PENSION FUND MANAGEMENT AND INTERNATIONAL INVESTMENT – A GLOBAL PERSPECTIVE

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Abstract: This paper examines the potential and actual role played by international investment in pension fund management. The paper draws largely on experience of a range of OECD countries and selected emerging market economies with established funded pension systems, although we also provide estimates for Trinidad and Tobago, and for Jamaica. It is shown that international investment allows superior investment performance in terms of risk and return, and pension funds are well placed to take advantage of the benefits, but they typically hold low proportions of foreign assets in their portfolios. Whereas some degree of "home bias" is likely to occur naturally, it is undesirable for regulations to enforce tighter limits on foreign assets than these market forces would suggest. The arguments favouring regulatory restrictions are weak. The future of funding itself seems likely to be turbulent, given the growing scope of asset flows and the future decumulation when ageing accelerates in OECD countries. These developments do not negate the case for international investment, but they do suggest a need to retain elements of a pay-as-you-go system, as a form of insurance.

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Introduction

Coming in the wake of social changes diminishing the role of the extended family, the ageing of the population in both OECD and Emerging Market (EME) economies is prompting an increased focus on provision of adequate retirement incomes to the elderly, either by public or private means (World Bank 1994). Pay-as-you-go pension schemes – where wages are taxed to pay pensions directly - have proven workable in the past where the population grows rapidly and the elderly cohort is small. However, these systems are facing increasing difficulties as ageing proceeds, because past benefit promises cannot be maintained without unacceptable increases in contribution rates or vast and growing government debt (Dang et al 2001). This situation is putting an increased emphasis on advance funding of pensions, where the transfer element between generations is minimised[2]. Funded systems are themselves not without risks, notably those arising from capital market volatility, or even poor returns due to economic performance in the long term, and there are many others relating to aspects such as system design and institutional background (Mitchell (1997), Davis (1998b), Mitchell and Bodie (2000)). It is in the context of performance of domestic capital markets that the potential benefits of international investment come to the fore, as a way of minimising exposure of retirement income of the performance of domestic markets. Tensions may however arise with domestic regulations that limit such international investment, whose ostensible aim is – mistakenly - often to "avoid risk" or, more plausibly, aid the development of domestic capital markets.

In this context, this article seeks to clarify the role of international investment in pension fund investment strategies, in both theory and practice. It draws on experience of OECD countries and of selected emerging market economies with established funded pension systems. The article is structured as follows. In Section 1, we introduce broad issues in pension fund asset management, as background for discussion of international investment. In Section 2, we look at aspects of international investment, looking at the theoretical benefits, the specific role of international investment in pension fund investment strategies and possible reasons for home asset preference. The third section looks empirically at domestic and international asset returns, current experience of international investment in pension fund portfolios, the current parameters of regulation, and the returns that pension funds do and could obtain via international investment. The fourth section looks at two policy issues, namely arguments for and against pension fund portfolio regulations limiting international investment and the implications for capital flows and asset prices of ageing in the coming decades. A final section draws conclusions and makes links to the situation in the Caribbean. Of course, with such a broad topic, the paper cannot be fully comprehensive. For example, those interested in details of tactical asset management techniques applied to international investment are referred inter alia to Davis (1995) and Bodie et al (1999).

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[2] Where pension monies are invested domestically, it remains the case that pensioners and workers will share the output of the economy, since the former obtain the return on capital.

1   Investment considerations for institutional investors

In this introductory section, we set out the issues in institutional investment in general terms, before going on in the next section to trace the economic influences that impinge on portfolio distributions of pension funds. This is essential background for a comprehensive assessment of international investment by pension funds.

1.1   General portfolio considerations for institutional investors

For any agent, the most basic aim of investment is to achieve an optimal trade-off of risk and return by allocation of the portfolio to appropriately diversified combinations of assets (and in some cases liabilities, i.e. leveraging the portfolio by borrowing). As derived by Tobin and Markowitz, with a mean-variance dependent configuration of risk preferences[3], the precondition for such an optimal trade-off is ability to attain the frontier of efficient portfolios, where there is no possibility of increasing return without increasing risk, or of reducing risk without reducing return. The exact trade-off chosen will depend on objectives, preferences and constraints on investors. In this context, there are common features of all types of institutional investment (see Trzcinka (1997), (1998) Bodie et al (1999)). Liabilities are perhaps the most crucial aspect, in the light of which, asset managers may identify the investors' objectives/preferences and constraints.

A liability is a cash outlay made at a specific time to meet the contractual terms of an obligation issued by an institutional investor. Such liabilities differ in certainty and timing, from known outlay and timing to uncertain outlay and uncertain timing. In this context, an institutional investor will seek to earn a satisfactory return on invested funds and to keep a reasonable surplus of assets over liabilities. Risk must be sufficient to ensure adequate returns but not so great as to threaten solvency. The nature of liabilities also determines the institutions' liquidity needs.

Hence, in terms of objectives, there is a need to assess where on the above-mentioned optimal risk return trade-off the investor wishes to be, in other words his or her risk tolerance in pursuit of return, which will depend on liability considerations. This may in turn impact of holdings of international assets.

Equally, there are a variety of constraints, all of which may have a marked effect on optimal portfolios, and thus on holdings of international assets. All of these may link to the nature of the liabilities, for example:

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[3] Investors' utility depends solely on the mean return and standard deviation, rather than higher moments indicating extreme values or asymmetries in preferences.

