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The Development of Financial Derivatives Markets: The Canadian Experience

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THE DEVELOPMENT OF FINANCIAL DERIVATIVES MARKETS:

THE CANADIAN EXPERIENCE

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ABSTRACT

In response to an intense demand for risk management services since the early 1980s, the over-the-counter (OTC) markets for financial derivatives in Canada have developed more vigorously than those for exchange-traded (EXT) derivative securities. This is particularly evident for interest rate derivatives. The objectives of this paper are to examine why Canadian interest rate derivatives have developed more robustly in OTC markets than in EXT markets and why markets for some EXT derivatives have developed more successfully than for others.

The paper concentrates on the basic derivatives — options, futures or forwards, and swaps. The investigation suggests that many of the informational and strategic financial requirements of Canadian institutional borrowers and lenders are served better in the markets for OTC financial derivatives than in the EXT derivatives markets. Furthermore, a high degree of integration with securities markets in the United States, combined with illiquidity in domestic securities markets, places many Canadian EXT derivatives at a competitive disadvantage in North American securities markets. Two other factors have also contributed to the stronger growth of markets for OTC interest rate derivatives in the Canadian financial system: the dominant position of chartered banks, which are the primary suppliers of domestic OTC interest rate derivatives, and the presence of regulatory barriers to the development of markets for financial derivatives, particularly EXT derivatives.

This paper concludes that the robust development of markets for OTC derivatives relative to those for EXT derivatives is not necessarily a regrettable outcome since both types of derivatives perform the same basic function. However, the paper warns that unwarranted regulatory barriers to the development of particular financial derivatives markets can have permanent economic effects.

RÉSUMÉ

En raison de la forte demande de services de gestion du risque enregistrée depuis le début des années 80, les marchés hors bourse de produits financiers dérivés se sont développés plus rapidement au Canada que les marchés de ces produits négociés en bourse. Cela est particulièrement manifeste dans le cas des produits dérivés sur taux d'intérêt. Dans la présente étude, l'auteur examine pourquoi, au Canada, les produits dérivés sur taux d'intérêt ont affiché une croissance plus vigoureuse hors bourse que sur des marchés organisés et pourquoi certains produits dérivés négociés en bourse connaissent plus de succès que d'autres.

L'étude porte principalement sur les produits dérivés de base, c'est-à-dire les options, les contrats à terme (contrats à terme d'instruments financiers et contrats à terme simples) et les swaps. Les résultats de la recherche laissent croire qu'une bonne partie des besoins des emprunteurs et des prêteurs institutionnels canadiens en matière d'information et de financement stratégique sont mieux satisfaits par les produits dérivés négociés hors bourse que par ceux qui le sont en bourse. L'auteur laisse également entendre que le fort degré d'intégration des marchés canadiens et américains des valeurs, conjugué à l'illiquidité des marchés intérieurs, a pour effet de nuire à la position concurrentielle sur les marchés nord-américains de bon nombre de produits dérivés canadiens négociés en bourse. Deux autres facteurs ont contribué à la progression rapide des marchés hors bourse de produits dérivés sur taux d'intérêt au sein du système financier canadien, à savoir la prédominance des banques à charte dans ce domaine (les banques à charte nationales sont les principaux fournisseurs de contrats de taux hors bourse) et l'existence de barrières réglementaires qui entravent le développement des marchés de produits dérivés, en particulier les produits négociés en bourse.

En conclusion, l'auteur estime que la forte croissance des marchés hors bourse des produits dérivés par rapport aux marchés organisés de ces produits n'est pas un phénomène fâcheux puisque la finalité des transactions est la même. Toutefois, prévient-il, l'établissement injustifié de barrières réglementaires en vue d'empêcher le développement de certains types de marchés peut avoir des répercussions économiques permanentes.

1. INTRODUCTION AND OVERVIEW

Studies on the economic role of financial derivatives indicate that derivatives lower the cost of managing non-diversifiable financial risk. Because of the volatility in exchange rates, interest rates and inflation rates through the 1970s and 1980s, the demand for risk management services and financial derivative securities intensified in most developed economies. In Canada, the over-the-counter (OTC) markets for financial derivatives have become quite active, but the development of Canadian markets for exchange-traded (EXT) derivatives has been less vigorous. In particular, the market for exchange-traded interest rate futures has developed more slowly than in the United States and Europe.

The purpose of this paper is to investigate the pattern of market development for financial derivatives in Canada. Specifically, the paper aims to determine why Canadian interest rate derivatives have developed more robustly in OTC markets than in exchange markets and why markets for some EXT derivatives have developed more successfully than for others. Following is a brief overview of the main results of the investigation.

- The financial system in Canada — including securities markets — is dominated by a small set of chartered banks. Motivated by the desire to widen their revenue base and to manage their own portfolio risks efficiently, these banks have become the primary issuers of OTC interest rate derivatives.

- Because of illiquidity in many EXT derivatives markets and in the spot markets for underlying assets, OTC derivatives, which are more flexible in contract design, are in many circumstances more cost-effective hedging vehicles. Also, with the development of screen-based information networks for OTC interest rate derivatives, the traditional trading information advantage of EXT derivatives markets has diminished substantially.

- Competition from more liquid EXT derivatives markets in the United States is more intense for EXT financial derivatives in Canada that do not strongly reflect the idiosyncrasies of the Canadian financial system than for the more customized OTC derivatives.

- Other inhibiting factors are the learning costs associated with the complex strategic use of financial derivatives and the absence of strong competitive incentives for Canadian investment managers to adopt such information-intensive strategies.

- Regulatory barriers have also delayed the development of a broadly based demand for financial derivatives in Canada with the extent of regulation of EXT derivatives being greater than for OTC derivatives.

Taken together, these findings suggest that many of the conditions necessary to maintain the demand for financial derivatives and to supply risk management services cost-effectively to the market are often better served in the markets for OTC financial derivatives than in those for EXT derivatives. Since both OTC and EXT financial derivatives perform the same general economic functions, the relatively strong development of OTC interest rate derivatives compared to EXT derivatives is not, therefore, a regrettable outcome.

Even though the analysis in this paper is primarily a "positive" rather than "normative" one, the Canadian experience with financial derivatives suggests some general guidelines that policy makers may find valuable. These guidelines apply to most developed financial systems and serve as reminders that some basic economic conditions must be satisfied before a market for any financial instrument can develop successfully. There are three main propositions: (i) since similar instruments in both OTC and EXT derivatives markets provide similar risk management services, there is no a priori reason to prefer the one market structure to the other; (ii) markets for new instruments will develop more successfully if the design of the instrument is consistent with the particular properties of the existing financial system,

especially when domestic financial markets are integrated into the global financial system; and (iii) the regulatory authorities must quickly remove unwarranted barriers to the development of markets for financial derivatives to avoid a permanent diversion of trade to other markets.

The remainder of the paper is organized into four parts. The next section defines derivative securities and their role in a financial economy. It focusses on the basic types of financial derivative assets — options, futures and swaps — and briefly examines the concepts associated with "complete" financial markets to explain the relevance of these markets. It also surveys some of the studies on the economic gains and losses associated with the introduction of derivatives when financial markets are incomplete.

The third section outlines a set of conditions that are necessary for the successful development of financial derivatives markets. This section draws the essential conditions from the simple analytical framework typically used to evaluate the costs and benefits of establishing financial derivatives markets, but generalizes and enriches them with reference to practical designs of financial markets.

The fourth part of the paper discusses the evolution of financial derivatives markets in Canada, highlighting the role of some key institutional and economic factors.

The last section of the paper summarizes the results of the study in the context of the conditions governing the successful development of financial derivatives markets and outlines some general policy guidelines for the development of financial derivatives markets.

2. THE ROLE OF FINANCIAL DERIVATIVE SECURITIES

Definition and types of financial derivatives

A financial derivative is a security whose value depends on the value of some "primitive" asset. A primitive asset is an elementary financial or real asset that singly or in combination (as in the case of a stock index) forms the underlying interest for a derivative security. In practice, the basic financial derivative securities are options, futures or forwards, and swaps; virtually all other derivative assets can be synthesized through various combinations of primitive assets and these basic derivatives.

Options give the holder the right to make delivery (in the case of a "put") or take delivery (in the case of a "call") on the underlying asset at a prespecified price, at or by some particular future date, without the obligation to actually do so. For example, a December 108 put on the 9 per cent Canada of March 2011 gives the option holder the right (but not the obligation) to sell this 30-year Canada bond to the option writer at a price of $108 (for each $100 in face value) by the expiry date in December.

A forward or futures contract gives the holder a claim on a specified value or quantity of the underlying asset at some particular future date. Futures and forward contracts obligate the buyer to take delivery and the seller to make delivery of the underlying asset. For example, a December Canada bond futures contract obligates the holder to take delivery of $100,000 in face value of 9 per cent 10-year Canada bonds or their equivalent on any business day in December selected by the contract writer.

Swaps are arrangements that obligate the counterparties to exchange return characteristics of one asset (or payment characteristics of one liability) for those of another at a specified rate of exchange and notional principal amount over a set period. Although there are no standard contracts,[1] a

1. The International Swap Dealers Association has, however, designed a standard master agreement used in most transactions that specifies the rights and obligations of the counterparties and provides guidelines with regard to reference rates. Notional amounts and swap rates are left to negotiation and features in the master agreement may be adjusted for some transactions.

5-year interest rate swap in Canada, for example, generally involves the exchange of a stream of fixed interest payments at a spread above the benchmark 5-year Canada bond yield for a stream of floating rate payments at the 3-month banker's acceptance (BA) rate, defined on some notional principal amount.[2]

Derivatives in complete financial markets

Much of the recent literature on financial derivatives focusses on the efficient pricing of these securities or on the design of sophisticated investment strategies using these instruments. However, the rapid development of these markets and questions regarding their influence on the stability of financial markets in the wake of financial crises, such as the stock market crashes in 1987 and 1989, are starting to direct greater attention to the economic role of derivative securities.

The general economic or social value of derivative assets is centred on their capacity to "complete" financial markets. In effect, the introduction of derivative securities allows investors to create, by combining derivative and primitive assets, new securities with payoff characteristics that correspond to uncertain states of the economy. In theory, when enough new securities are created to span the set of all possible states of the economy, financial markets are said to be complete. This is an important property for a financial economy because, given appropriate preferences and beliefs regarding future prices of commodities and appropriate trading and pricing processes of the economy, economic agents can efficiently allocate their resources across markets and across time despite uncertainty regarding future economic events.

Since the new securities created from derivatives have payoffs unique to each state of the economy, the equilibrium prices of these securities reflect the preferences and beliefs of all investors. As a result, the investors' portfolios yield the same risk-adjusted rate of return on wealth. In other words, financial derivatives allow the economic agents to obtain information on

2. In an interest rate swap, the notional principal does not actually involve an exchange of principal obligations; it is used only as a base on which to calculate the respective interest payments.

the expected future returns on the underlying assets and to price the risk associated with all investment opportunities in each uncertain state of the economy. Furthermore, by taking appropriate positions in the derivatives, the economic agents can ensure a rate of return on their investments regardless of which state ultimately occurs. In this sense, derivative securities play the same role as insurance contracts, indicating that the value of derivative securities to society corresponds directly to the value derived from managing non-diversifiable risk.

The fact that a derivative security is written for future delivery on some underlying primitive asset would link, in equilibrium, the current market value of the derivative security to the current market value of the underlying asset. The current prices of both the derivative and underlying assets reflect the market's expectations of the underlying asset's future value. The direct correspondence between the market value of a derivative security and its underlying primitive asset gives the derivative its insurance or hedging property.[3] By taking offsetting positions in the spot market for the underlying asset and its corresponding derivative asset, an investor can protect the current market value of the underlying asset against future losses, although possibly at the expense of future gains. Because of this correspondence, investors can also substitute the derivative asset for the underlying primitive asset in their portfolios and earn an equilibrium return with similar risk.[4]

In the very simple models typically used to evaluate the economic role of derivative securities, no particular type of derivative asset dominates. Ross (1976), for example, demonstrated that put and call options written on portfolios of primitive assets — theoretical precursors to stock index and interest rate index options — can yield the desired results of economic efficiency when they complete markets. Townsend (1978) showed that if for-

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3. The correspondence is not one-to-one for all market values of the underlying asset, since the value of the derivative depends also on the striking price, the level of interest rates and the volatility of the underlying asset's market value over the term of the contract. See Hull (1989) for a readable survey of valuation models on a variety of derivative securities.

4. For example, Cox, Ross and Rubinstein (1979) demonstrate that the return on a call option is equivalent to that of a leveraged position in the underlying stock.

ward contracts are used to complete markets, the same economic properties hold, and Hull (1989) notes that with perfect financial markets there are no real differences between forward and futures contracts.[5] Indeed, Hull argues that forward/futures contracts can be replicated by combinations of put and call options and that interest rate swaps are equivalent to a portfolio of forward contracts with successively longer maturities. Such substitutability among different types of derivative securities forms the basis for equilibrating arbitrage across their various markets, just as it forms the basis for arbitrage between the markets for derivatives and their underlying primitive assets. In fact, the same efficiency results are obtained when markets are completed by equity shares (Hakansson 1978) or by bonds with different maturities (Levhari and Rothschild 1983; Townsend 1984).

Derivatives in incomplete financial markets

Of course, complete financial markets do not exist. According to Greenwald and Stiglitz (1986), incomplete financial markets imply that existing securities have payoffs that are not unique to particular economic outcomes and that the risk associated with uncertain future economic events cannot be efficiently priced without assuming restrictions on investors' preferences, including the homogeneity of beliefs.[6] In the absence of efficient risk pricing, resources are not generally allocated efficiently across markets and time.

