

Futures Market Opportunities for a "Homemade" Solution to the Pension Indexing Controversy in Canada An Exploratory Analysis

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Summary

This paper reviews the pension indexing controversy in Canada, and undertakes an exploratory analysis of the opportunities for a "homemade" solution to this controversy through financial futures short-hedging by individual pension claimholders. A duration-based short-hedging model is employed as a conceptual framework for examining the factors which affect the *ex ante* feasibility of this "homemade" solution, and the data requirements for a more complete future investigation of this feasibility are stated. In addition, the paper presents some implications which such an investigation may have for public policy towards pensions, for the economic analysis of pensions and the retirement age, and for the potential role of regulation and of financial intermediation in enhancing individual (pension claimholder) participation in the Canadian futures market.

Résumé

Opportunités de Marchés de Contrats à Terme pour une Solution "Maison" al la Controverse sur l'Indexation des Retraites au Canada Une Analyse Exploratoire

Cet article examine la controverse de l'indexation des retraites au Canada et entreprend une analyse exploratoire des opportunités présentées par une solution "maison" à cette controverse grâce au couverture à court terme des transactions financières à terme par des personnes individuelles pouvant prétendre à une retraite. Un modèle couverture à court terme basé sur la durée est utilisé comme un cadre conceptuel pour examiner les facteurs qui affectent la faisabilité *ex ante* de cette solution "maison", et les données nécessaires pour une enquête future plus complète de cette faisabilité sont exposées. De plus, l'article présente quelques-unes des implications qu'une telle enquête pourrait avoir sur la politique publique vis-à-vis des retraites, sur l'analyse économique des retraites sur l'âge du départ en retraite, et sur le rôle potentiel de la réglementation et de l'intermédiation financière sur l'amélioration de la participation individuelle (de ceux qui peuvent prétendre à une retraite) dans le marché des contrats à terme canadien.

INTRODUCTION

A major focus of recent proposals for pension reform in Canada has been the search for effective mechanisms for protecting pensions in pay from the eroding effect of inflation (Pesando and Rea, 1977; Pesando, 1979; Task Force, 1979; Rea, 1981; Royal Commission, 1981; Canadian Association, 1982; Ontario Select Committee, 1982; Pesando, 1983; and Nader, 1987 and 1988). These proposals reflect a conviction among many public policymakers and a few economists, that some kind of explicit, formal inflation indexing of pensions in pay, similar to that which exists in the public sector, should also be introduced in the private sector through legislative action. Proponents of mandatory indexing believe that such a mechanism would constitute a preferred universal alternative to the increasingly widespread but discretionary (legally non-binding) practice, whereby private pension plan sponsors grant periodic, ad hoc inflationary adjustments of pensions in pay to retired plan members.¹

To date, the province of Ontario is the only Canadian jurisdiction committed to introducing legislation for private pension indexing, although the ongoing debate on the nature of the indexing formula has continued to delay the introduction of such legislation. This debate is only part of a wider controversy which (as explained below) ranges from the conceptual foundations and economic rationale of indexing, to the practicability of implementing specific indexing initiatives. The absence of tangible progress towards the implementation of indexing proposals indicates that satisfactory solutions to the indexing controversy, through legislative action, are not expected to become available any time soon.

The introduction of organized futures trading in Canada, starting in 1980, has expanded the capital market opportunity set in a manner which suggests that recipients of nominal pension income may, to a much

¹ Notes appear at the end

larger degree than previously believed possible, be able to deal with inflation risk through hedging against the overall interest rate risk attaching to the pension annuity. This in turn suggests that pension recipients, faced with inflation risk, may no longer be confined to a position of total dependence on private sponsors' discretion in the granting of ad hoc inflationary adjustments, or on government initiatives for imposing mandatory indexing of pensions in pay. Perhaps due to the relative novelty of futures trading in Canada, futures market opportunities for such a "homemade" solution to the pension indexing controversy have not yet been explored.