- liquidity based constraints link to the right for investors to withdraw funds as a lump sum or the current needs for regular disbursement;

- the investment horizon relates to the planned liquidation date of the investment, and is often measured by the concept of effective maturity or duration[4];

- inflation sensitivity relates to the need to hold assets as inflation hedges;

- tax considerations may change the nature of the trade-off;

- accounting rules can generate different 'optimal' portfolios;

- finally there is the influence of regulations. Besides those linking directly to asset allocation, which may directly limit international investment, there are sometimes liability restrictions, which may thereby affect desired asset allocations e.g. by enforcing indexation of repayments or minimum solvency levels.

After these considerations are taken into account, investment strategies are developed and implemented. A primary decision is to choose the asset categories to be included in the portfolio and whether it should include foreign assets. Following this, the investment process is often divided into several components, with asset allocation (or strategic[5] asset allocation) referring to the long term decision on the disposition of the overall portfolio (the main focus of this article), while tactical asset allocation relates to short term adjustments to this basic choice between asset categories in the light of short term profit opportunities, so-called "market timing". Meanwhile security selection relates to the choice of individual assets to be held within each asset class, which may be both strategic and tactical.

As noted, the above considerations are based broadly on the mean-variance model, which assumes that the investor chooses an asset allocation based solely on average return and its volatility. Certain considerations in respect of liabilities affecting risk preferences give rise to alternative paradigms of asset allocation, which may imply a different approach to investment (Borio et al 1997):

Immunisation is a special case of the mean-variance approach which implies that the investor tries to stabilise the value of the investment at the end of the holding period, i.e. to hold an entirely riskless position; this is done typically in respect of interest rate risk by appropriately adjusting the duration of the assets held to that of the liabilities. Since liabilities are typically in domestic currency, it implies holding of domestic assets. It necessitates a constant rebalancing of the portfolio - as well as the existence of assets that have a similar duration to liabilities. Matching is a particular case of immunisation where the assets precisely replicate the cash flows of the liabilities, including any related option characteristics.

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[4] Duration is the average time to an asset's discounted cash flows.
[5] Note that strategic choices include not only the disposition of the portfolio but also the choice of active versus passive management and domestic versus international.

Shortfall risk[6] and portfolio insurance approaches put a particular stress on avoiding downward moves, e.g. in the context of minimum solvency levels for pension funds. Hence, unlike mean-variance they are not symmetric in respect to the weight put on upward and downward asset price moves. Shortfall risk sees the investor as maximising the return on the portfolio subject to a ceiling on the probability of incurring a loss (e.g. by shifting from equities to bonds as the minimum desired value is approached, or hedging with derivatives). In portfolio insurance the investor is considered to want to avoid any loss but to retain upside profit potential. This may be achieved by replicating on a continuous basis the payoff of a call option on the portfolio by trading between the assets and cash (dynamic hedging), or by use of futures and options per se. By these means, the value of a portfolio may be prevented from falling below a given value.

A further issue is whether the benchmark for investment is seen in nominal terms, as implicitly assumed above, or real terms, reflecting liabilities. Asset management techniques which take into account the nature of liabilities are known as asset liability management techniques (ALM) (see also Blake (1999)), of which immunisation is a special case. They may be defined as an investment technique wherein long term balance between assets and liabilities is maintained by choice of a portfolio of assets with similar return, risk and duration characteristics to liabilities (although characteristics of individual assets may differ from those of liabilities). This approach may affect inter alia the appropriate degree of international diversification of the portfolio.

1.2   Investment issues for pension funds

In the context of the above discussion, we now go on to assess investment issues for pension funds in more detail. Pension funds collect, pool and invest funds contributed by sponsors and beneficiaries to provide for the future pension entitlements of beneficiaries (Davis (1995), Bodie and Davis (2000)). They thus provide means for individuals to accumulate saving over their working life so as to finance their consumption needs in retirement. In terms of the framework above, they must shape their assets to the relevant time horizon and varying degree of liquidity based constraints. Returns to members of pension plans backed by such funds may be purely dependent on the market (defined contribution funds) or may be overlaid by a guarantee of the rate of return by the sponsor (defined benefit funds). The latter have insurance features which are absent in the former (Bodie 1990). These include guarantees in respect of replacement ratios (pensions as a proportion of income at retirement) subject to the risk of bankruptcy of the sponsor, as well as potential for risk sharing between older and younger beneficiaries. Defined contribution plans have tended to grow in recent years, as employers have sought to minimise the risk of their obligations, while employees desire funds that are readily transferable between employers.

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[6] See Bodie (1991) and Leibowitz and Kogelman (1991).

For both defined benefit and defined contribution funds, the portfolio distribution and the corresponding return and risk on the assets seek to match or preferably exceed the growth of average labour earnings. This will maximise the replacement ratio (pension as a proportion of final earnings) obtainable by purchase of an annuity at retirement financed via an occupational or personal defined contribution fund[7], and reduce the cost to a company of providing a given pension in a defined benefit plan[8]. This link of liabilities to labour earnings points to a crucial difference with insurance companies, in that pension funds face the risk of increasing nominal liabilities (for example, due to wage increases), as well as the risk of holding assets, and hence need to trade volatility with return. In the context of the framework above, liabilities have an uncertain outcome and timing. In effect, their liabilities are typically denominated in real terms and are not fixed in nominal terms. Hence, they must also focus on real assets which offer some form of inflation protection. Note in this context that domestic equities are a matching asset when liabilities grow at the same pace as real wages, as is typical in an ongoing pension fund aiming for a certain replacement ratio at retirement, because the labour and capital shares of GDP are roughly constant, and equities constitute capital income. Domestic bonds are not a good match for real-wage based liabilities although they do match annuities for pensions.

