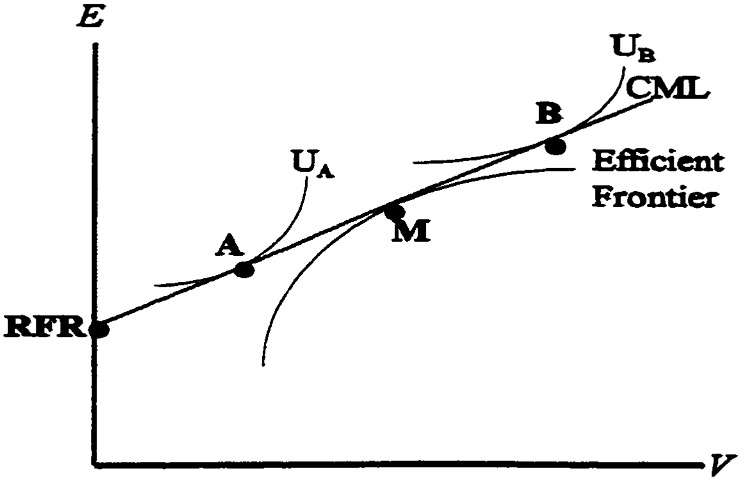
An important point to make is that it is after-tax returns that investors maximize for a given level of risk. Hence, investors must consider the effect of taxation when selecting the optimal portfolio, and to the extent taxes change demand for different assets will change. However, there have been no material changes to the personal tax code that would have provided the impetus for changes in the capital markets, although the capital gains exemption was eliminated in the 1994 Federal Budget. While statutory taxes have not experienced a significant change during the 1990s, effective tax rates have changed. For example, falling inflation has caused a decline in the effective tax rate on capital gains, and the lack of full indexation of personal taxes has caused the effective personal income tax rate to increase. These changes are more likely to have created a bias toward investments which tend to have a larger capital gain element and less of an interest income component, and may have therefore favoured high capital gain equities. However, it important to note that as much as 75% of the income from savings is not taxed at all at the personal level. This result is largely attributable to the RRSPs. Because the bulk of income from savings is effectively taxed at a zero marginal rate only a minority of income from savings will be impacted by changes in effective tax rates it is unlikely that taxation played a vital role in the development of the high-yield market. Hence to maintain the focus on factors that are likely to have had an important role the analysis will abstract for taxation; therefore, asset returns and other influences are considered all else equal.[13]

As noted, Markowitz showed that diversification holds the key to maximizing returns for a given level of risk, and he showed geometrically the set of attainable E & V combinations. However, of those obtainable only a small subset on the perimeter are efficient. That is, the maximum return for a given level of risk. The subset is achieved through diversification, and diversification is especially beneficial when assets with different correlation coefficients are combined to reduce portfolio variance. The inclusion of enough assets eliminates unsystematic risk, leaving only systematic, or market, risk. Graphically the optimal combination of assets that form the subset is known as the *efficient frontier*. The efficient frontier represents the set that has the maximum rate of return for a given level of risk. Graphed in E-V space the efficient set can be illustrated by a concave line (see Chart 4.0).

The optimal position on the frontier is determined by an investor's risk profile, and graphically investor utility is maximized at the point where the efficient concave set is tangent to the investor's convex indifference curves. Assuming risk preferences remain constant, the key variables affecting the demand for corporate bonds are their expected return, risk, the correlation with other assets, and the changes in the investor's wealth. Relative changes of the first three will alter the shape and/or position of the efficient frontier and lead to a new utility maximizing portfolio. These relative changes will affect the asset mix and the demand for various assets. Exogenous changes in wealth will affect asset demand according to each asset's elasticity.

In 1964 William Sharpe developed the capital market theory by augmenting Markowitz's portfolio theory with a risk-free asset.[14] A risk-free asset is one that has a zero variance, and its inclusion in the determination of portfolio variance changes the risk profile in a profound way.[15] That is, covariance between it and any other asset is zero, and therefore its inclusion greatly reduces overall portfolio risk. Moreover, the expected return of a portfolio that combines the zero variance asset with risky assets creates a new set of optimal portfolio choices that is linear. The line is known as the capital market line (CML), and it intersects the vertical axis at the risk-free rate of return (RFR) and is tangent to the efficient frontier; the point of tangency represents the market portfolio.

Chart 4.0 Portfolio Selection



The inclusion of the risk-free asset allows an investor to move above the efficient frontier, improving the risk-return profile of potential portfolios. The ability to move off of the efficient frontier follows from the assumption that investors can lend and borrow at the risk-free rate. With the inclusion of the risk-free asset the utility maximizing portfolio for an investor is not necessarily the tangency with the efficient frontier, but more generally the tangency between the indifference curve and the CML.

Whether an investor holds portfolio A, M, or B depends on his or her risk profile. If an investor bought on margin, or borrowed at the risk free rate, and invested the funds in the market portfolio, his utility maximizing portfolio would be at, say, point B where his indifference curve is tangent to the CML. Alternately, a more conservative investor may prefer to lend at the risk-free rate. Thus, her utility maximizing portfolio would be the tangency between her indifference curve and the CML between the market portfolio, M, and the vertical intercept at, say, point A. It is clear from Chart 4.0 that if, as mentioned previously, the efficient frontier changes shape, or the risk-free rate changes, or investor risk profile changes then the asset mix in the investor's portfolio will change. Within the asset mix of any portfolio the risk-free asset provides the foundation on which an investor portfolio is constructed and re-balanced when changes occur.

The resultant portfolio adjustments will affect the demand for different assets. For example, Aivazian et al. (1990) assessed the degree of substitutability between three broad asset classes: 'money', debt and equity. Money is defined as cash plus short term debt instruments. Their analysis concludes that debt and equity are substitutes with respect to expected return and variance. Hence, if the expected return falls and/or variance increases on one asset the demand for the other will increase. This finding is intuitively appealing because it seems reasonable that an investor would typically substitute away from an asset as its risk increases *ceteris paribus*. Similarly, Sandmo (1977) found that for risky assets demand increased positively with its own rate of return and that the risk had a negative effect. The key point to these observations is not so much whether some securities are complements and substitute but, rather, that relative changes between assets will impact the demand for various assets.

Capital market theory identifies three salient factors that influence asset demand and therefore demand for bonds, B^d. Expected return, R_i, and expected variance, σ_i, of i^th asset relative to other assets, correlation coefficient, ρ_{ij}, between the i^th & j^th asset, when investor wealth, W, is assumed exogenous. Hence, the demand for corporate bonds can be expressed as a function of these variables.

$$B^d = B^d(R_i, \sigma_i, \rho_{ij}; W) \qquad 4.1$$

This specification of asset demand is not controversial. Asset demand is most often specified as a function of asset return, risk and wealth (see Aivazian et al., 1990, Broer, et al., 1998, Koch, 1969, Sandmo, 1977, Schnabel, 1981, Tobin, 1958 and Zietz et al., 1988).

4.2 Four Asset Classes

The above discussion provides the theoretical basis for analysing the demand for corporate bonds. It emphasizes that relative changes between different assets will affect demand. Aivazian et al. (1990) pointed to three broad asset classes that should be considered: *'money'*, *debt*, and *equity*. However, because of the different performance characteristics between investment grade debt and non-investment grade debt the asset class debt should be broken into two categories based on credit rating, thereby creating four classes rather than three.

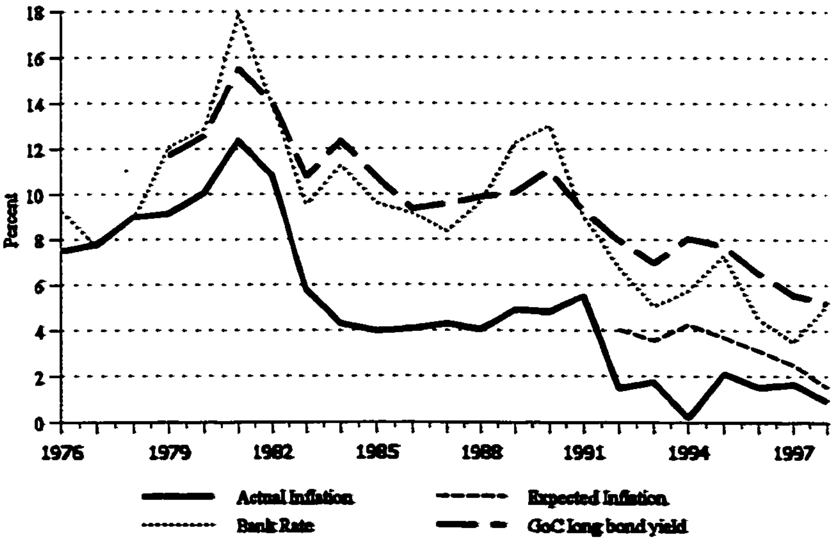
To capture the performance of investment grade bonds either Government of Canada bonds or double-A corporate bonds can be used. The analysis presented below considers both the Scotia McLeod (SCM) universe of government bonds and the SCM universe of double-A corporate bonds to highlight the performance difference between investment grade and high-yield issues, although the empirical analysis only considers the performance of government bonds. The SCM High Yield Index would provide the most appropriate measure of performance; however, because the index was introduced in 1995 too few quarterly data points are available for proper empirical analysis. Because triple-B rated bonds are effectively considered high-yield, the SCM universe of triple-B rated corporate bonds, which has tracked the performance of these bonds since 1985, is used. With respect to the performance of the equity category in Canada the logical choice is the TSE 300 index. The fourth asset, 'money', in practice holds the place of the risk-free asset. Cash and short term debt securities, or money market instruments, like government T-bills or commercial paper are typically treated as the risk-free asset and provide the fundamental building block in portfolio construction. However, until about the middle of the 1990s individual investors principally used fixed term bank deposits and guaranteed investment certificates (GICs) as the risk-free asset of choice. After 1995, the individual investor began favouring money market mutual funds as the risk-free asset. Hence, prior to 1995 there was a distinct difference between the securities that retail and institutional investors considered, or used as, the risk-free asset. For this reason the analysis presented below considers bank deposits and money market securities.

The preceding discussion illustrates that although only four asset classes are used in portfolio construction, there are a number of different securities that can fall into each category. The following section examines the performance of several different securities and other influences to understand the changes occurring in the bond market.

4.3 Inflation and Interest Rates

Now that four key assets have been identified and a number of securities that fall under each class have been highlighted, a review of their performance over time will aid in understanding the evolution of the domestic debt market. Because inflation is the most significant single driver of nominal interest rates the review begins with a look at inflation and monetary policy. Subsequently, the analysis turns to reduced government borrowing, which has strengthened the decline in interest rates.

Chart 4.1 Bank Rate and Inflation, 1976-1998



Source: Statistics Canada

Inflation ramped up to historical highs in the 1970s and early 1980s. From 1980 to 1981 the general price level increased in excess of 12% and then fell precipitously to about 4% in 1984 before climbing slightly at the end of the decade. In January 1988 John Crow, the Governor of the Bank of Canada, announced that the primary objective of monetary policy would be the pursuit of price stability in an effort to push inflation down further. The Canadian central bank increased the Bank Rate from an average of 8.4% in 1987, 9.69% in 1988 and 13.04% in 1990. As a result of contractionary monetary policy the overall price level increased only1.52% between 1991 to 1992 and has stayed below 2% since 1992. With the increase in short rates the yield curve became negative in 1989 and 1990, and a severe recession ensued.

While actual inflation dropped precipitously, expected inflation declined more slowly, as shown in Chart 4.1.[16] Expectations for lower future inflation also manifests as a narrower spread between Government of Canada long bond yield and actual inflation. The spread narrowed from about 8% in 1984 and 1994 to about 5% in 1996 and about 4% in 1997 and 1998.

Although inflation and interest rates had begun their secular decline early in the 1980s, prior to John Crow's 1988 announcement, the new monetary regime ensured that inflation would be held down and that interest rates could continue their descent. An analysis of inflation expectations by Fung, Mitnick, and Remolona (1999) estimated that Canadian inflation expectations were slow to adjust to the new inflation-targeting regime. Expectations were slow to adjust because it takes time for a central bank to earn credibility. The fact that credibility is not gained instantly, rather is earned over time, is highlighted by Blinder (1999).

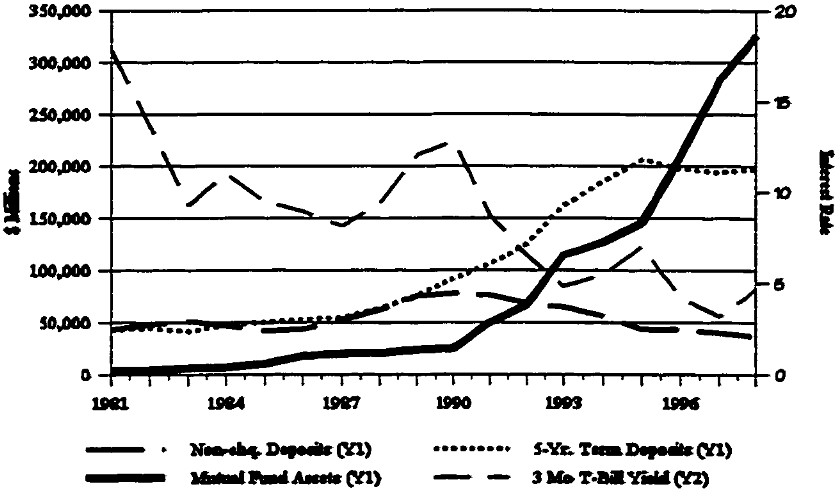
Theory and empirical evidence suggest that the term structure of interest rates reflect risk premiums as well as market expectations about future inflation and real interest rate. The importance of inflation expectations in interest rates, particularly the long-term rate, is accentuated by the fact that the Bank of Canada estimates inflation expectations as the difference between 30-year Canada bonds and 30-year Real Return bonds, which is effectively a representation of the Fischer Equation. The fundamental reason that nominal interest rates have been falling since the early 1980s is that inflation has declined steadily over the period.

4.4 Portfolio Shift: From Bank Deposits to Investment Funds

In the context of the capital market theory revised inflation expectations will shift the position of the CML. If expectations for future inflation are revised downward, the CML will shift downward and portfolios will have to be re-balanced. Consequently, the demand for the different asset classes will change. The previous section showed that inflation has been in secular decline for a decade and a half, but the Bank of Canada did not seriously commit itself to price stability until January 1988, and it was not until 1996 that expected inflation moved closer to actual inflation (see Chart 4.1).

As the Bank has earned credibility and Canadians have come to believe that inflation will remain low and stable, savings have experienced a fundamental shift. Through the 1990s mutual funds have displaced bank deposits as the savings vehicle of choice. The shift has not been unique to Canada, but has been part of a global phenomenon where institutional investors (life insurance companies, pension funds and investment funds) as holders of assets are becoming increasingly important (Blommestein, 1998). While the phenomenon has been global, as inflation has been tamed, Canada has experienced the fastest average annual rate of growth of assets held by investment companies among the G-7 countries. The average annual growth rate of investment fund assets between 1990 and 1995 was 29%. Germany was a close second with an average growth rate of 22% and the U.S. ranked third growing at 19% (Blommestein, 1998).

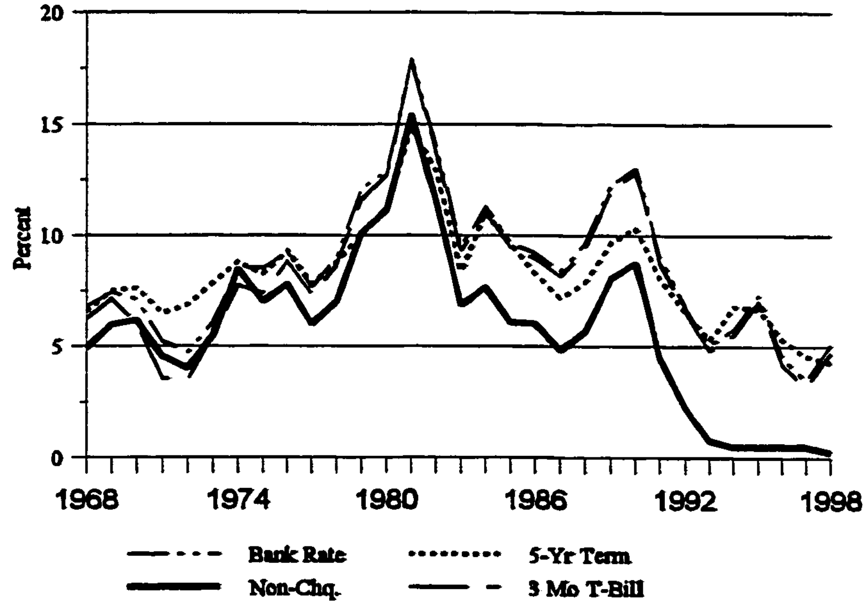
Chart 4.2 Deposits, Fund Assets & Rates, 1981-1998



Source: Statistics Canada and The Investment Fund Institute of Canada

The significance of the shift into investment funds away from traditional deposits is demonstrated by the change in the usefulness of some monetary aggregates as economic indicators, and is illustrated in Chart 4.2. In the 1980s the Bank of Canada used M2 and M2+ to gain leading information about future spending and inflation, but the portfolio shift has distorted the relationship between these broad money measures and future spending. Because of the substitution into mutual funds the broader measure M2++ which includes mutual fund assets is a more relevant indicator of future spending plans and price expectations (Atta-Mensah et al., 1999).[17] Hostland (1995) found evidence of parameter instability in reduced-form equations in his analysis of monetary aggregates. Parameter instability supports the hypothesis by Lucas (1976) that reduced-form parameters are dependent on monetary policy and provides evidence of a significant portfolio adjustment.

Chart 4.3 Interest Rates, 1968 - 1998



Source: Statistics Canada

Chart 4.2 shows that the shift out of bank deposits began with personal non-chequeable savings deposits at the start of the decade. Assets in these accounts declined $41.6 billion, or 53%, to $36.6 billion in 1998, from over $78 billion in 1990, and coincided with the renewed decline of interest rates, as shown in Chart 4.3. The average yield on 3-month treasury bills fell precipitously to 8.76% in 1991 from 12.81 in 1990, and the yield on bank savings deposits dropped to 4.48% from 8.77%. The return on these accounts continued to fall and has been below 1.0% since 1993 (see Chart 4.5). Coinciding with the drop in rates and falling demand for bank savings deposits was the strong increase in demand for investment fund assets, particularly 'money'. Funds invested in these short term securities jumped 102% to $13.8 billion from $6.8 billion between 1990 and 1991. Overall net assets managed by member firms of The Investment Fund Institute of Canada (IFIC) doubled to $49.9 billion in 1991 from $24.9 billion in 1990.[18] The jump was the result of asset performance and increased net sales. Between 1990 and 1991, net new sales by IFIC firms increased 244%, to $10.6 billion from $3.1 billion, and the number of fundholder accounts increased 75%, to 4.5

million from 2.6 million. Growth of assets in investment funds continued strongly over the next two years before moderating, and by the end of 1993 IFIC members managed the assets of over 8.9 million accounts.

About six years after the decline began in personal non-chequeable assets held in bank term deposits began to decline. These assets declined $9.2 billion from a peak of $206 billion in 1995 to $197 billion in 1996 after growing by more than $20 billion annually in each of the four prior years. The fall in term deposits corresponds with a renewed decline in interest rates. Three month T-bills averaged 7.1% in 1995, but only 4.2% in 1996 and the return to term deposits fell to 5.3% in 1996 from 6.7% in 1995. At the same time demand for mutual funds began growing again. Net new sales of mutual funds excluding reinvested distributions jumped 690%, or $35.8 billion, to $40.9 billion in 1996 from $5.2 billion in 1995, and the number of new fundholder accounts increased 46% to 22.3 million from 15.3 million. Over this period net assets increased 45%, or $65.5 billion, to $211.7 billion from $146.2 billion.

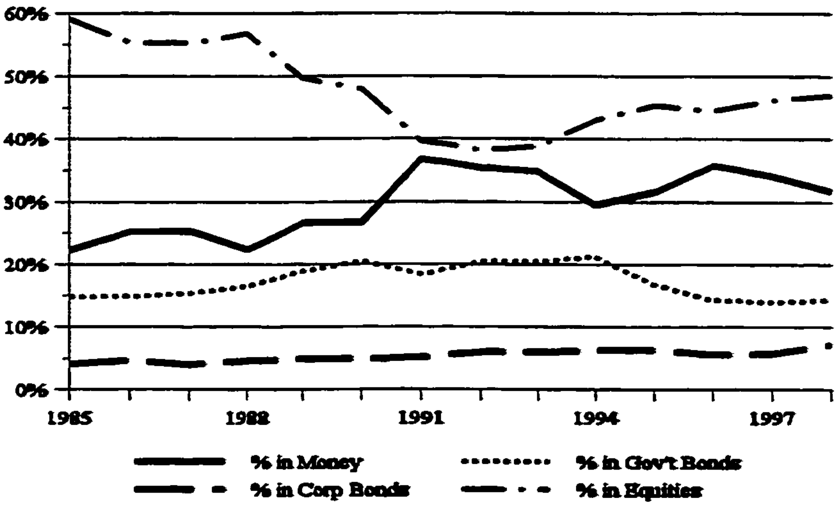
The analysis of bank deposits and investment fund assets showed a clear dramatic change in the way Canadians save, and it appears that the portfolio shift resulted from the decline in interest rates and inflation this decade. With respect to the Canadian experience and the cause of the portfolio shift a Bank of Canada research paper stated that:

> "This shift to mutual funds has been stimulated by the low-level of short-term interest rates, which has encouraged households to invest in bond and stock markets to increase the potential return on their savings. Furthermore, the reduced uncertainty associated with a low-inflation environment has encouraged individuals to lengthen the horizon for which they plan, which has increased their demand for long-term financial assets." (Atta-Mensah et al., 1999, p.15)

As money poured into mutual funds through the decade the number of fund companies has nearly tripled, the number of funds have more than doubled, and assets under management have increased thirteen fold. By 1998 The Investment Funds Institute of Canada (IFIC) had 301 member firms managing $326.6 billion in 1,030 different funds, up from 110 firms and $24.9 billion in 422 different funds in 1990. Of the assets managed in the various investment funds, the proportion invested in corporate bonds has witnessed the largest increase. Since 1985 the proportion of fund assets invested in corporate bonds has grown steadily, as shown in Chart 4.4. In 1985 corporate bonds accounted for about $328 million, or 4.1%, of fund assets[19], but grew to $15.3 billion, or 7.15% of fund assets in 1998. Over this period the relative importance of corporate bonds jumped by 75.2%. Short-term securities collectively classed as 'money' also experienced strong growth in demand. Money comprised about 22.2% of investment fund assets in 1985 or about $1.8 billion, but expanded to 31.6% or $67.7 billion by the end of 1998, representing a 42.7% increase in relative importance as a store of wealth. However, 'money' experienced its most significant growth between 1990 and 1991 just when the demand for bank savings deposits collapsed. During this period funds invested in money more than doubled to $13.8 billion from $6.8 billion, and the relative importance of money jumped to 36.9% from 26.7%. Chart 4.4 shows a clear spike in the proportion of funds invested in money during this time period.

As illustrated in Chart 4.4 the weight of government bonds and stocks lacked a clear trend between 1985 and 1998, although during this time the proportion of stocks declined and the relative importance of money movement increased. Since 1993 equities have been gaining in relative importance, conversely since 1994 government bonds have become relatively less important. The recent drop in the importance of government bonds is likely attributable to the declining supply of government bonds, rather than from poor asset performance. For example, the supply of net new government bonds peaked at $56.4 billion in 1993 and then fell to $53.1 billion in 1994,

Chart 4.4 Investment Fund Composition, 1985 - 1998

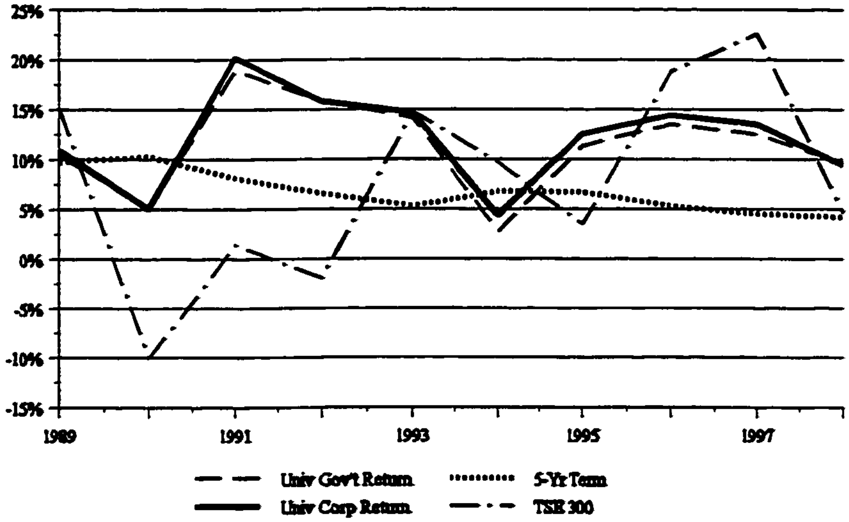


Source: Bank of Canada Review, Table D5

$41.2 billion in 1995 and $9.7 billion in 1998. That a declining supply of government bonds is placing pressure on investors to substitute into corporate issues is echoed in Lester and Lovely (1999), who state that portfolio managers will have to re-balance their funds toward corporate debt as the net new supply of government bonds falls to virtually zero in 1999. In addition to supply pressures, the average annual return to corporate bonds have exceeded the returns on government bonds and equities.

Bonds in general have performed better than equities on average for over a decade as shown in Chart 4.5. This may, in part, explain why equities declined as a proportion of total assets in investment funds. Corporate bonds as an asset class have on average outperformed government bonds and equities since 1980. Since 1980 corporate bonds have provided an average annual return of 12.6% versus 12% on government bonds, 8.3% on 5-year term deposits, and only 7.9% on equities. From 1989 corporate bonds generated a return of 11.9% versus 11.3%, 6.75% and 7.4% respectively.

Chart 4.5 Total Returns, 1989 - 1998

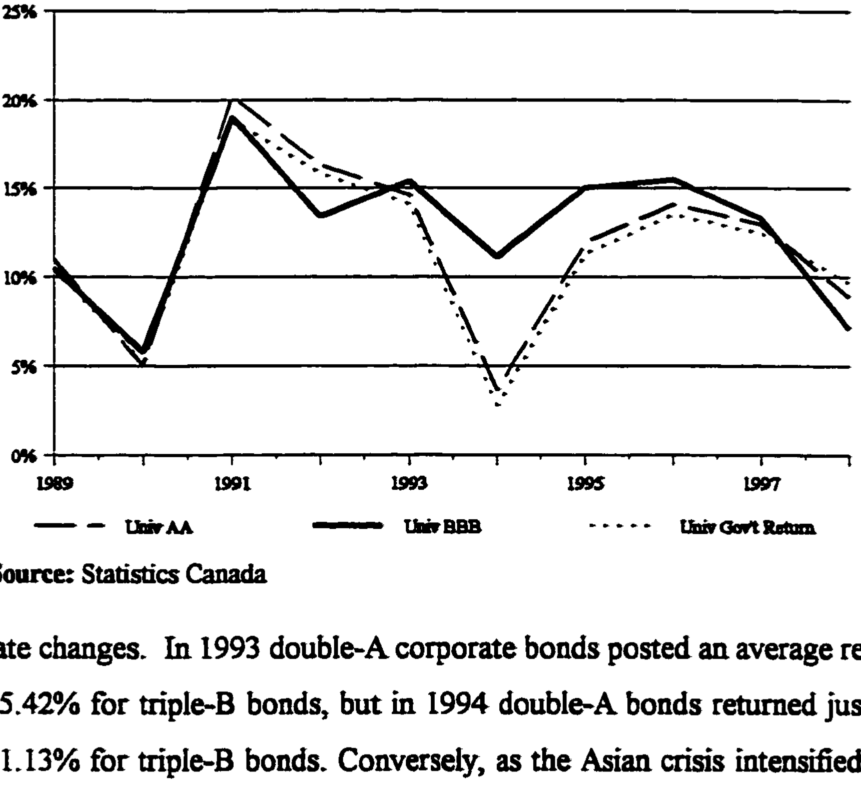


Source: Statistics Canada

While the universe of corporates performed slightly better than the universe of government bonds, triple-B rated bonds returned an average of 12.54% through the 1990s to outperform the other assets classes. Recalling Aivazian et al. (1990) and Sandmo (1977) who stated that asset demand is a positive function of asset return, it is not surprising that the portfolio shift has favoured corporate bonds over equities and government bonds.