This paper undertakes an exploratory analysis of the opportunities for individual hedging of nominal pension annuities with financial futures in Canada. Following an exposition of pension indexing proposals and the controversy that surrounds them, the paper presents a well-known, duration-based relationship for hedging bond portfolios with interest rate futures (Gay and Kolb, 1983a and 1983b), and develops this relationship for the case where the "bond" being hedged is a nominal pension annuity. Using the resulting formulation as an analytical framework, the paper then focuses on the manner in which two sets of factors interact to determine the nature of the opportunities available in the Canadian futures market for hedging pension annuities by their recipients. These are (i) factors specific to the individual and his pension annuity (e.g., attained age, survival probability and discount rate for the pension annuity), and (ii) the relevant characteristics of the Canadian futures market and the instruments traded in it (e.g., standard contract size, maturity, duration and margin requirements). The primary purpose of this exploratory analysis is to identify those factors whose further investigation in future empirical research and policy analysis would allow a full assessment of the ex ante feasibility of the "homemade" alternative to government indexing initiatives. Besides its public policy implications relative to the pension indexing debate, such an assessment would also have important implications for retirement planning by individuals, and for the formulation, by futures

market regulatory authorities and by private financial intermediaries, of policies that would enhance pensioner (and, more generally, household) access to and participation in futures markets.

THE INDEXING CONTROVERSY

Up to the present time, two main approaches have been at the focal point of the pension indexing debate: (i) performance indexing and (ii) contractual indexing.²

(i) Briefly, performance indexing involves setting a statutory real interest rate above which any "excess" investment earnings on the pension portfolio would be earmarked for inflationary adjustments, including enrichments of pensions in pay. The prime example of this approach is the "excess interest" method, recommended by the Canadian Association of Pension Supervisory Authorities (1982) and the Ontario Select Committee on Pensions (1982). In the absence of a nominal floor and a real ceiling on inflationary enrichments, the "excess interest" method has the effect of transforming the pension annuity into a standard variable annuity (VA).³

The major limitation of performance indexing is that its effectiveness depends directly on the effectiveness of the pension portfolio mix as an inflation hedge. For example, performance indexing would be totally ineffective with a pension portfolio consisting entirely of long-term bonds, because such a portfolio closely replicates the risk characteristics of a nominal pension annuity (Pesando, 1984a, p. 8 and fn. 20). Likewise, in the absence of short-selling, performance indexing bears little promise with a "typical" stocks-and-bonds pension portfolio,⁴ in light of empirical evidence (Bodie, 1976; Pesando and Rea, 1977; and Fama and Schwert, 1977) - confirmed by the disappointing performance of equity-based VAs (Bodie, 1980) - which shows that the real returns on common stocks, like those on fixed-income securities, are negatively correlated with unanticipated inflation.

Performance indexing may be most effective with a pension portfolio consisting almost exclusively of Treasury bills (Bodie, 1976; Pesando,

1984a), as such a "minimum variance" portfolio would provide the most stable real returns, and this would translate into the most stable real retirement income (Pesando, 1984b, p. 573).

The problem, however, is that a bills-only portfolio is far from the portfolio composition actually observed in the vast majority of Canadian pension funds, which consists mainly of common stocks and long-term bonds.⁵ Thus, the attractiveness of a bills-only portfolio as a basis for performance indexing seems purely theoretical. Furthermore, in the absence of short-selling, a pension annuity indexed to such a portfolio would still reflect any non-diversifiable risk inherent in this portfolio's real variance (Pesando, 1984b, p. 573) which, though minimum, is not zero.

(ii) Contractual indexing, on the other hand, involves the instatement of an explicit, legally binding commitment for private sponsors to provide full, "capped," or partial inflation protection of pensions in pay in accordance with a universal, statutory formula (Pesando, 1984b, p. 571). The formula would be geared to the actual inflation rate and totally independent of the investment performance of the pension portfolio.

The major problem with this approach is that it would assign to private sponsors the onerous and open-ended obligation of underwriting inflation risk for the steadily growing retired-lives subset of the population. There are those who argue that unless index bonds or equivalent vehicles are made available to plan sponsors, the burden of underwriting inflation risk should be borne directly by the central government (Pesando, 1979). In Canada, proposals for the issuance of index bonds by the federal government have raised fundamental concerns about the dramatic impact such issuance is likely to have on the financial markets, and its potentially negative implications for the conduct of monetary policy (Pesando, 1979, p. 87). Thus, it appears highly unlikely that the Government of Canada will move towards the issuance of index bonds or their equivalent in the foreseeable future.