An additional factor which will influence the portfolio distributions of an individual pension fund is maturity - the ratio of active to retired members. The duration of liabilities (that is, the average time to discounted pension payment requirements) is much longer for an immature fund having few pensions in payment than for a mature fund where sizeable repayments are required. A fund which is closing down (or "winding up") will have even shorter duration liabilities. Following the ALM approach, Blake (1994) suggests that given the varying duration of liabilities it is rational for immature funds having "real" liabilities as defined above to invest mainly in equities (whose cash flows have a long duration), for mature funds to invest in a mix of equities and bonds, and funds which are winding-up mainly in bonds (whose cash flows have a short duration). Flexibility in the duration of assets, which may require major shifts in portfolios, is hence essential over time.

There are also tax considerations. As shown by Black (1980), for both defined benefit and defined contribution funds, there is a fiscal incentive to maximise the tax advantage of pension funds by investing in assets with the highest possible spread between pre-tax and post-tax returns. In many countries this tax effect gives an incentive to hold bonds. There is also an incentive to overfund with defined benefit to maximise the tax benefits, as well as to provide a larger contingency fund, which is

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[7] The growth of receipts under funding with "defined contributions" depends on the rate of return on the assets accumulated during the working life. The actual pension received per annum varies with the number of years of retirement relative to working age (the "passivity ratio").

[8] Under full funding, the contribution rate to obtain a given "defined benefit" replacement rate depends on the difference between the growth rate of wages (which determines the pension needed for a given replacement rate) and the return on assets, as well as the passivity ratio (the proportion of life spent after retirement).

usually counteracted by government-imposed limits on funding. The accounting and regulatory framework will affect the approach to investment also.

Further key distinctions arise in the liabilities and investment approach of defined contribution and defined benefit funds:

1.3 Defined contribution pension funds

In a defined contribution pension fund the sponsors are only responsible for making contributions to the plan. There is no guarantee regarding assets at retirement, which depend on growth in the assets of the plan. Accordingly the financial risks to which the provider of a defined contribution plan (as opposed to beneficiaries) is exposed are minimal. In some cases, solely the sponsor and the investment managers it employs choose the portfolio distribution, and hence there is a risk of legal action by beneficiaries against poor investment. But increasingly, employees are left also to decide the asset allocation (e.g. in the US 401(k) plans). The remaining obligation on the sponsor is to maintain contributions.

As regards portfolio objectives, a defined contribution pension plan should in principle seek to maximise return for a given risk, so as to attain as high as possible a replacement ratio at retirement. This implies following closely the standard mean-variance portfolio optimisation schema outlined above. As noted by Blake (1997), in order to choose the appropriate point on the frontier of efficient portfolios, it is necessary to determine the degree of risk tolerance of the scheme member; the higher the acceptable risk, the higher the expected value at retirement[9]. The fund will also need to shift to lower risk assets for older workers as they approach retirement, thus reducing duration as outlined above and reducing exposure to market volatility shortly before retirement which might otherwise risk to sharply reduce pensions. They will imply marked portfolio shifts over time.

Until the approach of retirement necessitates a shift to bonds, the superior returns on equity and foreign assets are likely to ensure a significant share of the portfolio is accounted for by equities, depending on the degree of risk aversion. Where employers choose the asset mix, the degree of risk aversion is likely to be related to the fear of litigation when the market value of a more aggressive asset mix declines, where employees choose the asset allocation it is more direct risk aversion.

1.4 Defined benefit pension funds

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[9] Blake (1997) conceptualizes this as maximizing risk-adjusted expected value; the expected value of pension assets less a risk penalty, defined as the ratio of the variance of the funds assets to the degree of risk tolerance.

Unlike defined contribution funds, defined benefit funds are subject to a wide range of solvency risks affecting the sponsor. Given there is usually a guarantee of a certain replacement rate at retirement, the fund is subject to risk from earnings growth. Liabilities will also be influenced by interest rates at which future payments are discounted, and hence there are important interest rate risks. Falling asset returns will affect asset/liability balance. There are also risks of changes in government regulation (such as those of indexation, portability, vesting and preservation) that can vastly and unexpectedly change liabilities. The example of the UK, where such changes have been marked, is discussed in Davis (2001).

Defined benefit fund liabilities are, owing to the sponsor's guarantee, basically a form of corporate debt (Bodie 1991). Appropriate investment strategies will depend on the nature of the liabilities, including whether pensions in payment are indexed and the demographic structure of the workforce. Investment strategies will also be influenced by the minimum-funding rules imposed by the authorities which determine the size of surplus assets, as well as accounting conventions affecting the way shortfalls are presented in annual reports. These imply a focus on shortfall risk as defined above.

To assess the appropriate investment strategies in the light of liabilities, a number of definitions are needed. The wind-up definition of liabilities, the level at which the fund could meet all its current obligations if it were to be closed down completely, is known as the accumulated benefit obligation (ABO). The projected benefit obligation (PBO) implies that the obligations to be funded include a forward-looking element. It is assumed that rights will continue to accrue, and will be labour earnings-indexed up to retirement, as is normal in a final salary plan. The indexed benefit obligation (IBO) also assumes price-indexation of pensions in payment after retirement.

If the sponsor seeks to fund the accumulated benefit obligation, and the obligation is purely nominal, with a minimum-funding requirement in place, it will be appropriate to immunise the liabilities with bonds of the same duration to hedge the interest rate risk of these liabilities. Unhedged equities will merely imply that such funds incur unnecessary risk (Bodie (1995)), although they may be useful to provide extra return on the surplus over and above the minimum funding level. Regulations and practice differ between countries as to which of these is aimed for.