In Section 4.2 it was argued that the asset class debt should be divide into two categories: investment grade and high-yield. In chart 4.6, below, the unique performance characteristics of non-investment grade bonds relative to investment grade issues can be seen. The muted sensitivity to interest changes can be seen in how low grade bonds responded to the interest rate increase in 1994. The Bank of Canada began tightening monetary policy in the first quarter of 1994, the Bank Rate increased 4.59% between January 1994 and March 1995 to 8.47% from 3.88%. Triple-B rated bonds outperformed investment grade and government bonds during this period, showing less sensitivity to interest rate changes. In 1993 double-A corporate bonds posted an average return of 14.62% versus 15.42% for triple-B bonds, but in 1994 double-A bonds returned just 3.62%, compared to 11.13% for triple-B bonds. Conversely, as the Asian crisis intensified late in the summer of 1998, creating significant economic uncertainty and reduced expectations for corporate profitability, the return on high-yield bonds fell more than investment grade issues, but less so than equities. The return on equities as measured by the TSE 300 index dropped to 4.6% in 1998 compared to 22.6% in 1997. In 1997 triple-B bonds posted a 13.26% return compared to 12.92% for double-A bonds, but in 1998 these returns fell to 7.06% and 8.90% respectively. This brief analysis of returns shows that the performance characteristics of high-yield bonds is quite different from investment grade bonds and equities and shows why non-investment grade bonds are considered a separate asset class.

Char 4.6 Total Bond Retruns, 1989 - 1998



Source: Statistics Canada

4.5 Summary

The purpose of this chapter was to develop a model for asset demand with a strong theoretical foundation as the basis for an empirical analysis determining the significance of inflation, interest rates, asset returns, and mutual fund growth in the development Canada's nascent high-yield market. The chapter began with a review of Portfolio Theory which guides the decision for asset allocation and, thus, demand for various assets. Portfolio Theory highlights asset return, variance of return, and the covariance between assets as the key variables the affect demand. These variables, along with the exogenous variable wealth, were summarized in equation 4.1. Section 4.2 identified four asset classes as components of portfolio construction. Financial assets can be categorized as money, investment grade debt, non-investment grade debt, and equities, though in each class several different securities are available. The next section examined inflation, and interest rates and argued that the secular decline of inflation has reduced nominal interest rates to historic lows.

The subsequent analysis of the performance of different assets and securities in section 4.4 argues that decline of the risk-free rate of return and the strong performance of bonds in general, particularly corporate bonds, resulted in a massive portfolio shift from bank deposits and investment funds. Moreover, the portfolio shift favoured corporate bonds over other assets, and strong performance of high-yield bonds encouraged demand growth for this asset class which facilitated the development of a domestic high-yield market. The fall in supply of net new government debt issued likely strengthened demand for corporate bonds as investors were effectively forced to re-balance the fixed-income portion of portfolios in favour of corporate bonds. The growth in high-yield mutual funds and corporate bond funds in general were a critical factor in Canada because of the absence of many key institutional investors. Underlying the poor performance of bank deposits and strong performance of bonds has been the decline of inflation. Falling inflation and inflation expectations have pushed nominal interest rates down, but at the same time fuelled a bull market for bonds. That inflation has been the overarching factor is captured in the conclusion made by Atta-Mensah et al. (1999). In summary, the analysis presented in section 4.3 suggests that the return generated by different assets is the most critical factor determining asset demand. This conclusion conforms with portfolio theory and supports the model specified for the demand of corporate bonds. Next the question turns to the determinants of supply, and is the focus of the next chapter.

Chapter Five

Supply of Corporate Bonds

5.0 Introduction

The supply of bonds, which is provided by corporations seeking to implement corporate strategies, has seen remarkable growth over the past few years. The decision to issue new debt and/or equity or to rely on internal funds is based in part on the incentives and signals provided by the financial markets, and in part on the specifics of investment opportunities. These incentives are basic aspects of how financial markets allocate the economy's scarce savings (Friedman, 1986). In addition to market influences, the decision to seek external financing is affected by micro-considerations, such as the structure of ownership and management. To gain an understanding of the factors that influence the supply of bonds, it is critical that the rationale to issue debt versus other claims are examined. The purpose of this chapter is to review relevant economic theory to identify salient factors that affect a firm's decision to issue bonds in an effort to understand the impetus for the creation of a domestic market for high-yield debt.

The neoclassical investment theory highlights the cost of financing as a determinant of the value of the firm. Thus, the less expensive debt becomes, *ceteris paribus*, the more debt will be issued versus other obligations. The theory of corporate capital structure largely focuses on the implicit costs of debt or equity finance and concludes that there is a bias toward debt finance. Moreover, this literature points to corporate earnings before tax as well as investment in fixed asset as the most significant drivers of a firm's decision to issue bonds. The analysis in this chapter that follows the review of the relevant theories provides evidence supporting of economic theory. Analysis indicates that the firm's decision to issue debt is strongly influenced by the explicit cost of debt, pre-tax earnings, and corporate investment. In addition, government fiscal policy may influence the corporate ability to issue debt in the domestic market, and expected monetary policy may affect investment and financing decisions.

The results of the analysis contained in this chapter supports the hypothesis that low interest rates, low inflation, changing spreads, and the shortage of government fixed income products have been instrumental in the expansion of Canada's bond market, particularly a domestic high-yield market.

Section 5.1 summarizes the principal theories of capital structure to elucidate the key factors that influence the corporate decision to issue bonds. The section begins by highlighting that firms minimize the costs of financing and then look at the cost of capital. The next section focuses on capital structure starting with a review of the literature's seminal paper, Modigliani and Miller's (1958) "The Cost of Capital, Corporation Finance and The Theory of Investment". The remainder of the section reviews the prominent theories of capital structure. Following the myriad theories of capital structure, section 5.2 reviews the changes in the supply of corporate bonds and discusses how changes in key variables over the past decade have affected the supply of corporate bonds. Section 5.3 presents the conclusion.

5.1 Corporate Capital Structure

Prior to reviewing the literature of corporate capital structure it is necessary recall that that companies will minimize cost to maximize the present value of the firm. Form neo-classical investment theory it can be shown that one of the costs that is minimized is the cost of financing. The value of the firm can be expressed as follows:

$$V\left[K(t_o),t_o\right]=\underset{I(t)}{Max}\int_{t_o}^{\infty}e^{-rt}\pi\left[K(t),I(t)\right]dt \qquad 5.0$$

$$\text{subject to } \dot{K}(t) = I(t) - \delta K(t)$$

Hence, the present value of the firm at time t_0 is equal to the discounted flow of the firms future cashflow, which are a function of capital stock $K(t)$ and gross investment $I(t)$ and the discount rate r. Of course labour can be included, but for the purpose of the exposition it is unnecessary. The maximization problem is subject to the change in capital stock, which is equal to gross investment less the depreciated amount of capital stock, where the rate of depreciation is given by lower case delta. The discount rate, r, is the weighted average cost of financing and can be written as follows:

$$r = wR_e + (1 - w)R_d \qquad 5.1$$

Where w is the proportion of the firm financed by equity and $(1\text{-}w)$ is the proportion of the firm financed by debt, and R_e is the cost of equity financing and R_d is the cost of debt. Thus, it should be clear from equation 5.0 and 5.1 the value of the firm is affected by the cost of capital. And the lower is the discount rate the greater is the present value of the firm. In a world of certainty, the distinction between debt and equity funds is largely one of terminology, and the firm will invest up to the point where the marginal rate of return of a new investment is just equal to the market rate of interest. Equating the marginal rate of return to the cost of finance gives the necessary and sufficient conditions to maximize profits or the value of the firm, which are equivalent in a world of certainty. However, in an uncertain world the equivalence between profit maximization and value maximization disappears. In fact, in the presence of uncertainty, the profit maximization criterion is no longer well defined but the value maximizing criterion remains well defined. Modigliani and Miller's (1958) seminal paper, "The Cost of Capital, Corporation Finance and The Theory of Investment" highlights the distinction between certainty and uncertainty and its effect on optimization.[20] Modigliani and Miller assert that in an uncertain world when capital markets are perfect and there is no taxation to distort investment decisions, investors can use arbitrage to create the degree of leverage in an individual portfolio that suits individual preferences, so that corporate capital structure is irrelevant. That is, the choice of *w* is irrelevant. They conclude that not only is capital structure irrelevant to individual investors, but that it is irrelevant to the value of the firm.

The inclusion of corporate taxation and the deductibility of interest payments on debt has the effect of making capital structure matter by lowering the cost of debt. Equation 5.1 is re-written below to included the tax subsidy.

$$r = wR_e + (1-w)(1-T)R_d \qquad 5.2$$

Where T is the corporate tax rate, and the cost of debt financing is now $(1-T)R_d$. Therefore, the deductibility of interest payments make the choice of *w* matter. Modigliani and Miller (1963) show that the value of a firm is a function of its expected after-tax earnings, the corporate tax rate and the degree of leverage. In terms of equation 5.0 the cashflow discounted is after-tax cashflow and the discount rate is given by equation 5.2 rather than 5.1.

While some have suggested that their conclusion implies a capital structure 100 percent debt financed, Modigliani and Miller (1963) remind the reader in their conclusion that the tax advantage "does not necessarily mean that corporations should seek to use the maximum possible amount of debt in their capital structures." Further, they note that the need for preserving flexibility may encompass limitations imposed by creditors and other real-world problems that are not completely comprehended or captured in the static partial equilibrium framework, but nevertheless cause a firm to limit the use of debt. Therefore, what their papers conclude is not that capital structure is irrelevant or that firms should employ the maximum debt possible, but that the deductibility of interest payments reduces the cost of borrowing and that prudent borrowing can enhance the value of the firm.

In fact, modern corporate finance teaches that the use of debt, or leverage, can enhance earnings per share and return on equity. Leverage increases the amplitude of changes in income. That is, if a firm anticipates an increase in earnings then leverage will magnify the increase, but if earnings are expected to decline leverage will magnify the fall. Therefore, the use of debt is more beneficial when earnings before interest and taxes (EBIT) are relatively high and are expected to increase, but exposes the firm to greater risk if earnings decline. Because leverage is more beneficial as EBIT raises, a positive relationship between a firm's supply of net new debt and pre-tax earnings is expected. Thus, EBIT should provide significant explanatory power for the supply of corporate bonds. Indeed, Shum (1996) found that the greater the amount of past taxes paid or the lower past losses were, the more debt was issued. Effectively, firms with stronger earnings that pay more taxes are more likely to borrow than firms with weaker earnings and losses. In the same study Shum found that the statutory tax rate had an insignificant influence on the amount of debt issued by firms. There has been no material change to the corporate taxation, thus it is unlikely that the inclusion of statutory tax rates would have played a significant role in the creation of the high-yield market. While statutory rates have not changed materially, effective taxes have changed and may have affected corporate finance decisions through the 1990s. However, to keep the focus on other factors the analysis abstracts from taxation.

5.1.1 The Cost of Capital

It is now useful to reiterate Modigliani and Miller's (1958) vexing question in the opening of their paper:

> What is the 'cost of capital' to a firm in a world in which funds are used to acquire assets whose yields are uncertain; and in which capital can be obtained by many different media, ranging from pure debt instruments, representing money-fixed claims, to pure equity issues, giving holders only the right to a pro-rata share in the uncertain venture?

Modigliani and Miller (1958) did not address the issue to determine what the actual cost of capital is, rather they illustrated that the balance sheet of any given firm will be composed of more than one type of security, and that its composition will affect the value of the firm when a there is a positive corporate tax rate and debt payments are deductable. Therefore, the actual cost of equity and debt finance are now addressed in turn.

The determination of a firm's cost of equity is problematic because there is no direct way to observe the return that the firm's equity investors require on their investment. Rather the required return must be estimated. The two main approaches to estimating the required return are the well known Dividend Growth Model (DGM) and the Capital Asset Pricing Model (CAPM).

The DGM calculates the present value of a firm's share price (P_t) similar to the determination of the price of a consol bond, except the DGM accounts for the growth rate (g) of the firm's dividends.

$$P_t = \frac{D_{t+1}}{R_e - g} \text{ where } D_{t+1} \text{ denotes dividends next period} \qquad 5.3$$

equation 5.3 can be rearranged to yield the cost of equity in terms of return, which enters equations 5.1 and 5.2:

$$R_e = \frac{D_{t+1}}{P_t + g} \qquad 5.4$$

The DGM shows clearly that the price of a firm's share depends on the dividends it pays out, the required return to investors for supplying financing, and the rate at which the firm's dividend will grow. It is clear, then, that the greater is the degree of uncertainty or risk associated with the firm is, the lower its share price will be and the greater will be the cost of equity, R_e.

The CAPM is probably better and more widely known among economists, and is generally attributed to William Sharpe (1964), for which he received a Nobel prize. Sharpe augmented Markowitz's (1952) famous portfolio theory with a risk-free asset. The CAPM expresses the cost of equity as follows:

$$R_e = R_f + \beta_e(R_m - R_f) \qquad 5.5$$

The model states that the cost of equity is a function of the risk-free rate of return (R_f), the market rate of return (R_m), and the systematic risk of the asset relative to the market (β_e). The myriad assumptions underlying the CAPM will not be reviewed because the CAPM is so well known, and because to do so would provide the reader with no further insights to developments in the bond market.[21]

The DGM and CAPM each, of course, have their own unique advantages and disadvantages, thus many firms will employ both methodologies for capital budgeting problems. Regardless, it should be reasonably clear from the DGM and CAPM that the determination of the cost of equity financing is problematic. The DGM illustrates that share price and the cost of equity capital will move inversely. Hence, all else equal, equity financing becomes relatively less expensive when the firm's shares are trading at a higher price. That is, the higher the price the less shares will have to be issued to acquire a given amount of money. Thus, the price of a company's stock will influence the decision to issue new shares or borrow. As the price of the firm's stock increases, *ceteris paribus,* new stock issues are expected to increase. For the purposes of the study the value of the price-to-earnings ratio for Toronto Stock Exchange 300 Index will provide a good proxy for share prices.

The cost of debt is the interest rate that the firm's creditors demand on new borrowing. While in principle the CAPM could be used to determine the cost, estimation is not necessary because, unlike the cost of equity, the cost of borrowing can normally be observed either directly or indirectly. For the purpose of this study the cost of debt can be represented by the yield on Scotia McLeod's universe of corporate bonds or the universe of triple-B rated bonds. In addition, the cost of corporate borrowing should be viewed relative to yields on Government of Canada bonds because government issues are used as a benchmark in pricing other fixed-income securities (Harvey, 1999). The yield differential between Government of Canada bonds and corporate issues is referred to the corporate spread, and indicates overall credit conditions in the economy. A narrow spread indicates that credit conditions are favourable, and that corporate borrowing is relatively inexpensive in comparison to government issues. Conversely, widening corporate spreads indicate that credit conditions are tightening, as experienced in 1998 after the Russian default. More restrictive credit conditions will cause a contraction in the supply of corporate bonds, which occurred late in 1998. Thus, the absolute cost and the relative cost of borrowing should be considered as determinants of the supply of corporate bonds.

Adding to the firm's financing cost is the actual expense of issuing new securities. The floatation cost for bonds is about 1%, and for equity issues it ranges between about 2% and 3% of the total amount of funds being raised.[22] Therefore, the amount of funds that a firms requires must be grossed up by the floatation cost. That is, the total funds to be borrowed or the total value of equity to be issued is determined by dividing the funds needed by one minus the floatation cost.

Although the cost of equity cannot be directly compared to the cost of debt, it is generally assumed that borrowing is less expensive than issuing new shares. This assumption follows from the positive relationship that exists between risk and return. Debt securities are inherently less risky than equity securities, because payments to debtholders are contractual obligations whereas shareholders are entitled to the residual portion of a firm's uncertain earnings. Even though it is likely that a cost differential attributable to the nature of these securities results in debt financing being less costly, it is important to recall a fundamental rule stressed in corporate finance. That is, the cost of capital depends primarily on the *use of funds* rather than on the *source of funds*. Therefore, even if an inherent difference exists between sources, the differential may or may not be large enough to conclude that debt is always the preferred source of funding.

Thus far the discussion has ignored the cost of internal funds.[23] The reason for this is that it is assumed that firms will draw down their cash reserves an appropriate amount to fund opportunities prior to seeking external funds. For example, Donaldson (1961) observed that management strongly favoured internal generation as a source of new funds, even to the exclusion of external funds, except for occasional unavoidable 'bulges' in the need for funds. Internal funds should only be used, however, to the extent that a sufficient cash balance remain to maintain an appropriate amount of working capital.

The following sections review the prominent theories of corporate capital structure. Each theory suggests implicit costs of using debt or equity. The various influences may either enhance, neutralize, or reverse the apparent cost advantage of debt finance.

5.1.2 Imperfect and Asymmetric Information

Information problems and the separation between ownership and control of modern firms, particularly public corporations, lead to a conflict-of-interest between those who own and those who manage the firm. If both parties to the relationship are utility maximizers and managers hold less than 100% of the residual claim there is good reason to believe that the agent will not always act in the best interest of the principal. In general, it is impossible to eliminate or mitigate the problem at zero cost. In most cases both the principal and the agent will incur some monitoring and bonding costs (pecuniary and/or non-pecuniary). Any divergence between the decisions that agents make and those that would be made by the principal reduces the welfare of the principal, creating a residual loss. These *agency costs* can be reduced by creating a scheme that ties management's compensation, or welfare, to the value of the firm. One such notable scheme is to provide a portion of the agent's compensation in the form of stock options, thereby directly linking their compensation to the value of the firm.

Increased corporate leverage, adding debt to the financial structure, can attenuate these agency costs in two ways. First, holding constant the manager's absolute investment in the firm, increases in the relative level of debt increase the manager's share of the equity (Harris and Raviv, 1991). Second, as pointed out by Jensen (1986), more debt reduces a firm's free cashflow, which means that there is less cash available for management to pursue personal pecuniary and non-pecuniary perquisites, including investment opportunities that will do little to enhance shareholder value. Jensen concluded that free cashflow (FCF) and agency cost may be substantial enough to invite a hostile takeover that would leverage the firm to such an extent that the value of the firm would be increased. Therefore, a positive relationship between FCF and the issuance of new debt is expected.

After highlighting the classic principal-agent problem, Jensen and Meckling (1976) go on to describe the conflict that exists between debtholders and equityholders. This cost is attributable to *moral hazard* from asset substitution because equityholders will capture most of the benefits of successful investment projects, but are subject to limited liability for unsuccessful ventures. That is, the upside return for equity investment is effectively unbounded and the downside is bounded, but for debtholders the upside benefit is bounded. In addition, any *ex post* changes in the use of funds will change the risk debtholders are exposed to without increasing their opportunity for improved return. Hence, equityholders have incentive to borrow funds for a stated low-variance investment project, but actually invest the funds in a high-variance project with a higher possible payoff. Moral hazard is a significant motivator behind including various covenants in bond indenture provisions to limit managerial behaviour. The presence of moral hazard suggests that firms in industries where there are less opportunities for asset substitution will be more leveraged than firms in other industries. For example, if borrowed money is used to acquire fixed capital then *ex post* monitoring will be easier. In addition to facilitating monitoring fixed assets can be used as collateral. Shum (1996) states that firms with a higher percentage of fixed, tangible, assets to total assets will be less likely to undertake asset substitution, thereby mitigating moral hazard. Shum (1996) found an increase in the proportion of fixed to total assets to be a positive and significant determinant of the supply of corporate debt. Moreover, a positive relationship between corporate investment and borrowing should exist. Unless new funds are borrowed to pay down more expensive sources of finance, funds obtained from borrowing will be used to finance investment opportunities.

5.1.3 Pecking Order & Signalling

It has been shown that the explicit cost of debt is likely less than equity finance, the interest tax-shield, and agency costs may bias finance decisions toward the use of debt as the primary source of funds. But, as noted, Donaldson (1961) shows that internal funds are preferred over debt or equity financing, and that debt is preferred to equity. This hierarchical ordering of corporate preferences is known as the *pecking order*. Brealey and Myers (1984) and Taggart (1986) show using aggregate data a clear trend of heavy reliance on internal finance and debt is visible. Brealey and Myers observed that for all non-financial corporations between 1973 and 1982 internally generated cash funded, on average, 62% of all capital expenditures, including inventory and other current assets. Net new equity issues accounted for no more than 6% of external financing, with the debt financing the remaining 32%. Taggart's analysis of the total source of funds covers U.S. data between 1946 and 1983. He observed that new equity issues across the period was a relatively constant source of funds when compared to debt or internal funds accounting for less than 10% of total sources of funds.

Debt as a source varied considerably over the period, ranging from about 50% of the total source of funds to zero. For this data set Taggart found that new debt issues moved negatively with gross internal funds (defined as retained earning plus depreciation allowances), suggesting that firms tend to borrow when they do not have enough cash to finance investment opportunities. However, the negative relation found between new debt and internal funds conflicts with the prediction that the presence of agency cost would lead to a positive relationship between new debt and free cashflow, which measures the amount of funds that are available to finance new investments.

In Myers (1984) and Myers and Majluf (1984) *asymmetric information* provides the theoretical foundation for the apparent ordering of corporate preferences for funds. Both papers are premised on the notion that corporate managers (insiders) have special knowledge of their firm that is not widely possessed by the public and that managers will attempt to maximizes the value of the firm's existing shares. Because managers attempt to increase the value of existing shares, there exists incentive to sell shares only when the manager knows them to be overvalued, thereby increasing the value of the old shares. Investors are aware of the incentive and consequently will rationally adjust the price they are willing to pay. However, management will not want to issue new shares if new investors value them below what management knows to be their true value. Therefore, if management knows that shares are under priced by investors the firm will prefer to issue debt to avoid the lemon's premium of issuing new shares.

The Pecking Order theory asserts that insider information would lead firms to sell new shares when they know them to be overvalued. There is, however, another problem that may cause firms to issue debt rather than new shares. A corporation may have an opportunity to invest in a profitable venture, but its value has not been fully capitalized into the firm's share price. Whether investors do not accurately perceive the opportunity, or apply an overly high discount to future cashflows, if the firm issued shares it would be giving away free options on its future profits. Thus, firms will issue debt to *signal* to the market that they are confident in their future prospects (Ross, 1977). In addition, firms that are profitable and have better access to the debt market are more likely to issue debt to avoid selling undervalued share. Shum (1996) argues that profitability should be a determinant of new debt issues, which conforms with the assertion that EBIT will have a positive affect on new corporate debt issues.

To test the significance of corporate profitability as a explanatory variable, Shum (1996) used the return on assets (ROA) as a proxy for profitability. However, ROA is a poor choice to control for profitability. The return on equity (ROE) is a more appropriate variable because it is the return to shareholders, the contributors of equity, that firms attempt to maximize. Compounding the problem of using ROA is that capital intensive industries (e.g. forestry and communication) can only obtain good return on equity by employing a highly leveraged balance sheet. Such capital intensive industries will have low return on assets, but strong returns on equity. Hence, it is more likely that ROA will be negatively related to debt rather than positively as Shum postulated. Indeed, Shum found that ROA had a significant and negative effect on new debt issues.

5.1.4 Chaos, Options & Leverage

From the above discussion it is clear that several reasons exist why firms may choose to employ debt. All provide very good theoretical rationale for the use of debt. However, there are at least two other theories that explain a firm's decision to use debt or equity. The first is the *chaos theory of corporate finance*, which states that firms will use whatever mode of funding they can acquire in a timely manner as long as the investment opportunity provides an appropriate risk adjusted return. In sum, the chaos theory of corporate finance respects Brealey and Myer's (1981) Fourth Law of corporate finance, which is that you can make a lot more money by smart investment decisions than by smart financing decisions.

This is not to say that financing is irrelevant, but that financing decisions should be shaped to support the firm's investment strategy, not vice versa (Myers, 1984). Obviously, if the choice of funds is a random element then a variable cannot be proposed to account for this postulate in a systematic model, but would be picked up in the error term of the regression. It may be that the chaos theory of corporate finance is a significant and material determinant of financing decisions, thus providing an answer to why theories of capital structure, while insightful, do not seem to explain actual financing behaviour (Myers, 1984). Nevertheless, in the discussion of pecking order the aggregate data tends to exhibit systematic trends, rather than a random walk that would be expected if the chaos theory provided a consistent explanation of capital structure. However, a variable that picks up a firm's need for funds may have reasonable explanatory powers, particularly if there is a bias toward debt financing. Thus, corporate investment should be a material determinant of the decision to issue bonds.

An alternate explanation for the lack of predictive power of the various theories of capital structure is the need for financial flexibility in an uncertain world. To the extent that profits are uncertain and variable a firm will likely require a degree of financial flexibility and may, therefore, not want to use each possible source of funds to its fullest, as mentioned by Modigiliani and Miller (1958). The work of Black and Scholes (1972) in option pricing can lead to such flexibility being viewed as an option. Recall that an option is any security whose returns are dependent on the returns of some other underlying security (or securities). Thus, it may be worth the cost of purchasing an option (or financial flexibility) that enables the firm to exploit future opportunities. Because the value of options is driven largely by volatility, the advantage of including financial flexibility, an option, increases with market volatility and uncertainty (Mason, 1986). Therefore, as business risk, or the volatility of earnings, increases, it should be expected that firms will issue less fixed obligations. Thus, industries that are more prone to a large variance in earnings will employ less debt than industries whose revenues and profits are more stable. Not only does less debt create the flexibility to pursue future opportunities, flexibility helps guard against the likelihood of bankruptcy. That is, the greater a firm's fixed obligations when earnings are volatile and uncertain, the greater is the likelihood of bankruptcy. If bankruptcy costs are non-trivial or if firms merely leave borrowing room open to facilitate the exploitation of future opportunities, then the standard deviation of earnings will be a determinant of the decision to issue debt. Shum's (1996) analysis estimated a statistically significant and negative coefficient for the variable standard deviation of earning, which is consistent with the options theory and the bankruptcy cost theory.

The next rationale for employing debt is the inherent benefit of using debt. That is, leverage can dramatically alter payoffs to shareholders of a firm by magnifying changes in earning per share and return on equity. To gain the beneficial effect of leverage, EBIT must be relatively high and because leverage does magnify earnings, whether increasing or decreasing, the firm must be confident that its prospects are favourable.

Because the overarching factor contributing to favourable investment conditions is the performance of the overall economy, corporate confidence and borrowing should be positively related to expectations for the macro economy. Therefore, to the extent that this postulate is correct, expectations of future real economic growth and inflation will be salient explanatory variables determining a firm's decision to use debt as a source of funds. Furthermore, because the activities of the government can materially affect the overall economy a firm's belief about the direction of fiscal and monetary policies may influence the decision to borrow.

The actions taken, or expected to be taken, by a central bank have a material and rapid impact on the financial markets, and ultimately on the real economy. Expected changes are typically priced into the market before any announcements are made by a central bank, and if expectations and the announced intent deviate, the market's response is swift. In the U.S. the Federal Fund Rate is the Federal Reserve's official policy lever, and in Canada it is the Bank Rate. While anticipated changes in the official rate are reflected through the entire yield curve, money market securities like three month Treasury Bills and 90-day commercial paper move in anticipatory lock-step with the official rates. Commercial paper appears to be a better leading indicator of future movements on the Bank Rate than three month T-bills. For this reason, 90-day commercial paper will be used as the proxy for expected monetary policy.

5.1.5 Section Summary

This section started by highlighting that firms minimize the cost of financing to maximize the present value of the firm. Furthermore, it was suggested that debt financing is likely cheaper than equity, but cautioned that the cost of funds is largely determined by their use rather than their source. Also, it was noted that firms do not or should not focus exclusively on the cost of finance, but rather on the investment opportunities and the timely acquisition of financial capital that will facilitate the exploitation of profitable opportunities.