However, even if the introduction of derivative securities into a financial system leaves financial markets incomplete (although less so), financial derivatives can still yield an economic benefit. The derivative securities

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5. In actual financial markets, the specification of futures and forward contracts are different. Futures contracts specify a fixed maturity date; forward contracts specify a fixed interval of time to maturity. Futures contracts, which have both initial and variation margins, are marked to market daily; forward contracts are not marked to market and, therefore, have no variation margins. Finally, the terms of a futures contract are highly standardized, while those of a forward contract are quite flexible.

6. See Mossin (1977) and Huang and Litzenberger (1988) for a basic outline of the conditions needed for efficient resource allocation in the presence and absence of complete financial markets, excluding and including derivative securities.

are beneficial if they (i) reduce the price volatility of underlying assets; (ii) lower their rate of return because of improved hedging opportunities and lower volatility; and (iii) raise the trading volume of the underlying securities while lowering their spot market bid-ask spreads.[7] Such benefits would exist if the price of the derivative security yielded information on the market's expectation for its underlying asset's future price level and volatility and if an active derivatives market attracted traders to the underlying asset's spot market. However, because financial markets are costly to establish and operate and the resource costs borne by participants may not be proportionate to their gains, not all derivative securities may yield these benefits.

Options

Damodaran and Subrahmanyam (1992) provide a useful survey of the empirical literature on the effects of the introduction of options and futures contracts on the market characteristics of the underlying assets. In examining the effects of stock options, they note that the evidence overwhelmingly supports the proposition that, after options on the underlying stock are listed, the volatility of stock returns declines relative to its earlier value and relative to the volatility of non-optioned stocks. This is quite evident within two weeks of the listing, although the full adjustment can take several weeks more.

Damodaran and Subrahmanyam also cite evidence that the excess return on optioned stocks rises in the period around the listing date of options on the stock as a result of price increases, which are not generally reversed over the study period. No such change is apparent around the initial announcement of the introduction of the option, indicating that the price change is not simply an announcement effect. (Conrad, 1989, speculates that the carrying costs may discourage traders from accumulating the underlying stock in anticipation of its price increase.) Moreover, the excess

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7. Edwards (1988) suggests that higher asset price volatility may not be a negative outcome if it is accompanied by more efficient information processing in the spot market. In this event, transaction costs should be lower because of lower information costs and the rate of return on the spot asset should be relatively unaffected by the rise in volatility.

returns on optioned stocks associated with unanticipated events such as earnings surprises are found to be smaller after the options are listed than before, indicating that investment patterns are less sensitive to financial shocks following the introduction of options as hedging instruments. However, many of these listing effects were greatest in the 1970s when stock options were initially introduced, before investors had become more familiar with them.

When the listed options are split between puts and calls, the excess returns on stocks are negative around the listing date of the put options. Also, the average daily price change on the underlying stocks, which is positive for the two years before the listing of the put options, is slightly negative after. Damodaran and Subrahmanyam believe that both results indicate that put options allow investors to circumvent short-selling restrictions on stocks in the spot market.

The bid-ask spreads on optioned stocks decline after the options are listed and also decline relative to those on non-optioned stocks. Fedenia and Grammatikos (1992) show that the declines in bid-ask spreads on optioned stocks are due primarily to greater liquidity and lower volatility in the spot market following the options' listing. However, listing of the options also attracts less informed traders to the spot market, which limits the reduction in the bid-ask spread. Furthermore, according to Damodaran and Subrahmanyam, the trading volume of optioned stocks increases only slightly after the listing of options, and the increase is generally temporary. This reflects the fact that options are typically listed only for stocks that are already actively traded.

With regard to the information role of options, Damodaran and Subrahmanyam report that companies with options listed on their stocks receive more attention from the financial press and financial analysts after the options are listed than do similar companies without optioned stocks. Also, the price of optioned stocks relative to non-optioned stocks is found to adjust more quickly to relevant news after the options are listed than before.

Although not conclusive, some evidence indicates that the implied volatility of the underlying stock's price, which is embedded in the value of its option, is a better predictor of the actual future volatility of the stock's price than is its historical volatility. Furthermore, just as the uncertainty around an event intensifies because of increasing attention as the scheduled announcement date of its outcome approaches, the implied volatility of the stock price increases as the announcement date approaches. Once the announcement is made, the option price adjusts almost instantaneously.

There is, however, conflicting evidence on whether or not option price changes lead stock price changes. Initial studies supported the view that, given a market surprise, the option price change leads the stock price change by almost a trading day. More recent evidence suggests that, initially, stock price changes lead option price changes, but that the latter then feed back onto stock prices to create a second round of changes in the same direction.

Futures

The studies of the effects of futures contracts on the pricing properties of their underlying assets are less definitive. In particular, it is difficult to determine whether the increased volatility in the returns on some of the underlying asset is the catalyst for the introduction of the futures contract or the consequence of its introduction.

Harris (1989) found that when Standard & Poor's (S&P) 500 stocks were paired with non-S&P 500 stocks, the daily return volatility on the S&P index rose relative to that of an index of the non-S&P stocks following the listing of the S&P 500 index futures contract in 1982. He allowed, however, that the increase in the volatility of the S&P 500 stocks might not be related to the introduction of stock index futures. For example, foreign ownership of these stocks increased dramatically over this period. Tesar and Werner (1992) found that foreign investors turn over domestic stocks at a much higher rate than resident investors. In addition, Damodaran and Subrahmanyam note that the individual betas on the indexed stocks rose after the introduction of futures, making it difficult to know whether the increase in

the volatility of the S&P 500 index reflected diversifiable risk associated with higher volatility of some of the component stocks in the index or an increase in the non-diversifiable risk of all the component stocks.[8]

Edwards (1988) concluded, using a variety of volatility measures and controlling for a monetary policy regime shift in the United States during the 1979 to 1982 period, that the volatility in spot equity prices generally declined after the introduction of the S&P 500 stock index futures.[9] In arriving at a similar conclusion, Bessembinder and Seguin (1992) attribute the decline in equity price volatility to an improvement in the depth and liquidity of the spot markets associated with the introduction of the stock index futures.

Edwards also found that, when controlled for the monetary policy regime shift, the volatility of short-term interest rates was lower after the listing of futures contracts on money market instruments. In addition, Damodaran and Subrahmanyam report that the volatility of returns on Government National Mortgage Association (GNMA) securities rose soon after the introduction of the GNMA futures contract but that during this same period the return volatility of all fixed-income securities had increased. When the sample period following the introduction of the GNMA futures contract was extended, the spot market volatility in GNMA returns was found to be lower than before the introduction of the futures.

There is evidence of expiration day effects on the volatility of stock prices for stock index futures contracts. The volatilities of the stock prices included in the stock index rise on the day that the futures contract expires (Edwards 1988; Bessembinder and Seguin 1992). Also, studies centred around the stock market crash in 1987 indicate that the price movements in the stock index futures during that time led the movements in the index value and that, before the crash, the volatility of S&P stocks rose relative to

8. The beta of a stock measures the volatility of its own return against the volatility of the return on a market portfolio, which represents non-diversifiable market risk. The lower the value of beta, the less sensitive is the return of the stock to non-diversifiable market risk.

9. Between 1979 and 1982, the Federal Reserve implemented monetary policy with reference to money supply growth targets, a strategy which increased the volatility of short-term interest rates.

that of non-S&P stocks. However, the increased volatility found in these studies may be related to technical problems. Kleindon and Whaley (1992) find that the decoupling of the S&P stocks and their derivatives (futures and options) in October 1987 was related to an overload in the New York Stock Exchange's order-processing system for stocks. Similar order-processing problems may explain the expiration day effects on S&P 500 stocks.

In addition to empirical studies on the informational role of financial futures markets, there is also some interesting experimental evidence. Friedman, Harrison and Salmon (1983) constructed a set of experiments to investigate the intertemporal investment behaviour of experienced and inexperienced traders with and without financial futures markets for tradable certificates. The investigators recruited a small group of traders to operate in a controlled financial market structure. In each experimental round, they compared the experimental equilibria to theoretically derived equilibria. One equilibrium in each trading period would reflect only private information of the individual traders — the information that the individual traders had about their own asset positions and properties — and another would incorporate full market information — the private information of all individual traders that is aggregated and summarized through the trading process into the transaction prices.

The investigators found that the existence of futures markets reduced the volatility of spot market prices and accelerated the convergence of trading prices to the equilibria prices. However, they also found that the spot market prices converged to the informationally efficient equilibria (that is, the market information equilibria) with lower volatility only when the traders were experienced. Furthermore, experienced traders were able to distinguish market information from private information and were thus able to learn from the market, while inexperienced traders were not.

There is some actual market support for these experimental results. Examining price volatilities in the spot equity market and the stock index futures market, Chan, Chan and Karolyi (1990) found volatility persistence in both

markets and cross-market predictability of volatilities that reflected the linkages between the two markets. Although there was no evidence of a lead-lag relationship in price volatilities, the returns on the futures led those on the spot equities. Also, the innovations in the market returns on the futures had a larger impact on the spot market's volatility than the innovations in spot market returns had on the futures market's volatility. From this, the authors concluded that the two markets may process different types of information — market information in the futures market and stock-specific information in the spot equity market, which is more costly to gather and process.

Finally, in spite of some evidence of simultaneity in the relationship between the value of the S&P 500 index and the price of the S&P 500 stock index futures, Kawaller, Koch and Koch (1987) concluded that futures prices generally lead stock prices. However, while the systematic relationship was statistically meaningful, the authors considered it to be economically unexploitable with respect to arbitrage opportunities. Nevertheless, these results might also explain the increase in the volatility of S&P 500 stock prices that Harris found following the introduction of the S&P 500 stock index futures. Assuming that market volatility varies directly with the rate of information arrival, the price lead in the futures market may reflect the transmission of market information to the relevant spot equity markets at a more rapid pace after the introduction of stock index futures than before.

OTC derivatives

There is little evidence on the impact of OTC derivatives on their underlying assets, largely because of the recent origin of many of the instruments and the paucity of data on the OTC derivatives markets. However, Turnbull (1987) demonstrated that the existence of interest rate swaps relied on some form of market imperfection or externality associated with incomplete markets. Explanations by subsequent researchers quickly focussed on information asymmetries arising from private information that became public knowledge only after some interval or through trading decisions.

Arak, Estrella, Goodman and Silver (1988) explained the fixed-versus-floating-rate comparative advantage proposition for the use of swaps in terms of this informational problem and showed that swaps allow borrowers to separate the default risk-free component of long and short-term interest rates, which they can fix, from the credit spreads, which continue to vary.[10] Building on this separation, Titman (1992) showed that interest rate swaps permit informational equilibria that would not otherwise exist because of information costs and asymmetries. Borrowers with private information on the prospect of future improvement in their credit rating can borrow in the floating rate market and swap into a fixed rate obligation, thereby fixing the risk-free long-term interest rate while allowing the credit spread to improve over the life of the swap agreement.

Empirical work on OTC derivatives is just beginning. Zucker (1992) examined the arbitrage efficiency between markets for interest rate swaps and 10-year government bonds in Germany, France and Italy. Since changes in only French bond prices led changes in swap rates systematically, and by an economically insignificant amount, he concluded that the markets were well arbitraged. Pugh (1992b) examined the information content of the when-issued market for Government of Canada treasury bills and found that the price of the when-issued contract on the 3-month treasury bill is an efficient predictor of its weekly auction yield.[11]

Real economic implications

Behind these studies is the suggestion that the effects of the derivatives on their underlying assets have consequences for the intertemporal patterns

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10. The comparative advantage proposition argues that some borrowers with a comparative advantage in long-term credit markets can profitably borrow in the fixed rate market and swap the interest liability into a floating rate liability at a lower cost than if they borrowed directly in the short-term market.

11. A when-issued contract on Canada treasury bills combines elements of both futures and forward contracts, has a maximum one-week maturity, and promises to deliver new treasury bills at a specified price when they are issued following the upcoming regular weekly bill tender. Although not strictly an unbiased predictor, the prediction errors of the when-issued contract are economically insignificant for the 3-month treasury bill, which is the most actively traded money market instrument in Canada. For less actively traded 6- and 12-month treasury bills, the corresponding when-issued is informationally less efficient.

of real saving and investment. Levhari and Rothschild (1983) considered the case of a sequential investment project — one that has separately staged time components. They noted that if the investor can reconsider his financial participation in the project at each of the stages, it is equivalent to having a set of put options written on interest rates covering the full term of the project. When the volatility of interest rates increases, the value of the put option rises and investors direct their investment demand toward projects with such options. Arguing that the interest rate interacts with the value of the put option in the aggregate multiperiod investment demand schedule, Levhari and Rothschild found that as the volatility of interest rates increases, the interest rate sensitivity of the investment demand schedule diminishes.

Stein (1992) considered a richer model that features financial futures markets and spot securities markets with intermediaries that are effectively asset managers for ultimate investors. Since the futures contract allows intermediaries to hedge against non-diversifiable (absolute) interest rate risk, their demand for securities rises if the noise from the futures market does not diminish its information value regarding the future equilibrium price of securities. If this is the case, intermediaries bid up the price of securities, which encourages the issuing firms to invest more, thereby raising the rate of capital formation. Unfortunately, rigorous empirical studies of these propositions are not yet available.

3. CONDITIONS FOR THE DEVELOPMENT OF FINANCIAL DERIVATIVES MARKETS

The simple financial structures considered in most of the theoretical and empirical studies on the economic role of financial derivatives follow from the perfect financial market conditions. In their strictest form, these conditions define two aspects of market efficiency — informational efficiency and operating efficiency.