With a projected benefit obligation target, an investment policy based on diversification may be most appropriate, in the belief that risk reduction depends on a maximum diversification of the pension fund relative to the firm's operating investments (Ambachtsheer 1988), which could certainly include foreign assets. Moreover, it is normal for defined benefit schemes which offer a certain link to salary at retirement for the liability to include an element of indexation. Then fund managers and actuaries typically assume that it may be appropriate to include a significant proportion of real assets such as equities and property in the portfolio as well as bonds. By doing this, they implicitly diversify between

investment risk and liability risk (which are largely risks of inflation), see also Daykin (1995). As noted by Blake (1997), minimum funding levels and limits on overfunding provide tolerance limits to the variation of assets around the value of liabilities. If the assets are selected in such a way that their risk, return and duration characteristics match those of liabilities, there is a "liability immunising portfolio". This protects the portfolio against risks of variation in interest rates, real earnings growth and inflation in the pension liabilities[10]. Such a strategy, which determines the overall asset allocation between broad classes of instrument, may be assisted by an asset-liability modelling exercise (ALM) as discussed above (see Peskin (1997), Blake (2000))[11]. Strict minimum funding rules will overlay this with shortfall risk considerations also.

2   Issues in international investment

The discussion above is largely set in terms of assets in general. We now turn to an examination of international investment and its potential role in pension fund investment strategies outlined above.

2.1   Arguments Favouring International Investment

Modern portfolio theory (Solnik 1988, 1998) suggests that holding a diversified portfolio of assets in a domestic market can eliminate unsystematic risk resulting from the different performance of individual firms and industries, but not the systematic risk resulting from the performance of the economy as a whole. In an efficient and integrated world capital market, systematic risk would be minimized by holding the global portfolio, wherein assets are held in proportion to their distribution by current value between the national markets[12]. In effect, the improvement in the risk-return position from diversification more than compensates for the additional element of volatility arising from currency movements.

Several ways may be envisaged whereby a strategy of international diversification should reduce risk. Crucially, to the extent that national trade cycles are not correlated and shocks to equity markets tend to be country specific, the investment of part of the portfolio in other markets can reduce systematic risk for the same return. In the medium term, the profit share in national economies may move differentially, which implies that international investment hedges the risk of a decline in domestic

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[10] Note that this is distinct from classic immunization, which relates to interest rate risk only.
[11] Note that as described the ALM does not integrate the pension fund with the company balance sheet as may be warranted by its status as a collateral for the firm's guarantee, but treats it as an entirely separate financing vehicle.
[12] Baxter and Jermann (1997) go further and suggest that since human capital is non diversifiable and labour income growth and domestic capital market returns are strongly correlated, it is optimal to sell short domestic securities and hold wealth in a portfolio of foreign assets.

profit share and hence in equity values.[13] And in the very long term, imperfect correlation of demographic shifts should offer protection against the effects on the domestic economy of aging of the population.[14]. In effect, international investment in countries with a relatively young population may be essential to prevent battles over resources between workers and pensioners in countries with an ageing population, which could occur even with funding as pensioners consume part of GDP (Blake 1997).

Supporting arguments may be derived from the special circumstances of individual countries or from inefficiencies in global capital markets. There may be industries offshore (oil, gold mining etc.) which are not present in the domestic economy, investment in which will reduce unsystematic risk even if trade cycles were correlated. If oil prices change it is best to hold assets in both oil exporters (who benefit from an oil price rise and lose from a fall) and importers (vice versa). A high dependency on oil would imply a higher weighting towards oil producers.

The domestic stock market may itself be poorly diversified, being dominated by a small number of large companies (e.g. the Netherlands), or unduly exposed to one type of risk (e.g. Canada and raw materials). If the domestic currency tends to depreciate (as in the UK), real returns on foreign assets will be boosted correspondingly and vice versa for appreciation though in the long run, real returns will be equalized if purchasing power parity holds. This implies an additional inflation hedge. Other economies (e.g. the US in recent years) may be more successful in terms of growth than the domestic economy and hence offer higher total returns, given stock market returns ultimately depend on dividends, which in turn are a function of profits and GDP growth. Similarly, there may be a higher marginal productivity of capital in lower-wage countries (e.g. Korea) which may be attractive to investors[15]. For investors in certain markets, international investment may be stimulated by the unavailability of certain instruments in the home market. Equally, international investment avoids the risk of catastrophic failure of domestic financial markets due to war, revolution or other disaster, as has happened to Germany and Japan in 1945 and Russia in 1917. In the special case of Japan pension funds, investment in foreign assets provides a hedge against the possibility of a catastrophic domestic earthquake.

Finance-theory arguments for international investment (Kotlikoff 1998) apply strongly to emerging markets. In many developing countries the financial markets may themselves be poorly developed, offering only bank deposits leading to a need for international investment for a wider range of instruments. Even where they are active, such markets may be highly vulnerable to policy related or

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[13] See Davis (1995a). This will be of particular importance to defined benefit pension funds in which liabilities are tied to wages and hence rise as the profit share falls. Similarly, at an individual firm level, investment in competitors' shares hedges against a loss of profits due to partial loss of the domestic market.

[14] Erb et al. (1997) show how asset returns vary systematically with a country's demographic characteristics, with an older population being more risk averse and demanding a higher premium on equity investment.