After reviewing the principal theories of capital structure it is evident that there are two commonalities that exist. The first is that there appears to be an overall bias toward the use of debt. Second, profits or expected corporate profits should be a significant determinant of the supply of bonds. Also, corporate investment should provide a significant determinant of a firms decision to borrow.

Modigliani and Miller (1958) highlight the importance of the deductibility of interest payments. Thus, while one would expect that firms with higher tax rates would borrow more, it is more important to have sufficient taxable income to create the interest tax shield. As noted, Shum (1996) showed that the statutory tax rate had a statistically insignificant effect on corporate borrowing, but that the existence of current or past profits had a positive and significant effect on a firm's decision to sell bonds. Therefore, rather than using the tax rate to capture the value of the deductibility of interest payments, corporate earnings before tax and interest should provide a clearer picture whether the use of debt will reduce taxable income. As well, the effect of financial leverage depends on EBIT. If EBIT is relatively high then the benefit of leverage is greater, magnifying return on equity and earnings per share. Closely related to EBIT is earnings before interest, tax, depreciation, and amortization (EBITDA). In practice cashflow is measured by EBITDA and the agency theory of capital structure asserts that debt and cashflow should be positively related. The impact of moral hazard on corporate borrowing is attenuated when firms are profitable. If the firm has a track record of solid and profitable investments lenders will be less concerned about the possibility of asset substitution. Also, the risk of asset substitution is attenuated when borrowed funds are used to finance the acquisition of fixed assets that can be easily monitored and used as collateral. Thus, corporate investment in capital goods like structures or equipment should be a positive determinant of the supply of bonds.

Signalling theory suggests that firms will issue debt in order to signal that the firm expects to be profitable. That is, the firm is confident in its future. Supporting the conclusion of signalling theory is the options theory and the influence of bankruptcy costs. Both suggest that a firm will structure its balance sheet to provide some flexibility to avoid the cost of insolvency and bankruptcy.

In sum, the principal theories of capital structure assert that firms will sell more debt when profits are strong or expected to be strong. Chaos theory points to expected profits as well by focusing on investment opportunities, although it does not suggest a bias to using debt, just that when a firm has investment opportunities it will seek timely financing that supports the opportunity. Because corporate earnings is pointed to in each of these theories, a model that attempts to describe the supply of corporate debt would be misspecified if earnings was not included as an explanatory variable. To capture influence of fiscal policy government borrowing is used, and to capture the monetary policy expectations the yield on 90-day commercial paper is used,.

The factors that influence the corporate decision to borrow have been identified and can be compactly summarized as follows:

$$B^S = B^S(ND, Y) \qquad 5.6$$

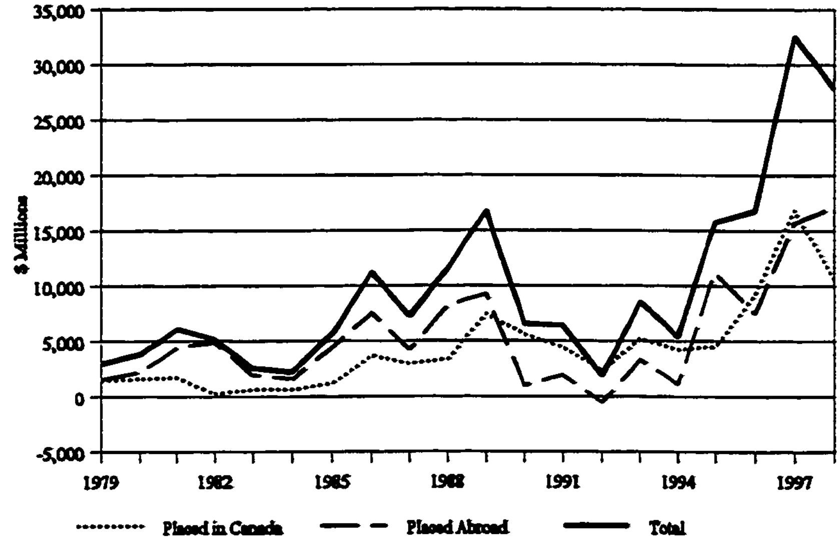
where B^S denotes the value of net new issues of corporate bonds, ND the yield on 90-day commercial paper, and Y denotes a vector of variables, such as the costs of capital, corporate investments, government debt issues, and pre-tax earnings.

5.2 Corporate Bond Supply and Influences

This section discusses some of the major influences on the net new supply of corporate bonds, and begins with a look at the amount of bonds issued annually by Canadian firms since 1979. Chart 5.0 illustrates that the annual net new issues of corporate bonds varies significantly over time and that the trend appears to be pro-cyclical. The analysis contained in this section focuses on the period from the late 1980s to the end of 1998, and argues that changes in the salient variables outlined in the previous sections have impacted the supply of corporate bonds in the predicted direction.

As shown in the chart below, the corporate bond market experienced dramatic growth in the latter half of the 1990s. In 1997 a record $32.6 billion in net new corporate bonds were placed in Canada and abroad, nearly doubling the previous record set in 1989 when supply reached $16.8 billion. In 1997 just over half the total, or $16.9 billion, was placed in Canada and the remaining $15.7 billion in new bonds were placed abroad. The record issuance of new bonds comes after fiver years of stagnation that resulted from a Bank of Canada induced recession. The recession began in the second quarter of 1990 and lasted through the first quarter of 1991, with real GDP declining 1.1% in 1990. The recession resulted in supply falling to only $6.6 billion in 1990. Although the decline in total supply was dramatic, the decline in new bonds placed abroad was more severe. Supply activity returned in 1995 when new issues placed abroad jumped 881% to $11.2 billion. This large increase corresponds with the excess demand for corporate bonds in the U.S. that began in 1993 (Fridson, 1994). The result of the excess demand was that U.S. investment dealers began searching for foreign issues to satisfy investor demand. Specifically, Merrill Lynch & Co. Inc., Salomon Brothers Inc., and Goldman Sachs & Co aggressively promoted the high-yield debt of domestic firms to U.S. investors (McNish, 1994). Recall that chapter three stated that through 1996 to 1999 more than half the corporate bonds placed with U.S. investors were below investment grade. Thus, the dramatic increase of net new bonds placed abroad can be viewed as the result of the pull from excess demand in the U.S. and a push from the lack of demand in Canada, which can be attributed to conservative Canadian institutional investors, many of which have bylaws barring them from buying bonds rated below single-A (Ip, 1995a). As a result of the push-and-pull forces, Canadian investment firms began losing many lucrative underwriting deals to aggressive U.S. dealers, increasing the pressure to overcome the push factor. In the summer of 1994 the president of brokerage RBC Dominion Securities Inc., Reay Mackay, stated that

Chart 5.0 Net New Corporate Bond Issues, 1979 - 1998



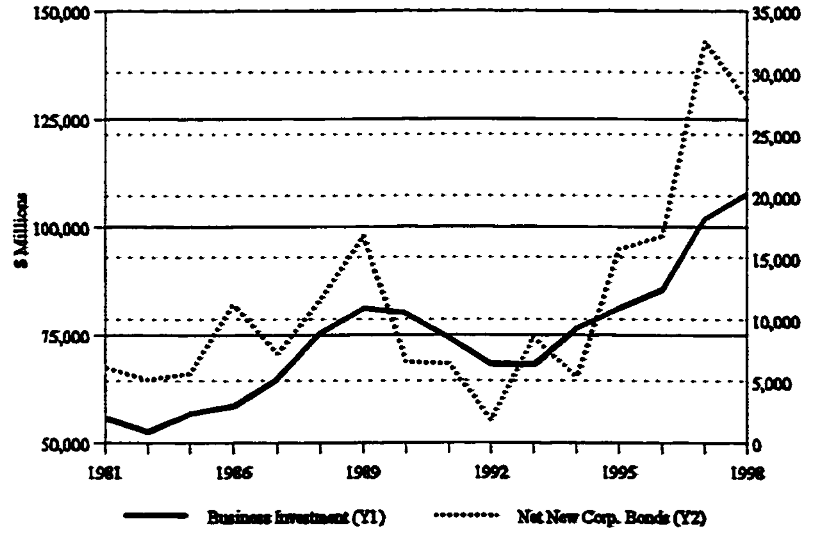
Source: Bank of Canada Review, Tables F4, F5, F6 and H2
Note: Millions of Canadian Dollars, par value

"we have to be a more viable competitor in this market place" (McNish, 1994, pB3). And, in the first quarter of 1995 Scotia McLeod launched their new High-Yield Index to attract interest in Canadian non-investment grade bonds. Hence, as a result of an effort by Canadian investment dealers to stem the loss of business to U.S. firms and other factors discussed below, activity in the domestic market took off in 1996. Net new issues placed in Canada doubled to $9.3 billion in 1996 from $4.5 billion in 1995.

The remainder of this section's analysis argues that a record supply of new bonds in 1989 and again in 1997 resulted from increased corporate earnings, increased corporate investment, and reduced borrowing costs. In addition, the decline in 1990 and 1998 resulted from increased borrowing costs, reduced corporate profits, and less investment activity.

The relationship between corporate investments and the annual flow of net new bonds is shown in chart 5.1. Business investment in non-residential structures and equipment increased strongly from 1987 through 1989. Business investment increased to $81.1 billion in 1989 from $58.5 billion in 1986. With a short lag the supply of corporate bonds expanded 59.8% in 1988 over the amount issued in 1987, and increased a further 44.7% in 1989 to set a record of $16.8 billion. Investment also peaked in 1989. The supply of new bonds and investment contracted with the economy in 1990. The bond market bottomed in 1992 and investment in non-residential structures and equipment reached its cyclical trough in 1993. The new bond issues rebounded in 1993 and investment in 1994. Chart 5.2 below shows that pre-tax earnings

Chart 5.1 Business Investment and Net New Bonds, 1981 - 1998

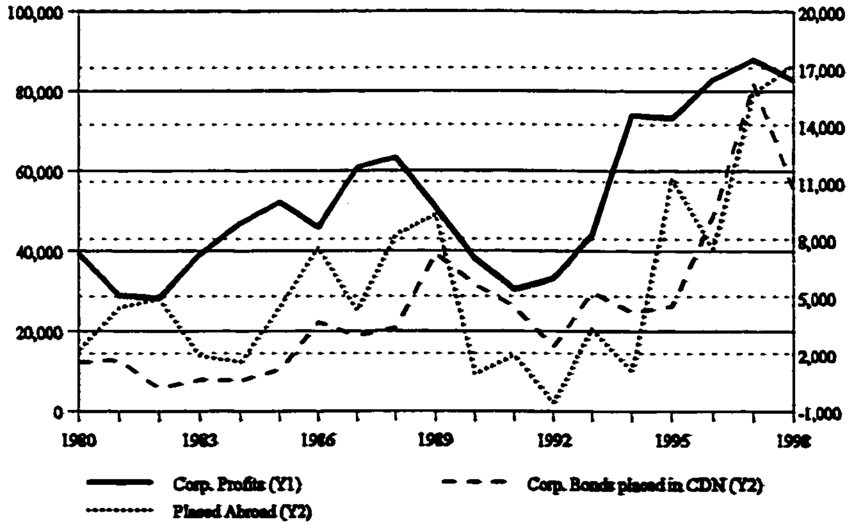


Source: CANSIM

rebounded strongly in 1993 and 1994. Earnings declined in 1995 corresponding to the slowing economy from rising interest rates, and the expansion of investment slowed, although the supply of new bonds in 1995 nearly tripled the amount issued in 1994. The increase pointed out above was almost entirely attributable to bonds placed with foreign investors. Investment expanded 19.5% in 1997, the largest annual growth through the sample analyzed, bettering the previous record of 16.4% in 1998. As already noted, the Canadian bond market issued a record $32.6 billion net new corporate bonds in 1997. The following year, in 1998, earnings and the supply of new bonds declined slightly, while the growth in investment slowed.

The previous sections argue that an increase in pre-tax corporate profits (EBIT) should cause firms to issue more bonds. That the supply of corporate bonds is sensitive to the existence of profits as Shum (1996) concluded is evident from Chart 5.2, which shows a strong positive relation between earnings and supply. That is, increased corporate pre-tax income leads to an expansion of supply. For example, when bond issuance fell precipitously in 1990 pre-tax corporate earnings fell 19.7% in 1989 from record earnings in 1988, and fell 25.1% in 1990 as real GDP slipped 1.1%. In addition, the rebound in the bond market was preceded by renewed profit growth, which began its recovery from the recession in 1992. Pre-tax earnings increased $29.9 billion, or 68%, to $73.9 billion in 1994 from $44.1 billion in 1993. The increase in corporate earnings corresponds with renewed economic expansion, real GDP increased 5.5% in 1994. Following the economic recovery and rebound in profits, total net new corporate bonds jumped 193%, or $10.4 billion

Chart 5.2 Corporate Profits & Corporate Bonds placed in Canada, 1971 - 1998



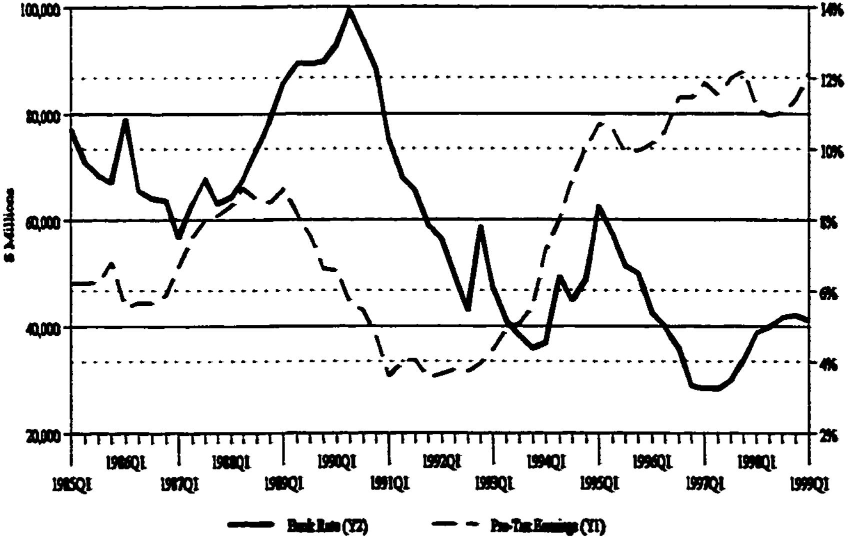
Source: CANSIM

in 1995. Growth in new issues slowed slightly in 1996 as earning growth paused in 1995 and economic growth stalled. As pre-tax profit resumed growth by 13.7% in 1996, new bond issues expanded 93.7% in 1997. In 1998 both profit and new issues fell as a result of increased global uncertainty and reduced global demand. A correlation analysis between total net new corporate bonds and corporate profits indicates a 79.6% linear association.

Examination of chart 5.2 adds evidence to support the conclusion reached in the previous sections that corporate earnings before tax should be an important variable in explaining a firm's decision to issue debt. However, it appears that it is the existence of profit rather than the expectation for future profits that drives new bond issues.

As noted at the start of this section, activity in the bond market in the late 1980s collapsed when monetary policy contracted, inducing the 1990 - 1991 recession. The Bank Rate averaged 14.05% in May 1990, up from 12.4% a year earlier. The reaction of the bond market to tightened monetary policy accords well with the earlier discussion on government activities and expectations, where it was noted that contractionary monetary policy would dampen economic activity and thus corporate profits resulted in a reduced supply of corporate bonds. Chart 5.3 illustrates that changes in the Bank Rate have had a predictable negative impact on corporate earnings. The response to changes in the Bank Rate appears to occur with a short delay, as expected.

Chart 5.3 Pre-tax Corporate Earnings and the Bank Rate, 1985Q1 - 1999Q1

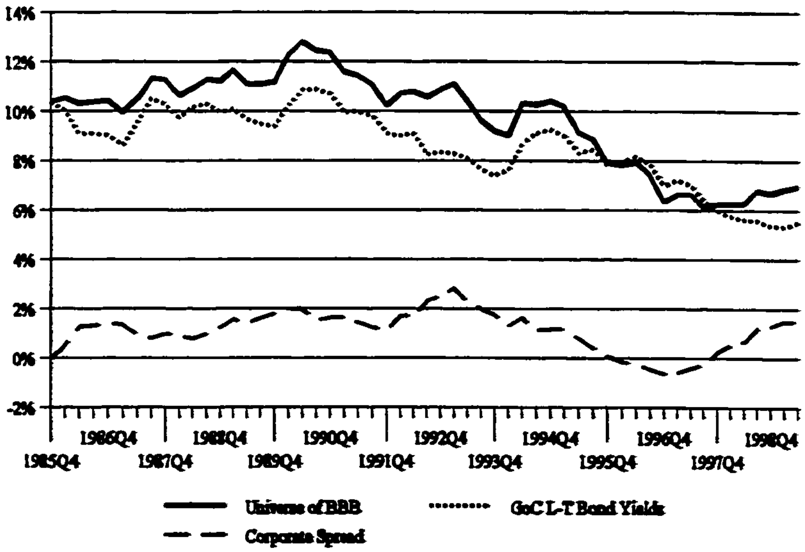


Source: CANSIM

After the Bank of Canada began easing monetary policy in late 1990, corporate pre-tax earnings began to rebound. Earnings expanded strongly through 1993 and 1994, peaking in the first quarter of 1995 at a record $78.2 billion before reversing direction after the Bank tightened credit conditions in 1994. Contractionary monetary policy in 1994 led negative real economic growth and falling corporate earnings in the second quarter of 1995. The economy started to grow again and earnings returned after the Bank Rate renewed its decline in 1995. The Bank Rate was ultimately lowered to 3.25% in November 1996, where it remained until July 1997. Corresponding with the rebound in economic growth was an expansion in corporate profits in 1996 and 1997, and increased net new corporate issues. However, the spreading Asian crisis caused profits to decline in 1998 as world demand contracted, and the Bank began increasing its lending rate to defend the Canadian dollar which had fallen to US$0.6343 on August 27th. The growing crisis cumulated with the Russian default and the collapse of Long-Term Capital Management in the summer and autumn of 1998, forcing the Bank of Canada to increase its official lending rate 75 basis points to 5.75% in September. The Rate increases began being unwound in October and were fully reversed in March 1999.

Slowing economic growth, declining profits, and general uncertainty caused the spread between corporate and government issues to widen significantly in the latter half of 1998, as shown in chart 5.3, thus making corporate borrowing more expensive. The consequence of these changes was a significant reduction in the amount of bonds supplied by firms. The decline is illustrated in chart 5.2. Corporate issues placed abroad experienced a

Chart 5.4 Corporate Spread, 1985Q1 - 1999Q2



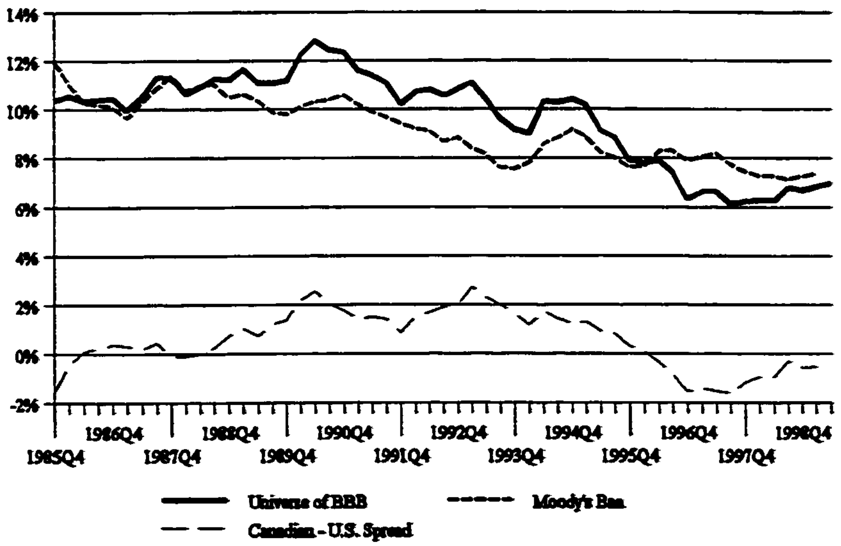
Source: CANSIM

year-over-year increase, while domestic issues experienced a year-over-year decline. The annual increase in issues placed abroad was the result of a very strong second quarter in 1998, not of a different reaction to the Asian crisis. Quarterly data reveals that issues placed both in Canada and abroad reacted identically to economic turbulence in the third quarter, declining 74% from the previous quarter. Not only did corporate borrowing become more expensive absolutely, but the yield differential between Canadian and U.S. corporates widened even though the spread remained negative, favouring Canadian bonds (see Chart 5.4). Increased spreads were felt most severely in the high-yield market. As noted in chapter three, between August 1998 and January 1999 no new high-yield bonds were placed in Canada and only one Canadian issue was sold in the U.S.

The fall in the issuance of new corporate bonds in 1990 also coincided with wider spreads between government of Canada issues and corporate issues in the U.S., though the spread with U.S. issues was more pronounced. Not only did new issues in Canada decline in 1990, but supply also fell in the U.S. High-yield issues in the U.S. fell in 1990 to their lowest level since the birth of the market in 1977.

Although real economic growth was stronger at the end of the 1980s than in the late 1990s, the supply of corporate bonds in 1997 was about double that issued in 1989. Avery Shenfeld, senior economist at CIBC Wood Gundy cites narrowing spreads as one of the key impetuses for increased supply, and in particular for the creation of the domestic high-yield market.[24] The significance of the

Chart 5.5 Canadian vs. U.S. Corporate Yield, 1985Q1 - 1999Q2

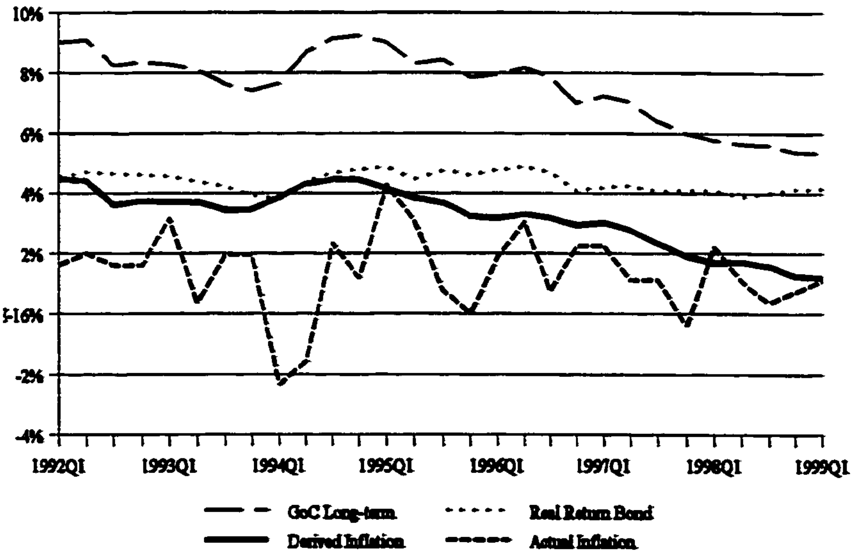


Source: CANSIM

corporate spread is that Government of Canada bonds are used as a benchmark to price corporate bonds (Harvey, 1999). Thus, a narrowing spread indicates that corporate credit conditions are becoming more favourable, so as the spread narrows the supply of corporate bonds should increase. The corporate spread turned negative in the first quarter of 1996 and became more negative as the Bank Rate continued to drop to 3.25% in November 1996. The spread reversed and became positive in the fourth quarter of 1997, and coincided with the renewed ascent of the Bank Rate.

Perhaps the difference in the corporate spread provides an explanation for why the supply in corporate bonds in 1997 was nearly double that in 1989. In fact, the corporate spread in 1997 was about three times narrower than in 1989, as seen in chart 5.4. The spread between the SCM universe of triple-B rated corporate bonds and the SCM universe of long-term Government of Canada bonds narrowed from 1.57% in the first quarter of 1989 to -0.59% in the first quarter of 1997.[25] While a narrower spread in 1997 appears to explain the difference in supply, it is important to remember that spreads are merely a reflection of changes in the forces of supply and demand. For example, although real GDP growth was not as strong in the middle to late 1990s as in the late 1980s, corporate pre-tax earnings were stronger in the 1990s. Improved profitability in the 1990s is illustrated in a CBRS (1997) study showing that 1996 was the first year since 1989 that the number of defaulted bonds issued by Canadian companies fell to zero. Further, the study noted that the number of defaults is

Chart 5.6 Inflationary Expectations, 1992 - 1999Q2



Source: CANSIM

returning to lower long term levels following a historically high level of defaults between 1990 and 1994 that resulted from the severe recession and the collapse of the real estate market.

It is important not to forget that while Canadian companies had strong profit growth and the relative cost of corporate borrowing declined significantly, the absolute cost of borrowing fell precipitously between 1989 and 1997. In the first quarter of 1989 the yield posted by the SCM universe of triple-B rate bonds was 11.67% compared with 6.64% in the first quarter of 1997, resulting in a much lower cost of borrowing.

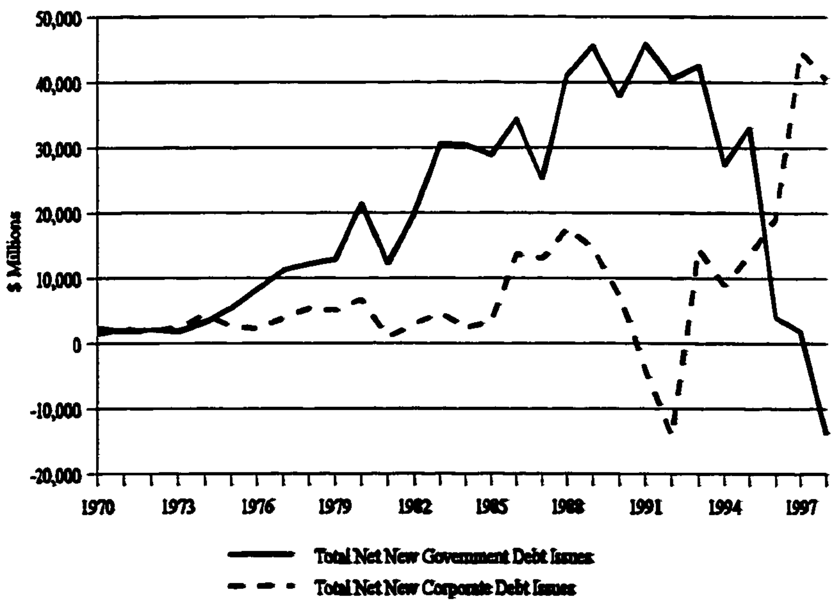
Coinciding with the narrower spread between Canadian corporate bonds and Government of Canada issues was a dramatic change in the yield differential between Canadian and U.S. corporates. As shown in Chart 5.5, the yield on Canadian bonds historically exceeds yields on similar U.S. issues. In the second quarter of 1996 the differential became negative for the first time since 1988. Between the first quarter of 1989 and 1997 the differential changed; the SCM universe of triple-B and Moody's Baa rated bonds declined from 1.03% to -1.43%. The most important reason for the reversal has been improved inflation fundamentals. The improvements in expected inflation and the Bank Rate, which began its descent in November 1995, were manifest in a narrowing spread between the SCM universe of triple-B rated corporate bonds and the yield on the SCM universe long-term Government of Canada bonds

Chart 5.6 shows that inflation expectations as measured by the spread between long-term Government of Canada (GoC) bonds and long-term GoC real return bonds fell steadily through this decade, from about 4.5% in 1992 to 1.2% in the first quarter of 1999. The fact that inflation expectations were slow to converge on actual inflation indicates that the Bank of Canada was slow in gaining credibility as an inflation fighter. Fung et al. (1999) concluded that the public was slow to react to the Bank's low-inflation policy and that the bond market was even slower to adjust. To gauge inflation expectations by the general public, survey data and derived expectations were used to capture the expectations of the bond market. They noted that while Canadian inflation became lower than U.S. inflation in 1989, expectations have been substantially higher than actual inflation. However, since 1997 derived expectations have moved closely with the survey data at about 2% per year, the mid-point of the Bank's target inflation band. The convergence between actual and expected inflation is shown in Chart 5.5, and it can be seen that after 1996 expected inflation was closer to actual change in the Consumer Price Index..