Informational efficiency implies that all traders have equal access to all relevant public information and that this information is fully and quickly reflected in the market's equilibrium trading prices. Therefore, the opportunities available to investors from financial innovations such as the introduction of financial derivatives markets are quickly recognized by all traders who incorporate these innovations into their valuation of revised investment strategies immediately.

Operating efficiency implies that only the most cost-efficient trading technologies are used in financial markets, which are generally costless to set up, enter and exit. None of the participants in the markets have dominant market power, so that the market prices and trading costs are competitively determined. Finally, all markets are continuous, active and free of distorting regulation.

Even though the results from some of the empirical work suggest that the perfect financial market conditions are unsupported in the strictest sense, the elements that characterize market efficiency are useful benchmarks in defining some practical conditions for successfully establishing financial derivatives markets. Following are the statements of these conditions and a discussion of their implications for financial derivatives markets.

The market structure condition

> *The development of derivatives markets must be consistent with the institutional arrangements of the financial system, especially in terms of its securities-based and credit-based components.*

In the absence of special technological conditions, the only types of intermediaries that exist under strict, informationally efficient markets are pure brokers and mutual funds. Their function is to reduce search and management costs for investors. They play no role in the price discovery process — the process by which relevant market information is quickly incorporated into securities prices — and offer no informational services to their clients regarding investment strategies. Furthermore, there is no meaningful counterparty risk, since agents can easily monitor the transaction and investment behaviour of counterparties. Consequently, the implicit financial structure under perfect financial market conditions is a securities-based structure as opposed to a credit-based structure where some intermediaries provide profitable informational services.

Because of costly informational inefficiencies in some financial markets, credit-based intermediaries can exploit informational advantages by acting as principal traders (Leland and Pyle 1977; Chant 1987). More relaxed informational efficiency conditions permit the co-existence of securities-based and credit-based financial markets. In turn, this allows the co-existence of securities-based EXT derivatives markets with OTC derivatives markets in which some financial intermediaries, acting as principal counterparties, write derivative securities on a range of credit-based instruments that they issue or can easily acquire.

The EXT derivatives markets, which are primarily composed of options and futures contracts, are highly organized and centralized and they trade contracts that are essentially standardized (except for price and quantity). The transactions costs (margins and commissions), which are determined by a mix of regulation, convention and competition, are lower because of the standardization of contracts and the centralization of trading. Accord-

ing to Telser (1981), this indicates that the price discovery process operates more efficiently than it would otherwise. The contracts are typically written on exchange-listed securities, stock and stock index options and futures, or on instruments that trade in highly organized and visible OTC markets, such as government securities and national currencies. An essential feature of EXT derivatives markets is the clearinghouse, which acts as official counterparty to each derivative transaction. The clearinghouse is responsible for managing counterparty risk and does so through a set of instruments and powers, including customer position limits and reporting rules, margin requirements and mark-to-market processes, and members' minimum capital standards, position capital limits and clearing balances.

Some OTC markets may be as highly organized as EXT markets but are not as highly centralized. Although standardized to some extent by counterparty master agreements, OTC financial derivatives are more customized with regard to underlying asset, maturity, amount, valuation procedures, and transaction fees. The most popular OTC derivatives include options on stocks and interest rate instruments (including swaps, caps, floors and collars), forwards on interest rates and currencies, and interest rate and currency swaps. Of course, without centralized trading and reporting, there is generally no clearinghouse for OTC derivatives. Therefore, counterparty risk is of primary importance in a transaction decision. Consequently, OTC derivatives transactions are generally between highly credit-worthy counterparties, who have well-established working relationships in other financial markets and who offer publicly accessible, detailed financial reports. At times, acceptable collateral, guarantees or credit enhancements from a credit-worthy third party are used to cover counterparty risks.

The market learning condition

> *Financial derivatives markets develop gradually, since investors must learn to use new financial derivatives efficiently in their portfolio management strategies.*

Since experimentation indicates that experience is important in how well traders use derivatives markets in designing investment strategies, it is

clear that full information regarding the properties of new derivative securities is not as instantaneously accessible to all traders as the perfect financial markets conditions would suggest. In other words, new product information is costly and, consequently, learning is a time-consuming process.

Napoli (1992) and Traynor (1992) argue that investors first become familiar with the use of derivatives in OTC markets and subsequently create EXT derivatives markets, with their more standardized contracts, as a way of lowering trading and communication costs for high volume transactions. The primary suppliers of OTC derivatives are credit-based institutions, which operate on a client relationship basis that emphasizes client service and education. The derivative securities in the OTC markets are generally "supply-driven" in the sense that intermediaries offer these products to their clients with the hope that they will find them valuable. Intermediaries are motivated to offer these securities to increase their own returns by managing their own risk exposures more efficiently and by diversifying their revenue sources. By offering derivative securities that better immunize their clients against financial shocks, intermediaries reduce the prospect of credit default by their clients.

As a direct counterparty to the transaction, an intermediary buys a client's risk exposure through the sale of an OTC derivative instrument but can transform that position into a valuable hedge if it can be matched against its own risk exposure or that of another client. The market for the OTC derivative security is sustained only if clients develop a viable demand for the asset. In a subsequent search for lower cost and more liquid derivative securities, that demand may become a basis for the development of EXT derivative securities markets.The high-volume, anonymous trading process in EXT derivatives markets concentrates on pricing efficiency and is facilitated by securities-based institutions.

Furthermore, because of the costs involved in learning, all investors do not become proficient at the same pace or to the same degree. Since profitable investment is information-intensive, particularly when the perfect financial

markets conditions do not hold strictly, hedging opportunities arising from EXT derivative securities may attract some of the less-informed (more risk-averse) traders to the spot markets (John, Koticha and Subrahmanyam 1992). Some of the better-informed (less risk-averse) traders are attracted to the derivatives markets because of leveraged investment opportunities. The implication is that less-sophisticated investors are attracted to derivatives markets as hedgers, and more sophisticated investors, who find it profitable to acquire more relevant market information and are typically more experienced, are attracted to derivatives as speculators.[12]

The spot market condition

> *Since the primary function of derivative securities is risk management, the spot market price for the underlying asset of a successful derivative security must be volatile and unpredictable with a sufficient (trading) volume to ensure convergence to a competitive equilibrium price.*

This condition is understandably fundamental to the success of derivative securities markets. If an asset's price is not volatile or if it is predictable, there is no meaningful price risk against which to insure, and any insurance program would be too costly. However, the process that generates the prices for the underlying asset must be reasonably continuous and stable. Jumps in price levels and volatility make it difficult for markets to value derivative assets and the risk in spot markets. Furthermore, if trading volume in the underlying security is insufficient, participation in the markets for its derivative assets will also be insufficient to achieve the degree of risk-pooling necessary to sustain the suppliers of the derivative securities. Because of the illiquidity of the spot markets, the quoted prices for underlying assets are also unreliable indicators of equilibrium transaction prices, making strategies involving derivative instruments difficult to evaluate.

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12. One interesting result of the analysis, which is supported empirically by Fedenia and Grammatikos (1992), is that stock market prices may be less informative because of greater participation of uninformed traders, even though market liquidity improves and price volatility diminishes when options on the stocks are introduced into the financial market system.

This condition is not unique to actively traded securities; it applies, as well, to non-transferable credit liabilities extended to clients by financial institutions. However, the tendency to securitize such credit assets by lending institutions broadens the effective distribution of these assets. This in turn encourages the development of interest rate derivatives.

The market participation condition

> *A successful derivatives market involves active participation among a broad set of players — hedgers, speculators and intermediaries — in the markets for the derivative securities, the underlying assets and related assets.*

While this condition is essentially an extension of the spot market condition to all related markets, it is an important extension. Burns (1983), for example, notes that broad participation in the spot market for the underlying asset is necessary to prevent market corners and squeezes. Such occurrences can make settlement on the delivery or exercise date unduly costly for the writer of a futures contract or call option — a prospect that is borne out empirically by evidence of termination day effects on spot prices. Jarrow (1992) demonstrates that if a derivatives market contains a dominant investor, he or she can manipulate the derivatives market to earn excess profits in the spot market and, through this manipulation, cause jumps and excessive volatility in the spot market prices. Paradoxically, Burns' proposition that successful derivatives markets allow investors to lower portfolio management costs by narrowing the composition of their portfolios suggests that less participation in spot markets for assets without derivatives markets is possible. This would increase the probability of squeezes in these markets. Such circumstances could hamper the development of markets for derivative securities written on other assets, because the cross-hedging and arbitrage opportunities between different assets are less attractive.

The major investors in financial markets are, of course, financial institutions. Equally important as the competitive structure of the securities mar-

kets in which these institutional investors operate is the contestability of the markets for the financial management services that they provide to other investors. If fund managers, who are the major source of demand for derivative securities for hedging purposes, are not competitive suppliers of management services, they are insulated to some extent from relative performance evaluations and, therefore, are not motivated to adopt new investment strategies that involve costly learning.

The contract design condition

> *A successful derivative security provides a unique risk management or yield opportunity to investors, which is determined largely by the design of the contract.*

In the complete markets literature, a derivative asset has a unique correspondence between its payoff and the state of the economy; any two derivative assets that have the same payoff characteristics across economic states are identical by definition. If one derivative asset has an inferior payoff compared to another in even one state, the inferior derivative asset will disappear when capital markets are perfect. However, because learning is a costly exercise for most investors, and because markets are costly to set up and operate, different types of derivative assets that actually perform (or purport to perform) the same economic function can co-exist for some time. In a world where learning eventually pays off, artificial differentiation of derivatives or duplication of their economic role cannot be sustained, and only the most cost-efficient derivative security will survive.

The market dynamics condition

> *Markets for particular derivative securities, like other markets, develop in response to technological innovations and economic incentives that can change considerably over time.*

This fundamental condition can be easily overlooked in an overview of the academic literature of derivatives. In the literature, markets for derivative securities are "demand-driven," partly because most studies rely on pure exchange models, and their introduction is costless because of frictionless

markets. They are essentially static models in the sense that the dimensions of the economic environment, as defined by the set of probable economic events, are identical over time.

By relaxing this latter restriction and allowing overlapping subsets of possible economic events to correspond to different stages in a multiperiod horizon, Breeden and Litzenberger (1978) and Hakansson (1978) demonstrated that the set of derivative securities required to complete markets at each stage are generally different. More practically, the market for a particular derivative security may be more active over some periods than others because the particular characteristics of the economic environment in those periods, including technological differences, encourage the demand for that derivative.

The regulation condition

> *To avoid retarding the development of useful derivatives markets, financial market regulation must be responsive to the other conditions required for the development of these markets.*

The absence of complete and perfect financial markets creates a role for financial market regulation (Greenwald and Stiglitz 1986). In developed financial markets, that role is to protect investors and ensure effective competition. These goals are generally addressed through disclosure rules for securities issuers and promoters, minimum capital standards (often risk-related), ethical practice rules, operating restrictions and licensing standards for advisers. The objective is to encourage the propagation of relevant information and discourage the uneven distribution of economic power in order to permit financial markets to allocate investors' resources efficiently. Effective regulation is informed about market structure and operations, comprehensive in its recognition of market interdependency and directed towards a market-based process for resource allocation.

4. FINANCIAL DERIVATIVES MARKETS IN CANADA

As noted previously, the increase in financial uncertainty during the 1970s and 1980s spawned a global interest in risk management practices.[13] Innovations in communications and computer technologies allowed the financial industry in Canada, as elsewhere, to respond to this demand with a host of new financial derivatives. Aside from forward contracts on foreign exchange, financial derivatives markets are, nevertheless, a recent phenomenon in Canada. Although listed equity options were first traded in the mid-1970s, trading in EXT options and financial futures and in most OTC derivatives did not begin in earnest until the early 1980s.

An overview of financial derivatives markets

Exchange-traded derivatives

Equity options began trading on Canadian exchanges in 1975 and trade now on the Toronto Stock Exchange (TSE), the Montreal Exchange (ME) and the Vancouver Stock Exchange (VSE). The TransCanada Options Corporation (TCO) is the clearinghouse for financial options trading on Canadian exchanges.[14] A stock index option, written on the TSE 35 index and listed on the TSE, also clears through the TCO. Although this index option was first listed only in 1987, it replaced an earlier option written on the TSE 300 index that had begun trading in 1984.

The majority of trading in equity options occurs on the TSE, which dominates the spot market trading in Canada for listed equities. For example, the TSE currently accounts for about 75 per cent of the value of spot market

13. For a discussion of the development of EXT financial derivatives markets in the United States, Europe and Asia, see Abken (1991), Napoli (1992), and the Bank for International Settlements (1992a). For a brief overview of developments in Canada in the 1980s, see Kirzner (1988), Hore (1989) and Gagnon (1990).

14. The gold options listed on the ME and the VSE and the silver option listed on the VSE, which cleared through the International Options Clearing Corporation, were delisted in 1991. The silver option listed on the Toronto Futures Exchange and the gold option currently listed on the VSE clear through the TCO. Details on listed options in Canada are available in Canadian Securities Institute (1989).

equity trading in Canada and over 50 per cent of the volume.[15] Similarly, almost 60 per cent of the equity option contracts traded in Canada, accounting for over 40 per cent of the premium value, are traded on the TSE (Chart 1, p. 49). In 1992, 2.1 million equity option contracts were traded on Canadian exchanges, down from a peak of 5.7 million in 1987. Based on a delivery amount of 100 shares per contract, which is typical for an equity contract in Canada, listed options trading was around 2 per cent of the spot market's equity volume in 1992, compared to a peak of about 19 per cent in 1981 (Chart 2, p. 50).