[15] Technically these results imply inefficiency and/or slow adjustment of global capital markets.

external macroeconomic shocks leading to high and variable inflation that are damaging to the value of domestic financial assets. If the domestic currency tends to depreciate owing to inflation, real returns on foreign assets will be boosted temporarily. Even more than for smaller OECD countries, the domestic stock market may itself be poorly diversified, being dominated by a small number of companies, or unduly exposed to one type of risk. There will be many industries offshore which are not present in the domestic economy, investment in which will reduce risk. Small markets - particularly in developing countries - may be inherently volatile and illiquid both due to their inherent characteristics and the entry and exit of foreign institutional investors (Davis and Steil 2001) If there are higher mean returns in emerging markets than in OECD countries then there would be a trade-off of return and risk in investing abroad (Reisen 1997). Experience suggests that this phenomenon is partly endogenous to pension reform but is not to be depended on in the long term.

In the context of these arguments, a number of academic studies using data over the long term have shown that investors free to choose foreign assets may obtain a better risk/return trade off than if they are restricted to assets of one country. (See, for example Solnik (1988), Meric and Meric (1989)). As an example, we illustrate in Tables 1-3 three important results.

First, in Table 1 we show the correlations between equity index returns for the G-7 using monthly changes in the MSCI indices. The correlations for the G-7 over 1970-2002 are 0.43 on average, as compared with correlations of 0.9 for stocks in a domestic market. This indicates scope for risk reduction via international investment. The data for 1985-2002 indicate that the correlations have risen over time to an average of 0.49, showing the integration of global stock markets and growing scope of international investment, but remain relatively low. Correlations of the EME index with the OECD countries are lower than those between OECD countries, showing benefits of diversification in both directions. Note also that the volatility of the world index is the lowest of any in the table, showing the diversification benefits it offers.

Second, we show in Table 2 results for the G-7 of a factor regression on the determinants of share prices of individual companies, drawn from Solnik and De Freitas (1988) cited in Bodie et al (1999). The numbers indicate the percentage of volatility of an individual company stock (averaged for a number of stocks in each country) accounted for by each factor. The domestic factor is the dominant influence, with addition of the other factors adding very little to the outcome. The result is consistent with Table 1. Note however that the results date back to the 1980s, so the relative importance of factors may have changed. In addition, developments such as EMU will have led to drastic changes in the effects for the countries concerned (with a euro-wide factor and industry factors becoming dominant).

Third, Jorion and Goetzmann (1999) provide evidence for longer term returns and risks to international equity investment over the period 1921–1996, using GDP to weight portfolio holdings. The results, shown in Table 3, show that there is a major reduction in risk; even the inclusion of markets that failed (i.e., ceased to function entirely) does not greatly reduce the global total return.

2.2   Benefits to pension funds

Viewed in the light of the description of pension fund investment in Section 1.2, a significant number of benefits for pension funds are apparent from international investment.

The most important is the broadening of the frontier of efficient portfolios as a consequence of international investment possibilities. This means that for a mean-variance based investor such as a defined contribution pension fund, a higher return is available for the same level of risk (when risk preferences dictate high returns for immature funds) or lower risk for the same returns (when risk considerations dictate low risk for a mature fund). Given risk aversion falls with income and wealth, low income pensioners as in emerging market economies will be particularly adverse to avoidable risks to retirement income.

In terms of defined benefit funds, similar considerations will for the most part be important. In an ALM approach, it can be argued that international assets will tend to be part of a portfolio of assets with similar return, risk and duration characteristics to pension liabilities, as long as the fund is not winding down (i.e. with very short duration liabilities). Indeed, foreign assets may offer enhanced inflation protection, as the exchange rate depreciates during periods of inflation when domestic asset returns are poor.

Where shortfall risk considerations are important, it is an empirical question whether international assets offer greater downside risk than domestic ones, but better diversification and the exchange rate offset for inflation suggests this would not be the case. Well developed derivatives markets would allow protection. In this context, we note that estimation of the frontier of efficient portfolios based on historical variances and covariances of asset returns (such as Greenwood (1993)) shows *minimum* risk for a given return to be at an exposure to foreign assets of 20-30%. Such calculations only show average risks rather than extreme values, however. Shortfall risk can arise from domestic as well as international investment. As noted, such risk in the domestic economy may itself be relatively high in emerging market economies subject to high and volatile inflation.

Foreign assets may be avoided where the investment policy is merely to immunise or match assets and liabilities. In these cases a more precise match is provided by domestic assets. On the other hand, to the extent that pensioners will seek to spend part of their income on foreign goods and services, the

case for a degree of international investment may remain, to an extent dependent on the import share in the consumption basket.

International investment benefits pension funds at a wider level. In small countries, the assets of pension funds and other institutional investors may exceed the entire domestic equity market, and hence simple liquidity considerations necessitate international investment, abstracting from risk/return considerations, if regulations permit. Moreover, in emerging market economies, pension funds may be vulnerable to banking crises as well as the more general risks noted above, given that funded pension systems in their early stages hold a certain amount of bank assets (Mitchell 1997). International investment avoids this and related "catastrophic risks" (Kotlikoff 1998).

2.3   Reasons for "home asset preference" of pension funds

Given the force of these arguments, it is a puzzle that pension funds tend to invest at least 60% of their assets in the home market, and in most, the figure is over 90%, see Section 3.1.[16] Enormous differences in expected yields would be needed to account for such portfolios in the context of the theory of efficient markets.[17] Reasons for this home asset preference include the following:

Liabilities may play a role. As noted, the arguments above for sizeable exposure to international assets apply best to a portfolio that is following a mean-variance approach such as a defined contribution pension fund, or a defined benefit pension funds with inflation-linked liabilities following ALM considerations. For both types of fund, maturity will make the fund less willing to accept the risk of foreign assets. Funds following shortfall risk or immunisation strategies, or funds with very short term liabilities (e.g. due to winding up), may wish to avoid foreign assets altogether.