The reversal of the historically positive differential meant that it became less expensive to borrow domestically. More favourable pricing conditions at home provided a strong incentive for Canadian firms issuing high-yield bonds to place their debt with Canadian investors. In addition, the improved yield differential likely helped Canadian investment banks repatriate deals lost to U.S. investment banks. As already noted, coinciding with positive development on the supply-side, demand conditions were much improved as mutual funds experienced extremely strong sales in 1996 and 1997, and the flow of money into investment funds favoured corporate bonds, thus creating a favourable supply and demand mix.

The supply and demand for loanable funds affects the level of interest rates. Loanable funds theory concludes that increasing government deficits that are financed by borrowing funds from the public will increase interest rates and crowd out private investment. That is, increased demand for loanable funds, or supply of bonds, will depress bond prices causing interest rates to increase. The negative effect of government debt finance may be eliminated or attenuated in an open economy depending on degree of capital mobility, and crowding-out may not occur if the Ricardo-Barro Equivalence Theorem holds. This theorem states that economic agents foresee a greater future tax liability and thus save for its eventual re-payment —this in

Chart 5.7 Net New Gov't & Corporate Debt Issues, 1970 - 1998



Source: Bank of Canada Review, Table F5
Note: Millions of Canadian Dollars, par value. Securities placed in Canada.
Government includes Federal, Provincial & Municipal Bond & Bill, excludes CSBs and CPP bonds. Corporate includes bonds, BAs commercial paper.

effect relies on Say's Law so that the real interest rate holds steady —so that no crowding-out occurs. However, Barro (1989) notes that there is a parallel between Ricardian equivalence and Modigliani and Miller (1958) theorem. That is, the former suggests that fiscal policy is irrelevant and the latter suggests that corporate capital structure is irrelevant, and that both are literally incorrect, but both theorems are valuable because they eliminate "numerous sloppy reasons for why" fiscal policy and corporate finance might have mattered.

Spiro (1994) notes that the question of a relationship between deficits and interest rates has not been empirically resolved even though a large literature exists. However, Cebula, Killingsworth, and Belton (1994) note that although an extensive literature has evolved since 1980, it has focussed primarily on the relationship between short-term rates and budget deficits, which is why the link between government borrowing and interest rates and crowding out has not been confirmed. They assert that because investment is more sensitive to long-term interest rates empirical analysis should focus on long-term rates. Their analysis concludes that government deficits do increase interest rates and that investment is crowded out. Moreover, they note that nearly all of the empirical studies on budget deficits and long-term rates indicate that deficits do have a significant influence. More recently, Gretzinger (1999) found that a $1 billion decline in the quarterly issuance of net new government debt (federal, provincial or municipal bonds or bills) is consistent with corporate yields dropping 2 to 3 basis points in the following quarter. And, if the decline is permanent, the decrease could be 7 to 14 basis points. Total net new government and corporate issues of debt securities placed in Canada are shown in Chart 5.7. Net new total government debt placed in Canada has experienced a dramatic reversal this decade. Total net new issues of government debt placed in Canada peaked at $45.9 billion in 1991 and then declined steadily to a net retirement of $13.9 billion in 1998. The most significant decline in government borrowing occurred between 1995 and 1996 when net new government issues fell from just over $33 billion to $4 billion and then to only $1.9 billion in 1997. Conversely, net new corporate debt issued in Canada jumped to $45 billion in 1997 from $19 billion in 1996 and $14 billion the year before. The negative relation between corporate and government issue is highlighted in Gretzinger (1999). A correlation analysis of net new government debt and net new corporate debt reveals a strong negative linear association. Between 1970 and 1998 the correlation between private and public debt issues was minus 25.2%. However, looking at more recent periods reveals a significantly stronger linear relationship. The correlation between 1980 and 1998 was minus 62.4%, and between 1990 and 1998 it was minus 84.5%. The strong negative relation between issues of government and corporate debt is the relationship expected if the government borrowing does crowd out private investment.

It is likely that the forces of supply and demand do affect the price of loanable funds. Hence, it is likely that large government borrowing will effect on interest rates, although, as mentioned, the effect may be attenuated by capital mobility. A plausible postulate for the lack of consistent empirical support for crowding-out is that while the supply of government bonds affects the price of bonds, price changes are dominated by inflation expectations. Certainly the strong negative correlation between government debt issues and corporate issues has strengthened considerably this decade as inflation has subsided.

It follows that if increasing deficits crowd out private investment then the elimination of such deficits and the paydown of net public debt would lead to a crowding-in effect. In fact, it has been asserted that dramatically reduced government borrowing since 1995 has provided room for corporate borrowing and an impetus for the nascent high-yield market (Curren, 1997 and Shenfeld, 1997).

5.3 Summary

The analysis of supply and relevant influences indicates that declining inflation and inflation expectations allowed nominal and real interest rates to decline substantially. Analysis and theory suggests that reduced government borrowing also exerted downward pressure on interest rates. Moreover, the reduced supply of government debt forced investors and investment banks to place more attention on corporate issues. Further, the positive effect of the declining cost of borrowing was strengthened by growing corporate profits and fewer defaults that allowed the corporate spread to narrow significantly, making borrowing relatively less expensive. In addition to corporate yields moving closer to benchmark issues, the Canada-

U.S. yield differential reversed making domestic borrowing less expensive thereby adding pressure to repatriate lost high-yield deals

In sum, the review of economic theory and the analysis of key influence provide evidence supporting the hypothesis that low interest rates, low inflation, changing spreads, and the shortage of government fixed income products have been instrumental in the expansion of Canada's bond market, particularly in the development of a domestic high-yield market. Additionally, it was noted that the timing of changes that effect corporate supply were supported by the demand-side factor identified in the previous chapter.

Chapter Six

Empirical Analysis

6.0 Introduction

While the focus of this study is non-investment grade bonds, the dependent variable used in the econometric analysis is the quarterly total net new issue of corporate bonds placed in Canada, including both high-yield and investment grade bonds. The reason for this selection is one of data restrictions. That is, the high-yield market only began in 1996 so there are to few data points for proper analysis. For example, in 1996 only 3 non-investment grade corporate bond issues were placed domestically. While it is recognized that Canada is a small open economy and firms can and do issue their bonds outside of Canada, only net new bonds placed in Canada are included in the analysis in an attempt to isolate changes in the domestic bond market. Therefore, from the results of the econometric investigation inferences can be made about the nascent high-yield market. It is believed that the same forces that motivated the strong growth of total new corporate bonds are the same forces that facilitated the development the market for junk bonds. It is important to recall, however, that the growth in mutual funds played a vital role in the development of the high-yield market, and that this factor was not likely essential for the expansion of investment grade issues placed in Canada.

6.1 The Model

The previous two chapters reviewed economic theory with the purpose of specifying structural models for supply and demand. Chapter four developed a model of demand and was summarized by equation 4.1, and chapter five a model of supply that was captured by equation 5.6. These equations can be written more generally and compactly as follows:

$$B^d = B^d(ND,X) \qquad 6.0$$

and

$$B^s = B^s(ND,Y) \tag{6.1}$$

Where B^d denotes the amount of net new corporate bond purchased by Canadian investors, and B^S represent the supply of corporate bonds, and ND represents the yield on 90-day commercial paper. X and Y are vectors of demand and supply variables respectively.

The common variable ND (the yield on 90-day commercial paper) represents the risk-free rate of return in the demand model is the fundamental building block in portfolio construction. In the supply model ND provides the proxy of corporate expectations for the direction of monetary policy. As noted in chapter five the market prices 90-day paper are based on anticipated changes in the Bank Rate. Because of the significant role that expectations play in the economy particularly in the financial markets, and because of the immediate impact that monetary policy has on the price of financial assets changes in the yield of 90-day paper are expected to have a immediate and material impact in the bond market. The vector X in the demand model contains those variables that are unique to demand, such as asset return and wealth, and vector Y contains the variables that are unique to the supply model.

Assuming a linear functional form the structural model can be written from the above functions:

$$B^d = \alpha_1 + \alpha_2 ND + \alpha_3 X + \mu \tag{6.2}$$

and

$$B^s = \delta_1 + \delta_2 ND + \delta_3 Y + \upsilon \tag{6.3}$$

Where *m* and *u* are *i.i.d.* normal random variables. From the two linear equations 6.2 and 6.3 the ***reduced form*** equation can be derived. The process to obtain the equations for estimation begins by assuming the amount of net new domestic corporate bonds purchased by Canadian investors equals the amount of net new bonds sold by domestic firms. That is, the supply and demand for bonds are in equilibrium, such that $B^s = B^d = B$. Because the focus of this study is on the changes in the domestic bond market only bonds placed in Canada are considered. Hence, equations 6.2 and 6.3 can be re-written to get:

$$B = \alpha_1 + \alpha_2 ND + \alpha_3 X + \mu \qquad 6.4$$

and

$$B = \delta_1 + \delta_2 ND + \delta_3 Y + \upsilon \qquad 6.5$$

Manipulating the structural equations 6.4 and 6.5 yield two reduced form equation for econometric estimations:

$$ND = \phi_1 + \phi_2 X + \phi_3 Y + \varepsilon_1 \qquad 6.6$$

and

$$B = \pi_1 + \pi_2 X + \pi_3 Y + \varepsilon_2 \qquad 6.7$$

The complete derivation is presented in Appendix D. With respect to identification a brief glance at equation D3 and D5 in appendix D show that it is impossible to recover the structural parameters because of under identification. However, there is no need to obtain the structural parameters because it is the reduced form parameter that are of interest. Though it would be interesting determine the slope of the demand curve given the assumption that it is perfectly elastic. The parameter estimates of equation 6.7, or more specifically equation 6.9, are sufficient for the purposes of this analysis. These estimated parameters will reveal the direction and the quantum of influence the supply and demand variables have on the dependent variable, net new issues of corporate bonds placed in Canada.

Equations 6.6 and 6.7 provide the form that the econometric estimation will follow, but prior to estimation the variables to be included must be delineated. Table 6.0 below summarizes the key variables identified in Chapter Four that influence demand for corporate bonds and were summarized above in equation 6.0.

The first four variables listed in the table represent the return on the four key asset classes. The first, the risk-free rate is not lagged because the return is effectively known at the time of purchase, and because the analysis in chapter four indicated that the portfolio shift occurred with no apparent lag with respect to changes in short-term interest rates. 90-day commercial paper was selected over term deposit rate as the risk-free proxy because 90-day paper is expected to contain more information than term rates because its price is set in the money market.

Table 6.0 Demand Variables

ND_t	90 day commercial paper, proxy for the risk-free rate of return	endogenous
$RBBBI_{t-1}$	Total Return on the Scotia Mcleod's universe of triple-B corporate bonds	exogenous
$RUGI_{t-1}$	Total Return on the Scotia Mcleod's universe of government bonds	exogenous
TSE_{t-1}	Toronto Stock Exchange 300 index (The return on equities)	exogenous
MFA_{t-1}	Mutual fund assets, proxy for wealth	exogenous

The remaining demand variables listed in the table were summarized by the vector *X* in equation 6.0. Included are the return variables, $RBBBI_{t-1}$, $RUGI_{t-1}$, TSE_{t-1}, and the proxy for wealth, MFA_{t-1}. The return on the government bonds, $RUGI_{t-1}$, is the performance measure for investment grade and the return on triple-B rate corporate bonds is the performance measure of high-yield bonds. The two Scotia Mcleod bond universes measure the total return to holding these asset classes. The measure is not given in percentage return, but is an index similar to the TSE 300 index; the bond indexes began in December 1985 at 100. The drawback, however, is that by using the indexes rather than percentage returns means that the coefficient estimates will not provide a meaningful interpretation. While the data can be manipulated to yield a percent return, the data are left in the original form so that no measurement errors resulting from smoothing are introduced. The return variables are lagged because it is assumed that investors focus on the past performance of different assets when making their allocation decisions. As well, the proxy for wealth, mutual fund assets, is lagged because it is assumed that economic agents do not have knowledge of their current wealth. Rather investors have better knowledge of last periods wealth than current wealth because most mutual funds provide quarterly reports of performance and net asset value.

Absent from the table of demand variables are the correlation coefficients between the different asset classes and the variances of returns. The reason for the omission of these variables is because there are too few data points available to compute a quarterly correlation coefficient or variances. To compute these variables would require daily or weekly data, but the highest frequency available for these return variables is monthly. Hence, three data points is insufficient to compute the necessary variables. The correlation coefficients and variances are, therefore, dropped because no reasonable alternate variable would suffice as a proxy. Based on an interview with bond fund manager who stated that in practice little focus is placed on the correlation coefficients or variances and that of primary importance is the expected return generated by the asset.[26] An omitted variable bias is not expected because the emphasis is placed on expected returns rather than correlation coefficients and variances.

Table 6.1 below delineates the salient variables that affect the corporate decision to issues bonds that were identified in chapter six and summarized above by equation 6.1. The analysis of supply suggested that the relative cost of corporate borrowing compared to government borrowing had a clear impact on the amount of net new corporate bonds issued, and that the cost differential between borrowing domestically and in the U.S. should have an impact on the amount of net new bonds placed with domestic investors. The negative spread between Canadian triple-B and U.S. junk bond likely had a material impact on borrowing in Canada, particularly for non-investment grade borrowers who have historically been forced to place their bonds with U.S. investors. Narrowing spreads are expected to encourage new bond issuance. Hence, a negative relationship is expected between the spreads and the dependent variable. The third variable listed in the table is included to capture the cost of issuing new stock. The price earning ratio of the TSE 300 index is used as a measure of the cost of issuing new shares. All else equal the greater the ratio the cheaper it is to issue new equity. Thus the spread and equity variables are lagged because it is assumed there is a lag between identifying market conditions and planning and implementing a new issue of debt or stock.

In addition to the cost of financial capital, the review of the capital structure literature indicated that pre-tax corporate earnings, and investment should explain the decision of firms to borrow. The analysis of supply influences in section 5.2 supported economic theory and suggested that the existence of profits had a strong positive relationship with new bond issues. For this reason pre-tax profits are included as a lagged explanatory variable. The literature also identified corporate investment, particularly in fixed assets as a determinant of the supply of new bonds. Investment in fixed assets is given by corporate investment in non-residential structures and equipment. Business investment enters the model at time *t* because it is assumed that there is little if any lag between the acquisition of financial capital and its deployment.

Table 6.1 Supply Variables

ND_t	90 day commercial paper, monetary policy expectations	endogenous
$SBBG_{t-1}$	Canadian corporate spread, triple-B minus Gov't of Canada long-term	exogenous
$SCUHY_{t-1}$	Spread between Canadian triple-B and U.S. Baa	exogenous
TPE_{t-1}	Price earning ration of the TSE 300, proxy for the cost of equity finance	exogenous
PRF_{t-1}	Corporate pre-tax profits	exogenous
BI_t	Business Investment in non-residential structures & equipment	exogenous
GBD_t	Total net government domestic borrowing, fiscal policy expectations	exogenous

Crowding-out theory asserts that government borrowing will reduce the amount of private borrowing and investment. Therefore, total government borrowing by the federal, provincial, and municipal governments in the Canadian money and bond markets is included as an explanatory variable, GDB_t. Government borrowing is included contemporaneously because government borrowing is most likely to impact private borrowing negatively during the same period. In addition to government borrowing the activity of the central bank will affect the credit market for Canadian corporations. Expected monetary policy is represented by 90-day commercial paper because changes in the yield on commercial paper tend to lead changes in the Bank of Canada's official policy lever. This variable is included contemporaneously because changes in the Bank Rate are felt instantly in the financial markets. Rate changes may cause a firm to scuttle or alter a planned issue of securities.

Now that the relevant variables have been identified the reduced form equations can be re-written and expanded. Equation 6.6 becomes

$$\begin{aligned} ND_t = {} & \phi_1(RBBBI_{t-1}) + \phi_2(RUGI_{t-1}) + \phi_3(TSE_{t-1}) + \phi_4(MFA_{t-1}) + \phi_5(SBBG_{t-1}) \\ & + \phi_6(SCUHY_{t-1}) + \phi_7(TPE_{t-1}) + \phi_8(PRF_{t-1}) + \phi_9(GBD_t) + \phi_{10}(BI_t) + \varepsilon_1 \end{aligned} \qquad 6.8$$

and equation 6.7 becomes

$$\begin{aligned} BPC_t = {} & \pi_1(RBBBI_{t-1}) + \pi_2(RUGI_{t-1}) + \pi_3(TSE_{t-1}) + \pi_4(MFA_{t-1}) + \pi_5(SBBG_{t-1}) \\ & + \pi_6(SCUHY_{t-1}) + \pi_7(TPE_{t-1}) + \pi_8(PRF_{t-1}) + \pi_9(GBD_t) + \pi_{10}(BI_t) + \varepsilon_2 \end{aligned} \qquad 6.9$$

Where BPC_t is the amount of net new corporate bonds issued and placed domestically. Now that the expanded reduced form equations have been identified they can be estimated in an attempt to determine the significance the explanatory variables and to infer the factors that were critical in the development of a domestic market for lower rated corporate bonds. Hence, it is the parameters of the reduced form equation rather than those of the behavioural equations that are of primary interest, and it is the results generated from estimating equation 6.9 that will help determine the main influences that led to the development of the domestic public market for non-investment grade bonds.

6.2 The Results of OLS Estimation

Table 6.2 and 6.3 below summarize the results of the OLS regression on equation 6.8 and equation 6.9 respectively. While the basic thrust of econometric modelling is to explain as much of the variation in the dependent variable as possible, a high R-squared value alone does not tell the whole story. Also of great importance are the coefficient estimates, the parameter estimates should have a sign that is consistent with the predictions of theory. As well the size of the estimates should suggest reasonable changes in the dependent variable, and the corresponding standard errors should be as small as possible. Thus, overall these criteria combined should lend support to the hypothesis being tested.

Although equation 6.9 is of the focus of this study, it is of interest to see how the yield to 90-day commercial paper is affected by the explanatory variables in the reduced form equations. The regression on equation 6.8 generated an adjusted R-squared suggesting that the four demand and six supply variables explains 88.1% of the variation in the dependent variable. With an F-statistic equal to 38 the null hypothesis that the coefficients are jointly all equal to zero can be convincingly rejected. However, individually nine of ten coefficient are not insignificantly different from zero, but only two are signed incorrectly. There is some difficultly interpreting the coefficients because changes in some of the independent variables may be caused by changes in the dependent variable or are reacting to inflation expectations. Also, because the yield on 90-day paper mirrors the Bank Rate any causal relationship running from the right-hand variables is likely to be dominated by the Bank's policy lever. Thus, the lack of significant *t*-statistics is not surprising nor is the high R-squared.

The coefficient on corporate investment is significant, and the sign is consistent with *a priori* expectations. All else equal if investment increased then rising demand for loanable funds would increase interest rates. However, if interest rate declined one would expect a investment to increase because of falling borrowing costs. Unlike investment the link between the yield on 90-day paper and government borrowing is expected to run in one direction. Increased government borrowing all else equal will cause interest rates to increase.

The coefficient on TSE 300 PE ratio is also signed correctly, though the coefficients on the TSE 300 index and corporate earnings are the opposite expected. Generally one would expect a negative relationship between these independent variables and interest rates. The positive coefficients on the spread variables are consistent with expectations. If credit conditions become tighter because the supply of loanable funds falls the spread should widen and the interest rates in general should increase, but more so for the debt obligations of less creditworthy borrowers. Also consistent with expectations is the sign of the coefficient on mutual funds assets. If mutual fund assets increase then demand for money market securities like 90-day commercial paper will rise increasing the price and pushing down the yield. The *a priori* sign for the return on triple-B rated bonds and government bonds is difficult to determine. Though generally one would expect a negative link between the return on bonds and 90-day paper.

Table 6.2 OLS Regression of Equation 6.8 (ND_t)

Sample(adjusted): 1986:3 1999:1
Included observations: 51 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Sign	Prob.
Constant	-0.061918	0.170968	-0.362164		0.7191
Demand Variables					
RBBBI(-1)	-3.32E-05	0.000595	-0.055857	correct sign	0.9557
RUGI(-1)	-0.000505	0.000653	-0.773611	correct sign	0.4437
TSE(-1)	1.54E-06	4.80E-06	0.321624	wrong sign	0.7494
MFA(-1)	-4.46E-15	1.55E-13	-0.028667	correct sign	0.9773
Supply Variables					
SBBG(-1)	0.210643	0.876698	0.240268	correct sign	0.8113
SCUHY(-1)	0.840581	0.617361	1.361571	correct sign	0.1810
PRF(-1)	5.35E-14	3.27E-13	0.163745	wrong sign	0.8708
TPE(-1)	-3.43E-05	0.000104	-0.328609	correct sign	0.7442
GDB	1.25E-13	3.46E-13	0.362716	correct sign	0.7187
BI	1.83E-12	6.52E-13	2.802236	correct sign / significant	0.0078

R-squared	0.905071	Mean dependent var	0.074927
Adjusted R-squared	0.881339	S.D. dependent var	0.029570
S.E. of regression	0.010186	Akaike info criterion	-6.147141
Sum squared resid	0.004150	Schwarz criterion	-5.730473
Log likelihood	167.7521	F-statistic	38.13684
Durbin-Watson stat	1.495975	Prob(F-statistic)	0.000000

The regression results of equation 6.9, reported in Table 6.3 below, are much easier to assess because the causal link runs strictly from the explanatory variables to net new corporate bonds placed in Canada. The sign on low grade bonds and equities meet *a priori* expectations and are significant at the 5% level of significance, but the coefficient on investment grade bonds is insignificant and negatively signed, the opposite expected. All else equal as the return to high-yield bonds increases demand is expected to rise and the dependent variable will increase. The positive and significant coefficient for $RBBI_{t-1}$ adds support for the argument in chapter five that strong bond returns had a positive affect on the issuance of corporate bonds, and because triple-B rated bonds outperformed investment grade bonds the demand likely increased proportionately more for lower rated bonds. Unfortunately, as noted previously, little can be said about the size of the parameter estimate because the variables are indexes rather than percent returns. The return to triple-B bonds is particularly important when considered alongside the precipitous decline of the return to bank deposits. On balance this result provides evidence supporting the notion that the creation of Canada's nascent public high-yield market was strongly influenced by increased demand for corporate bonds, and is consistent with Fridson's (1994) conclusion that the performance of non-investment grade debt helped to expand the U.S. junk bond market.

Also lacking significance and signed incorrectly is the coefficient on mutual fund assets. While the overall bond market did not require the growth in mutual funds to thrive, it is surprising that the coefficient on mutual fund asset has a negative sign. The estimated coefficient suggests that a $1 billion increase in mutual fund assets would result in $5.12 million decline in demand for corporate bonds. Rather one would expect an increase in demand in the neighbourhood of $70 million based on the 1998 proportion of investment fund asset in corporate bonds. Economic theory asserts that the demand for normal goods should increase if wealth increases. In this study mutual fund assets have been used as a proxy for wealth. Additionally, mutual funds have been a huge recipient of the shift of funds from bank deposits to marketable securities.[27] And, as highlighted in chapter four that corporate bonds benefited relatively more than did domestic equities or government bonds from this shift, which is consistent with the positive coefficient on the return to triple-B rated bonds and the fact that through the 1990s triple-B rated bonds outperformed investment grade issues and equities. Perhaps the lack of explanatory power can be attributed to the small proportion of mutual funds assets invested in corporate bonds. However, because Canadian non-investment grade bonds comprise such a small percentage of the total public market it does not rule out the possibility that mutual fund growth aided the development of a public high-yield market particularly in light of the support for increased demand for bonds because of superior returns to high-yield bonds. The increased availability of mutual funds and entrance of high-yield specialty funds in the middle of the decade is believed to have been the facilitator of increased demand for bonds that resulted from strong returns. Of the six variables influencing the corporate decision to issues bonds the three relative cost variables are signed the opposite expected, and the two spread variables are not significant, although the cost of equity as measured by the price earning ratio is significant and positive rather negative. The three other supply variables investment, earnings, and government debt issues are signed as expected though the coefficient to earnings is not significantly different from zero.

Table 6.3 Regression on Equation 6.9 (BPC_t)

Sample(adjusted): 1986:3 1999:1
Included observations: 51 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Sign	Prob.
Constant	4.51E+10	1.87E+10	2.417189		0.0203
Demand Variables					
RBBBI(-1)	1.32E+08	64894736	2.039657	Correct Sign	0.0480
RUGI(-1)	-98786435	71253441	-1.386409	incorrect Sign/ not significant	0.1733
TSE(-1)	-1524836.	523601.9	-2.912206	Correct Sign	0.0058
MFA(-1)	-0.005121	0.016971	-0.301762	Wrong Sign / not significant	0.7644
Supply Variables					
SBBG(-1)	6.37E+10	9.57E+10	0.666028	Wrong Sign / not significant	0.5092
SCUHY(-1)	1.14E+10	6.74E+10	0.169158	Wrong Sign / not significant	0.8665
PRF(-1)	0.038792	0.035696	1.086745	Correct Sign/ not significant	0.2837
TPE(-1)	24184331	11394015	2.122547	Wrong Sign	0.0400
GDB	-0.097552	0.037722	-2.586087	Correct Sign	0.0135
BI	0.277596	0.071124	3.902964	Correct Sign	0.0004

R-squared	0.566674	Mean dependent var	1.63E+09
Adjusted R-squared	0.458343	S.D. dependent var	1.51E+09
S.E. of regression	1.11E+09	Akaike info criterion	44.68488
Sum squared resid	4.94E+19	Schwarz criterion	45.10155
Log likelihood	-1128.464	F-statistic	5.230932
Durbin-Watson stat	2.563534	Prob(F-statistic)	0.000000

Also surprising is the incorrect sign and lack of significance of both relative debt cost variables ($SBBG_{t-1}$ and $SCUHY_{t-1}$). The coefficient for the corporate spread suggests that supply should increase $637 million for a 1% increase in the spread, and the coefficient on the Canada-U.S. spread indicate that the dependent variables should increase $114 million for a 1% widening of the spread. Theory asserts that as the cost of issuing bonds decreases relative to other source of finance that the supply of bonds should increase. The analysis in section 5.2 suggests that the relative cost of borrowing should be an important determinant of supply. The lack of explanatory power is not sensitive to using alternate measures of the cost of issuing corporate bonds. For example, the inclusion of the yield on triple-B rated corporate bonds and long-term Government of Canada bonds, and U.S. non-investment grade corporate bonds in place of the spread variables do not change the results (see Section E9.4 in Appendix E).

The regression results conclude that the third cost variable, the price-to-earning ratio of the TSE 300 index group of companies is a positive and significant determinant of the supply of corporate bonds. The estimated coefficient indicates that the supply of bonds would increase $24.2 million if the TSE 300 PE ratio increase by 1 unit. While it is difficult to speculate what a reasonable parameter size should be the estimate appears to be with in reason. However, the sign of the coefficient is inconsistent with *a prior* expectations. Chapter five argued that if the cost of issuing new equities decreased all else equal that new issues of bonds would decline relative to the new equity issues. Thus if the price of the firms stocks increase all else equal equity financing becomes relatively less expensive. This, however, assumes that firms view equity and debt financing as substitutes. Debt and equity financing may not be substitutes. For example, the theory of corporate capital structure suggests that a bias toward the use of debt exists. If the bias does exist it may eliminate or attenuate the degree of substitutability between these securities. Furthermore a bias toward debt issues may exist because existing owners may not want to dilute their ownership stake, and would, therefore, rather borrow. Moreover, if the PE ratio increases because stock prices are rising then corporate net debt to total capital ratio will decline and may make it easier to issue new bonds and may lower the cost of borrowing. That is, a decrease in this ratio may improve the credit rating of a firms and thus decrease borrowing costs.[28] Therefore, although the sign is inconsistent with the theoretical argument presented in chapter five, there is a valid and logical explanation for the sign. And, the fact that the sign is positive rather negative does suggest that firms do not see these alternate sources of external funds as substitutes.