MORE FUNDAMENTAL CONCERNS

More fundamentally, some economists have questioned the very principle that governments and/or private sponsors should play a leading role in underwriting the inflation risk inherent in pensions in pay. For example, there is the concern that such action may have the undesirable effect of weakening the government's resolve to combat inflation through the conduct not only of monetary policy but also fiscal policy (Pesando, 1979, p. 89). There are also those who argue that individuals (households) may prefer not to have indexed pensions, since risk-averse individuals will generally choose to bear at least some risk - inflation risk being no exception (Feldstein, 1981; Merton, 1981). Furthermore, there is the suggestion that because the corporate tax system is not indexed to inflation, households may be better suited to bearing inflation risk than firms (Summers, 1982). In the pension context, this implies that household assumption of inflation risk may be more efficient than indexation of pension income by corporate sponsors (Pesando, 1984a, p. 2). Interestingly, this suggestion seems to provide an economic rationale for the growing trend among private sponsors, since the early 1980's, to shift the responsibility for retirement income security to their employees.⁶

To sum up, proposals for the indexing of private pensions through government initiatives do not appear to present any decidedly preferable or readily practicable alternatives to the presently existing market arrangement, which is the assumption of inflation risk primarily by pension recipients, with a discretionary (legally non-binding) commitment by many sponsors to mitigate this risk on an ad hoc basis.

"HOMEMADE" INDEXATION: AN UNEXPLORED ALTERNATIVE

Notwithstanding the foregoing concerns, government action to impose mandatory indexing of private pensions may be economically justified under either of the following conditions: (i) Market mechanisms whereby households can hedge nominal pension income against inflation may be

non-existent; (ii) such mechanisms may exist but only at "non-competitive" prices. Under each of these conditions, a role for the government in ensuring the supply of inflation protection at "competitive" or "fair" prices may be advocated.

In Canada, the belief in capital market failure to provide such hedging mechanisms for individuals may have been well-founded in the 1970s (Pesando, 1979, p. 89). Inexplicably, however, the advent of organized futures trading starting in 1980, and especially the introduction, in January 1984, of financial futures trading on the newly established Toronto Futures Exchange (TFE), does not seem to have altered this belief in a tangible way. Pesando (1984b, p. 574), for example, reports that "existing opportunities in the [Canadian] capital market do not permit an individual to construct his own indexed annuity." However, the analysis leading to this conclusion is based entirely on common stocks, long-term bonds and Treasury bills, while futures market opportunities are totally excluded.

In sum, "homemade" indexation of pension income with financial futures, as an alternative to government indexing initiatives, remains a largely unexplored option despite its potential for resolving the indexing controversy.

A FRAMEWORK FOR EXPLORING "HOMEMADE" INDEXATION

A well developed body of knowledge on the use of financial futures to hedge institutional portfolios is already in existence (Kolb and Chiang, 1982; Gay and Kolb, 1983a and 1983b; Landes, Stoffels and Seifert, 1985). In particular, it is well known that a pension fund manager can hedge a bond portfolio (ex ante) against interest rate fluctuations over a given holding period, by taking a short position in bond futures, determined as follows (Haugen, 1986, pp. 440-1):

$$F_N = \frac{D_T}{D_N} \cdot \frac{\Delta (1 + k_T)}{\Delta (1 + k_N)} \cdot V_T, \quad (1)$$

where Δ denotes change,

F_N = futures short position (in dollars) in a bond with an N-year maturity,

D_N, D_T = duration of the N-year bond, and of the T-year (average maturity) bond portfolio,

k_N, k_T = yield to maturity (YTM) on the N-year bond, and average YTM on the pension portfolio, respectively,

V_T = market value of the pension portfolio.

Empirical evidence presented in the works cited above indicates that the preceding short hedge can provide substantial ex post protection of bond portfolios against interest rate risk, especially if the hedge is adjusted frequently for changes in the right-hand side variables of Equation (1) during the holding period. Accordingly, this hedging strategy has been widely recommended for use by pension fund and other institutional portfolio managers. However, its potential application by pension recipients (as holders of pension "bonds") has not yet been examined, although, as shown below, this application may form the basis for "homemade" indexing of nominal pension income.