A related point is that foreign investment will not overcome systemic risks to world capital markets. Solnik et al. (1996) showed that downside market movements, notably in equity markets, occur much more in parallel than do upside ones (as in the 1987 crash). Pension funds that are adverse to shortfall risk (e.g., owing to minimum funding requirements or low risk tolerance of asset managers) will therefore be cautious in assuming diversification benefits. Nevertheless, if such shocks are truly systemic, they are not avoided by domestic investment either (Section 4.2).

The argument for the global portfolio assumes efficiency of markets. If markets are inefficient, for example showing bubbles, then global indexation by market capitalization will not be an efficient

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[16] In the United States, for example, international assets for pension funds account for 11% of their total assets and 16% of equities.

[17] For example, French and Poterba (1993) suggest that the low level of Japanese investment in the U.S. stock exchange could be rationalized only by a five percentage points higher than expected annual yield in Japan compared with the United States.

strategy, as those who built up holdings of Japanese stocks in the late 1980s and early 1990s discovered. Or atypically high returns on domestic bonds, as historically in Germany, may encourage domestic investment. Consistent with the point made above about the consumption basket, Howell and Cozzini (1990) suggest that there remains an optimal level of international diversification in the presence of inefficient global markets. This is based on the "openness" of the economy, and thus its exposure to output and inflation shocks. This suggests a higher level of international investment is appropriate for small open economies (both OECD and emerging markets) with high import/GDP ratios than in relatively closed economies such as the US, Japan and the Euro area.

A related point is that there is scepticism regarding purchasing power parity holding, even in the very long term (Reisen 1996). This can be justified by the existence of long term shifts in real exchange rates, which means currency mismatching can involve risk, especially for a mature fund. The issue will be of greater importance, the higher the share of non traded goods that pensioners buy. Whereas short term currency fluctuations can be hedged against, the optimal degree of hedging is highly uncertain (Solnik 1998).

The arguments about global diversification may be considered to apply to different degrees in the cases of equities, property, and bonds. They apply most precisely to equities, although one counterargument is that diversification may be obtained by investment in the domestic market if domestic companies carry out foreign direct investment. Bond markets are more globally integrated, and hence there is less benefit from diversification out of domestic markets. Property is a real asset similar to equity but is less liquid and more reliant on imperfect local information. This make international diversification more difficult, although as Eichholz (1996) argued, returns are for that reason less internationally correlated, and hence property company shares offers considerable diversification benefits.

There are also issues of information and other costs. Better information on home markets may be a reason why investors choose to concentrate their investments there.[18] Consistent with this, we show in Table 4 that UK pension funds obtain much lower returns in foreign markets relative to passive benchmarks than they do in their home market. Kang and Stulz (1995) show that foreign investors in Japan concentrate on larger stocks, which are better known. Frankel and Schmukler (1995) showed that prices of Mexican stocks declined more than closed-end funds traded in the United States, suggesting that investors in Mexico were better informed about fundamentals than are those in the United States. There will be sunk costs of setting up access the information that institutions may choose not to incur, as they cannot be recovered when emerging from the market. Equally, higher transactions costs, linked also to clearance, settlement, and custody, may limit investment in foreign

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[18] See Gehrig (1993).

markets. Blake and Timmermann (2001) show that UK pension funds also earned negative returns from international market timing (i.e. switching between markets).

Home bias may to some extent be driven by the structure of corporate ownership around the world. Global market portfolios based on outstanding shares may give a false impression of the proportion of shares that are actually tradeable, given that a significant proportion may be firmly held in large stakes which control the corporation in question. This is particularly important outside the US and UK. This implies an equilibrium degree of home bias may be appropriate for US and UK investors (because foreign markets have low free float) and elsewhere (because controlling shareholders are usually domestic). Estimates of this have been produced by Pinkowitz et al (2001)

A weaker justification for home asset preference is that international investment poses additional risk compared with domestic investment—settlement, liquidity, transfer, and exchange rate risk. But settlement, liquidity, and transfer risks may be avoided by appropriate choice of markets. Exchange rate risk can be hedged,[19] and, viewed in the context of modern portfolio theory rather than in isolation, contributes to, rather than offsetting, the benefits of offshore investment in terms of returns and diversification of risk, notably for equities. In practice, foreign bonds are often hedged while foreign equities are not.

Finally, home asset preference is widely considered to be driven by foreign asset restrictions in portfolio regulations. Given the importance of this issue from a policy point of view, we discuss the pros and cons of limiting international investment separately in Section 4.1. Suffice to say here that the main choice facing the authorities is between so called prudent person rules typically allowing international investment and quantitative portfolio restrictions which usually limit it, although authorities may also vary the tightness of such portfolio restrictions. To offer brief definitions, a quantitative portfolio regulation is simply a quantitative limit on holdings of a given asset class. Typically, those instruments whose holding is limited are those with high price volatility and/or low liquidity, such as equities, real estate and foreign assets. Explicit allowance is by definition not made for potentially offsetting correlations between types of financial instrument. Such regulations thereby override the free choice of investments that was assumed in Section 1. Meanwhile, a prudent person rule stipulates that investments should be made in such a way that they are considered to be handled "prudently" (as someone would do in the conduct of his or her own affairs). The process of making the investment is the key test of prudence. The aim is to ensure adequate diversification, thus protecting the beneficiaries against insolvency of the sponsor and investment risks[20]. The prudent person rule, in effect, allows the free market to operate throughout the investment process

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[19] On the analytics of hedging, see Bodie et al (1999) and Solnik (1998).
[20] See Goodman (2000) and Davis (2002b).