The coefficient associated with corporate earnings accords with expectations and suggests that a $1 billion increase in corporate pre-tax earnings should lead to a $38.8 million increase in the supply of corporate bonds placed in Canada. Again it is difficult to state how much supply would increase if earnings expanded by $1 billion, but the estimates does appear to be of a reasonable size. However, the standard error is nearly as large as the coefficient and results in an insignificant *t*-statistic. Hence, the econometric model fails to offer support for the analysis of profits or the theoretical review in chapter five that argued profits should be an important determinant of the supply of new corporate bonds.

Unlike the profit variable business investment is both a positive and statistically significant determinant of supply as expected. Based on the estimated coefficient an increase in investment of $1 billion the supply of corporate bonds placed in Canada should expand by about $278 million. It is interesting to note that investment is positive and significant whether the variable enters the model lagged, contemporaneously, or ahead one period. This suggests that business investment is an important determinant of a firm's decision to issue bonds. Although the individual variable is significant regardless of the time subscript, the fit of the model deteriorates markedly when investment is lagged one period. In fact, the coefficients on the constant, return on high-yield bonds, PE ratio, and government debt are no longer statistically significant, and the adjusted R-squared drops to 37.40% from 45.83%. This result should not be a surprise given that financial capital must first be acquired before employed. When investment enters ahead one period five of the *t*-statistics decline including one that falls below the 10% level of significance; the coefficient of the PE variables is no longer significant (see Section E9.0 in Appendix E). The changes that results from adjusting the lag of the variables suggests that the investment should be included contemporaneously as originally hypothesized. In the next chapter an analysis of change in capital investment and long-term debt show a contemporaneous relationship.

The coefficient on government debt is negative and significantly different from zero supporting the crowding-out theory and the analysis in chapters four and five. The parameter estimate indicates that for every $1 billion in government borrowing in the domestic debt market that $97.6 million in corporate bonds will be squeezed out. Therefore, the hypothesis that reduced government borrowing provided an impetus to the growth in net new bonds and the development the nascent public high-yield market is supported. As noted previously, government borrowing should enter the equation contemporaneously. If government debt issues are lagged the associated coefficient becomes insignificantly different from zero. In addition three other *t*-statistics are lowered below the threshold of significance. The coefficients on the constant, return on high-yield bonds, and the PE ratio all become insignificantly different from zero, and the F-statistic falls to 3.97 from 5.23. Thus, at the 1% level of significance the null hypothesis the coefficient are jointly equal to zero can no longer be rejected, though the null can still be reject at the 5% level (see Section E9.3 in Appendix E)..

Overall, the F-statistic is 5.23 leading to the rejection of the null hypothesis that the estimated coefficients are jointly equal to zero, and the adjusted R-squared value is 45.8%. Hence, the goodness of fit is less than anticipated, or hoped for, but combined with the other criteria the model provides a reasonable explanation of the supply of net new corporate bonds. Moreover, the model is largely consistent with economic theory reviewed in prior chapters. However, the big surprise is the lack of explanatory power of the spread variables and the cost of borrowing generally, and lack of significance of the mutual fund variable.

6.3 Diagnostic and Specification Tests

There are five key assumptions that underlie the method of least squares estimation in the Classical Linear Regression Model that must be satisfied. In addition the error term must be normally for valid hypothesis testing, at least for small sample sizes. These six requirement are discussed in appendix E, *Diagnostic Tests*.

One the key assumptions is that the error term must not be serially correlated. Formally this assumption requires that the covariance between errors is zero. If serial correlation is present then OLS estimators may not be efficient, and will lead to smaller standard errors and narrower confidence intervals resulting in an increased likelihood of committing a Type-I error (reject H_0 when it is true), and the goodness-of-fit will be overly optimistic. Using the Durbin-Watson d statistic to test the null that there is no first-order autocorrelation the result is indeterminate because the test statistic for each equation falls within the zone of indecision. Next the Breusch-Godfrey Lagrange multiplier serial correlation test was performed using different lags. For equation 6.8 the null hypothesis of no AR(1) is rejected, though the null of no AR(2) or AR(3) cannot be rejected. For equation 6.9 Breusch-Godfrey test rejects the null indicating the presence of AR(1), AR(2), and AR(3). Further diagnostics using Q-statistic test confirm the results obtained using the Breusch-Godfrey test (see section E2.0, in appendix E).

Because the assumption of no autocorrelation is violated OLS estimators are no longer minimum variance and remedial measures must be. For example, autocorrelation may be present if relevant variables were omitted, or if the wrong functional forms was assumed. As noted because of data limitations two variables have been omitted, but that an omitted variables bias is not anticipated because the variables play a minimal role in practice. No useful proxy or instrumental variable is available, and thus there is no way to determine if these omissions are the source of serial correlation.

The most important assumption to be fulfilled for OLS econometric analysis is that the model is correctly specified. The review and analysis presented in the previous two chapters was an effort to ensure a theoretically solid model of supply and demand for corporate bonds, and to avoid a specification error. All salient variables identified have been included, while ensuring the model was specified parsimoniously. However the econometric model has been assumed linear. The Ramsey's RESET is used as a general specification test. Estimates of the dependent variables are introduced into the respective original equations to test if the R-squared value increases a statistically significant amount. The dependent variable estimates introduced into the respective equations are raised exponentially. That is, the first fitted value included is squared; if two fitted values are introduced then the first is squared while the second is cubed et cetera. Up to four fitted values were introduced in each equation. The results of the Ramsey RESET test indicate that there may be a specification error. In both models the inclusion of an extra variable (e.g. squared value of the estimated dependent variable) improves the fit of the model by a statistically significant amount at the 5% level, although at 1% the null hypothesis of no specification error cannot be rejected. Adding two fitted values of the dependent variables (one squared and one cubed) indicates a possible specification error in equation 6.8 at the 5% level, but the null is rejected at the 1% level, and at both levels of significance the null cannot be rejected for equation 6.9 (see Section E4.0 in Appendix E). Although there is some indication of a specification error, it does not appear to be particularly severe. Any error that may exist is more pronounced in equation 6.8, which is not too surprising since any econometric equation that models an interest rate should contain inflation or expected inflation as an explanatory variable. However, because it is equation 6.9 that is of primary interest and because the null cannot be rejected at 1% level of significance, and there is no *a priori* reason to suspect a non-linear model no changes are proposed.

Before preceding to review the results of the remedial regression on the equation 6.8 and 6.9, which is undertaken to correct for serial correlation, the time series must be examined to determine if they are stationary or non-stationary. This step is necessary since many economic times series seem to follow random walks, and it is likely that the dependent variable and / or some of the explanatory variables may follow random walks. If a variable follows a random walk then its mean will be time-dependent, and the time series is said to be non-stationary. A random walk is just one type of non-stationary process. A potentially serious problem arises if one random walk is regressed against another because it can lead to spurious results. That is, regression results may suggest a structural relationship between the variables when in fact none exists. To determine if one or more of the variables follow a random walk the *augmented Dickey-Fuller* (ADF) unit root test is used. The ADF unit root test is the most commonly used test to determine if a series follows a random walk, and is thus non-stationary. Table E2.0 in Appendix E presents the ADF test statistics showing which variables follow random walks. As suspected many of the variables are non-stationary, and, in fact, only the series of net new corporate bonds is stationary the rest are non-stationary, including the ND series.

While variables that follow a random walk may lead to spurious results because of inconsistent OLS parameter estimates, this need not be the case if the residuals of the regression are stationary. If this is the case then the variables regressed are cointegrated. The variables may be cointegrated because many economic variables tend to move together over time and have long-term equilibriums. If the equations are cointegrated then the OLS parameter estimates will be consistent.

Moreover, if the model is cointegrated then the autocorrelation coefficient will quickly converge to zero as the number of lags, *k*, in the autocorrelation function increases. That is, the residual is stationary, and if the autocorrelation coefficient is zero or close to zero the residual will be stationary. The Q-statistic mentioned above with respect to serial correlation provides a convenient test to determine if the autocorrelation coefficient converges to zero. The Q-statistic follows a chi-squared distribution, thus the critical value to assess the Q-statistic significance is the chi-squared statistic for *k* lag at the10% level of significance. The null hypothesis tested is that all autocorrelation coefficients are jointly equal to zero. Thus rejecting the null suggest that the error is non-stationary. For equation 6.8 lags greater than 10 lead to the rejection of the null indicating that equation 6.8 is not cointegrated. However, the null cannot be rejected for equation 6.9 indicating the error term is stationary, and that the equation is cointegrated and that parameter estimates will be consistent. This is good news because it is equation 6.9 that is of primary interest. Given that the dependent variable is stationary it was more likely that the error term would be stationary. Nevertheless, remedial measure are undertaken to resolve the problem in equation 6.8. The most common method of resolving a non-stationary model is to first difference the variables and the test the model again.

Both equations 6.8 and 6.9 were modified using first differences and estimated again. The results are presented in Section E7.0 of Appendix E. The modified regression of equation 6.8 yields no significant *t*-statistics, and the hypothesis the all the coefficients are jointly equal to zero cannot be rejected. Correspondingly the adjusted R-squared is just 2.8%. Moreover the sign on two demand and two supply coefficients reversed and are now of the wrong sign. The four variables are the return on government bonds, mutual fund assets, corporate spread, and the PE ratio. Thus, the fit of the model has declined dramatically, though using Q-statistic for 20 lags the null hypothesis that all autocorrelation coefficients are joint equal to zero cannot be rejected. Hence, the first differencing had the desired effect of introducing stationarity. The OLS regression on the augmented equation 6.9 did not yield perverse sign changes, and in fact the one sign that reversed was the mutual fund coefficient. Hence, the parameter estimate changed to positive, the *a priori* sign. However, differencing equation 6.9 resulted in the null hypothesis of the Q-test being rejected.[29]

The deteriorated fit that resulted from estimating the equation based after first differencing was not unexpected, though non-zero autocorrelation functions in equation 6.9 was. The theory examined in chapter four and five did not suggest models of supply and demand based on first differences, but one of levels.

6.4 Correcting Serial Correlation

Because autocorrelation was detected in both equations 6.8 and 6.9 standard OLS estimation may yield inefficient parameter estimates. Hence, if no specification errors can be found or cannot be logically resolved then the equation must be re-estimated to account for the presence of autocorrelation. EViews estimates AR models using nonlinear least squares techniques that is asymptotically equivalent to maximum likelihood estimate and coefficient estimates are asymptotically efficient. The process allows for various orders of autocorrelation.

Equation 6.9 was re-estimated to account for AR(3) and resulted in the elimination autocorrelation. The problem was also eliminated when the model was adjusted to account for AR(2). For the modified equation 6.9 the Q-statistic at all lag levels cannot reject the null that all autocorrelation coefficients are jointly equal to zero. Hence, the modified equation 6.9 to account for an AR(2) process eliminated serial correlation. As expected with respect to equation 6.8 the modification to account for autocorrelation eliminated lower order autocorrelation, but for lags greater than 3 the Q-statistic test rejects the null that all autocorrelation coefficients are jointly equal to zero. Thus lower order serial correlation was eliminated by accounting for an AR(1) process, and as expected the residual is still non-stationary. This result is not surprising because of equation 6.8 is not stationary where as equation 6.9 is stationary.

Table 6.4 below summarizes the regression result on equation 6.9 augmented for an AR(2) process. Results from the modified regression on equation 6.8 are presented in section E8.0 in Appendix E. Two sign changes occurred in the augmented regression on 6.8; the sign on the coefficient to the return on investment grade bonds reversed from positive and correct, and the sign on the corporate spread variable reversed to become negative and correct.

In addition to removing serial correlations the augmentation of equation 6.9 improved the fit of the model. The adjusted R-squared increased to 53.72% from 45.83% and again the null that all coefficients are jointly equal to zero is rejected. Most of the *t*-statistics increased including the coefficient on corporate earnings, which increased to 1.78 from 1.09. Thus at the 5% level of significance the null hypothesis that the coefficient is equal to zero is rejected. Positive and significant coefficient on corporate pre-tax earnings supports the economic theory in chapter five that asserts earnings should be a positive determinant of the supply of corporate bonds. The size of the earnings coefficient increased slightly to 0.0498 from 0.0388. The new parameter estimates indicates that a $1 billion increase in pre-tax corporate earnings will lead to net new corporate bonds placed in Canada increasing $49.8 million. The new parameter estimate on business investment asserts that a $1 billion increase in investment will lead to a $291 million increase in net new bonds compared to the original estimate of $277 million. As well the crowding out effect is strengthened. For each $1 billion in net new government borrowing $109 million in net new corporate bonds placed in Canada in squeezed out. The remainder of the parameter estimates declined with one exception. The coefficient on $SCUHY_{t-1}$ increased to close the gap between it and the parameter estimate on the corporate spread. The coefficient estimate for the Canada-U.S. spread suggests that each 1% increase in the spread that corporate bond issuance will rise by

Table 6.4 AR(2) Model of Equation 6.9 (BPC_t)

Sample(adjusted): 1987:1 1999:1
Included observations: 49 after adjusting endpoints
Convergence achieved after 6 iterations

Variable	Coefficient	Std. Error	t-Statistic	Change in *t*-statistic	Prob.
Constant	4.88E+10	1.61E+10	3.029573	increase	0.0045
Demand Variables					
RBBBI(-1)	126000000	48884196	2.585854	increase / correct	0.0139
RUGI(-1)	-83728329	54708803	-1.530436	increase / incorrect	0.1346
TSE(-1)	-1170341.	466950.1	-2.506352	decrease / correct	0.0169
MFA(-1)	-0.011298	0.012846	-0.879515	increase / incorrect	0.3850
Supply Varaibles					
SBBG(-1)	5.2900e+10	77600000000	0.681494	incorrect	0.4999
SCUHY(-1)	3.7000e+10	5.84E+10	0.633819	increase / incorrect	0.5302
PRF(-1)	0.049755	0.027922	1.781926	now sig. at 5% / correct	0.0832
TPE(-1)	22210844	8784877.	2.528304	increase / incorrect	0.0160
GDB	-0.108669	0.032305	-3.363876	increase / correct	0.0018
BI	0.291250	0.060011	4.853307	increase / correct	0.0000
AR(1)	-0.412866	0.155526	-2.654638		0.0117
AR(2)	-0.356531	0.158902	-2.243716		0.0311

R-squared	0.652904	Mean dependent var	1.63E+09
Adjusted R-squared	0.537205	S.D. dependent var	1.54E+09
S.E. of regression	1.05E+09	Akaike info criterion	44.59679
Sum squared resid	3.94E+19	Schwarz criterion	45.09870
Log likelihood	-1079.621	F-statistic	5.643137
Durbin-Watson stat	2.078027	Prob(F-statistic)	0.000025
Inverted AR Roots	-.21+.56i	-.21 -.56i	

$370 million by comparison the corporate spread predicts a $529 million increase. As in original specification the sign are the of *a prior* expectations, and make little economic sense. The interpretation is that the more expensive debt financing becomes, all else constant, that more will be borrowed.

6.5 Summary

The results of the regression analysis confirms that assets returns are important determinants of asset demand supporting the theoretical and analytical arguments made in chapter four. Two of the three asset classes have the correct sign and are statistically significant. The fact that the return on triple-B rated bonds proved significant supports the argument made in chapter four that the performance of corporate bonds in general increased demand for bonds, and that the superior performance of high-yield bonds likely increased demand proportionally more. This is consistent with the entrance of specialty high-yield bond funds that began appearing in 1993 and 1994. However, the incorrect sign on the mutual fund asset coefficient and its lack of statistical significance was surprising. While its is not believed that mutual fund growth played a central role in the growth of the entire corporate bond market, as a proxy for wealth fund assets should have at least generated a positive coefficient. As well, the negative sign is inconsistent with the analysis in chapter four that showed the proportion of investment fund assets invested in corporate bonds increasing relatively more than other assets. Although this surprise provides evidence that indicates the portfolio shift did not have a material impact on the overall domestic bond market, it does not invalidate the hypothesis that the growth in mutual funds aided the development of Canada's public high-yield market. However, it does temper the argument by eliminating quantitative support. Certainly the existence of institutional barrier limiting demand for non-investment grade bonds and the entrance of specialty high-yield funds and the significance the return on triple-B corporate bonds suggest that mutual funds did play an important role in the birth of a domestic public high-yield market.

Another surprise in the results, perhaps the biggest surprise, was the lack of explanatory power by the cost of debt variables. The lack of significance suggests that the cost of borrowing does not matter, which makes little economic sense. The conclusion of irrelevance is difficult to explain, but it does help highlight the importance of investment opportunities in the corporate decision to borrow. That is, firms do not borrow merely because it is inexpensive to do so, but rather they borrow because have profitable investment opportunities. This may include repaying more expensive sources of finance. The importance of investment opportunities is highlighted in the next chapter.

Not surprising is the result that indicates some profitable investment opportunities may be left unexploited when the government enters the public debt market and competes for private savings. Thus the empirical results support the hypothesis that the dramatic decline in government borrowing has provided fuel for the corporate bond market.

Chapter Seven

Industry Analysis

The review of developments in the Canadian bond market in chapter three revealed that the Rogers group of companies has been involved in two watershed deals. The first was in 1994 when they issued the first non-investment grade Canadian dollar denominated bonds in the U.S. and the second was when Rogers Communications Inc. sold the first non-investment grade corporate bonds to Canadian investors through the public bond market in February 1996. Rogers Cantel Inc. was responsible for the second public high-yield bond issue sold in the Canadian public market in May 1996. The third and final high-yield issue of 1996 came in December from Livent Inc., though this was their only bond issue in this period. The three issues totalled $308 million, and the Rogers group of companies accounted for 76% of the total.

These firms were from two industries: Rogers Communications Inc. and Livent Inc. are part of the communication and media industry, and Rogers Cantel Inc. belongs to the telephone industry. As shown in Table 7.0, these two industries have been responsible for 62% and 48% of Canadian non-investment grade bonds placed in Canada and the U.S. respectively from 1996 through 1998, and Table 7.1 shows that the importance of these industries has grown from 1996 to 1998. Firms from the consumer products and the paper and forest industries were also significant sources of original issue high-yield bonds through this period, though largely in the U.S. Table 7.0 also shows that there is a greater number of industries issuing high-yield bonds in the U.S. compared to the concentration in Canada. This result is indicative of the fact that the market for non-investment grade bonds in the U.S. is more mature. This dichotomy is evidenced by the total dollar value of high-yield bonds placed in Canada and the U.S. over this 3-year period. For example, over these three years $3.3 billion and $16.4 billion in high-yield bonds were placed in Canada and the U.S. respectively (see Chart 3.1 in chapter three). The proportion of Canadian high-yield issues placed in Canada and the U.S. was clearly shown in Table 3.1 in chapter three. However, the share of high-yield to total corporate bonds issued in domestic public market is increasing. In 1996 high-yield issues accounted for only 3.7% of total corporate bonds, but jumped to 15.1% in 1997. However, the proportion of high-yield declined to 7.5% in 1998, but is attributable to the Asian Crisis which unsettled the bond market. Table 7.1 illustrates this change as well as providing a dollar breakdown for each industry for 1996, 1997, and 1998.

Table 7.0 below provides a breakdown for 1996-1998 period by industry which industries have accounted for the largest share of investment grade bonds sold by Canadian firms in the U.S. and at home. Of investment grade bonds sold in the Canadian public market, the financial services sector is by far the single largest issuer, with the real estate sector a distant second followed by transportation and environmental services. The dominance of financial services in the domestic market is clearly shown in both Table 7.0 and 7.1 below. Financial services is also the single largest issuer of high grade bonds in the U.S. market, and is followed closely by oil and gas, and transportation and environmental services. While the majority of Canadian high-yield bonds are sold to U.S. investors, the reverse is true of investment grade bonds. For example, over these three years $30.3 billion and $21.6 billion in investment grade bonds were placed in Canada and the U.S. respectively (see Chart C3.1 in appendix C). The fact that most investment grade bonds are sold to domestic investors and the bulk of high-yield

Table 7.0 Industry Proportions based value of Issues, 1996 - 1998

Industry	of HY placed in Canada	of IG placed in Canada	of HY placed in the U.S.	of IG placed in the U.S.
Comm. & Media	29%	2%	12%	2%
Conglomerates	0%	0%	0%	2%
Consumer Products	3%	2%	17%	0%
Financial Services	0%	47%	0%	26%
Paper & Forest Products	6%	1%	11%	9%
Gas & Electric Utilities	0%	2%	0%	0%
Industrial Products	5%	2%	9%	8%
Merchandising	0%	3%	0%	0%
Metals & Minerals	6%	0%	3%	10%
Oil & Gas	0%	1%	7%	21%
Pipelines	0%	1%	0%	8%
Real Estate	10%	20%	1%	0%
Telephone	33%	4%	36%	0%
Transportation & Environment	7%	17%	3%	15%
Total	100%	100%	100%	100%

Source: CIBC Wood Gundy

is placed in the U.S. is a testament to the immaturity of Canada's public high-yield market. As noted, however, the proportion of high-yield to total corporate bonds has increased in the first three years of existence.

The concentration of high-yield bond issues from corporations involved in communication, media, and the telephone industry poses several questions. In the context of the theory of corporate capital structure the two prominent questions are: have these industries had strong profits and cashflows?, and have these sectors undertaken significant investment programs, particularly in fixed capital? To gain an understanding of changes in profitability and investments, a short case study focussing on Rogers Communications Inc. will be used to highlight firm-level factors that have motivated these firms to issue bonds, and identify why debt issues from these sectors are more likely to be rated below investment grade.

Table 7.1 Canadian Bond Market: New Issue Volume, 1996 - 1998

	1996			1997			1998		
Industry	HY	IG	HY to Total	HY	IG	HY to Total	HY	IG	HY to Total
	($ millions)			*($ millions)*			*($ millions)*		
Comm. & Media	148	350	29.7%	390	250	60.9%	425	100	81.0%
Conglomerates	0	0	-	0	0	-	0	0	-
Consumer Products	0	0	-	115	200	36.5%	0	300	0.0%
Financial Services	0	4,350	0.0%	0	4,950	0.0%	0	4,843	0.0%
Paper & Forest Products	0	0	-	0	125	0.0%	215	125	63.2%
Gas & Electric Utilities	0	261	0.0%	0	68	0.0%	0	250	0.0%
Industrial Products	0	175	0.0%	70	0	100.0%	85	297	22.3%
Merchandising	0	375	0.0%	0	375	0.0%	0	150	0.0%
Metals & Minerals	0	0	-	210	0	100.0%	0	0	-
Oil & Gas	0	100	0.0%	0	200	0.0%	0	150	0.0%
Pipelines	0	250	0.0%	0	0	-	0	0	-
Real Estate	0	255	0.0%	225	3,458	6.1%	113	2,262	4.8%
Telephone	160	480	25.0%	936	665	58.5%	0	0	-
Transportation & Environment	0	1,350	0.0%	230	1,900	10.8%	0	1,802	0.0%
Total	308	7,946	3.7%	2,176	12,191	15.1%	838	10,279	7.5%

Source: CIBC Wood Gundy

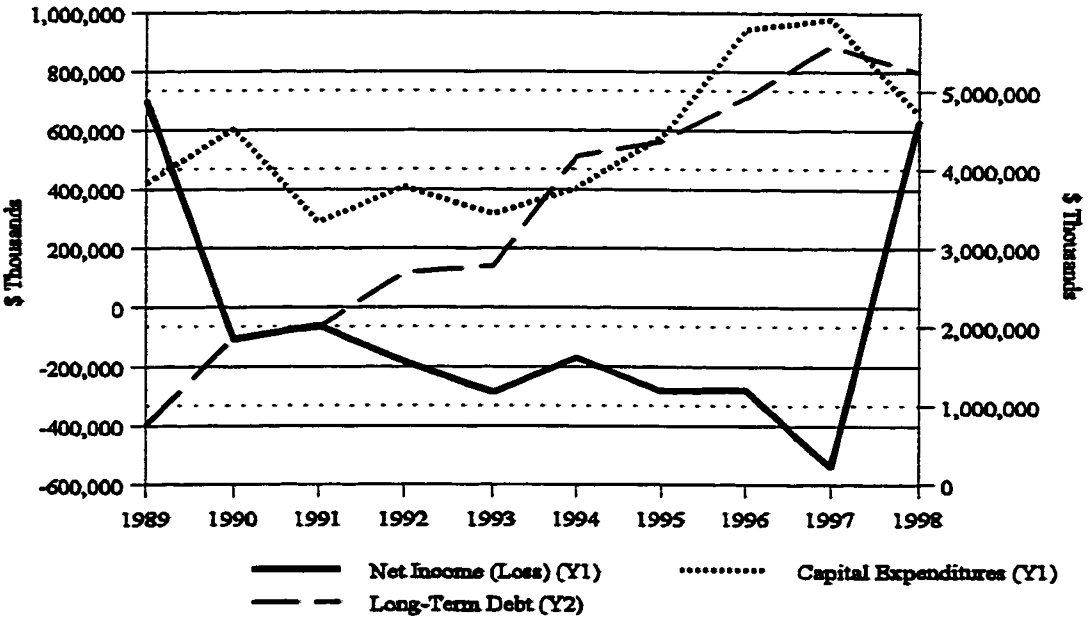
The underlying forces propelling economic globalization are the expansion of international trade, the liberalization of telecommunications, and technological advances that reduce the impedients or challenges of conducting commerce across large distances. The result of these forces is that trade is freer now than it was prior to the first World War. Arguably the rapid change in technology is the single biggest driver of economic globalization. For a point of reference with respect to technological advances and how rapid changes are occurring it is interesting to recall that it was in 1981 that IBM introduced the first personal computer, cellular phones were introduced to Canada in 1983, the introduction of Microsoft's Windows platform in 1991, and the Internet was not open for commercial users until 1994, but is today an integral part of the way people and firms communicate (Cooper, 1999). Change is happening so quickly that it is frequently referred to as a revolution, and the sectors at the forefront of the digital and information revolution will be the fast growing sectors in the Canadian economy over the next two years (Mamourian, et al. 1999).

The most profound effect of the revolution is the convergence between media, or a blurring of borders between telecommunications, computing, and media. The key to convergence is digital technology that facilitates the interconnection and integration of satellites, wireless, microwave, cable TV networks, and telephone lines into one overall system, and enables traditionally separate sectors to enter each others' markets. At the industry level convergence manifests in mergers, alliances, and more intense competition, and at the service level it has resulted in a growing range of services and products (Tarjanne, 1999).

This technological revolution, it is argued, is creating a structural shift in the world economy equivalent to the creation of movable type by Gutenberg in 1455, and is creating a new meaning for literacy, as well as impact productive processes like the railroad and the assembly line. And some are reviving Schumpeter's (1943) long-wave theory of economic growth brought on by innovation, notably growth theorist Paul Romer (Cooper, 1999). Some argue that technology has caused the death of inflation in the 1990s and refer to the change as the "new economy". Regardless of whether technology has created a new economic paradigm, or will lead to a new 20 to 25 year upwave of economic growth, the rapid change in technology has generated a need for new regulations governing the industries that are intimately involved in the convergence.

In Canada regulators have been forced to react. Competition has been opened in the telecommunications and cable sectors, formerly natural monopolies, because technological advances have reduced the cost for new entrants. For the former monopolies investment planning must now anticipate rapid changes in technology, in customer demand, and in competitor response. In addition to opening former monopolies to competition, the creation of mobile communications networks has created an entirely new industry and provides additional competition to traditional telecommunication firms. Canada's cellular industry was launched in 1983 with licenses going to Rogers Cantel and BCE Inc. and was extended in 1995 with the entrance of Clearnet Inc. and Microcell Communications. It is the wireless sector that is the fastest growing segment of telecommunications (Campbell, 1999).

Chart 7.0 Rogers Communications Inc. 1989 - 1998



Source: Rogers Communications Inc., Annual Reports

The complement to technological change is investment, which is needed to exploit or employ technological advances, and investment requirements directly affects the need for corporations to raise funds to exploit new opportunities. In fact, Verma and Chaykowski (1997) state that while capital expenditures are influenced by the business cycle, capital expenditure patterns are likely to be more closely associated with technological changes in this industry.

The Rogers group has led the communications sector, placing three high-yield issues in Canada and the five in the U.S. in the past three years, Clearnet has placed two high-yield issues in the nascent domestic public market, and Microcell has placed one. BCE has not issued non-investment bonds through this period, though they have issued investment grade bonds. As shown in the previous chapter business investment is a positive and significant factor of net new corporate bonds.