At present, only the ME lists interest rate options, which are written on Government of Canada bonds and cleared through the TCO (Chart 3, p. 50). Options on Canada treasury bills, previously listed on the ME, and TSE-listed options on Canada bonds, which appeared around 1985, traded for only a few years before delisting. In 1992, the trading volume on listed interest rate options was only 51,000 contracts.

The only financial futures contracts currently active on Canadian exchanges are futures on the TSE 35 stock index, futures on 10-year Canada bonds and futures on 1-month and 3-month bankers' acceptances (BAs), all of which clear through the TCO.[16] The TSE 35 stock index futures, which are listed on the Toronto Futures Exchange (TFE) — a subsidiary of the TSE — began trading only in 1987. They replaced an earlier futures contract on the TSE 300 stock index that was introduced in 1984. Since 1987, the average annual volume (in terms of the number of contracts traded) for the TSE 35 stock index futures has increased at an 11 per cent annual rate, yet only 59,000 contracts were traded in 1992. If the notional delivery amount was 3,500 shares per contract (or 100 shares of each stock in the index), this would represent less than 3 per cent of the shares traded on the TSE last year. Also, the number of transactions in 1992 was just over 24,000 compared to 3.5 million spot market equity transactions on the TSE alone.

15. There is also an OTC spot market in equities in Canada operated through the Canadian Dealing Network — a subsidiary of the TSE. Trading volume was, however, less than 3 per cent of exchange volume in 1992 and is sporadic.

16. BAs are essentially commercial paper issues that have been guaranteed by a chartered bank (for a fee) and sold at a discount into the domestic money market.

All the existing interest rate futures contracts are listed on the ME. These contracts succeed the Canadian interest rate futures contracts that had been introduced in late 1980 by the TFE. These earlier contracts were written on long-term Canada bonds and on 3-month Canada treasury bills. Both contracts were delisted in 1986.[17] The ME introduced its futures contract on 3-month BAs in early 1988 and followed up with the futures on 1-month BAs in early 1992. The ME's futures contract on 10-year Canada bonds was listed in late 1989.

The bond futures contract registered a 19 per cent increase in the number of transactions to 75,000 in 1992 — its third full year of operation — and an increase of 19 per cent in the number of contracts traded to almost 516,000. Given the notional value of the contract ($100,000 in par value), this is only about 5 per cent of the value of bond trading in Canada during 1992. The ME's experience with the 3-month BA contract has been more positive. Both the number of transactions and contract volume more than doubled in 1992 to over 27,000 transactions involving more than 443,000 contracts. At a notional amount of $1 million per contract, this represents almost 30 per cent of the value of spot money market trading in Canada last year.

The ME also introduced options on its Canada bond futures contract in March 1991. However, trading volume has declined from 15,000 contracts in 1991 to only about 5,000 last year. Foreign currency options, which had been listed on the ME, and a U.S. dollar futures contract that had been listed on the TFE did not survive the competition from similar contracts listed on U.S. exchanges and OTC forward contracts on foreign currencies.[18]

Over-the-counter derivatives

In Canada, as elsewhere, there is only an incomplete statistical picture of domestic OTC derivatives markets. However, the major commercial and

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17. In fact, the original futures contract on the long-term Canada bond was replaced in the summer of 1985 with another contract written on 15-year Canada bonds.

18. An option on Canadian dollars was also listed briefly on the VSE.

investment banks in Canada, which are the primary suppliers of OTC derivatives, indicate that the most important instruments include forward contracts on foreign exchange; forward and futures contracts on interest rates; interest rate swaps; and interest rate, currency and equity options. In 1992, the six major chartered banks, which account for 90 per cent of the balance sheet assets in the Canadian banking industry, had a notional principal outstanding of almost $2.2 trillion in all derivatives, which is about five times the amount reported in 1986.[19]

Over 45 per cent of this amount is forward contracts on foreign exchange (Table 1, p. 55), down from about 80 per cent in 1986. Domestic interest rate swaps are the most prominent OTC derivatives next to the foreign currency forwards (Chart 4, p. 51), followed distantly by forward interest rate agreements (FRAs) and interest rate futures (including bond forward contracts).[20] Interest rate options, which make up about 75 per cent of the OTC options trading value (currency and equity options account for the remainder), include options on interest rate swaps (swaptions) and interest rate caps, floors and collars. An interest rate cap — an agreement that defines an upper limit on the interest rate charged on a loan commitment over a specified interval — is effectively a put option written on a floating rate note. An interest rate floor — an agreement that defines a lower limit on the interest rate charged on a loan commitment over a specified interval — is effectively a call option written on a floating rate note. A collar, which defines upper and lower limits on a loan's interest rate, is equivalent to a combination of a put and a call option with different exercise prices written on a floating rate note.

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19. There are sixty-six chartered banks in Canada. Banks account for about 75 per cent of the assets of all deposit-taking institutions in the country. The six largest chartered banks in order of size are the Royal Bank, the Canadian Imperial Bank of Commerce, the Bank of Montreal, the Bank of Nova Scotia, the Toronto-Dominion Bank and the National Bank.

20. A forward rate agreement is a contract that becomes effective at a specified future date for a specified interval, typically three months, over which a particular rate of interest, fixed at the initiation of the agreement, is charged on some notional underlying principal amount. If the reference rate, typically the 3-month BA rate in Canada, rises relative to the contract rate, the seller of the FRA pays the buyer the rate difference on the notional principal; if the reference rate falls relative to the contract rate, the buyer pays the seller. A bond forward contract is similar to an FRA in structure but typically has a longer termination date and generally uses a long-term Canada bond as the reference rate.

All compete against listed interest rate options and futures as hedging instruments. There are currently about 35 to 40 financial institutions in Canada offering OTC derivative products. Although about one-half of these institutions are regular participants in the various OTC interest rate options markets, four large securities firms account for most of the activity (Steiner 1992; Traynor 1992).

The OTC interest rate derivatives markets in Canada have developed extremely rapidly, a phenomenon that is not unique to Canada.[21] Although the foreign currency forward market, which is primarily an interbank market, has been active in Canada for the past thirty years, the domestic interest rate swap market began only in 1985. FRAs, which first appeared in London in 1983, were introduced into the Canadian market in 1987. While the original FRAs are priced off LIBOR — the London interbank offer rate — the domestic FRAs are priced off 3-month BAs. Interest rate swaps and FRAs involve the most standardized contract among OTC derivatives, probably because interbank trading accounts for a large portion of the activity in these markets. The market for when-issued (WI) contracts on Canada treasury bills is also well established (Pugh 1992a, 1992b). The contracts are highly customized and their trading volume has a distinct intra-weekly pattern, increasing substantially as the auction date for new treasury bills approaches. The WI contracts began trading in 1978 and market activity has expanded rapidly over the past decade.

Most other OTC interest rate derivatives markets have been introduced into Canadian markets over the past five years, many — as in the case of the swaptions market — as adjuncts to swaps and FRAs. One exception is interest rate caps, which have existed for some time in the mortgage and commercial loan markets, although interest rate floors and collars are much more recent innovations. The newest markets emerging in Canada are OTC options with interest rate spreads (defined on Canada bond yield curves, bond interest indices, or Canada-U.S. bond yield differentials) as the underlying interest. Markets for OTC equity options are also develop-

21. For a discussion on the development of OTC markets in Canada, see Hull and White (1990) and Traynor (1992). For a discussion of similar developments internationally, see Bank for International Settlements (1992a, 1992b).

ing but at a slower pace, probably because of the competition from EXT equity derivatives.

Some of the transactions in foreign currency forwards, interest rate swaps and WI contracts are completed, to varying degrees, through brokers. This indicates that participants in these markets rely to some extent on electronic information services, obtained through market "screens," to guide trading activities. Representative quotes on basic FRAs are similarly displayed on market screens. The growing use of market information screens to aid trading activities in OTC derivatives improves the pricing efficiency in these markets.

The statistical evidence regarding EXT derivatives in Canada together with the largely anecdotal evidence on OTC derivatives markets indicates that the rapid growth in the OTC markets has been partly at the expense of EXT markets, particularly in the case of interest rate derivatives. Two obvious questions arise from this recent history. Why have OTC markets for financial derivatives developed more robustly in Canada than EXT markets? And does it matter if OTC derivatives markets dominate EXT markets?

Factors in the development of OTC and EXT markets

There are essentially four factors that explain the emerging dominance of OTC financial derivatives markets in Canada relative to EXT markets. The first factor is the structure of the Canadian financial system. Canadian chartered (commercial) banks are the dominant force in the system, which includes domestic securities markets that even by international standards are well-developed for a relatively small country. The second factor is the illiquidity of Canadian equity markets and the design of interest rate derivatives contracts. OTC interest rate derivatives are written on the same underlying interest as many EXT derivatives but with more flexible contract terms. The third factor is the dominant competitive position of the United States in North American, and indeed global, spot and derivative securities markets. The final factor is an approach to financial sector regulation in Canada, which until recently discouraged the development of financial derivatives markets.

The structure of the Canadian financial system

In the initial stages of discussions surrounding proposals for restructuring the Canadian financial system, Courchene (1985) drew a sharp distinction between a capital-based and a credit-based financial system. A capital- or securities-based financial system is characterized by the direct issue of debt and equity securities to investors as the primary means of corporate financing and by active secondary trading markets in these instruments. A credit-based system finances corporate requirements primarily through loans from financial intermediaries acting as principal lenders in the transaction. Of course, most developed financial systems feature a mix of both types and Canada's is no exception. With almost 60 per cent of its non-financial business cash requirements over the past five years having been met through securities issues, it is essentially a securities-based system. However, compared to the U.S. system (Chart 5, p. 51), the Canadian financial system has a moderately stronger credit orientation.

Since 1987, when reregulation of the Canadian financial system began, the large chartered banks have become an even more dominant force than in the past. In addition to their majority share positions in commercial and retail banking markets,[22] the six major chartered banks have either developed or acquired ownership of the largest full-service securities dealers in Canada, established discount brokerage operations that currently dominate that segment of retail securities trading, and are aggressively entering into the mutual funds business (Boreham 1990; Campbell 1990; el Baroudi 1992; Fine and Zelmer 1993). As noted in an earlier section, these banking institutions are also the primary suppliers of OTC derivatives in Canada. Building on their client relationships and their growing sophistication in investment and risk management, these banks have been able to broaden their range of profitable services through the development of OTC derivatives markets. Because they draw on a relatively deep knowledge of the

22. Although the chartered banks hold the largest share of retail and commercial deposit and credit markets in Canada, they face stiff competition in most of these markets from other financial intermediaries, such as trust and mortgage loan companies, credit unions and insurance companies. Recent empirical work (Nathan and Neave 1989; Neave and Nathan 1991; Shaffer 1993) indicates that Canadian deposit and credit markets are, indeed, contestable.

financial affairs and requirements of their clientele, they can effectively tailor an attractive risk management program using interest rate swaps, forwards and options. Their dominant position in the Canadian financial structure provides the banks with a credibility, credit-worthiness and market penetration that is unmatched by most independent securities dealers, who offer EXT financial derivatives as substitute hedging instruments.

As in other countries, financial institutions account for the vast majority of securities trading and investment in Canada. The rapid growth of pension funds, mutual funds, and individual investment management and advisory services has increasingly institutionalized personal savings. Therefore, it is the financial institutions that would be expected to be most active in financial derivatives markets as hedgers. However, a recent survey of pension funds in Canada indicated that only about twenty of the largest eighty funds use financial derivatives other than currency futures and forwards in their investment management programs, and only about the same number use currency hedging instruments (Williams 1992). The survey documents a "puzzling reluctance to embrace derivative strategies" that is explained by (i) the limited role that aggressive, independent, investment consultants play in pension fund decisions (Williams 1992); (ii) the absence of sophistication of many in-house pension managers with regard to financial derivatives and the lack of incentives for them to learn (Gallagher 1992); (iii) the slow development of new business for EXT financial derivatives by the listing exchanges and their members (Riverin 1992); and (iv) the absence of performance-driven competition in the mutual and managed funds markets (Naiglie 1992).

In support of the latter point, McLaughlin and Bossen (1990) found that no particular Canadian managed fund systematically outperformed the others. While the results were generally consistent with efficient market propositions, McLaughlin and Bossen concluded that regulatory barriers might also have discouraged fund managers with different capabilities from constructing optimal strategies. Traynor (1992) suggests that many of these funds are not active trading institutions and that they prefer the customized design of OTC derivatives to the standardized design of EXT deriva-

tives. The latter are considered to be more cost-effective in the management of actively traded portfolios.[23]

Market characteristics and the design of derivatives

As indicated in Table 2 (p. 56), securities trading in Canada is heavily skewed toward money market securities and bonds, all of which trade over-the-counter. Within these classes, the most heavily traded securities are Canada treasury bills and Canada bonds (Table 3, p. 57). Yet, it is the EXT derivatives written on these instruments that have enjoyed the least success.

Gagnon (1990) argues that it was the illiquidity in the EXT bond options market that prompted the development of the OTC bond options market. The most rapidly developing OTC derivatives — interest rate options and futures — are written against the same underlying interest, and they have terms that can range from 5 to 10 years for amounts up to $100 million. The terms and amounts for OTC options are well beyond those for EXT options in Canada, so that the gains from customizing the hedge by using OTC bond options exceed their illiquidity costs to make them cost-effective hedging vehicles. Also, interest rate caps and collars offered by the banks can be packaged directly into their credit services to clients. Similarly, swaps are attractive to Canadian corporations, since spot market trading in corporate debt securities is quite thin relative to that of government securities, and the maturity of a swap is longer than that of even the longest EXT bond futures contract.