For defined benefit funds, solvency and minimum funding rules and their interaction with associated accounting arrangements may also play a crucial role in influencing portfolios, and may limit international investment independently of portfolio restrictions. This is because they determine the size and volatility of the surplus, as well as defining the rules for dealing with a corresponding deficit. They hence influence the likelihood and cost[21] of any deficiency, and hence the importance for pension funds of maintaining a stable valuation of assets relative to liabilities, independent of portfolio limits. Furthermore, minimum rates of return set annually by regulation can constrain diversification even when quantitative limits are not stringent (OECD 2000). This is because they limit holdings of volatile assets which could reduce returns below the limit in one year, even if they offer a high mean return. And application of accounting principles which insist on positive net worth of the fund at all times, carry equities on the balance sheet at the lower of book value and market value[22] and calculate returns net of unrealised capital gains (as in Germany till recently and Switzerland) may also restrain international asset holdings independently of portfolio regulations (see Hepp 1992).

3   International investment of pension funds in practice

In this section we seek to assess how the issues brought out above arise in practice using data over 25 years for the pension fund sectors of ten OECD countries (Australia, Canada, Denmark, Germany, Japan, the Netherlands, Sweden, Switzerland, the UK and US) and three emerging market economies with long experience of pension funds and pension fund investment (Chile, Singapore and Malaysia). These systems are mandatory in the cases of Australia, Denmark, Sweden, Switzerland and the three emerging market economies, and voluntary elsewhere. These mandatory systems are all defined contribution, while systems elsewhere are either a mixture or purely defined benefit. In most of the countries pension funds are sizeable, with assets amounting to 50% or more of GDP. Investment is by private managers expect in Singapore, Malaysia and till recently in Sweden. For further detail on these pension fund sectors see Davis (1995, 1998a and 1998c) and Davis and Steil (2001).

3.1   Asset return characteristics

To begin the empirical analysis and complementing the data in Section 2.1, we illustrate the risk and return characteristics of international assets, in comparison with domestic assets that are held by pension funds, in order to evaluate their potential role in pension fund investment. The estimated risks and returns based on annual data for 1967-95 are illustrated in Table 5. Note that these are real returns and their corresponding risks. Nominal returns will be boosted by the corresponding rate of inflation in

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[21] As an example, in the UK, the accounting rule FRS17, being introduced at the time of writing, enforces mark to market, on balance sheet accounting for pension liabilities with no smoothing and use of a corporate bond yield discount rate. It is considered to be leading to widespread abandonment of defined benefit funds altogether (Davis 2001b).
[22] These regulations were abolished in Germany after the impact on life insurers' and pension funds' solvency of asset price falls following the terrorist attacks on the US on September 11th 2001 became apparent.

the country concerned. They are also total returns, with estimated capital gains and losses on bonds, equities and real estate being added to the yield. Foreign asset returns are calculated by use of a simple weighting scheme of nominal total returns to G-7 country equities and bonds, based on rough estimates of world capitalisation weights[23]. These weighted returns are then derived in domestic currency in real terms by subtracting the change in the nominal effective exchange rate and the domestic inflation rate.

The line "OECD average" provides a summary for industrial countries. It is shown that the highest real returns are typically from (domestic) equities, which also have the greatest volatility. Other high-return assets are property and foreign equities, followed by bonds and loans, and finally short-term assets. As regards standard deviations, Table 5 verifies the proposition from Section 2 that the risks on foreign assets are generally lower than for domestic assets of the same type because of the diversification benefits of foreign assets, which more than offset exchange rate risk. Meanwhile, contrary to the expectations of finance theory, the volatility pattern is not entirely congruent with the pattern of real yields, with total returns on bonds showing a relatively high volatility despite rather low real returns. This is partly linked to the fact that in the 1970s, the real value of bonds fell sharply with high and volatile inflation, a pattern that was unique in history and has been much less characteristic of the 1980s and 1990s.

Table 5 also shows inflation and growth in real average earnings. The latter, a key target of pension fund investment, has been an average of 2% for the countries shown. Inflation averaged 6% over the period shown, although levels for individual countries varied significantly. The limited data we have for the three emerging market economies shows that average earnings growth considerably exceeds that in OECD countries, in line with economic development, while Chile experienced higher inflation over 1980-95[24]. Returns on foreign assets are comparable with those in OECD countries.

3.2   Current portfolios of pension funds

Patterns of portfolio shares in 1998 are shown in Table 6. There are major contrasts in terms of the proportion of foreign assets, as well as the balance for domestic assets between bonds and equities. The largest share of foreign assets is in the Netherlands (42%), a small open economy with very large pension funds relative to the size of the domestic financial markets. Note, however, that although many of these characteristics are shared by the Scandinavian countries, the holding of foreign assets is much lower (owing as discussed below to portfolio restrictions on foreign investment). Shares of foreign assets are close to 20% in Australia, Canada, Japan, Switzerland and the UK, of which Japan and the UK are medium-to large economies while the others are again relatively small. The US, a

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[23] A cross check with the MSCI world equity index revealed similar risks and returns.
[24] In the 1970s there was a hyperinflation, which contributed to the demise of the pay-as-you-go system.

large open economy, has 11% in foreign assets. Finally, there are a number of countries with very few foreign assets, including Denmark, Germany, France, Italy, Sweden and Finland. As noted, this is particularly surprising for the small Scandinavian economies. There appears to be no strong link from defined benefit or defined contribution to foreign investment, although there is a slight tendency for more international assets to be held in largely defined benefit based systems.