DEVELOPMENT OF THE BASIC MODEL

Equation (1) can readily be considered from the perspective of a retired individual who receives an annual nominal pension of \$X for the remaining T years of his life expectancy. Using Canadian data, Nader (1990) has shown that the appropriate discount rate for valuing a T-year nominal, default-free pension annuity by a retired individual does not differ tangibly from the nominal YTM (i.e., k_T) on a riskless bond whose maturity is also T years. Thus, the expected present value of the pension annuity, as determined by its recipient, is:

$$V_T = X \sum_{t=1}^T \frac{a_t}{(1 + k_T)^t}, \quad (2)$$

where a_t is the survival probability in each successive year of retirement. The duration of the pension annuity (Copeland and Weston, 1988) is:

$$D_T = \frac{x \sum_{t=1}^T \frac{t \cdot a_t}{(1 + k_T)^t}}{V_T} . \quad (3)$$

Thus,

$$D_T \cdot V_T = x \sum_{t=1}^T \frac{t \cdot a_t}{(1 + k_T)^t} . \quad (4)$$

Substituting the value of $D_T \cdot V_T$ from Equation (4) into Equation (1), it follows that in order to hedge the pension annuity, the individual should take a short position in N-year bond futures (N may or may not equal T), such that:

$$F_N = \left[\frac{\Delta (1 + k_T)}{\Delta (1 + k_N)} \right] \left[\frac{\sum_{t=1}^T \frac{t \cdot a_t}{(1 + k_T)^t}}{D_N} \right] x . \quad (5)$$

In this manner, the futures short-hedge is expressed as a multiple or fraction of the individual's annual pension income.

It is important to note that Equation (5) represents a hedge against total interest rate fluctuations (since k_N and k_T are nominal), inclusive of the real as well as the inflationary components of such fluctuations. Thus, provided it is feasible, this individual hedging strategy would seem to be a superior private alternative to government indexing initiatives concerned exclusively with the impact of inflation-

ary fluctuations on pensions in pay. Clearly, therefore, a thorough investigation of this strategy should emerge as a new, important and timely current in futures market research.

Such an investigation should be performed in two stages, aimed at assessing (i) the ex ante feasibility, and (ii) the ex post effectiveness of the individual short hedge (provided it is feasible ex ante). The remainder of this paper deals with the first stage, through an exploratory analysis of the factors which affect ex ante feasibility, and the data requirements for performing an investigation of such feasibility in future research.

DETERMINANTS OF EX ANTE FEASIBILITY

Size of F_N Relative to X

The larger is F_N/X , the less practicable is the short-hedge, because (i) the wealth requirement at the futures delivery date may become prohibitively large for the individual, and (ii) the initial and maintenance margins for the hedge may also become excessive (and may strain the individual's liquidity), in the event that F_N consists of a number of standard contracts. Given X, F_N depends on several determinants, as follows (see Equation (5)):

- F_N varies directly with T (inversely with the individual's attained age). Thus, other things equal, the short-hedge seems a priori to be better suited for older individuals than younger ones (e.g., for those who retire at the normal retirement age, as opposed to those who take early retirement). Among other things, an investigation of the relationship between F_N and T should indicate whether this age dependence of individual hedging opportunities through financial futures, is important enough to be considered as a determinant of the individual's tradeoff between early and normal retirement. The latter tradeoff is an important theme of current economic research on pensions (Hogarth, 1988; Mitchell and Luzadis, 1988; Pesando and Gunderson, 1988).

- F_N varies directly with a_t (inversely with the mortality decrement). This affirms the preceding point, since a_t diminishes for each successive age (Winklevoss, 1977). Future research should investigate the effect of different a_t structures (male vs. female, as well as industry-specific a_t values) on the feasibility of individual hedging with financial futures.
- F_N varies inversely with D_N . Thus, the availability of futures contracts on bonds with longer maturities (and durations) would enhance the feasibility of individual short-hedging. At present, futures on standardized 9% coupon Government of Canada (GOC) bonds with 15-year maturities or longer, are traded on the TFE (Hatch and Robinson, 1989, p.656). Future research should investigate the adequacy of these existing futures for purposes of individual hedging by different pensioner cohorts (different T and a_t). This will indicate whether a wider range of bond maturities is needed, to make individual hedging of pension annuities on the TFE feasible to more cohorts.
- F_N varies directly with the yield change ratio. This ratio must be estimated for any given holding period, using historical data (Haugen, 1986, p. 441). However, if futures are available on bonds whose N equals T (i.e., if a "perfect hedge" exists), then the yield change ratio cancels out of Equation (5) and the need for such estimation (with the potential for estimation errors) is eliminated. Future research should investigate whether, for various cohorts, the existing GOC bond futures allow the construction of such a "perfect hedge."