The most credit-worthy short-term corporate debt market in Canada is that of bankers' acceptances. The 3-month BA yield is generally used to price FRAs, which have maturities of up to two years. Moreover, this asset is the underlying interest on the most successful EXT interest rate derivative

23. While particular financial derivatives in each of the market types may be substitute securities in some investment strategies, they can also be complements in other strategies. For example, suppliers of OTC derivatives with temporarily unmatched open positions are becoming more active participants in the Canadian EXT derivatives markets. In particular, both FRAs and interest rate swaps are priced off 3-month BAs in Canada. This enhances the attractiveness of the 3-month BA futures contract listed on the ME as a short-term hedging vehicle.

instrument to date — the 3-month BA futures contract listed on the ME, which also has a 2-year series cycle. However, while the FRA contract has a negotiated term that can end on any date, the futures contracts have termination dates that are fixed at calendar quarter ends.

Liquidity problems have also plagued the EXT equity options markets in Canada and made efficient pricing — and, therefore, effective hedging, speculation and arbitrage — a more difficult task than otherwise (Mandron and Perreault 1983; Kirzner 1988; Myers 1991). Thin trading in the underlying spot equity markets (Fowler, Rorke and Jog 1980) also created problems in the markets for Canadian equity options. Standard (Black-Scholes) option pricing models do not accurately replicate observed options prices because of discontinuities in spot equity prices and trading activity, resulting in inefficiencies in the listed options markets (Perrakis and Ryan 1989; Halpern and Turnbull 1985). Consequently, the valuation of spot market risk is inappropriate, since the information on the market's expected spot price volatilities and price levels embedded in the equity options is suspect.

The timing of the introduction of particular contracts may also have been unfortunate for some of the EXT derivatives. Most notable is the Canada treasury bill futures contract that was first listed in 1980. Since the delisting of this contract in 1986, the outstanding stock of Canada treasury bills has continued to grow rapidly (at a 15 per cent average annual rate compared to the 22 per cent rate in the 1980-86 period). Moreover, the most active trading is in the 3-month treasury bill, which was the underlying asset for the futures contract. The success of the OTC when-issued contract, particularly over the past five years, indicates that there is, indeed, a demand for a short-term, flexible, derivative instrument on 3-month treasury bills.

The dominance of U.S. securities markets

For those Canadian fund managers and traders who do wish to trade financial derivatives actively, the depth and liquidity of the EXT markets in the United States are attractive and accessible. Canadian securities dealers have a long history of participation in commodity trading on American

exchanges and were quick to broaden their participation to financial derivatives as they became available on the International Money Market, the Chicago Board of Trade (CBOT), the Chicago Mercantile Exchange (CME) and other U.S. derivatives exchanges. In spite of structural differences, the financial system in Canada is deeply integrated with that of the United States, particularly with regard to securities markets. Although there was some evidence of segmentation before 1981 between the markets for domestically listed Canadian and American stocks (except those that were interlisted), Mittoo (1992) found strong evidence that the two countries' stock markets have since become fully integrated. Furthermore, empirical tests cannot reject the proposition of perfect substitutability in long-term capital flows between Canada and the United States (Caramazza et al. 1986), a condition well-illustrated by the coherence of long-term interest rate movements in the two countries shown in Chart 6 (p. 52).

The Canadian dealers' willingness to trade on U.S. exchanges is clearly illustrated by the pattern of interlisted equity trading shown in Table 4 (p. 58). While American exchanges recently traded over 40 per cent of the total volume of Canadian-based interlisted stocks, the Canadian exchanges traded less than 1 per cent of the U.S.-based interlisted stocks. In examining the trading behaviour in five countries (Canada, Germany, Japan, the United Kingdom and the United States), Tesar and Werner (1992) found that Canadian equity markets were much less active than those in other countries. They also found that an unusually large portion of the activity in Canadian markets was due to trading by non-residents. Even though easier access to relevant information and a clearer legal status of investments are strong incentives to trade home-based interlisted securities on domestic exchanges (French and Poterba 1991), the magnitude of these disparities suggests that other factors are at play. Notably, the liquidity of securities markets in the United States is generally greater than in Canada.

Greater liquidity translates into lower bid-ask spreads and, therefore, lower trading costs. In comparing the bid-ask spreads on the stocks of the 35 largest capitalized firms listed on the TSE with the spreads on the stocks of the 70 largest capitalized firms listed on the NYSE, Schulman (1989)

found that the bid-ask spreads on the U.S. stocks, as a percentage of their stock value, were about one-half those of the Canadian stocks. Similarly, long-term U.S. Treasury bond bid-ask spreads are typically quoted in multiples of 1/32 of a point, while similar maturity Canada bonds are generally quoted in multiples of 1/16 of a point.

The Canadian investors' willingness to trade on U.S. exchanges extends to derivative products as well. Tables 5 and 6 (pp. 58, 59) illustrate the comparative liquidity advantage of U.S. EXT financial derivatives markets over their Canadian counterparts. Because of this liquidity advantage, some estimates suggest that by 1989, the year that the ME introduced its bond futures contract, over 90 per cent of Canadian trading in EXT financial futures was directed to the CBOT and the CME (Hore 1989). A large part of this volume is concentrated apparently in the U.S. Treasury bond futures contract, which Canadian investors use to hedge even their portfolios of domestic bonds. In a recent study Gagnon, Mensah and Blinder (1989) compared the hedging effectiveness for Canadian corporate bond portfolios of the U.S. Treasury bond futures contract to that of the Canada bond futures contracts listed on the TFE until 1987. They found that, because of illiquidity in the Canadian futures market, the U.S. Treasury bond futures contract combined with a currency hedge was the more effective hedging vehicle.[24] This result not only underscores the high degree of long-term capital substitutability between the two spot markets but also explains why some Canadian fund managers and institutional investors are reluctant to use the domestic EXT Canada bond futures contracts in their hedging strategies.

This reluctance may still persist. Evidence on the distribution of 1991 trading volume for the interest rate futures listed on the ME shows that member firms and locals — independent traders or traders for member firms

24. Without the currency hedge, the Canada bond futures contract proved to be the more effective hedge, indicating that the currency risk was the dominant risk factor. In other words, in the absence of currency risk, the cross-basis risk between spot market bond prices of Canadian corporates and the U.S. Treasury bond futures contract (that is, the risk that the futures contract written on one asset cannot perfectly hedge spot market positions in other assets) was less than the cross-basis risk using the Canada bond futures contract. The illiquidity in the latter market adversely affected its price sensitivity to optimal hedge adjustments.

that undertake the responsibility to trade the futures contract actively as market-makers — accounted for about 70 per cent of the volume of the Canada bond futures (Ballard 1992).[25] Conversely, for the more successful 3-month BA contract, clients accounted for about 80 per cent of the trading volume. As indicated by Chart 7 (p. 53), the correspondence between Canadian and U.S. short-term interest rates is less than that of the long-term yields, indicating that the EXT futures contract on domestic short-term interest rates is probably a more effective hedging vehicle for Canadian money market positions than its U.S. EXT counterpart.[26]

Competition among exchanges listing derivative products is not unique to North America; it is also an emerging trend in the European and Asian markets (Napoli 1992). But a high degree of capital mobility among the national markets and similarly designed derivative instruments are necessary for effective substitutability among the contracts. Therefore, while the EXT derivatives initially listed on Canadian exchanges were clones of U.S. instruments, the most successful derivatives are those whose underlying interest is uniquely Canadian and least correlated with short-term U.S. financial trends. These are the equity options listed on the TSE, the 3-month BA futures contract listed on the ME and the TSE 35 stock index futures listed on the TFE.

Because trading networks are costly to set up and to maintain, the exchange that is the first to introduce an innovative, cost-effective financial product not only attracts the initial demand flow but also has the advantage, because of sunk costs, in retaining that flow. Only if rival exchanges can introduce more cost-effective instruments will some of that order flow be diverted to them.[27] Although the initial EXT derivatives listed on Canadian exchanges had the design advantage of being written on domestic

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25. Although the Chicago Board of Trade does not report on the institutional distribution of trading activity in its futures contracts on U.S. Treasury bonds, anecdotal evidence suggests that member firms and locals account for as much as 75 per cent of the trading volume.

26. Caramazza et al. (1986) demonstrate this proposition more formally.

27. See Schulman (1989) for a brief discussion on the implications for Canadian derivatives exchanges of U.S. exchanges that are first to capture the order flow from Canadian investors.

securities that were actively traded on spot markets and were, therefore, most responsive to domestic financial trends, they were neither first off the ground, nor highly innovative, nor cost-effective as a hedging or arbitrage vehicle.

In a recent paper, Appelt (1992) has shown, however, that the TSE 35 stock index futures contract is a cost-effective vehicle for participating speculatively in the Canadian equity market. Important to the success of this contract was the listing of the TSE 35 Index Participation Units (TIPS) on the TSE in early 1990. The TIPS are effectively shares in an EXT mutual fund composed of the same shares as those in the TSE 35 index and in the same proportions as their index weights. They quickly became popular with fund managers since they are a cost-effective vehicle for diversified participation in the high-quality Canadian equities market and can be cost-effectively hedged with offsetting positions in the TSE 35 index futures market. Similarly, the success of the OTC derivatives in Canada relative to EXT derivatives can be attributed partly to their customization to the buyer's needs, which insulates them to some extent from competition with U.S. derivatives markets.

The regulation of Canadian financial markets

Napoli (1992) has noted that the successful development of derivatives markets in Europe and Asia followed quickly in the wake of financial regulatory reform. In the same vein, participants in Canadian derivatives markets have argued that the development of domestic derivatives markets has been slowed by regulatory barriers. Rupert (1991), for example, has stated that Canadian institutional investors have, until recently, limited their participation in derivatives markets because of restrictions on insurance company, pension fund and mutual fund investments.

The structure of financial regulation in Canada is fairly complex and, as a result, policy co-ordination can sometimes be problematic. Chartered banks are subject only to federal regulation while securities dealers and brokers are regulated solely by the provinces in which they choose to operate. Other financial institutions, such as trust and mortgage loan compa-

nies, insurance companies, credit union organizations and pension funds, can be regulated by either federal or provincial authorities.

Formerly, financial institutions in all jurisdictions were governed according to a strict "corporate powers" approach to regulation that defined eligible investments and financial operations. New financial innovations that were not specifically included in the class of eligible investments, such as derivative products, were largely out-of-bounds. Consequently, few institutions other than securities firms and chartered banks had unlimited access to derivative securities investments.[28] However, the corporate powers approach to financial regulation has been replaced recently by the "prudential portfolio" approach. Within broad quantitative limitations designed to minimize risk concentration and exposure, the prudent portfolio approach allows institutions to invest in any class of securities that seems a prudent investment opportunity.

The prudent portfolio approach either has been incorporated into the financial legislation of all jurisdictions or has encouraged revisions to broaden the scope of corporate powers limitations. For example, the Canadian Securities Administrators, the national umbrella organization for all provincial securities regulators, revised its national policy on mutual fund investments in 1991 in a fashion that retains the corporate powers approach but now permits the use of derivative products for hedging and investment (Walters 1992). Also, new federal legislation governing the operations of federally incorporated trust and mortgage loan companies, insurance companies and credit union organizations, which came into effect only in June 1992, subscribes to the prudent portfolio philosophy (Daniel, Freedman and Goodlet 1993).

In Canada, the activities in EXT derivatives are regulated by provincial securities authorities. The trading of financial derivatives on the TSE and the TFE, for example, is regulated under the Ontario Commodity Futures Act, which is administered by the Ontario Securities Commission, while

28. Most institutions had limited access to derivatives through a "basket" clause that permitted restricted investment in securities and loans not otherwise permitted in their class of eligible investments.

derivatives trading on the ME is governed by the Quebec Securities Commission. In addition, the exchanges themselves are recognized self-regulatory organizations, along with the Investment Dealers Association of Canada, for trading activities in the listed derivatives products. These organizations set out and enforce the disclosure requirements for the derivative products and strategies, the registration requirements and compliance rules for derivatives dealers, the trading rules (position limits, margins, price limits) for derivatives products, and the minimum capital standards for registered dealers' derivatives positions.

These provincial authorities also negotiate international securities agreements. In the area of financial derivative securities, they have recently established agreements in the form of memorandums of understanding with the Commodity Futures Trading Commission in the United States and the Commission des Opérations de Bourse in France that permit appropriately registered Canadian derivatives dealers to actively sell EXT derivatives listed on the TSE, TFE and the ME to residents of those countries.

The activities in OTC derivatives markets are much less regulated than in EXT derivatives markets. In the past, the Canadian provincial securities authorities have avoided regulating these activities because the primary suppliers of the OTC products are federally chartered banks and because the primary buyers of the derivatives are sophisticated managers of large portfolios. Investment managers are expected to be better informed about the risks involved in derivatives-based investment strategies than retail investors. However, the self-regulatory organizations in the Canadian securities industry impose minimum capital requirements and trading rules on their members which cover some of their activities involving OTC derivatives.

Similarly, federal legislation governing the operations of chartered banks has not restricted bank activities in financial derivatives markets. However, the Office of the Superintendent of Financial Institutions (OSFI), the federal financial regulatory body, does oversee the operations of chartered banks

in the derivatives markets. Its objective is to ensure adequate risk management to preserve the solvency of the institutions. Indeed, the imposition on Canadian banks of the Bank for International Settlements' (BIS) capital standards, which involve lower asset-risk weights for off-balance sheet than on-balance sheet credit exposures, may have even encouraged banks to develop OTC derivatives markets in order to lower the capital costs of their own investment and hedging strategies (Bank for International Settlements 1992a).