Table 7.2 Microcell Financial Highlights

Year	1995	1996	1997	1998
		($ '000)		
Total Revenue	0	945	27,319	143,412
EBITDA	-4,282	-29,054	-132,890	-219,000
Net Income (Loss)	-3,022	-44,390	-231,487	-408,920
Capital Assets	35,519	200,312	362,262	489,380
Long-Term Debt	9,440	340,711	726,872	965,617

Source: MicrocellTelecom, Annual Reports

Chart 7.0 illustrates that Rogers Communications Inc. has been investing heavily in capital assets, particularly after 1995. Capital expenditures increased $365 million, or 63%, to $945 million in 1996 from $580 million in 1995. Over the same period long-term debt increased $562 million, or 13%, to $4.92 billion from $4.36 billion. This increase in debt and investment is consistent with the theory presented in chapter five and the econometric analysis in chapter six, which revealed a positive and significant coefficient for the investment variable. However, the relationship between Rogers profits and the change in long-term debt is not consistent with the theoretical argument that profits should be a positive determinant of new bond issues. Chart 7.0 shows that through most of the 1990s Rogers Communications experienced large net losses rather the than net gains suggested by the theory, and that there is a negative relationship between net income and capital expenditures. The pattern of Rogers' profits, investment, and new borrowing suggests that investment opportunities should have a stronger impact on the decision to borrow than the presence of profits. Regression results in chapter six indicate that investment is a more important variable, and that it is more important than the cost of borrowing. Moreover, the lack of profits provides a clue to why bonds issued by Rogers would be rated below investment grade. Lenders are exposed to significant risk if the company's business plans fail to materialize as planned. That is, with low or negative profits a firm may have difficultly repaying debts. While Rogers has experienced nearly a decade of negative net income, cashflow as measured by EBITDA has at least been positive.[30] Other high-yield issuers like Microcell and ClearNet have experienced negative cashflow as well as negative accounting profits, which is why these firms' bond issues are rated below investment grade. Table 7.2 highlights some of Microcell's financial statistics. These firms have also undertaken significant investments in capital assets.

Cashflow to total debt is one key criterion that the Dominion Bond Rating Service looks at when determining ratings (see Appendix A). For an investment grade rating, cashflow to debt must be greater than 20%, thus if cashflow is negative this standard will not be met. Furthermore, stability of earnings is a key rating standard. To garner an investment grade rating earnings should be relatively stable. This standard is not met by Rogers, which has volatile and negative earnings. A related criterion is overall industry conditions. In addition to these financial criteria, for a firm's debt to be rated investment grade, any deregulation and technological change should be under control; whereas if deregulation is in process and an industry is experiencing rapid technology change then the overall business environment will be highly uncertain, and firms in this environment are more likely to be rated non-investment grade.[31]

Based on the above analysis it is clear that corporate investments should be a significant determinant of new bond issues, and that profits (and cashflow) rather than being a determinant of borrowing will be a significant determinant of the borrower's credit worthiness. These conclusions are consistent with the empirical conclusions of chapter six, which found that corporate investment is a positive and significant determinant of the supply of corporate bonds, while profits did not exert a material influence on the supply of new bonds. However, the lack of explanatory power of corporate earnings in the previous chapter and its apparent lack relevance in Rogers borrowing activities suggests that earnings are not the important determinant that theory asserts. The conclusion of importance of corporate investment, though is not a huge surprise, is expected because companies should tend to seek to acquire financial capital when they have profitable investment opportunities available.

Chapter Eight

Conclusion

This analysis of Canada's nascent high-yield market was motivated by a strong interest in economics, corporate finance, a long time fascination with the financial markets, and the lack of any serious theoretical and empirical research about recent developments in the domestic public bond market. The focus was to develop a model grounded in economic theory to confirm or dismiss the influences that have been cited numerous times in the financial press. Hence, it is hoped that this analysis fills a void in the literature and assists others who may wish to understand the recent development in Canada's bond market.

Canada's Nascent High-Yield Market is a synthesis of different literatures and began by examining the junk bond market in the U.S. to gain insight and understanding of the impetuses that spurred the evolution in Canada's fixed-income market. The literature focussing on junk bond market in the U.S. concluded volatile interest rates and uncertain inflation were the primary economic drivers. For firms junk bonds served to lower borrowing costs, reduce risk, and provide flexibility for U.S. firms, and the muted sensitivity of non-investment grade bonds to interest rate changes and greater sensitivity to corporate profits provide investors with return superior to investment grade bonds with less risk. The Canadian macro economy performed much differently through the 1990 when the Canadian high-yield market emerged than the U.S. economy did in the late 1970s and early 1980s. Interest rates were less volatile and certainly lower, and inflation declined through the 1990s and has now been below 2% for several years.

Thus firms did not substitute away from bank loans to increase certainty, though they may have done so to exploit historically low long-term interest rates. However, the empirical analysis in chapter six failed to find support for interest rates as a material determinant of the supply of corporate bonds. Therefore, the hypothesis that changing spread had an impact on the bond market was rejected. The price of stocks did appear as an important positive factor in the supply of new bonds, though in the reverse direction than expected. Theory asserts that all else equal, the higher the price of a firm's stock and therefore the lower the cost of raising equity capital that equity issues would be a more attractive method of acquiring financing. This reasoning implicitly assumes that equity and debt are substitutes. The estimated coefficient on the price of equities as measured by the TSE 300 PE ratio was positive rather the expected negative sign. It is believed that the positive influence can be attributed to equity and debt being only weak substitutes. It is important to remember that selling new shares in a firm dilutes the ownership of existing shareholders. Thus the owners of a firm may not want to dilute their holdings. In addition to this factor as the firm's share prices increase this lowers the ratio of debt to total capitalization and may make it less costly to issue bonds because this is an important criterion is the determination of the credit rating a firm receives.

While low interest rates and inflation appear not to provide a determinant of supply, the empirical analysis suggests that these factors were important on the demand side of the equation. The return on triple-B rated corporate bonds did positively influence the demand for corporate bond, particularly lower rated bonds. Because falling interest rates and inflation are key factors determining the returns to bonds the significance of the return on triple-B rated bonds supports the hypothesis that low interest rates caused investors to shift from low yielding bank deposits to mutual funds. And recalling Chart 4.5, the proportion of fund assets invested in corporate bonds increased throughout the decade. When the significance of the return on triple-B rated bonds is consider in conjunction with the entrance of high-yield specialty mutual funds in the middle of the decade the hypothesis that mutual funds played an important role in the development of the nascent high-yield market is supported. However, mutual fund assets as a determinant of the demand for all corporate bonds was rejected. Augmenting the demand for corporate bonds in general has been the dearth of new government bonds. The empirical analysis confirms economic theory that asserts government borrowing will crowd-out private borrowing and the hypothesis that reduced government borrowing has positively influenced the supply of new corporate bonds.

The theory reviewed in chapter five to develop a model of supply identified two variables that were not commonly cited, if at all, in the financial press as factors in the growth of the high-yield market. These are corporate pre-tax earnings and investment, especially investment in fixed or capital assets. It was argued that both variables should positively affect the supply of new corporate bonds. The econometric model supported pre-tax earning as a positive determinant of supply, though the significance of the coefficient was not strong. Before correcting for serial correlation the coefficient on earnings was positive, but not statistically significant. Business investment appeared as a more robust determinant of the supply of corporate bonds, and remained a positive and statistically significant variable when changes were made to the model. For example, it was argued that investment should be considered a contemporaneous influence on supply, but even when lagged or entered ahead one period investment remained a material influence on the supply of bonds. Although when investment is lagged the fit of the model describing the supply of corporate bonds exhibited a marked deterioration. This result was not a surprise given that a lagged investment variable makes no economic sense. That is, a firm cannot investment prior to acquiring the necessary financial capital to execute their business plan.

The findings of the industry analysis in chapter seven was consistent with the empirical results that profit is a weak positive determinant and that corporate investment should be a very important explanatory variable of the supply of corporate bonds. While one would expect that firms require the presence of strong earnings or at least positive accounting profits to borrow in the bond market, this is not necessarily the case with firms issuing non-investment grade bonds. However, almost certainly a firm must acquire financial capital to fund investment projects if it lacks sufficient internal funds.

The communication and media, and telephone industries have been the biggest issuers of high-yield bonds in the Canadian public market. These industries are at the forefront of the digital revolution and competition has been opened in formerly regulated monopolies. Technological change has created completely new industries, lowered the cost of entry into old natural monopolies, and has led to a convergence of these industries. The result of technological change has been heavy capital investment creating a large requirement for financial capital. Many of these firms that are undertaking massive capital investment have no profits and in many cases negative cashflow. It is because of the lack of profits and negative cashflow that the bonds issued by such firms are considered risky and therefore rated below investment grade.

In summary this study asserts that most important factors contributing to the development of a domestic high-yield market have been secular decline of inflation which has driven down interest rates and bond and stock prices up to stimulate investor demand for marketable securities with higher potential returns than bank deposits. This environment created an opportunity for the entrance of specialty high-yield funds. While direct empirical support was not found for mutual fund assets as determinant of overall supply increase of corporate bonds, all other evidence suggests that mutual funds did play a vital role in the nascent high-yield market by attenuating institutional barriers that restrict demand. To balance demand-side pressures have been technological change which has caused firms like Rogers to invest heavily in capital assets to survive and exploit globalization, the digital revolution, and de-regulation.

Endnotes

1.*Junk bonds* and ***high-yield bonds*** both refer to corporate bonds or debentures that are rated below investment grade. These three terms will be used interchangeably throughout this paper. The Dominion Bond Rating Service (DBRS) defines non-investment grade to be bonds or debentures that carry a credit rating of BB(high) or lower. A credit rating is meant to indicate the firm's ability to meet its financial obligations, and a lower rating indicates less ability to meet such obligations. Hence, a bond rating indicates the perceived risk of default associated with a debt security, and credit worthiness of the issuer. For example, the Canadian Bond Rating Service (CBRS, 1997) has estimated that the default rate for investment grade bonds varied between 2.59% and 3.71%, but was 7.97% for non-investment grade bonds rated B+ between 1973 and 1996. The rating is an assessment of the issuer's ability to meet the contractual obligations as set out in the bond's trust indenture. In determining quality, a rating agency will conduct a thorough review of both the micro and macro factors that may influence a company's financial health and its ability to meet fixed financial obligations. There are four major North American rating agencies that rate Canadian corporate debt. In Canada the two rating agencies are DBRS and CBRS, and the two rating agencies in the U.S. are Moody's Investor Service, Inc. and Standard & Poor's Corporation. The Dominion Bond Rating Service of Canada (DBRS) defines high-yield debt as bonds carrying a credit rating of BB(high) or lower, and is consistent with the definition of non-investment grade bonds in the United States. In Canada, however, many institutions define high-yield to be BBB(high) or lower. High-yield bonds may also be unrated, but not all unrated debt is speculative.

2.*Private Placement* is a term generally used to describe a debt or equity issue placed privately, usually with institutional investors using statutory exemptions from the requirement to file a prospectus with regulatory authorities. The exemption to file a prospectus places certain restrictions on the issues for re-sale. The buyer of the security in a private deal is better able to influence the terms of the deal than when buying securities in the public market.

3. Based on an interview with Joanna Zapior, Director of Fixed Income Research, at CIBC Wood Gundy November 9, 1998

4.Taggart (1986) measures internal funds as the sum of retained earnings and depreciation.

5.*Duration* is the measure of a bond's price sensitivity to changes in interest rates (price elasticity of a coupon with respect to infinitesimal changes in its own yield to maturity). The shorter the duration of a bond, the less sensitive its price is to changes in interest rates. The size of the bond's coupon and its term to maturity influence duration. A larger coupon will shorten the duration as will a shorter term to maturity. Because non-investment grade bonds have larger coupons and tend to have shorter term to maturity they have short durations and are less sensitive to interest fluctuations than investment grade bonds. Chart 4.7 in chapter four illustrates this concept.

6.The *Prudent Man* rule dictated that fiduciaries "observe how men of prudence, discretion and intelligence manage their own affairs, not in regard to speculation, but in regard to the permanent disposition of their funds, considering the probable income, as well as the probable safety of the capital invested." This rule forced portfolio managers to ignore the benefit of adding non-investment grade bonds to a diversified portfolio, effectively discounting Modern Portfolio Theory.

7.*Subordinated debt* refer to debt securities that are subordinate to other debt securities. That is, creditors holding subordinate debt rank lower in priority to be repaid. Because of lower repayment priority a hierarchical principle applies to the credit rating each debt security receives –the lower the priority ranking the lower the rating (see Schroeder, 1992).

8.The amount of new high-yield and investment grade bonds issued refers to the par value of gross amount issued in Canadian dollars. The data was kindly provided by Joanna Zapior at Wood Gundy.

9.Scotia Capital Markets, Canadian High-Yield Research, May/June 1998

10.Alberta Heritage Savings Trust Fund, Annual Report, 1998

11.Based on an interview with Joanna Zapior, Director of Fixed Income Research, at CIBC Wood Gundy, November 9, 1998.

12.Of the provinces only British Columbia and Ontario ran deficits in 1998. Preliminary figures from the March 1999 Fiscal Monitor indicate that the federal government has a budgetary surplus of $9.1 billion for 1998-1999; and reported in the June 1999 Fiscal Monitor is a year-to-date surplus of $4.8 billion. Thus the net borrowing requirements by the provinces and the federal government will continue to decline.

13.Thanks to, defence committee member, Dr. Ken McKenzie for his helpful comments and information with respect to the taxation of investment income.

14.John Lintner (1965) and J. Mossin (1966) also augment Markowitz's portfolio theory with the inclusion of a risk-free asset.

15.In practice, however, various short-term debt securities generally referred to as "money"are used as the risk-free asset. Securities like government T-bills, commercial paper, bank deposits, and Guaranteed Investment Certificates (GICs) are all classed as money. However, not all money is considered risk-free. Professional portfolio managers consider T-bills risk-free because default risk is effectively zero. The average individual or family more likely considers bank deposits as the risk-free asset of choice.

16.The Bank of Canada measures 'expected inflation' as the difference between the yield on Government long-term bonds and the yield on Government of Canada long-term Real Return bonds. The data series in Chart 4.1 begins in November 1991 because that is the earliest data on Real Return bonds available.

17.Broad money measure M2++ includes M2+ and bond and equity assets in mutual funds.

18.As of September 1991, IFIC members represent 97% of assets under management in Canada. Prior to that, the figure was approximately 75-80%.

19.Total investment fund assets excludes foreign securities and mortgage backed securities.

20. For an excellent discussion of Modigliani and Miller see Ross, et al. (1995)

21. For an excellent discussion of CAPM see Ross, et al. (1995)

22. These floatation costs are only rough approximations and actual cost would be negotiated. The point of the exposition is to highlight that the transaction costs for issuing debt is lower than for equity issues.

23. Internal funds are defined by Donaldson (1961) as retained earnings plus depreciation. Effectively, internal funds is the cash available to finance investment opportunities.

24. From an interview with Avery Shenfeld December 1997.

25. It should be noted that the spread between long term Government of Canada bonds and long-term triple-B corporate bonds would not have become negative, because government issues function as a benchmark for pricing other fixed-income securities. The negative spread between the universe of triple-B and government long bonds is the result of short maturities being included in the universe of triple-B rated bonds. However, corporate spreads between similar maturities did narrow significantly through this period.

26.Gary Feltham, portfolio manager at Mawer Investment Management Inc.

27.Augmenting mutual funds by adding bank deposit may create a more reasonable measure of financial wealth. This modification was tried and the wealth coefficient remained negative and insignificant. In addition the fit of the model deteriorated noticeably. Also tried was modifying the wealth variable to better pick up the portfolio shift. A ratio of mutual funds to the sum of mutual fund assets and bank deposits was considered. The new shift variables remained a negative influence on the dependent variable, but became significant at 10%. The coefficient on the investment grade variable also became significant, but retained the incorrect sign. However, the spread between Canada and U.S. high-yield bonds became significant and the sign switched to negative–the correct sign. Though the domestic corporate spread variable retianed its positive sign. The government debt variable became insignificant. Overall the model became non-stationary.

28. One of the key criterion that bond rating agencies focus on is the net debt-to-total capital (see 'Key Standard' in Appendix A).

29. The Q-statistic for the modified equation 6.8 is 33.2 at 20 lags and the chi-squared value at 10% is 34.38. However, the modified equation 6.9 generated a Q-statistic of 43.48 for 20 lag resulting in the null hypothesis that all autocorrelation coefficients are jointly equal to zero is rejected indicating that first differencing the equation has caused the equation to become non-stationary.

30. EBITDA denotes Earnings before interest, taxes, depreciation, and amortization and is commonly used as a measure for cashflow.

31. See Appendix A for the definition of bond ratings and the key standards or criterion used in judging a firm and its debt.

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Appendix A

Credit Ratings

A1.0 What a Rating Means

The following section is taken from the Canadian Bond Rating Services "Objectives and Rating Definitions" (1986) and describes their bond rating standards.

The rationale behind credit ratings is to provide investors with a readily identifiable measure of the credit quality of an issue., in order that its relative level of risk and hence the required return may be compared to other types of securities throughout a diversified portfolio.

A2.0 Long-Term Bond Rating Definitions

A++ Highest Quality

This category encompasses bonds of outstanding quality. They possess the highest degree of protection of principal and interest. Companies with debt rated A++ are generally large national and/or multinational corporations whose products or services are essential to the Canadian economy.

These companies are the acknowledged leaders in their respective industries and have clearly demonstrated their ability to best withstand adverse economic or trade conditions, either national or international in scope.

Characteristically, these companies have had a long and creditable history of superior debt protection, in which the quality of their assets and earnings has been constantly maintained or improved, with strong evidence that this will continue.

A+ Very Good Quality

Bonds rated A+ are similar in characteristics to those rated A++ and can also be considered superior in quality. These companies have demonstrated a long, satisfactory history of growth with above-average protection of principal and interest on their debt securities.

These bonds are generally rated lower in quality because the margin of assets or earnings protection may not be as large or as stable as those rated A++. In both these categories the nature and quality of the asset and earning coverages are more important than the numerical values of the ratios.

A Good Quality

Bonds rated A are considered to be good quality securities and to have favorable long-term investment characteristics. The main feature that distinguishes them from the higher rated securities is that these companies are more susceptible to adverse trade or economic conditions and the protection is consequently lower than for the categories of A++ and A+.

In all cases the A rated companies have maintained a history of adequate assets and earnings protection. There may be certain elements that may impair this protection sometime in the future. Confidence that the current overall financial position will be maintained or improved is slightly lower than for the securities rated above.

B++ Medium Quality

Bonds rated B++ are classified as medium or average grade credits and are considered to be investment grade. These companies are generally more susceptible than any of the higher rated companies to swings in economic or trade conditions that would cause a deterioration in protection should the company enter a period of poor operating conditions.

There may be factors present either from within or without the company that may adversely affect the long-term level of protection of the debt. These companies bear closer scrutiny but in all cases both interest and principal are adequately protected at the present time.

B++ (low) and B+ Lower Medium Quality (Non-Investment Grade)

Bonds which are rated B+ are considered to be lower medium grade securities and have limited long-term protected investment characteristics. Assets and earnings coverage may be modest or unstable.

A significant deterioration in interest and principal protection may occur during periods of adverse economic or trade conditions. During periods of normal or improving economic conditions assets and earnings protection are adequate; however, the company's ability to continually improve its financial position and level of debt protection is at present limited.

B Poor Quality

Securities rated B lack most qualities necessary for long-term fixed income investment. Companies in this category have a general history of volatile operating conditions, and the assurance has been in doubt that principal and interest protection will be maintained at an adequate level. Current coverages may be below industry standards and there is little assurance that debt protection will significantly improve.

C Speculative Quality

Securities in this category are clearly speculative. The companies are generally junior in many respects and there is little assurance that the adequate coverage of principal and interest can be maintained uninterruptedly over a period of time.

D Default

Bonds in this category are in default of some provisions in their trust deed, and the companies may or may not be in the process of liquidation.

Rating Suspended Suspended

A company which has its rating currently suspended is experiencing severe financial or operating problems of which the outcome is uncertain. The company may or may not be in default but at present there is uncertainty as to its ability to pay off its debt.

A3.0 High and Low Designation Definitions

A high or low designation after a rating indicates an issuer's relative strength within a rating category. For example, B++ is considered investment grade, while B++(low) is classed as High-yield.

A4.0 Key Standards: Investment Grade vs. High Yield Securities

The following list is taken from "The High Yield Debt Market in Canada" DBRS (1994) highlights some of the most important criteria used to assess a firm's credit worthiness.

	Investment Grade	High yield: below BBB (low)
Net interest coverage:	Over 2 times through a cycle	Under 2 times and unstable
% net debt/total capital:	Below 40%	Above 40%
Cash flow/total debt:	Over 20% and stable	Under 20% and unstable
Fixed charges coverage:	Over 2 times through a cycle	Under 2 times and unstable
Return on equity:	Over 400 B.P. above inflation measured through the cycle	Under 400 B.P. above inflation measured through a cycle
Minimum equity:	Over $200 million	Below $200 million
Size:	Shareholders equity above $200-300 million	Equity below $200-300 million
Stability:	Relatively stable earnings and industry conditions	Volatile earnings and industry conditions
Niche:	Company has special niche in its product line	No special niche in company product line
Rankings:	Ranks in top three companies in the industry	Ranks below top 3 positions in the industry
Industry conditions:	Any deregulation and technological change under control; Industry shows reasonable growth	Deregulation or rapid technology change raise risk; Growth may be either very slow or too fast

Discussion of Key Standards

(a) Fixed charges and interest coverage should be at least 2 times through a cycle and the number of times coverage falls below this level is limited.

(b) The percentage of debt in the total capitalization is generally below 40% for investment grade companies, unless the company or industry is unusually stable. Higher yield ratings reflect the additional risk of larger debt positions.

(c) Cash flow is defined as earnings plus depreciation plus deferred taxes. Generally, for an investment grade rating, cash flow should equal at least 20% of debt. This means that cash flow, as defined, should be able to repay all debt in a time period of under five years. If a Company is unusually stable, this standard may be relaxed. Total debt is used in the denominator of the ratio, so allowance must be made for seasonal factors.

(d) For an investment grade rating, return on equity should be at least 400 basis points over inflation through a cycle. For individual years in between, many cyclical companies will fall below this level in any one year. Also, if there is unusually high leverage, return on equity tends to be distorted. Thus, if the difference between return on capital is in between, many cyclical companies will fall below this level in any one year. Thus, if the difference between return on capital and return on equity exceeds 400 basis points, return on equity is probably distorted.

(e) Size is an important factor since larger more dominant firms tend to have more resources to avoid bankruptcy. Generally, it is difficult for companies with equity below $200-300 million to attain investment grade ratings unless there are specific strengths or niches present. Larger companies have greater critical mass, efficiency and economies of scale, and have natural advantages.

(f) The ranking of a company within an industry is important. Generally, the #1 firm either dominates or flourishes, the #2 firm performs satisfactorily, and #3 struggles to compete, but is sufficiently strong enough to survive. Below #3, a company either eventually goes under, restructures, changes its focus of operations, or needs a special niche to survive. It likely will not be very profitable or rated highly.

(g) Stability is an important consideration in a rating. Even though earnings at the top of the cycle may be exceptional, if a company consistently has heavy losses, it may never emerge from the bottom of the cycle, and goes bankrupt.

(h) Industry conditions can play a large role in a rating. Deregulation of an industry is disruptive, as is rapid technology change, since both items create uncertainty. Rapid growth in an industry can also be unsettling, as it may lead to over-expansion. Growing slowly may also be a problem, as well as low barriers to entry into the industry, which leads to excess competition.

(i) Overall, it is normally a combination of events and not one individual factor that determines the rating.

Appendix B

A Collection of Tabular Data

Table B3.0 Canadian Gross New Issue Volume, 1996 -1999*

	Domestic Market			U.S. Market		
Month	Investment Grade	High Yield	Total	Investment Grade	High Yield	Total
		(C$ Millions)			(US$ Millions)	
Jan-96	250	0	250	0	125	125
Feb-96	400	75	475	450	100	550
Mar-96	100	0	100	0	475	475
April-96	715	0	715	125	34	159
May-96	551	160	711	250	740	990
June-96	105	0	105	725	0	725
July-96	150	0	150	0	275	275
Aug-96	125	0	125	0	250	250
Sept-96	725	0	725	108	125	233
Oct-96	1,700	0	1,700	250	125	375
Nov-96	1,225	0	1,225	800	275	1,075
Dec-96	1,900	73	1,973	100	0	100
Total	*7,946*	*308*	*8,254*	*2,808*	*2,524*	*5,332*
Jan-97	1,125	0	1,125	650	110	760
Feb-97	900	100	1,000	0	150	150
Mar-97	1,095	0	1,095	0	1,220	1,220
Apr-97	0	110	110	500	100	600
May-97	1,440	0	1,440	270	200	470
Jun-97	750	115	865	650	625	1,275
Jul-97	1,300	856	2,156	650	580	1,230
Aug-97	60	100	160	0	175	175
Sept-97	2,260	430	2,690	425	1,040	1,465
Oct-97	1,016	250	1,266	300	570	870
Nov-97	1,763	125	1,888	130	405	535
Dec-97	572	0	572	750	0	750
Total	*12,281*	*2,086*	*14,367*	*4,325*	*5,175*	*9,500*
Jan-98	260	215	475	0	325	325
Feb-98	1,749	0	1,749	400	0	400
Mar-98	930	0	930	200	0	200
Apr-98	2,307	113	2,420	1,500	310	1,810
May-98	1,270	300	1,570	0	1,193	1,193
June-98	780	75	855	0	1,041	1,041
July-98	1,250	85	1,335	925	555	1,480
Aug-98	211	0	211	225	125	350
Sept-98	0	0	0	400	0	400
Oct-98	50	0	50	300	0	300
Nov-98	672	0	672	1,250	425	1,675
Dec-98	750	0	750	200	0	200
Total	*10,229*	*788*	*11,017*	*5,400*	*3,974*	*9,374*
Jan-99	421	175	596	1,100	0	1,100
Feb-99	1,000	169	1,169	1,345	0	1,345
Total	*1,421*	*344*	*1,765*	*2,445*	*0*	*2,445*
Total 1996-1999	31,877	3,526	35,403	14,978	11,673	26,651

Source: CIBC Wood Gundy

Table B4.0 Short-Term Interest Rates

Year	Bank Rate	5-Yr Term Rate	Non-Chq.	90 Day Commercial Paper	3 Month T-bill
1970	7.12%	7.62%	6.17%	7.34%	6.02%
1971	5.19%	6.48%	4.54%	4.51%	3.51%
1972	4.75%	6.88%	4.00%	5.10%	3.56%
1973	6.12%	7.88%	5.48%	7.45%	5.51%
1974	8.50%	8.81%	8.50%	10.51%	7.78%
1975	8.50%	8.27%	7.00%	7.93%	7.36%
1976	9.29%	9.31%	7.83%	9.17%	8.86%
1977	7.71%	7.79%	6.00%	7.48%	7.34%
1978	8.98%	8.79%	7.04%	8.83%	8.67%
1979	12.10%	10.02%	10.12%	12.07%	11.66%
1980	12.89%	11.25%	11.15%	13.15%	12.72%
1981	17.93%	14.90%	15.42%	18.33%	17.82%
1982	13.96%	12.94%	11.50%	14.15%	13.67%
1983	9.55%	8.40%	6.85%	9.45%	9.31%
1984	11.31%	11.02%	7.69%	11.19%	11.05%
1985	9.65%	9.62%	6.08%	9.56%	9.44%
1986	9.21%	8.25%	6.02%	9.16%	8.97%
1987	8.40%	7.17%	4.81%	8.37%	8.16%
1988	9.69%	7.94%	5.69%	9.67%	9.46%
1989	12.29%	9.71%	8.08%	12.21%	12.05%
1990	13.04%	10.33%	8.77%	13.03%	12.81%
1991	9.03%	8.10%	4.48%	8.91%	8.76%
1992	6.78%	6.58%	2.27%	6.74%	6.57%
1993	5.09%	5.29%	0.77%	4.97%	4.84%
1994	5.77%	6.79%	0.50%	5.66%	5.52%
1995	7.31%	6.70%	0.50%	7.22%	7.05%
1996	4.53%	5.33%	0.50%	4.35%	4.21%
1997	3.52%	4.56%	0.50%	3.61%	3.20%
1998	5.10%	4.25%	0.24%	5.05%	4.72%