Indivisibility of the Standard Futures Contract

At present, the standard GOC bond on which futures are traded on the TFE is a 15-year, 9% bond with a face value of \$100,000. However, several long-term GOC bonds with different coupon rates and maturities (and hence different k_N and D_N), are allowed as "good delivery" on the standard bond (Hatch and Robinson, 1989, p. 656). Because the standard contract can only be traded in integer quantities, a given individual

(for whom T , a_t and k_T are given) who wants to short-hedge in accordance with Equation (5) must choose a "good delivery" bond whose D_N and k_N would set F_N exactly equal to the value of one standard contract (at a minimum) or an integer multiple thereof. Consequently, the indivisibility of the standard contract makes the feasibility of individual short-hedging dependent upon the following factors, which should be investigated in future research:

- The availability, on the TFE, of "good delivery" bonds whose k_N and D_N are varied enough to enable different cohorts to set F_N in Equation (5) accordance with the integer contract quantity constraint.
- The extent to which this integer constraint (by virtue of the large F_N values and the corresponding wealth and margin requirements it could necessitate) might interact with the factors described earlier (see subsection on size of F_N above), to further reduce the feasibility of individual short-hedging.

DATA REQUIRED FOR FURTHER STUDY OF "HOMEMADE" INDEXATION WITH
FINANCIAL FUTURES

<u>Type of Data</u>	<u>Source</u>
(1) "Good delivery" GOC bond issues, coupon rates and maturities	} TFE publications
(2) k_N and market value for bonds in (1); k_T for a T-year pension annuity (proxied by a T-year GOC bond; see Nader, 1990)	} Bank of Canada <u>Review</u>
(3) D_N for bonds in (1)	} Can readily be computed once (1) and (2) are obtained (Copeland and Weston, 1988)
(4) a_t for males and females, for various industries, and for individuals who retire early (starting at age 55) vs. those who retire at normal retirement (age 65)	} Actuarial tables used by William M. Mercer, Ltd.
(5) $\Delta(1 + k_T)/\Delta(1 + k_N)$ estimates from past YTM data on GOC bonds (not needed for the case where a "perfect hedge" can be constructed)	} Bank of Canada <u>Review</u>
(6) X: Any hypothetical value can be used; "typical" (average) values, published by Statistics Canada for various pensioner categories, would be appropriate	} Statistics Canada, <u>Catalogue #74-401</u>
(7) Initial and maintenance margins, and commissions on TFE bond futures short-hedging	} TFE publications

CONCLUSION

The main purpose of this paper has been to undertake an exploratory analysis of an as yet unexplored, and potentially superior alternative to government initiatives for imposing the indexation of Canadian private pensions to inflation. This alternative consists of individual short-hedging with financial futures, to obtain "homemade" indexation of nominal pension annuities. The paper has reviewed the pension indexing controversy, developed a conceptual framework (the duration-based futures short-hedging model) for exploring the "homemade" solution to this controversy, and stated the data requirements for further investigation of the feasibility of this solution.

Besides stating the implications which such an investigation may have for public policy towards pensions, the paper has also pointed out some implications of such an investigation for the economic analysis of pensions and the retirement age, and for the potential role of regulation and of financial intermediation in enhancing individual (pension claimholder) participation in the Canadian futures market.

The exploratory analysis presented in this paper charts the way to further, more complete research on a new, timely and important application of financial futures to the area of pensions.

NOTES

- ¹ See reports published by the Financial Executives Institute Canada for various years.
- ² Pesando (1984b), p. 571, provides a comprehensive tabulation of these approaches, their variants, their incidence in Canada and the U.S., and the inflation protection formula under each method.
- ³ See Bodie and Pesando (1982), and Pesando (1983, 1984a and 1984b).
- ⁴ See Statistics Canada, Catalogue #74-201.
- ⁵ See Statistics Canada, Catalogue #74-201.
- ⁶ See the article "Should Employees Shoulder More of the Retirement Burden?" Institutional Investor (May 1983), pp. 99-101.

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