The regulatory status of OTC derivatives is, however, in the process of changing. Early in 1992, the Canadian Securities Administrators (CSA) submitted for public comment a draft of a national policy on trading in warrants, which are broadly defined to include all put and call options with an underlying interest related to securities indexes, debt-like securities or commodities that are not already listed on recognized exchanges. The draft proposes regulations governing the design of the derivative and the specification of its underlying interest, the disclosure of information regarding the product and the trading of the instruments. In other words, it proposes to regulate the OTC market for options in a manner consistent with the rules for EXT options. It does, however, exempt private placements to institutional investors from many of the requirements, thereby insulating the institutional OTC market, particularly the banks supplying these products, from provincial regulatory oversight.

The CSA is also in the process of developing a draft of a national policy for other derivatives, which from preliminary definitions would apparently include OTC futures contracts (Ontario Securities Commission 1992). Furthermore, OSFI is actively involved in the Bank for International Settlements' planning forum on the design of minimum capital standards for market risk arising from trading positions in derivatives and other securities (Gresser 1992). At present, the BIS capital adequacy provisions are defined only on the credit risk of derivative products, not the position risk. Just as the federal authorities are currently extending minimum capital standards similar to the BIS's standards to federally incorporated non-bank financial institutions, they are also proposing to extend the capital stand-

ards covering derivatives market risk to these federal financial institutions. Finally, IOSCO — the International Organization of Securities Commissions — is designing similar capital standards for securities dealers (International Organization of Securities Commissions 1989, 1990).

5. SUMMARY AND CONCLUSIONS

Market conditions and the Canadian experience

The structure of the Canadian financial system was more favourable to the development of OTC derivatives markets than to that of EXT markets. The largest Canadian chartered banks, which are the primary suppliers of OTC derivatives, are the dominant force in Canadian financial markets, including the securities markets. They have developed the OTC derivatives markets to diversify their revenue sources and to manage their own portfolio risks and are well situated to offer strategic advice to their clients on the appropriate design of risk management programs.

One of the key economic differences between the two types of markets relates to their relative information content. When EXT derivatives markets are sufficiently attractive to a broad range of market participants who trade actively in reasonable volume, they can provide useful information on market expectations of future spot market values at a fairly low cost. In this way, they enhance the price discovery process. Unfortunately, the trading activity and, consequently, the liquidity of many EXT derivatives markets, or of the underlying spot market assets, has often been insufficient to yield accurate market information. Moreover, the markets for some OTC derivatives, such as the when-issued contract on treasury bills, are also quite well organized and can provide similar information for price discovery. Indeed, in many OTC cash and derivatives markets, the development of electronic trading systems and screen-based information networks has diminished the traditional price information advantages of EXT securities markets over OTC markets.

Furthermore, specific information on the idiosyncrasies of investment strategies involving financial derivatives is as important as market price information in the evaluation of strategic risk. The investment rules necessary to maintain the optimality of particularly complex investment strategies are not always immediately apparent to investors. The institutions offering OTC derivatives seem to have addressed the need for this type of information better.

Many of the OTC derivatives are written on the same underlying interests as EXT derivatives. With more customized contract terms, however, the OTC derivatives are often more effective hedging vehicles. Yet, the most active OTC derivatives are those with the most highly standardized contracts. Because of the competition among derivatives trading on the two types of markets, the degree of standardization of contract characteristics for the instruments are converging to some extent and cross-market competition is becoming more intense. The exchanges are increasing the flexibility of the contract terms for their listed derivatives in order to improve the cost-effectiveness of EXT derivatives in investment strategies. In turn, the issuers of OTC derivatives are pricing their instruments in close accordance with the market values of the underlying asset and of rival EXT derivatives and are standardizing the features of some contracts in order to attract demand away from EXT markets. Since the markets for standardized contracts are quite active, the standardization of some OTC derivative contracts erodes the liquidity advantages of similar EXT financial derivatives.

In a more global context, the Canadian financial system is highly integrated with the U.S. system, particularly in securities markets. However, much greater liquidity in U.S. markets results in substantially lower costs of transactions than in similar Canadian markets. Canadian investors and fund managers who need to trade derivative securities actively to comply with their investment strategies tend, therefore, to look to the U.S. EXT markets. The most successful financial derivatives listed on Canadian exchanges are those most genuinely Canadian in terms of underlying securities and most independent of trends in U.S. financial markets. Of course, because of customization, many OTC derivatives in Canada are also less vulnerable to competition from U.S. financial derivatives.

With strict regulatory limitations on fund managers' participation in financial derivative markets and a high concentration of cash market assets such as treasury bills in the portfolios of non-trading institutions, there was simply too little demand in Canada through most of the 1980s to support EXT financial derivatives markets. Many who were able and willing to invest in

derivative securities did so largely for hedging purposes and found that more flexible OTC derivatives were more attractive than EXT derivatives. To the extent that investment strategies involving derivative instruments are still sufficiently new to fund managers, many are still wary of their strategic value and may not be sufficiently competitive over the short term to experiment with financial derivatives.

The relative absence of regulation of OTC derivatives markets compared to EXT derivatives also tilted the pattern of development somewhat in favour of the OTC products. Some regulations such as the BIS capital standards may have even promoted the development of OTC derivatives markets. Recent regulatory changes and proposals for further revisions have removed some major barriers to the development of markets for financial derivatives. Other proposals may eventually even the distribution of the regulatory burden between markets for similar OTC and EXT derivatives. Nevertheless, the relative efficiency with which the two types of markets can provide risk management services remains a concern to regulators.

One concern with OTC derivatives is the concentration of supply. If the OTC markets are not sufficiently contestable, the banking institutions that are the main participants in these markets can earn rents. But, by the same token, specific EXT derivatives are typically listed on only one exchange, either by regulatory design or market selection. Consequently, the members of that exchange — all of whom provide transactions services to investors — have some degree of market power in setting transaction fees, client and dealer margins, and other incidental intermediation costs. In general, the costs and benefits of participating in existing markets for specific derivative instruments, or of setting up and operating rival EXT or OTC markets, define the contestability of the particular markets. A high degree of contestability in these and related markets, and the limitations imposed by regulatory authorities, contain the market power of individual participants. In the Canadian case, several items suggest that Canadian financial derivatives markets are contestable: the removal of regulatory barriers to investment in financial derivatives for institutional investors, the apparent contestability of more traditional banking markets despite the concentra-

tion of activity among a small number of institutions, and the competition among OTC, domestic EXT and U.S. EXT derivative securities.

Also associated with supply concentration in OTC derivatives markets is the concentration of market and credit risk. With particular regard to financial derivatives, regulators have focussed on the systemic risk implications of such concentration (that is, the risk that failure at one institution in one market may spill over to threaten the solvency of other institutions and the efficiency of other markets and the cash payment system) in formulating proposals to regulate financial derivatives markets (Organisation for Economic Co-operation and Development 1991; Kessler 1992; Rotberg 1992). The concern of regulators extends to EXT derivatives markets as well. Market failures such as those experienced in 1987 and 1989, which were characterized by decoupling of cash and derivatives markets, stale pricing problems and order processing failures, indicate that EXT markets for securities are not free of broadly defined systemic risks.[29]

Some general policy guidelines

Canada's experience with emerging markets for financial derivatives suggests a set of guidelines that policy makers may find useful. These guidelines, presented below, are generally applicable to most developed financial systems because they illustrate quite vividly some practical extensions of the basic conditions that must be fulfilled before a market for any financial instrument can develop successfully.

- There is no apparent a priori reason to prefer the development of EXT over OTC financial derivatives markets, since instruments trading in both types of markets provide similar risk management services. The economics of the decision hinges on the cost-effectiveness of the two markets in satisfying the investors' objectives.

29. Stale pricing problems occur when transaction prices or market quotes are reported with an unusual delay. As a result, actual market prices may be substantially different from observed prices, causing investors to make transactions that would otherwise not be initiated.

- The markets for OTC financial derivatives will develop more quickly and more successfully than the markets for similar EXT derivatives if that market structure is more consistent with the overall structure of the financial system. However, since each type of market may have a comparative advantage in satisfying different strategic and informational needs of investors, markets for both OTC and EXT financial derivatives can be sustained in most financial systems.

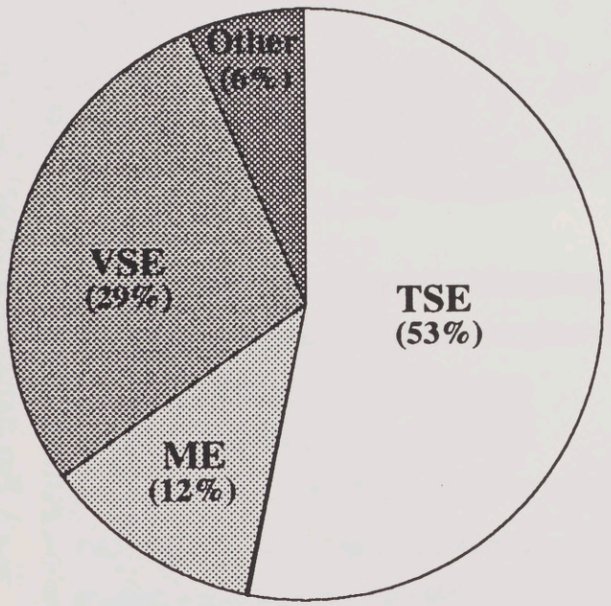
- Similarly, in a financial system that is well integrated into a highly competitive international financial structure, successful domestic markets for particular financial derivatives are obtained only for instruments that are the most coherently designed with regard to the idiosyncrasies of the domestic financial system and the most cost-effective in meeting investors' objectives.

- The investment management services industry must be sufficiently well-developed to support a broad range of investment fund managers with large pools of investable funds. These investment managers must be highly competitive and performance-driven in order to encourage the use of complex, information-intensive investment strategies, such as those involving derivative securities.

- The regulatory authorities can aid the development of markets for financial derivatives by quickly learning about the value and risk of these securities and by eliminating unwarranted regulatory barriers to the development of these markets. A slow response will divert trade to other domestic and international markets, and set-up costs will prevent subsequent full recovery of the trade loss, diminishing the prospect for the successful development of particular financial derivatives markets.

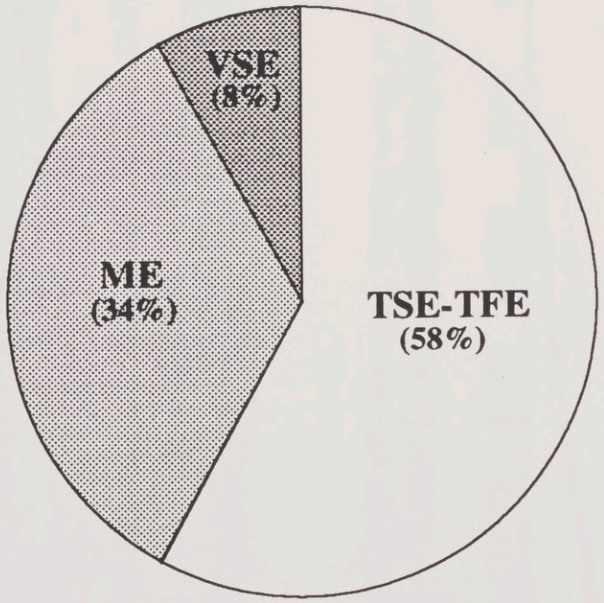
CHART 1: Market Share by Exchange: 1992
(per cent of trading volume)