Source: CANSIM Series: B14006, B14045, B14019, B14017 and B14060

Table B4.1 Return on Alternate Assets

Year	Univ Gov't Bonds	Univ Corp	Univ AA Corp.	Univ BBB Corp.	TSE 300
1980	1.85%	1.87%	-	-	34.77%
1981	1.23%	1.12%	-	-	1.54%
1982	21.06%	21.96%	-	-	-24.01%
1983	27.58%	30.77%	-	-	44.30%
1984	7.65%	9.60%	-	-	-1.10%
1985	22.47%	22.43%	-	-	15.89%
1986	19.16%	17.10%	6.12%	5.06%	10.99%
1987	8.25%	7.51%	6.79%	8.42%	18.51%
1988	8.85%	10.21%	10.34%	10.56%	-7.43%
1989	10.44%	10.85%	11.03%	10.51%	15.10%
1990	5.25%	5.00%	5.01%	5.77%	-10.01%
1991	18.86%	20.13%	20.19%	19.01%	1.41%
1992	15.84%	15.81%	16.30%	13.42%	-1.92%
1993	14.12%	14.66%	14.62%	15.42%	14.73%
1994	2.77%	4.39%	3.62%	11.13%	9.73%
1995	11.33%	12.53%	11.95%	15.00%	3.50%
1996	13.51%	14.42%	14.08%	15.48%	18.81%
1997	12.47%	13.54%	12.92%	13.26%	22.59%
1998	9.69%	9.39%	8.90%	7.06%	4.63%
19 Yr. (1980 - 98) Geo. Avg. Return	**12.01%**	**12.57%**	**N/A**	**N/A**	**7.96%**
10 Yr. (1989 - 98) Geo. Avg. Return	**11.33%**	**11.98%**	**11.76%**	**12.54%**	**7.42%**

Source: CANSIM Series D89830, D89826, D89810, D89818, and B4237

Table B4.2 Banks and Investment Fund Assets

Year	Bank non-chq	Bank 5-Yr. Term	IFIC Assets
		($Millions)	
1981	43,206	43,086	3,513
1982	48,246	44,698	4,070
1983	51,232	41,265	5,785
1984	46,793	47,537	6,701
1985	42,239	49,824	10,150
1986	43,974	52,718	17,506
1987	52,107	54,797	20,361
1988	62,069	63,762	20,853
1989	75,585	76,316	23,469
1990	78,206	91,918	24,916
1991	76,031	106,212	49,916
1992	68,345	125,716	67,267
1993	64,487	162,857	114,598
1994	56,192	186,171	127,288
1995	43,287	206,824	146,228
1996	43,552	197,665	211,771
1997	40,413	194,033	283,159
1998	36,574	197,735	326,628

Source: CANSIM Series: B679, B680, and Investment Fund Institute of Canada

Table B5.1 Toronto Stock Exchange 300

Year	TSE 300 Index	Return	P/E
1970	910.81	-12.15%	14.81
1971	967.21	6.19%	16.56
1972	1137.58	17.61%	17.86
1973	1216.58	6.94%	15.34
1974	1016.63	-16.44%	9.09
1975	1000.19	-1.62%	8.13
1976	1035.23	3.50%	9.14
1977	1009.95	-2.44%	8.43
1978	1159.09	14.77%	8.33
1979	1577.24	36.08%	8.66
1980	2125.62	34.77%	8.61
1981	2158.42	1.54%	9.06
1982	1640.2	-24.01%	10.91
1983	2366.75	44.30%	25.32
1984	2340.7	-1.10%	16.08
1985	2712.53	15.89%	14.65
1986	3010.59	10.99%	15.52
1987	3567.78	18.51%	18.86
1988	3302.73	-7.43%	12.02
1989	3801.53	15.10%	12.08
1990	3421.1	-10.01%	16.08
1991	3469.48	1.41%	29.05
1992	3402.92	-1.92%	86.64
1993	3904.22	14.73%	88.51
1994	4284.06	9.73%	60.83
1995	4433.88	3.50%	14.65
1996	5268.01	18.81%	19.48
1997	6458.2	22.59%	22.6
1998	6757.27	4.63%	28.67

Source: Bank of Canada Review, Table F3 Stock Market Statistics

Table B5.2 Net New Issues Corp. Bonds

Year	Placed in Canada	Placed Abroad	Total
		($ Millions)	
1970	1,138	362	1,501
1971	1,889	-19	1,869
1972	1,516	66	1,582
1973	1,575	-44	1,531
1974	1,555	245	1,800
1975	2,276	643	2,919
1976	1,108	2,865	3,974
1977	2,997	2,036	5,034
1978	3,039	1,465	4,503
1979	1,435	1,530	2,966
1980	1,575	2,248	3,822
1981	1,688	4,455	6,144
1982	229	4,919	5,147
1983	635	1,902	2,539
1984	609	1,566	2,175
1985	1,183	4,502	5,685
1986	3,679	7,600	11,280
1987	2,977	4,297	7,272
1988	3,368	8,257	11,625
1989	7,515	9,304	16,819
1990	5,633	937	6,572
1991	4,480	1,940	6,420
1992	2,414	-554	1,858
1993	5,230	3,344	8,574
1994	4,225	1,144	5,369
1995	4,510	11,225	15,735
1996	9,268	7,549	16,818
1997	16,852	15,725	32,577
1998	10,610	17,211	27,822

Source: CANSIM Series B3055 and B3056

Table B5.3 Corporate pre-tax Profits & Real GDP

Year	Corp. Profits	Business Investment	Real GDP
		($ Millions)	
1982	28,188	52,509	527,096
1983	39,220	49,365	561,100
1984	46,996	51,352	593,052
1985	52,172	56,598	625,336
1986	45,972	58,467	627,472
1987	60,868	64,869	667,984
1988	63,324	75,516	692,396
1989	50,840	81,116	705,868
1990	38,080	79,974	698,204
1991	30,388	74,313	695,860
1992	33,244	68,306	702,020
1993	44,076	67,870	722,076
1994	73,976	76,570	761,564
1995	73,024	81,155	772,364
1996	82,996	85,394	791,156
1997	88,124	102,014	825,756
1998	82,804	107,825	848,848

Source: CANSIM series D14806, D15420 and D14872

Table B7.0 Canadian High-yield Issues placed domestically 1996 - 1998

Industry	Type	Number of Issues	Number of Issuers	Amount (C$Millions)	Percent of Issues	Percent of Issuers	Percent of Value
Comm. & Media	HY	8	8	963	31%	32%	29%
Conglomerates	HY	0	0	0	0%	0%	0%
Consumer Products	HY	1	1	115	4%	4%	3%
Financial Services	HY	0	0	0	0%	0%	0%
Paper & Forest Products	HY	2	2	215	8%	8%	6%
Gas & Electric Utilities	HY	0	0	0	0%	0%	0%
Industrial Products	HY	2	2	155	8%	8%	5%
Merchandising	HY	0	0	0	0%	0%	0%
Metals & Minerals	HY	2	2	210	8%	8%	6%
Oil & Gas	HY	0	0	0	0%	0%	0%
Pipelines	HY	0	0	0	0%	0%	0%
Real Estate	HY	5	4	338	19%	16%	10%
Telephone	HY	5	5	1,096	19%	20%	33%
Transportation & Environment	HY	1	1	230	4%	4%	7%
Total	HY	26	25	3,322	100%	100%	100%

Source: CIBC Wood Gundy

Table B7.1 Canadian Investment Grade Issues placed domestically 1996 - 1998

Industry	Type	Number of Issues	Number of Issuers	Amount (C$Millions)	Percent of Issues	Percent of Issuers	Percent of Value
Comm. & Media	IG	4	4	700	2%	3%	2%
Conglomerates	IG	0	0	0	0%	0%	0%
Consumer Products	IG	3	2	500	2%	2%	2%
Financial Services	IG	60	31	14,143	36%	26%	47%
Forest Products	IG	2	2	250	1%	2%	1%
Gas & Electric Utilities	IG	7	7	579	4%	6%	2%
Industrial Products	IG	4	4	472	2%	3%	2%
Merchandising	IG	7	6	900	4%	5%	3%
Metals & Minerals	IG	0	0	0	0%	0%	0%
Oil & Gas	IG	3	3	350	2%	3%	1%
Pipelines	IG	2	1	250	1%	1%	1%
Real Estate	IG	52	41	5,975	31%	35%	20%
Telephone	IG	8	7	1,145	5%	6%	4%
Transportation & Environment	IG	17	10	5,052	10%	8%	17%
Total	IG	169	118	30,316	100%	100%	100%

Source: CIBC Wood Gundy

Table B7.2 Canadian High-yield Issues placed in the U.S. 1996 - 1998

Industry	Type	Number of Issues	Number of Issuers	Amount (US$Millions)	Percent of Issues	Percent of Issuers	Percent of Value
Comm. & Media	HY	7	5	1,345	11%	10%	12%
Conglomerates	HY	0	0	0	0%	0%	0%
Consumer Products	HY	12	9	2,000	19%	18%	17%
Financial Services	HY	1	1	55	2%	2%	0%
Forest Products	HY	9	7	1,280	14%	14%	11%
Gas & Electric Utilities	HY	0	0	0	0%	0%	0%
Industrial Products	HY	9	9	1,034	14%	18%	9%
Merchandising	HY	0	0	0	0%	0%	0%
Metals & Minerals	HY	3	3	325	5%	6%	3%
Oil & Gas	HY	5	5	795	8%	10%	7%
Pipelines	HY	0	0	0	0%	0%	0%
Real Estate	HY	1	1	125	2%	2%	1%
Telephone	HY	14	9	4,129	22%	18%	36%
Transportation & Environment	HY	3	2	385	5%	4%	3%
Total	HY	64	51	11,473	100%	100%	100%

Source: CIBC Wood Gundy

Table B7.3 Canadian Investment Grade Issues placed in the U.S. 1996 - 1998

Industry	Type	Number of Issues	Number of Issuers	Amount (US$Millions)	Percent of Issues	Percent of Issuers	Percent of Value
Comm. & Media	IG	2	1	300	3%	3%	2%
Conglomerates	IG	1	1	200	2%	3%	2%
Consumer Products	IG	0	0	0	0%	0%	0%
Financial Services	IG	9	7	3,275	16%	18%	26%
Forest Products	IG	6	3	1,100	10%	8%	9%
Gas & Electric Utilities	IG	0	0	0	0%	0%	0%
Industrial Products	IG	6	3	1,000	10%	8%	8%
Merchandising	IG	0	0	0	0%	0%	0%
Metals & Minerals	IG	6	5	1,300	10%	13%	10%
Oil & Gas	IG	13	11	2,670	22%	29%	21%
Pipelines	IG	4	2	1,000	7%	5%	8%
Real Estate	IG	0	0	0	0%	0%	0%
Telephone	IG	0	0	0	0%	0%	0%
Transportation & Environment	IG	11	5	1,888	19%	13%	15%
Total	IG	58	38	12,733	100%	100%	100%

Source: CIBC Wood Gundy

Outline

Introduction

What factors do we need to consider that will help us establish a framework that will determine whether or not the automobile industry adopted leasing in order to mitigate the Coase Conjecture?

Relevant Theory/Principles

The automobile industry's market structure and its characteristics
- few sellers, differentiated product, and large number of buyers
- production of automobiles subject to economies of scale

The theory behind the durable goods monopolist/ oligopolists
- factors that may affect monopolist and consumer decisions
- the Coase Conjecture
- assumptions of the Coase Conjecture
- implications of leasing on the Coase Conjecture
- the consequences of leasing versus selling on producers and consumers
- the impact of planned obsolescence on the choice of leasing vs. selling

Competition policies
- US and Canada Autopact
- Voluntary export restraints

R&D and technological innovation
- planned obsolescence

Relevant Facts

How the above theory applies to the automobile industry
- leasing versus selling in the automobile industry
- regulations applied to the automobile industry
- degree of durability of automobiles
- cost and prices of automobiles

Analysis

From the theory, what factors are relevant to the automobile industry that will help us answer our question of whether or not leasing was adopted by the automobile industry to mitigate the Coase Conjecture?

Look at the effects of:
- leasing
- regulation
- competition
- technological innovation
- any other important factors which I haven't discovered yet

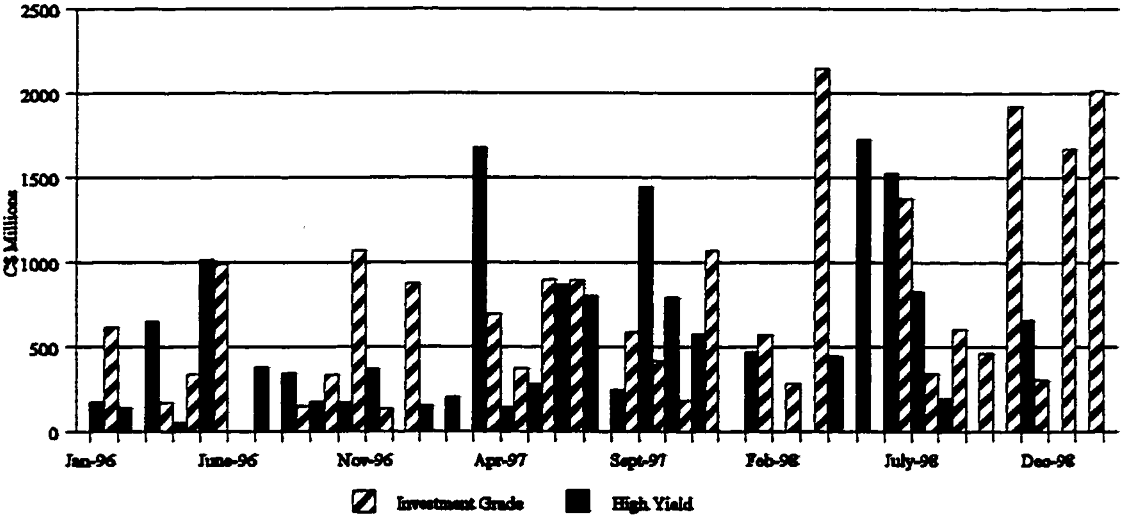
Conclusion

Summary of main arguments that describe which factors are to be considered to answer the question.

Appendix C

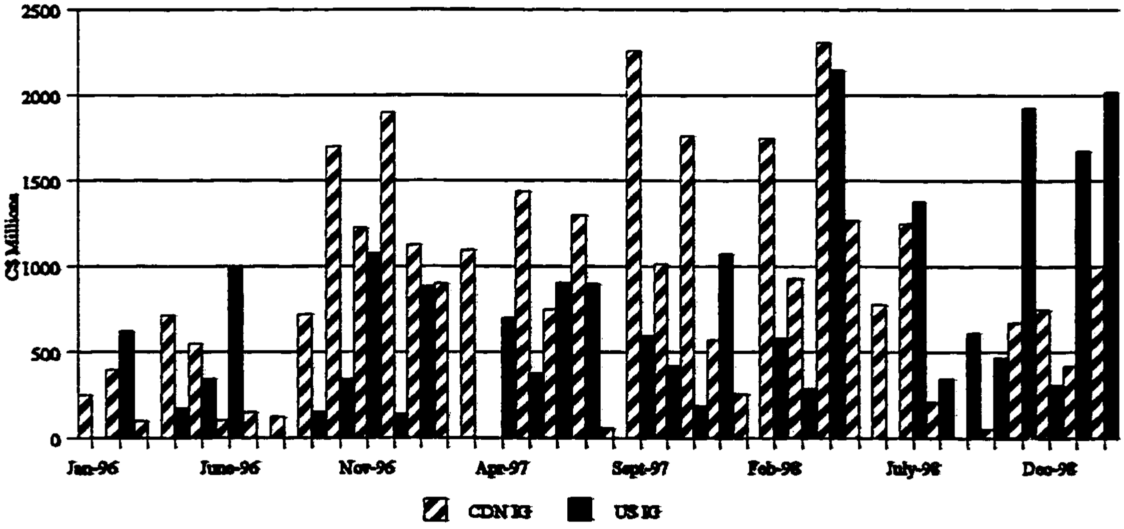
A collection of Charts

Chart C3.0 CDN Corp. Bonds placed in the US, 1996 - 1999



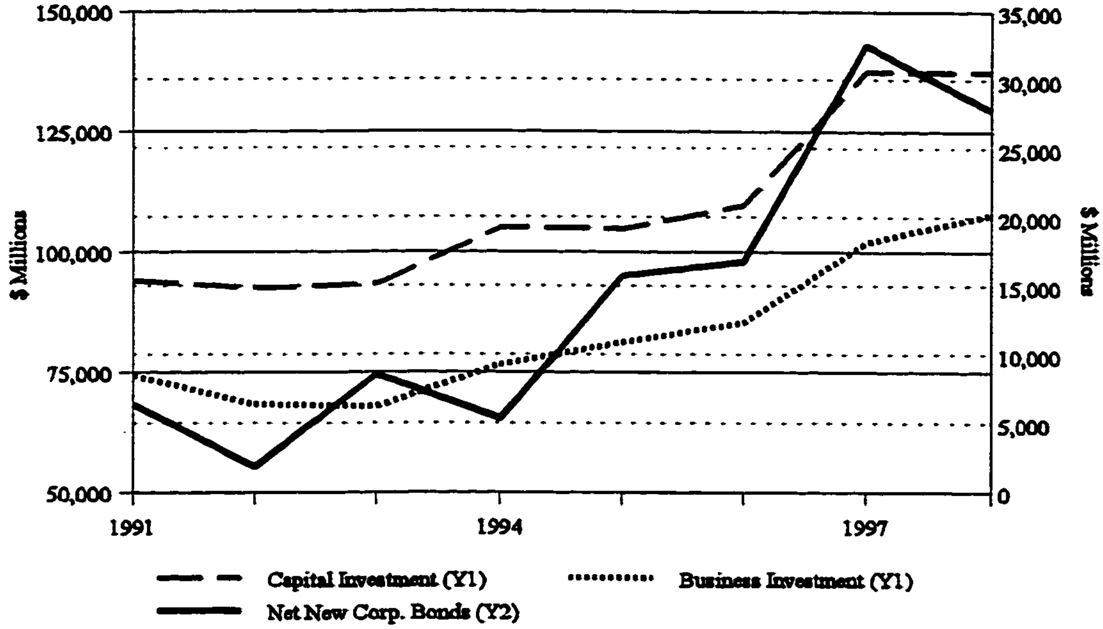
Source: CIBC Wood Gundy

Chart C3.1 CDN Investment Grade bonds placed in Canada & the US, 1996 -1999



Source: CIBC Wood Gundy

Chart C5.0 Capital, Business Investment & Total New Corp. Bonds, 1991 - 1998



Source: CANSIM

Appendix D

The Derivation of Reduced Form Equations

The two linear econometric equation in equilibrium that where given by equations 6.4 and 6.5 in chapter six are re-stated here as D1 and D2 respectively:

$$B = \alpha_1 + \alpha_2 ND + \alpha_3 X + \mu \tag{D1}$$

and

$$B = \delta_1 + \delta_2 ND + \delta_3 Y + \upsilon \tag{D2}$$

Step 1: equate equations D1 and D2 to solve for *ND*

$$\alpha_1 + \alpha_2 ND + \alpha_3 X + \mu = \delta_1 + \delta_2 ND + \delta_3 Y + \nu$$

collect the variable *ND* on the left

$$ND\alpha_2 - ND\delta_2 = \delta_1 - \alpha_1 - \alpha_3 X + \delta_3 Y + \nu - \mu$$

Now isolate *ND*

$$ND = \frac{(\delta_1 - \alpha_1)}{(\alpha_2 - \delta_2)} + \frac{-\alpha_3}{(\alpha_2 - \delta_2)} X + \frac{\delta_3}{(\alpha_2 - \delta_2)} Y + \frac{(\nu - \mu)}{(\alpha_2 - \delta_2)} \tag{D3}$$

let $\phi_1 = \frac{(\delta_1 - \alpha_1)}{(\alpha_2 - \delta_2)}$, $\phi_2 = \frac{-\alpha_3}{(\alpha_2 - \delta_2)}$, $\phi_3 = \frac{\delta_3}{(\alpha_2 - \delta_2)}$, and $\varepsilon_1 = \frac{(\nu - \mu)}{(\alpha_2 - \delta_2)}$

and substitute into equation D3 to get the first reduced form equation:

$$ND = \phi_1 + \phi_2 X + \phi_3 Y + \varepsilon_1 \qquad \text{D4}$$

equation D4 is presented in chapter six as equation 6.6

Step 2: substitute equation D3 into D1 and solve for B

$$B = \alpha_1 + \alpha_2 \left[\frac{(\delta_1 - \alpha_1)}{(\alpha_2 - \delta_2)} + \frac{-\alpha_3}{(\alpha_2 - \delta_2)} X + \frac{\delta_3}{(\alpha_2 - \delta_2)} Y + \frac{(\nu - \mu)}{(\alpha_2 - \delta_2)} \right] + \alpha_3 X + \mu$$

gather like terms to simplify

$$B = \alpha_1 + \frac{\alpha_2(\delta_1 - \alpha_1)}{(\alpha_2 - \delta_2)} + \left[\alpha_3 + \frac{-\alpha_2\alpha_3}{(\alpha_2 - \delta_2)} \right] X + \frac{\alpha_2\delta_3}{(\alpha_2 - \delta_2)} Y + \frac{\alpha_2(\nu - \mu)}{(\alpha_2 - \delta_2)} + \mu \qquad \text{D5}$$

let $\pi_1 = \alpha_1 + \frac{\alpha_2(\delta_1 - \alpha_1)}{(\alpha_2 - \delta_2)}$, $\pi_2 = \left[\alpha_3 + \frac{-\alpha_2\alpha_3}{(\alpha_2 - \delta_2)} \right]$, $\pi_3 = \frac{\alpha_2\delta_3}{(\alpha_2 - \delta_2)}$, and $\varepsilon_2 = \left[\frac{\alpha_2(\nu - \mu)}{(\alpha_2 - \delta_2)} + \mu \right]$

and substitute into equation D5 to get the second reduced form equation:

$$B = \pi_1 + \pi_2 X + \pi_3 Y + \varepsilon_2 \qquad \text{D6}$$

Equation D6 is presented in chapter six as equation 6.7

Appendix E

Diagnostic Tests

E1.0 Key Assumptions

The classical linear regression model makes five assumptions that underlie the method of least squares, and is the cornerstone of most econometric theory. The assumptions focus on the explanatory variables and the error term. The appropriate behaviour of these variables and their interaction is critical to the valid interpretation of the regression estimates, which is why they are briefly summarized below. Remembering the key underlying assumptions gives more meaning to the diagnostic tests. If the assumptions are fulfilled the least squares estimators are BLUE. That is, in the class of unbiased linear estimators least squares estimators have minimum variance.

The first assumption requires that the expected value of the error terms is zero. Simply this assumption states that factors not explicitly included in the regression model and therefore picked-up in the error term do not systematically affect the mean value of the dependent variable. What this assumption requires is that on average negative errors cancel out positive errors so that the mean value of the error is zero. Second it is assumed that there is no autocorrelation between the errors. That is, the disturbance terms are not correlated. In a times series model there is likely to be some serial correlation. The third assumption that is critical is that the errors have an equal variance, or rather errors are to be homoskedastic. Whereas serial correlation is likely to be the rule rather than the exception with time series the problem of heteroskedasticity is not expected to be a problem because it tends to be more common in cross-sectional data. Next, it is assumed that there is no covariance between the error and the explanatory variables. This assumption is made because if the explanatory variables and the errors are correlated it is not possible to assess their individual impact on the dependent variable. This assumption automatically fulfilled if the explanatory variables are nonstochastic, but they need not be nonrandom for the assumption to hold. The fifth assumption is the most critical of the five. It requires that the model estimated is correctly specified. It is for this reason two chapters and very careful thought was devoted to the development of the models. For the model to be correctly specified the correct variables must be included and all irrelevant variables be omitted. However, by definition modelling cannot include all relevant variables, but the most important of the relevant variables must be included. As noted in chapter six two variables identified by theory have been omitted from the analysis because of data limitations, but a bias is not expected because of the minimal role of these variables in practical investment decisions. Nevertheless, the influence that these variables do exercise over the dependent variable are subsumed in the error, and increase the likelihood of serial correlation. In addition to including the most relevant variables that influence the dependent variable, it is important to specify the correct functional form for the model. The present analysis assumes that the models are linear because there is no *a priori* reason to suspect otherwise.

An additional assumption that is important to make if the objective regression is one hypothesis testing as well as estimation. If the errors are normally distributed then the common t and F tests can be used to test various hypothesis. Since the objective is be able to draw inferences about the population regression function the normality assumption is a crucial one. The assumption of normality, however, is more critical for small samples. For large samples the central limit theorem asserts that the error will tend to a normal distribution as the number increase indefinitely. That is, the error will be asymptotically normal as the sample size becomes large. With respect to the previous five assumptions this final one effectively captures the first three.

E2.0 The Residuals

With respect to the first three assumptions that underlie the method of least squares estimation in practice the sum of the residuals from the sample regression function equal zero, are uncorrelated and are homoskedastic. Because the normality assumption captures the first three the Jarque-Bera (JB) statistic can be used to assess if the normality assumption is satisfied. Normality is explicitly tested because the sample size is not very large.

E2.1 Normality of the Residuals

If the JB statistic is greater than the critical chi-squared then the null hypothesis of normality is not rejected. For equation 6.8 where the dependent variable is ND:

$$JB = 2.17 < \chi^2_{10\%,41} = 51.81$$

Hence, the null hypothesis of normality cannot be rejected, and the normality assumption is satisfied.

For equation 6.9 where the dependent variable is BPC

$$JB = 4.47 < \chi^2_{10\%,41} = 51.81$$

Therefore the null hypothesis of normality cannot be rejected, and the normality assumption appears to be satisfied.

The results of the JB test suggest that the residuals are normally distributed, so that hypothesis testing is valid. However, because the null is not rejected rather than explicitly accepted. It is important that the residual are examined further, particularly for serial correlation –the violation of assumption two.

E2.2 Actual, Fitted, and Residual Graph

The nature of the preceding assumptions indicate that the behaviour of the residuals is critical to the validity of the regression analysis. Hence, the examination of the plot of residuals a subjective yet necessary step in the diagnostic evaluation of regression models. Because residuals should resemble a white noise process visual inspection of a residual plot will help assess the randomness in the residuals. For a process of white noise the residuals will be nearly uncorrelated and the sample autocorrelation function will be close to zero. If the residuals are correlated then the autocorrelation function will be non-zero, and at the extreme it will be unity if there is perfect positive or negative autocorrelation.