Stocks



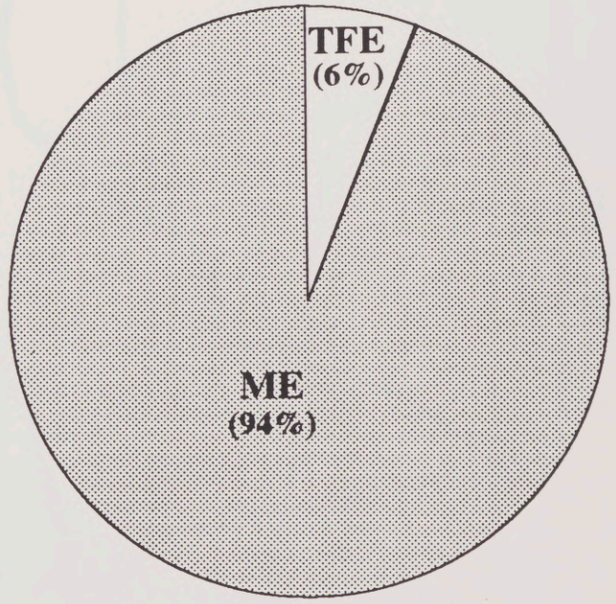
13.8 billion shares

Options



2.1 million contracts

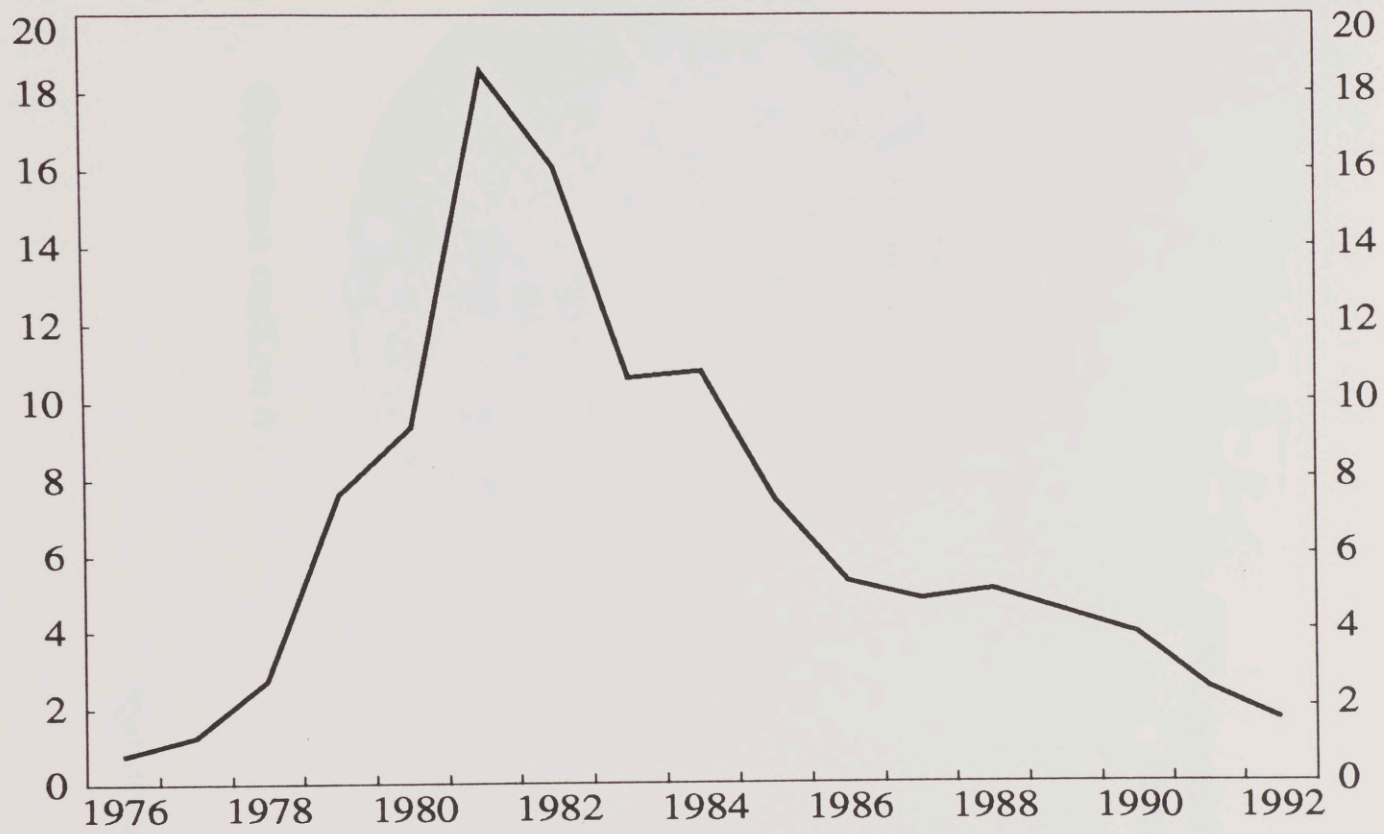
Financial Futures



1.0 million contracts

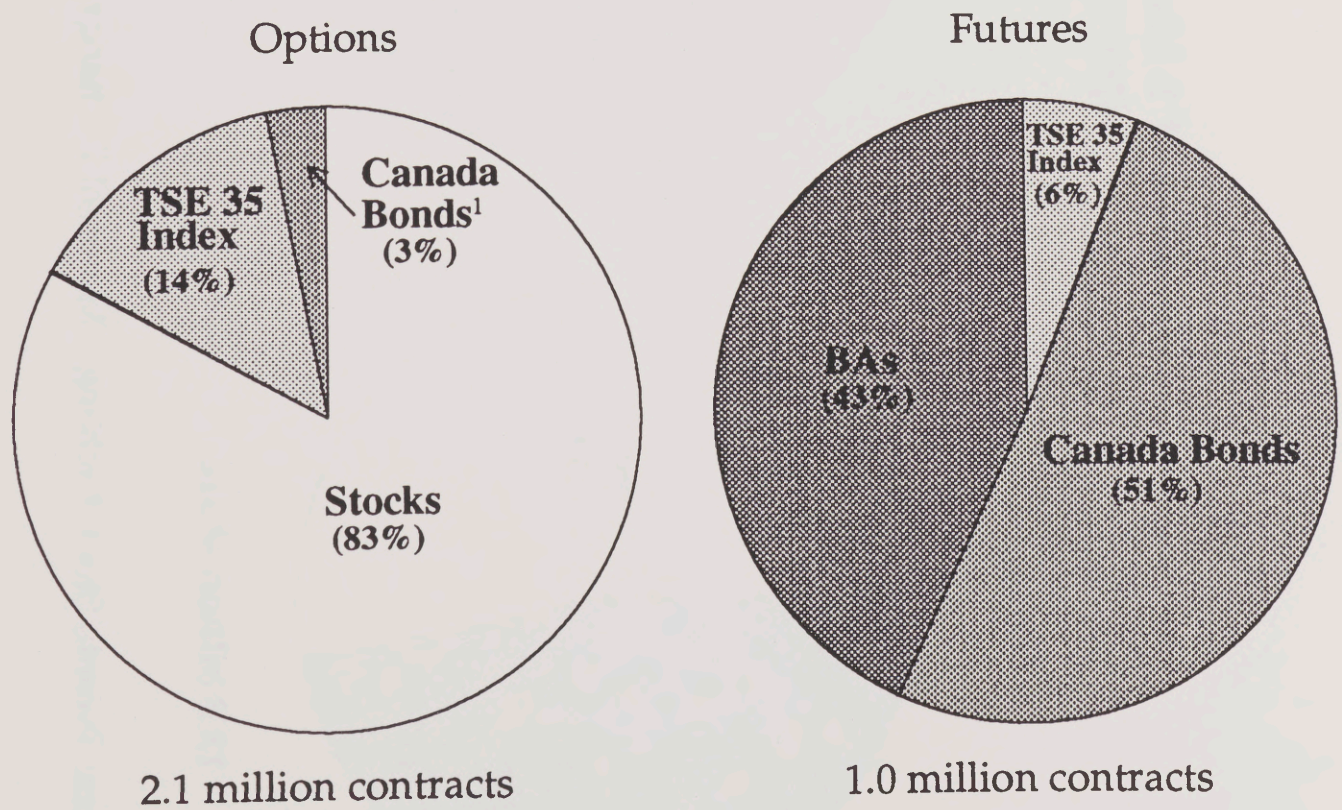
Sources: Toronto Stock Exchange, Montreal Exchange, Vancouver Stock Exchange

CHART 2: Notional Option Volume / Stock Volume
(per cent)



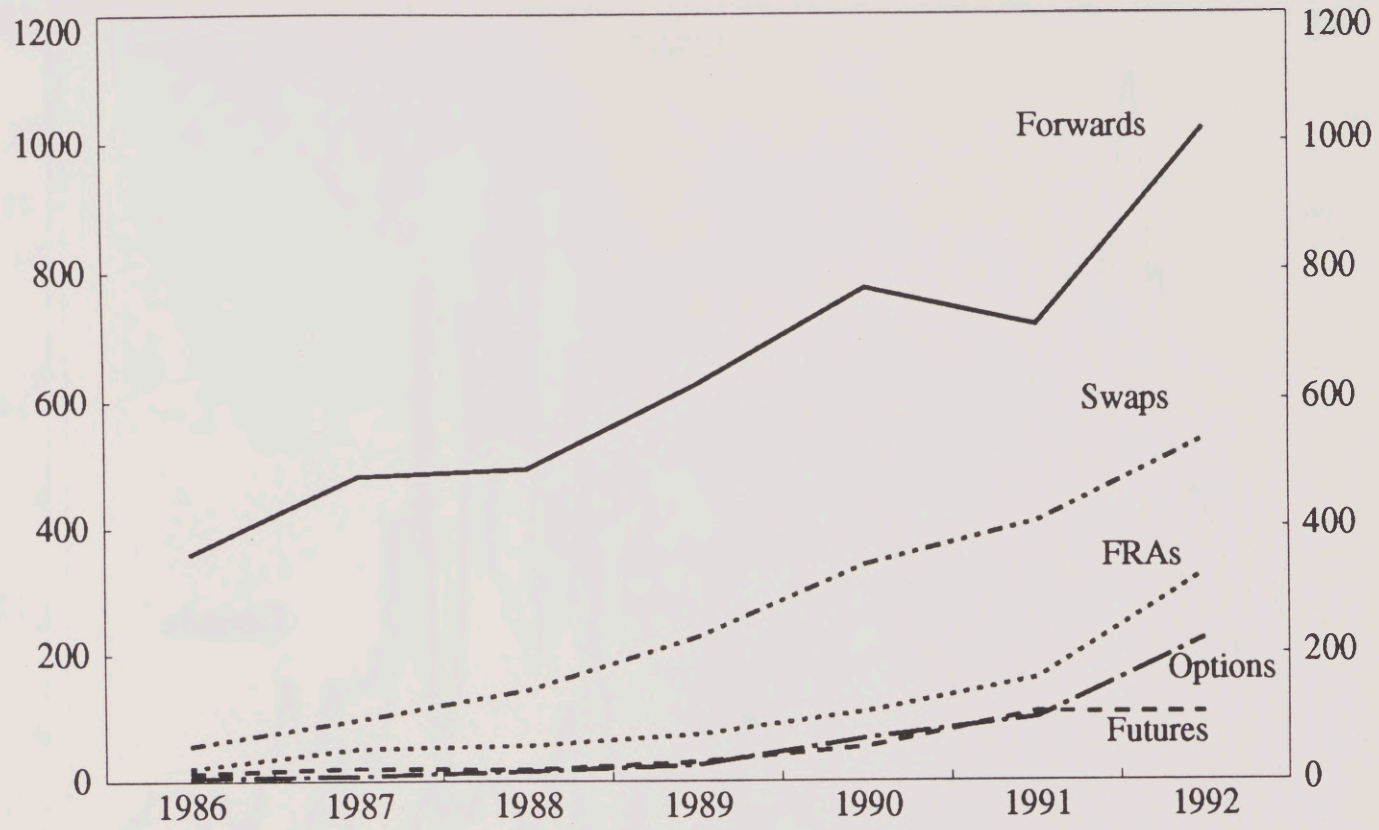
Note: (Number of contracts [x 100] / Number of shares) x 100
Source: Toronto Stock Exchange

CHART 3: Financial Derivatives by Underlying Asset: 1992
(per cent of trading volume)



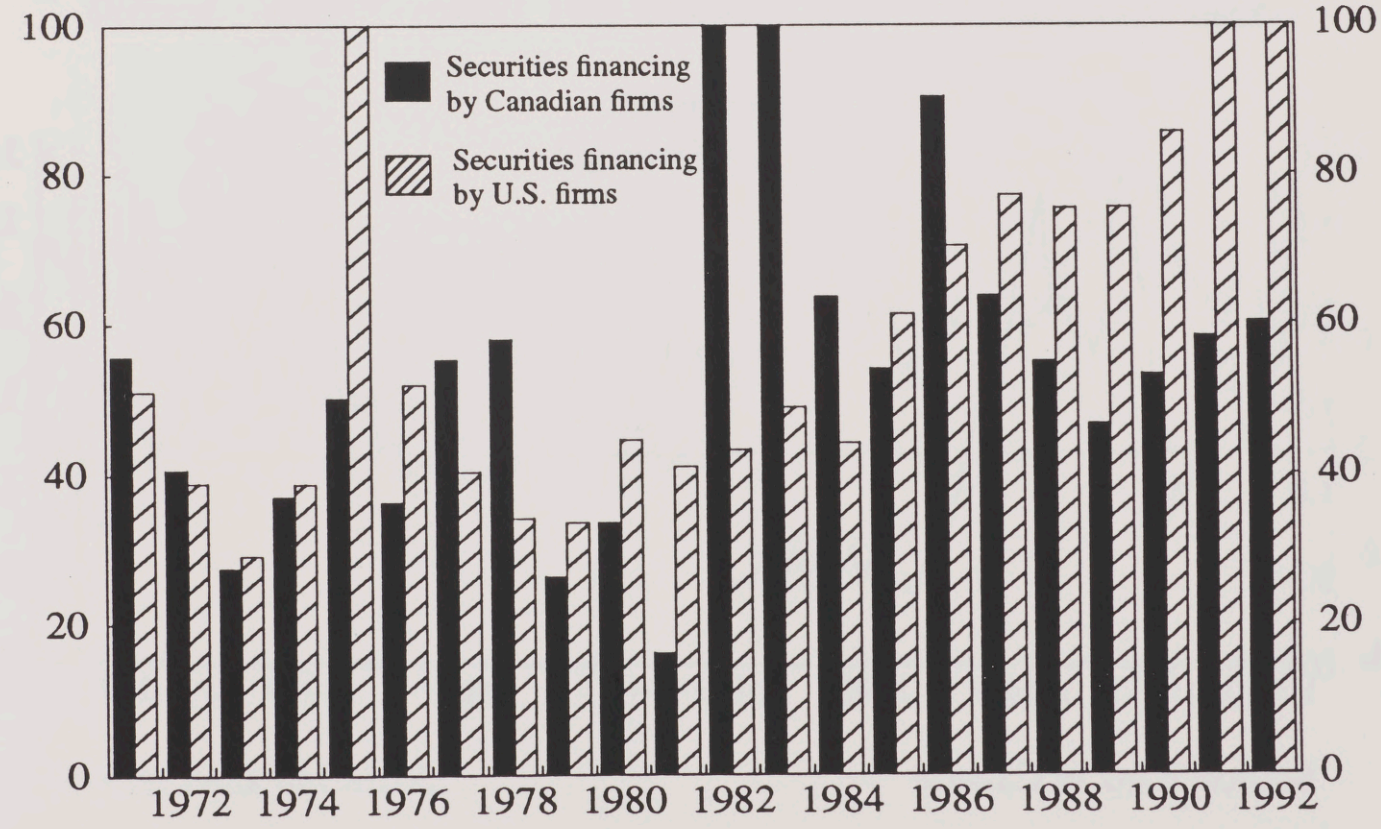
1. Include options on bonds and options on futures.
Sources: Toronto Stock Exchange, Montreal Exchange, Vancouver Stock Exchange