The residual plot for equation 6.8 does not appear to have been generated by a completely random process. However, the residual plot does not move in systematic way with the dependent variable. Perhaps the systematic influence shown in the residuals is the result of inflation. However, if the pattern of the plotted residual was the result of the influence of inflation then one would expect the residual to move more systematically with the dependent variable. Because the residual plot does not appear to closely resemble a white noise process it suggests that the

Chart E1.0 Residual Plot for Equation 6.8 (ND)

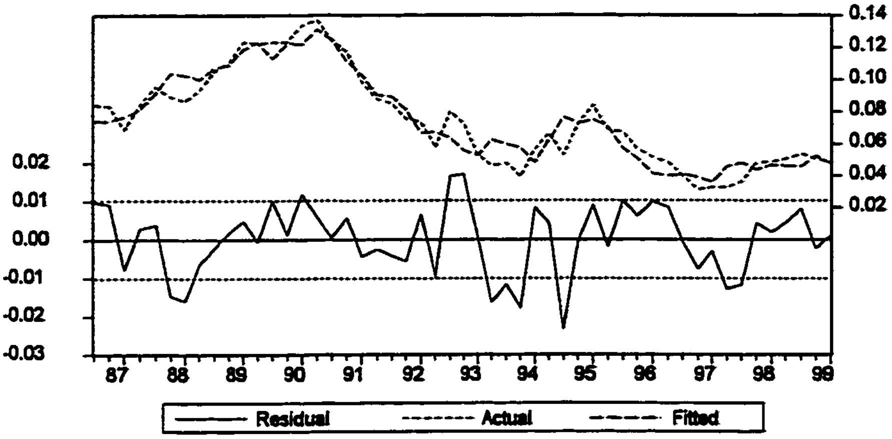
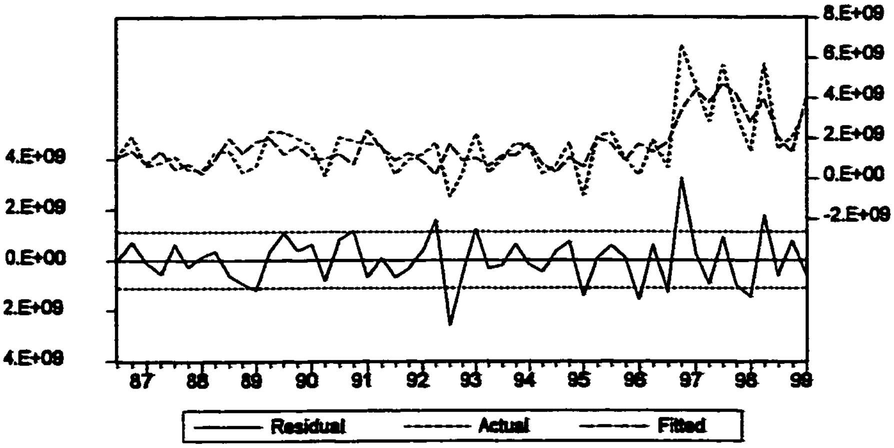


Chart E2.0 Residual Plot for Equation 6.9 (BPC)



autocorrelation functions are non-zero. This is an empirical question that is dealt with below.

The plot for equation 6.9 more closely resembles a random process that is assumed of the residuals. But, a closer look suggests that the movement of the residuals is correlated with the dependent variable, BPC.

E3.0 Serial Correlation

As noted above the residual do not appear to possess the random process that is assumed. It the residuals are correlated then the residuals will be related to last periods residual. For example, consider the error term in equation 6.4 in chapter 6. If the error followed an AR(1) process the it would be dependent on last period's error and a random disturbance:

$$\mu_t = \rho\mu_{t-1} + \varepsilon \qquad \text{E1}$$

where ε is assumed to be *i.i.d.* normal random variables. If the autocorrelation coefficient, ρ, is non-zero then the residual, μ_t, from the original regression is not an random disturbance, but rather is time dependent. Autocorrelation may be of a higher order. That is, were μ_t is a function of more than just one previous time period. As noted above, the autocorrelation coefficient varies between zero and unity, and the closer the coefficient is to zero the less serious is the problem. If the autocorrelation coefficient is unity and does not decay to zero after the number of lags become reasonably large then the error is non-stationary.

If autocorrelation is present (a non-zero autocorrelation coefficient) then OLS estimator may not be efficient, and will lead to smaller standard errors and narrower confidence intervals resulting in an increased likelihood of committing a Type-I error, rejecting the null hypothesis when it is in fact true. As well the goodness-of-fit will be overly optimistic.

E3.1 Equation 6.8 (ND)

To test the null hypothesis that there is no first order serial correlation, AR(1), the Durbin-Watson *d* test statistic can be used. If From the regression of equation 6.8 $d = 1.496$. Therefore, it follows that

$d_L = 1.17$ and $d_U = 2.051$ at 5% it follows that $4 - d_L = 2.83$ and $4 - d_U = 1.949$

Hence *d* falls in the zone of indecision and whether AR(1) is present cannot be determined. An alternate method of testing for the presence of autocorrelation is the Brerusch-Godfrey Lagrange multiplier test. This test can detect AR(1) and higher order processes. Using one, two, and three lags to test for AR(1), AR(2) and AR(3) the Breusch-Godfrey obs*R-squared statistics is 3.40, 3.99, and 4.32 respectively. Below the test statistics are compared to the Chi-squared critical values.

$$R^2_O = 3.40 > \chi^2_{10\%,1} = 2.71$$

And

$$R^2_O = 3.99 < \chi^2_{10\%,2} = 4.61$$

And

$$R^2_O = 4.32 < \chi^2_{10\%,3} = 6.25$$

Therefore in the null hypothesis of no AR(1) is rejected, but the null of no AR(2) or AR(3) cannot rejected.

E3.2 Equation 6.9 (BPC)

From the regression of equation 6.9 $d = 2.56$. Therefore, if follows that:

$d_L = 1.17$ and $d_U = 2.051$ at 5% it follows that $4 - d_L = 2.83$ and $4 - d_U = 1.949$

Hence *d* falls in the zone of indecision, and whether AR(1) is present cannot be determined.

Using one, two, and three lags to test for AR(1), AR(2), and AR(3) the Breusch-Godfrey obs*R-squared statistics is 4.32, 9.28, and 9.55 respectively. Below the test statistics are compared to the Chi-squared critical values.

$$R^2_O = 4.32 > \chi^2_{10\%,1} = 2.71$$

And

$$R^2_O = 9.28 > \chi^2_{10\%, 2} = 4.611$$

And

$$R^2_O = 9.55 > \chi^2_{10\%, 3} = 6.25$$

Therefore the null hypothesis of no serial correlation is rejected for each case. Serial correlation is discussed further below in relation to cointegration in Section E6.0 Due to the presence of autocorrelation remedial measure must be taken to ensure efficient parameter estimates.

E4.0 White Heteroskedasticity Test

The third of five key assumptions that underlie the method of least squares estimation in the classical linear regression model is that the variance of error terms of the population are homoskedastic. If the error term are not homoskedastic then the OLS estimators will not be efficient. While the problem of non-constant errors, or residuals is more a phenomenon associated with cross-sectional data, the test is still undertaken.

For equation 6.8 where the dependent variable is ND

$$R^2_O = 26.97 < \chi^2_{10\%, 31} = 40.26$$

Hence, the null hypothesis of homoskedasticity cannot be rejected.

For equation 6.9 where the dependent variable is BPC

$$R^2_O = 18.62 < \chi^2_{10\%, 31} = 40.26$$

Therefore the null hypothesis of homoskedasticity cannot be rejected.

E5.0 Ramsey RESET Test

The test compares the original model to one that has one or more estimated values of the dependent variables introduced as additional explanatory variable. Each estimate introduced as a new independent variable enter non-linearly. That is the first enters squared, if a second is added it enter cubed and so on. The new R-squared is compared to the old and an F-statistic is calculated. If the calculated F-statistic is larger than the critical value then the null hypothesis that the additional coefficients are jointly equal to zero, no specification error, the is rejected.

Table E1.0 Ramsey RESET Test

	$F_{critical}$		ND	Spec. Error		BPC	Spec. Error	
Fitted Dep. Var.	5%	1%	F_{calc}	at 5%	at 1%	F_{calc}	at 5%	at 1%
$\hat{y}^{2}$	2.66	4.17	4.15	Yes	No	3.43	Yes	No
$\hat{y}^{2,3}$	2.53	3.86	2.62	Yes	No	1.77	No	No
$\hat{y}^{2,3,4}$	2.44	3.63	2.17	No	No	1.19	No	No
$\hat{y}^{2,3,4,5}$	2.35	3.45	1.64	No	No	0.91	No	No

The results of the Ramsey RESET test indicate that there may be a specification error. In both models the inclusion of an extra variable (e.g. squared value of the estimated dependent variable) improves the fit of the by a statistically significant amount at the 5% level of significance, although at 1% the null hypothesis cannot be rejected. Adding two fitted values of the dependent variables (one squared and one cubed) indicates a possible specification error in equation 6.8 at the 5% level, but the null is rejected at the 1% level. The potential specification error may be attributed to the omission of the two demand variables. Though little can be done to correct for the possible error or to test for because the omitted explanatory variables are not available. Further it is possible that these omitted variables are responsible for the lower order serial correlation.

E6.0 Unit Root Test

The augmented Dickey-Fuller (ADF) unit root test is used to determine which time series follow a random walk and, therefore, non-stationary. If the ADF test statistic is greater than the critical value then the null hypothesis of a non-stationary series can be rejected. The results are summarized in Table E2.0. Of the 12 series tested only the dependent variable in equation 6.9, BPC, is stationary. Therefore the equations must be tested to determine if the errors of the models are non-stationary. If the residuals are non-stationary then the regression results may be spurious.

Table E2.0 Augment Dickey-Fuller Test for Unit Roots

Test Variable	ADF Test t-Stat.	1% Critical Value	5% Critical Value	Random Walk
BPC	-4.22	-4.15	-3.50	Stationary
ND	-2.17	-4.15	-3.50	Non-Stationary
RBBBI	-1.82	-4.15	-3.50	Non-Stationary
RUGI	-1.58	-4.15	-3.50	Non-Stationary
TSE	-1.76	-4.15	-3.50	Non-Stationary
MFA	0.48	-4.15	-3.50	Non-Stationary
SBBG	-1.51	-4.15	-3.50	Non-Stationary
SCUHY	-1.57	-4.15	-3.50	Non-Stationary
PRF	-1.37	-4.15	-3.50	Non-Stationary
TPE	-2.00	-4.15	-3.50	Non-Stationary
GDB	-1.28	-4.15	-3.50	Non-Stationary
BI	-1.05	-4.15	-3.50	Non-Stationary

E7.0 Q-Statistic Test (for Cointegration)

The Q-statistic test is commonly used to test for serial correlation. If there is no serial correlation in the residuals, the autocorrelation function at all lags should be nearly zero, and all Q-statistics should be insignificant. The Q-statistic also provides a convenient test for cointegration. An econometric model is cointegrated if the residuals are stationary. As noted in the section discussing serial correlation, the residuals are stationary if the autocorrelation function will converges to zero after *k* lags. Although many economic time series particularly financial series may individually be non-stationary, together they may be cointegrated because they move together over time and have a long-term equilibrium. If cointegrated then test results will not be spurious. Formally if the Q-statistic is less than critical Chi-squared value at 10% after 20 to 25 lag the null hypothesis that all autocorrelation coefficients are jointly equal to zero (or a stationary residual) cannot be rejected. Cointegration and autocorrelation can be mutually exclusive. That is, it is possible to have lower order serial correlation and a stationary residual. Table E3.0 below summarizes the Q-statistics and Chi-squared values for lags 1 to 5 and 10, 15, 20, 25, and 30.

Table E3.0 Q-Statistic Test

		ND		BPC	
k - Lags	χ^2_k	Q-stat	Ho: = $\rho_1 = \rho_j = 0$	Q-stat	Ho: = $\rho_1 = \rho_j = 0$
1	2.71	3.12	Reject	4.41	Reject
2	4.61	3.23	Do not reject	6.37	Reject
3	6.25	3.29	Do not reject	6.76	Reject
4	7.78	6.22	Do not reject	7.68	Do not reject
5	9.24	8.14	Do not reject	7.75	Do not reject
10	15.99	18.10	Reject	14.33	Do not reject
15	22.31	24.36	Reject	15.70	Do not reject
20	28.41	39.01	Reject	27.65	Do not reject
25	34.38	51.79	Reject	35.73	Do not reject
30	40.26	58.52	Reject	38.27	Do not reject

The results of the Q-statistic test are consistent with Breusch-Godfrey serial correlation tests. In addition it appears that the error term in equation 6.8 is not stationary because with lags greater than 10 the null is rejected. This result is not a surprise given that the dependent variable and all the explanatory variables are non-stationary. Conversely regressing the stationary variable BPC against the non-stationary explanatory variables results in a stationary error term. The fact that equation 6.9 is stationary suggest that the coefficient estimates are efficient and that results are not spurious; however, because equation 6.8 is non-stationary remedial measures must be taken to make the model stationary. The most common measure to correct for a non-stationary model is to first difference all the variables.

E8.0 Regression Results Using First Differences

Table E4.0 First Difference Regression on Equation 6.8 (ND)

Sample(adjusted): 1986:4 1999:1
Included observations: 50 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	1st Diff. Sign vs. Original	Prob.
Demand Variables					
D(RBBBI(-1))	-0.000531	0.000737	-0.720756	same / correct	0.4753
D(RUGI(-1))	0.000307	0.000719	0.426645	reverse / incorrect	0.6719
D(TSE(-1))	1.28E-06	3.98E-06	0.320428	same / incorrect	0.7503
D(MFA(-1))	6.10E-14	2.29E-13	0.266224	reverse / incorrect	0.7914
Supply Variables					
D(SBBG(-1))	-0.871095	0.864698	-1.007399	reverse / incorrect	0.3198
D(SCUHY(-1))	0.238294	0.598555	0.398116	same / correct	0.6927
D(PRF(-1))	2.27E-13	5.16E-13	0.439481	same / incorrect	0.6627
D(TPE(-1))	3.86E-05	0.000101	0.383117	reverse / incorrect	0.7037
D(GDB)	4.37E-15	3.76E-13	0.011614	same / correct	0.9908
D(BI)	1.29E-12	8.35E-13	1.542763	same / correct	0.1308

R-squared	0.160939	Mean dependent var	-0.000710
Adjusted R-squared	-0.027850	S.D. dependent var	0.010107
S.E. of regression	0.010247	Akaike info criterion	-6.146763
Sum squared resid	0.004200	Schwarz criterion	-5.764358
Log likelihood	163.6691	F-statistic	0.852483
Durbin-Watson stat	1.949190	Prob(F-statistic)	0.573763

Table E5.0 First Difference Regression on Equation 6.9 (BPC)

Sample(adjusted): 1986:4 1999:1
Included observations: 50 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	1st Diff. Sign vs. Original	Prob.
Demand Variables					
D(RBBBI(-1))	23592574	1.24E+08	0.190685	same /correct	0.8497
D(RUGI(-1))	-4603977.	1.21E+08	-0.038152	same / incorrect	0.9698
D(TSE(-1))	-2081151	668750.0	-3.112001	same / correct	0.0034
D(MFA(-1))	0.028798	0.038468	0.748609	reverse / correct	0.4585
Supply Variables					
D(SBBG(-1))	30000000000	145000000000	0.20666	same / incorrect	0.8373
D(SCUHY(-1))	10100000000	1.00E+11	0.100781	same / incorrect	0.9202
D(PRF(-1))	0.047203	0.086561	0.545320	same / correct	0.5886
D(TPE(-1))	22159704	16924808	1.309303	same / incorrect	0.1979
D(GDB)	-0.088963	0.063183	-1.408019	same / correct	0.1669
D(BI)	0.175929	0.140272	1.254198	same / correct	0.2171

R-squared	0.277285	Mean dependent var	49500000
Adjusted R-squared	0.114674	S.D. dependent var	1830000000
S.E. of regression	1720000000	Akaike info criterion	45.54639
Sum squared resid	1.18000e+20	Schwarz criterion	45.92879
Log likelihood	-1128.66	F-statistic	1.705207
Durbin-Watson stat	2.87062	Prob(F-statistic)	0.119804

E9.0 Remedial Measures for Serial Correlation

EViews estimates AR models using nonlinear least squares techniques that is asymptotically equivalent to maximum likelihood estimates and coefficient estimates are asymptotically efficient. The process allows for various orders of autocorrelation, and can be used to correct for autocorrelation.

Table E6.0 AR(1) Model of Equation 6.8 (ND)

Sample(adjusted): 1986:4 1999:1
Included observations: 50 after adjusting endpoints
Convergence achieved after 13 iterations

Variable	Coefficient	Std. Error	t-Statistic	Change in the *t*-stat.	Prob.
Constant	-0.149454	0.183617	-0.813947		0.4207
Demand Variables					
RBBBI(-1)	-0.000735	0.000673	-1.092522	increase	0.2815
RUGI(-1)	0.000257	0.000718	0.358411	decrease /now wrong sign	0.7220
TSE(-1)	7.86E-07	4.40E-06	0.178764	decrease	0.8591
MFA(-1)	-4.67E-14	1.83E-13	-0.255431	increase	0.7998
Supply Variables					
SBBG(-1)	-0.687619	0.906087	-0.758889	increase / now wrong sign	0.4526
SCUHY(-1)	0.753043	0.589802	1.276773	decrease	0.2094
PRF(-1)	2.40E-14	3.72E-13	0.064601	decrease	0.9488
TPE(-1)	1.66E-05	0.000108	0.153620	decrease / wrong sign	0.8787
GDB	2.54E-13	3.44E-13	0.738957	increase	0.4645
BI	1.89E-12	6.54E-13	2.897632	increase	0.0062
AR(1)	0.476582	0.159521	2.987577		0.0049

R-squared	0.918529	Mean dependent var	0.074746
Adjusted R-squared	0.894945	S.D. dependent var	0.029842
S.E. of regression	0.009672	Akaike info criterion	-6.233509
Sum squared resid	0.003555	Schwarz criterion	-5.774623
Log likelihood	167.8377	F-statistic	38.94739
Durbin-Watson stat	1.972153	Prob(F-statistic)	0.000000
Inverted AR Roots	.48		

The Q-statistic test illustrates that the modified regression equation did eliminate lower order serial correlation in both equations, and completely in the modified equation 6.9. And, it is more clear now that equation 6.9 is stationary, though, of course, the modified equation 6.8 remains non-stationary.

Table E7.0 Q-Statistic Test for AR(ρ) modified Equations

		ND AR(1)		BPC AR(2)	
k - Lags	χ^2_k	**Q-stat**	**Ho: $= \rho_i = \rho_j = 0$**	**Q-stat**	**Ho: $= \rho_i = \rho_j = 0$**
1	2.71	0.00	cannot reject	0.0920	cannot reject
2	4.61	0.29	cannot reject	0.8132	cannot reject
3	6.25	3.11	cannot reject	3.30	cannot reject
4	7.78	9.33	reject	5.00	cannot reject
5	9.24	10.37	reject	5.04	cannot reject
10	15.99	18.92	reject	10.67	cannot reject
15	22.31	22.75	reject	13.83	cannot reject
20	28.41	26.87	cannot reject	19.88	cannot reject
25	34.38	39.43	reject	23.85	cannot reject
30	40.26	46.20	reject	27.84	cannot reject

E10.0 Sensitivity To Changes in Lag Structure

It is believed that corporate investment and government debt should enter the model contemporaneously. Because it was argued that the demand variables and the other supply variable should be lagged it is of interest to see how the fit of the model changes when different lags are considered for investment and government debt.

E10.1 Suppose BI(t-1) rather than BI(t)

The fit of the model is very sensitive to the change, as shown in the table below. When investment is lagged four *t*-statistics are no longer significant and the adjusted-R value drops to 37.5% from 45.83%. As well the F-statistic declines to 3.99 from 5.23, and null that all coefficients are jointly equal cannot be rejected at the 1% level of significance. It should not be a surprise that the fit deteriorates when investment is lagged because acquisition of financial capital should generally precede or occur nearly at the same time as the investment in new assets or opportunities.

Table E8.0 Regressing Equation 6.9 with Investment Lagged

Sample(adjusted): 1986:3 1999:1
Included observations: 51 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Change in *t*-*stat*	Prob.
C	3.04E+10	1.98E+10	1.530493	no longer significant	0.1338
RBBBI(-1)	88555748	68537030	1.292086	no longer significant	0.2037
RUGI(-1)	-58793814	77038476	-0.763175		0.4498
TSE(-1)	-1282827.	554741.0	-2.312479	lower	0.0260
MFA(-1)	-0.007780	0.018245	-0.426417		0.6721
SBBG(-1)	5.34E+10	1.05E+11	0.506298		0.6154
SCUHY(-1)	-2.95E+10	7.17E+10	-0.411599		0.6828
PRF(-1)	0.045020	0.043666	1.031006		0.3087
TPE(-1)	18923432	12261314	1.543344	no longer significant	0.1306
GDB	-0.066816	0.040170	-1.663322	no longer significant	0.1041
BI(-1)	0.192902	0.068835	**2.802369**	lower	**0.0078**
R-squared	0.499848	Mean dependent var			1.63E+09
Adjusted R-squared	**0.374809**	S.D. dependent var			1.51E+09
S.E. of regression	1.19E+09	Akaike info criterion		Higher	44.82830
Sum squared resid	5.71E+19	Schwarz criterion			45.24497
Log likelihood	-1132.122	F-statistic		Lower	**3.997561**
Durbin-Watson stat	2.234158	Prob(F-statistic)			0.000776

Critical *t* values: $t_{\alpha=5\%} = 2.021$ and $t_{\alpha=10\%} = 1.684$ and

E10.2 Suppose BI(t+1) rather than BI(t)

Including investment ahead one period cause the fit to deteriorate somewhat compared to the case when investment enters the at time *t*. The adjusted R-squared drops four *t*-statistics are noticeably lower and one has fallen below the threshold of significance. So investment should remain in the model at time *t* as postulated.

Table E9.0 Regressing Equation 6.9 with Investment Ahead One Period

Sample(adjusted): 1986:3 1998:4

Included observations: 50 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Change in *t -stat*	Prob.
C	3.01E+10	1.60E+10	1.880691	lower	0.0675
RBBBI(-1)	1.24E+08	69758008	1.772664	lower	0.0841
RUGI(-1)	-1.00E+08	75138441	-1.336883		0.1890
TSE(-1)	-1861985.	723086.7	-2.575051	lower	0.0139
MFA(-1)	-0.001579	0.019673	-0.080267		0.9364
SBBG(-1)	1.01E+11	9.55E+10	1.060200		0.2956
SCUHY(-1)	-2.37E+10	6.52E+10	-0.362944		0.7186
PRF(-1)	-0.006776	0.031357	-0.216101		0.8300
TPE(-1)	11882967	10850924	1.095111	no longer significant	0.2802
GDB	-0.066570	0.032344	-2.058221	lower	0.0463
BI(1)	0.256828	0.067249	3.819056	lower	0.0005
R-squared	0.551529	Mean dependent var			1.59E+09
Adjusted R-squared	0.436537	S.D. dependent var			1.50E+09
S.E. of regression	1.13E+09	Akaike info criterion		higher	44.71635
Sum squared resid	4.96E+19	Schwarz criterion			45.13700
Log likelihood	-1106.909	F-statistic		lower	4.796217
Durbin-Watson stat	2.509379	Prob(F-statistic)			0.000171

Critical *t* values: $t_{\alpha=5\%} = 2.021$ and $t_{\alpha=10\%} = 1.684$

E10.3 Suppose GDB(t-1) rather than GDB(t)

Lagging government debt does not improve the model. Three *t*-statistics are no longer significant including the one associated with government debt issues. The adjusted R-squared declined to 38.5% from 45.83% and the F-statistic fell slightly.

Table E10 Regressing Equation 6.9 with Government Debt Lagged

Sample(adjusted): 1986:3 1999:1
Included observations: 51 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic		Prob.
C	1.71E+10	1.90E+10	0.903989		0.3714
RBBBI(-1)	1.37E+08	70179782	1.955737	lower	0.0575
RUGI(-1)	-1.20E+08	75406116	-1.590620	higher	0.1196
TSE(-1)	-1393948.	562994.5	-2.475953	lower	0.0176
MFA(-1)	-0.013238	0.017705	-0.747672		0.4590
SBBG(-1)	1.10E+11	1.00E+11	1.102511	higher	0.2768
SCUHY(-1)	-5.95E+10	7.37E+10	-0.807418	higher / correct sign	0.4242
PRF(-1)	-0.009911	0.031953	-0.310187	no longer sig./ wrong sign	0.7580
TPE(-1)	15081998	11416540	1.321065	no longer sig.	0.1940
GDB(-1)	-0.040765	0.038955	-1.046462	no longer sig.	0.3016
BI	0.191082	0.080452	2.375105	lower	0.0224

R-squared	0.507702	Mean dependent var	1.63E+09
Adjusted R-squared	0.384627	S.D. dependent var	1.51E+09
S.E. of regression	1.19E+09	Akaike info criterion	44.81247
Sum squared resid	5.62E+19	Schwarz criterion	45.22914
Log likelihood	-1131.718	F-statistic	4.125153
Durbin-Watson stat	2.444620	Prob(F-statistic)	0.000598

Critical *t* values: $t_{\alpha=5\%} = 2.021$ and $t_{\alpha=10\%} = 1.684$

E10.4 Spreads versus Yields as Explanatory Variables

The table below summarizes the regression on a n augmented version of equation 6.9. The spread variables were dropped and replaced with yields to determine if this might improve the fit of the model. To the contrary the fit declines. The adjusted R-squared drop to 36.9% from 45.8% and the lower F-statistic no longer reject the null hypothesis that the coefficients are jointly equal to zero. In addition the coefficients on government debt and the constant are no longer significantly different from zero.

Table E11.0 Regressing Equation 6.9 with Yield Rather Than Spreads (BPC)

Sample(adjusted): 1986:3 1999:1
Included observations: 51 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Change in *t*-stat	Prob.
C	1.71E+10	1.92E+10	0.890014	no longer sig.	0.3789
RBBBI(-1)	1.36E+08	71215374	1.915137	lower	0.0628
RUGI(-1)	-1.22E+08	77374732	-1.578919	higher	0.1224
TSE(-1)	-1415270.	582645.4	-2.429042	lower	0.0198
MFA(-1)	-0.012873	0.018043	-0.713472		0.4798
YBBB(-1)	4.57E+10	7.79E+10	0.586844		0.5607
YCGL(-1)	-1.09E+11	1.02E+11	-1.071465		0.2905
YBAA(-1)	5.31E+10	8.31E+10	0.638773		0.5267
PRF(-1)	-0.011938	0.034332	-0.347733	lower / wrong sign	0.7299
TPE(-1)	15010797	11564443	1.298013	lower	0.2019
GDB(-1)	-0.038190	0.042058	-0.908028	no longer sig.	0.3694
BI	0.191222	0.081448	2.347773	lower	0.0241
R-squared	0.508093	Mean dependent var			1.63E+09
Adjusted R-squared	0.369350	S.D. dependent var			1.51E+09
S.E. of regression	1.20E+09	Akaike info criterion			44.85089
Sum squared resid	5.61E+19	Schwarz criterion			45.30544
Log likelihood	-1131.698	F-statistic		lower	3.662119
Durbin-Watson stat	2.443583	Prob(F-statistic)			0.001277

E11.0 Summary Statistics

Table E12.0 Summary Statistics

	BPC	ND	RBBBI(-1)	RUGI(-1)	TSE(-1)	MFA(-1)	SBBG(-1)	SCUHY(-1)	PRF(-1)	TPE(-1)	GDB	BI
Mean	1,63E+09	0,074927	228,3441	216.8406	4215,654	1,05E+11	0.011127	0,006474	5.86E+10	32,97314	7,32E+11	8,01E+10
Median	1,46E+09	0,072200	201,7200	209.1500	3760,910	6,78E+10	0,012400	0,008174	6,02E+10	20,95000	7,09E+11	7,79E+10
Max.	6,64E+09	0,137300	420,8100	388,6700	7558.500	3.34E+11	0.028400	0,027094	8.81E+10	156,5000	8,58E+11	1.12E+11
Min.	-9,08E+08	0,031300	105,2200	108,3500	2979.300	7,49E+09	-0,006300	-0,016365	3,04E+10	10,86000	6,27E+11	5,78E+10
Std. Dev.	1,51E+09	0,029570	101,9865	85,40668	1183,639	9,57E+10	0,008115	0,011522	1,85E+10	31,50614	5,96E+10	1,40E+10
Skewness	1,413533	0,488596	0,529604	0,466535	1,390571	0.972128	-0,470152	-0,343775	-0,037365	2.212901	0,441225	0,778126
Kurtosis	5,468825	2,199468	1,934788	2,007963	4,040136	2,853475	2,838314	2.227343	1,665208	7,542444	2,294383	2,933505
Jarque-Bera	29,93572	3,390983	4,795273	3,941363	18,73534	8,078403	1,934416	2,273163	3,797917	85,47074	2,712801	5,155978
Probability	0,000000	0,183509	0,090933	0,139362	0.000085	0.017612	0.380143	0,320914	0,149724	0,000000	0,257586	0,075927
Obs.	51	51	51	51	51	51	51	51	51	51	51	51