CHART 4: OTC Financial Derivatives of the "Big Six" Banks
($billions)



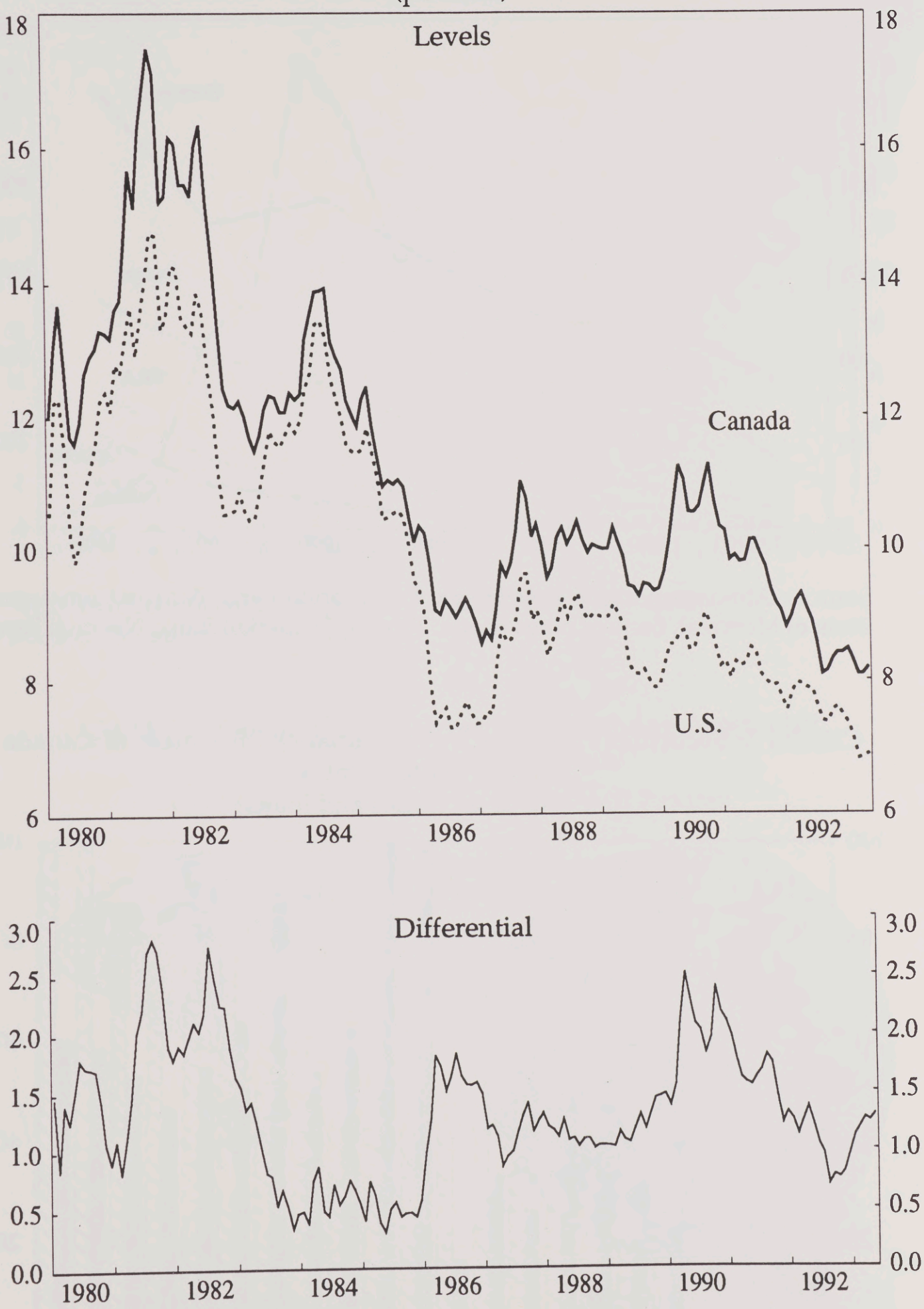
Sources: Annual reports of Royal Bank, Canadian Imperial Bank of Commerce, Bank of Montreal, Bank of Nova Scotia, Toronto Dominion Bank, National Bank

CHART 5: Securities Financing by Non-financial Business in Canada and the United States
(per cent of securities and loans)



Sources: Bank of Canada and Board of Governors of the Federal Reserve System

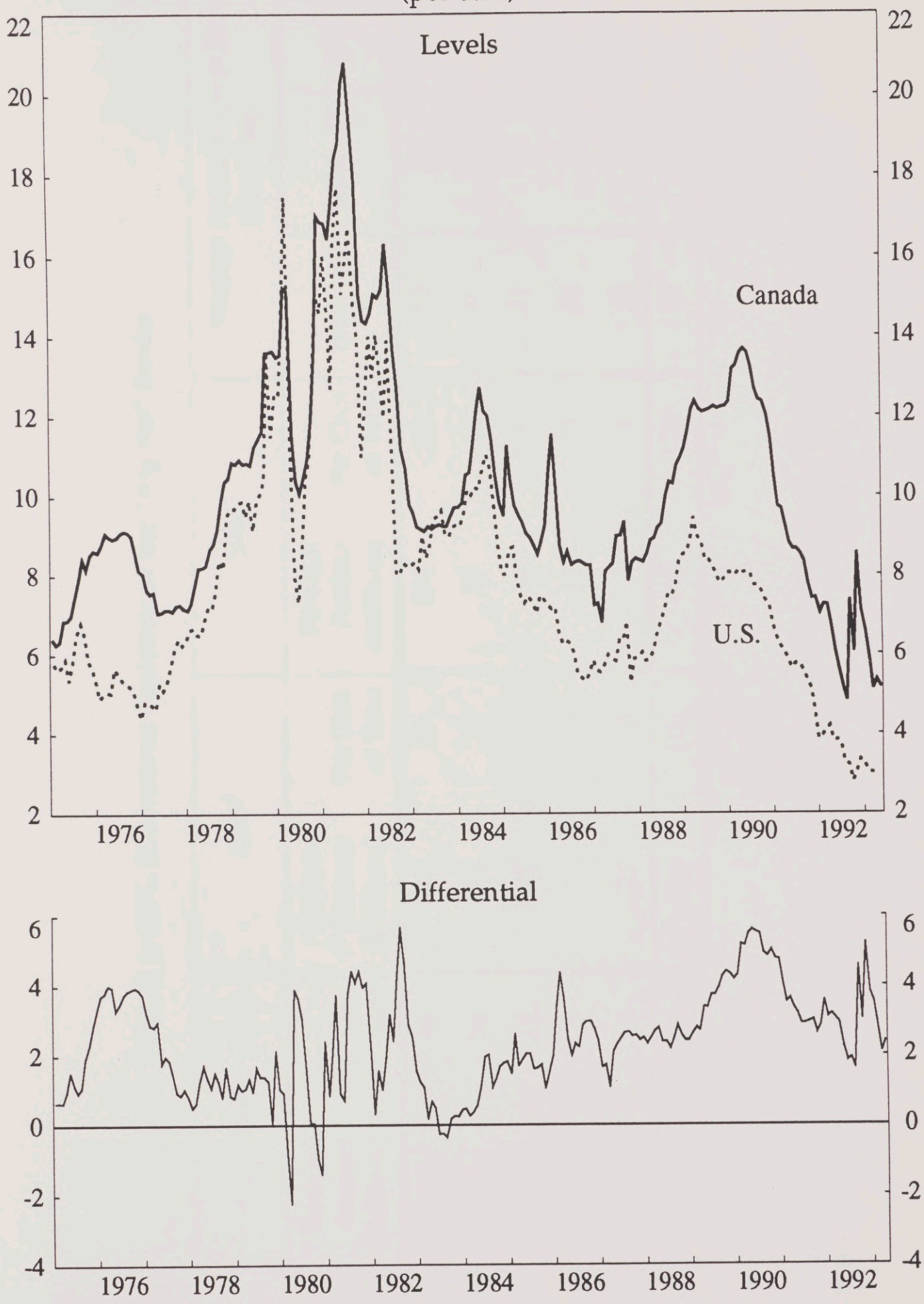
CHART 6: Long-Term Canada Bond and U.S. T-Bond Yields
(per cent)



Source: Bank of Canada

CHART 7: Canada and U.S. 3-Month Treasury Bill Yields

(per cent)



Source: Bank of Canada

TABLE 1: OTC Derivatives Positions of the "Big Six" Banks

	1992		1989[1]		1986[1]		Average Annual Growth Rate (Per Cent)		
	Notional Amount ($billions)	Per Cent of Total	Notional Amount ($billions)	Per Cent of Total	Notional Amount ($billions)	Per Cent of Total	1986 - 92	1986 - 89	1989 - 92
Forwards	1,020	46	623	64	358	80	19	20	18
Swaps	537	24	226	23	55	12	46	60	33
FRAs	325	15	72	7	19	4	61	56	65
Futures	106	5	30	3	12	3	44	36	52
Options	222	10	25	3	4	1	95	84	107
Total	2,210	100	976	100	448	100	31	30	31

1. Includes some estimates.

Sources: Annual reports of Royal Bank, Canadian Imperial Bank of Commerce, Bank of Montreal, Bank of Nova Scotia, Toronto Dominion Bank, National Bank

TABLE 2: Value of Securities Trading in Canada

Instruments	1992		1986		1980		Average Annual Growth Rate		
	$billions	Per Cent	$billions	Per Cent	$billions	Per Cent	1980 - 92	1980 - 86	1986 - 92
Money Market	1,516	57	852	70	333	78	13	17	10
Bonds	1036	39	285	23	57	13	27	31	24
Equities	102	4	85	7	38	9	9	14	3
Total	2,654	100	1,222	100	429	100	16	19	14

Source: Investment Dealers Association

TABLE 3: Value of Bond and Money Market Trading

	1992		1989		1986		1983		Average Annual Growth Rate		
	$billions	Per Cent	$billions	Per Cent	$billions	Per Cent	$billions	Per Cent	1983 - 86	1986 - 89	1989 - 92
Money Market											
Canada T-Bills	920	61	648	49	464	55	201	39	32	12	12
Prov. T-Bills	58	4	43	3	36	4	26	5	11	6	10
Corp. Paper	407	27	440	33	221	26	151	30	14	26	-3
BAs	131	8	205	15	130	15	130	26	0	16	-14
Total	1,516	100	1336	100	851	100	508	100	19	16	4
Bond Market											
Canada Bonds	885	85	437	84	224	79	65	58	61	25	27
Prov. & Mun. Bonds	100	10	48	9	30	10	17	15	21	17	28
Corp. Bonds	51	5	33	7	31	11	30	27	1	2	16
Total	1,036	100	518	100	285	100	112	100	37	22	26

Source: Investment Dealers Association

TABLE 4: Distribution of Trading in Interlisted Stocks
(per cent of total value)

	1992		1986		1980	
	Cdn. Stocks	U.S. Stocks	Cdn. Stocks	U.S. Stocks	Cdn. Stocks	U.S. Stocks
Cdn. Exchanges	59.8	0.1	52.8	0.1	42.0	0.1
U.S. Exchanges	40.2	99.9	47.2	99.9	58.0	99.9
Total	100	100	100	100	100	100

Source: Toronto Stock Exchange

TABLE 5: Bond Futures Trading in Canada and the United States

	1992	1991	1990
Canada			
Contracts Traded (thousands)	516	422	454
Debt Outstanding[1] ($billions)	165	148	131
Turnover Ratio (contracts / $million)	3.1	2.9	3.5
United States			
Contracts Traded (thousands)	89,532	79,379	75,499
Debt Outstanding[1] ($billions)	1,975	1,760	1,577
Turnover Ratio (contracts / $million)	45.3	45.1	47.8

1. Average of year-ends

Sources: Futures Industry Association, Board of Governors of the Federal Reserve System, Bank of Canada

TABLE 6: Equity Index Futures in Canada and the United States

	United States		Canada	
	Contracts Traded[1]	Contracts Per Million Shares Traded	Contracts Traded[2]	Contracts Per Million Shares Traded
1984	12,529,794	288	19,104	4
1985	15,152,536	275	48,730	7
1986	19,514,057	266	126,572	13
1987	19,044,673	197	67,084	5
1988	11,353,898	141	27,938	3
1989	10,560,455	124	36,005	3
1990	12,139,209	147	52,709	4
1991	12,340,380	127	60,950	5
1992	12,414,157	111	59,049	4

1. Futures contracts on S&P 500, S&P 100, S&P OTC traded on the Chicago Mercantile Exchange.

2. Futures contracts on TSE 300 and TSE 35 traded on the Toronto Futures Exchange.

Sources: Chicago Mercantile Exchange, Securities Industry Association, Futures Industry Association, Toronto Stock Exchange, National Association of Securities Dealers.

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