It may be added that earlier data (in Davis and Steil 2001) shows that even for some of the sectors shown to have substantial assets, this is a relatively recent phenomenon. In 1970, only the Netherlands (7%) and the UK (2%) had foreign assets at all, due in most cases to exchange controls as well as specific regulations on pension funds.

In the emerging market economies, the stated level of foreign assets is very low, despite the fact that they are small open economies where pension funds are very large relative to the economy and domestic financial markets. Note, however, that in Singapore, the fund is administered by the government investment agency, the Central Provident Fund (CPF), although the actual investment of the accumulated monies is carried out by the Government of Singapore Investment Corporation (GSIC) and the Monetary Authority of Singapore (MAS). The investment of the CPF is in nontradable government bonds and liquid bank deposits with the MAS. The MAS then invests the assets as foreign exchange reserves, and the GSIC in foreign equities. Moreover, in Chile, bonds all tend to be indexed and thus offer inflation protection. Foreign investment in Chile rose sharply to 10% in 2000 following deregulation to allow hedging of currency risk using derivatives.

3.3   Portfolio regulations on pension funds

As background for interpreting the portfolio data, Table 7 illustrates the current pattern of portfolio regulations in the OECD countries as well as in Chile, Singapore and Malaysia. In Japan, the Netherlands, UK, US pension funds are subject to a "prudent man rule" which requires the managers to carry out sensible portfolio diversification, and which is taken to include international investment; there are no limits on portfolio distribution, although trustees may impose limits on portfolio distribution. This is a relatively recent phenomenon in Japan, where regulations limited international investment until 1998. Australian funds are not again subject to prudent pension rules but taxation provisions, which enable domestic dividend tax credits to be offset against other tax liabilities, are reportedly a major disincentive to international investment (Bateman *et al* 1993). Canadian funds, despite having a prudent person rule, face limits on the share of external assets (but not their composition) as tax regulations limits foreign investment to 30% of the portfolio. A tax of 1% of excess foreign holdings was imposed for every month the limit is exceeded.

The other countries have quantitative restrictions on foreign investment. This helps to explain the low levels of foreign investment there. For example, German funds are subject to the 20% limits on foreign investment imposed on life insurers under the relevant EU Directives, despite the different liability composition of pension funds to life insurance. In Finland, this EU limit is supplemented by tighter limits on investment outside the European Economic Area. Swedish funds are limited to 5-10% foreign investment, and Swiss and Italian funds to 30% and 33% respectively.

In the emerging market economies, the current limit in Chile is 20% foreign assets, while in Malaysia 70% of assets must be in domestic government bonds. As noted, Singapore is a hybrid in that investments are carried out by the government independently of the fund and its returns (the government "saves" the excess return over that on bank deposits as a contingency reserve for the "future of the country").

Table 8 shows that there is considerable headroom relative to the foreign asset restrictions imposed by countries on their pension funds. The main exception is Sweden. Note that the interpretation of headroom could be on the one hand that there is no effect of the restrictions on normal business - or on the other that the existence of such restrictions may lead to very cautious portfolio management to avoid ever breaching them even if markets soar. The distinction is hard to test; as noted in Section 2.3, some home bias seems to occur even in the absence of regulation. As noted above, caution in portfolios may also link to accounting and solvency limits. For example, Davis (1998a) shows that these historically compounded the pressures on pension funds in countries such as Germany and Switzerland by enforcing accounting on a "lower of cost or market" basis – leading to a preference for stable valued assets.

3.4   Potential and actual returns on international investment

In this section we seek to address the degree to which pension funds' actual returns or potential domestic returns could be improved by more international investment. We use a dataset for pension fund portfolios and asset returns covering the period 1970-95. This is a sufficiently long and turbulent period to offer some reasonably robust conclusions. Our calculations provide, first, an estimate of actual real returns on pension funds, calculated by weighting each portfolio share in each year by its expected return (as illustrated for a slightly longer period in Table 5) and subtracting the inflation rate. Second, we provide a benchmark based on the returns on a dummy portfolio of 50% domestic bonds and 50% domestic equities (referred to as 50-50 domestic). Compared to the actual returns, this illustrates the influence of regulations limiting domestic investment in equities as well as risk preferences. Then, we provide successive estimates of the effects of diversifying this portfolio (while retaining the balance between equities and bonds), up to 20% international and 40% international, and finally a full global portfolio. Note that in the last case, there will only be domestic assets for the G-7

countries according to their global capitalisation weights and no domestic assets for the smaller countries. Unfortunately, consistent data for domestic equity and bond returns back to 1970 were not available for the EMEs, so we focus on the comparison of the actual portfolio with the global portfolio.

Following the discussion in Sections 1 and 2, we divide the results into those relevant to the traditional mean-variance approach, to shortfall risk and to Asset-Liability-Management (ALM). Beginning with mean-variance, Table 9 shows that for the 10 OECD countries, actual portfolios had a lower return than a 50-50 domestic portfolio, and also markedly lower risk. As noted, this cautious asset allocation may link to risk preferences but also to portfolio and other regulations. As regards international diversification, this is shown to have little effect on return short of the full global portfolio, which offers 30 basis points more than the rest. However, there are shown to be benefits in terms of risk reduction up to 40% foreign assets, while on average the global portfolio has a higher risk of the internationally diversified ones. This is consistent with the Greenwood (1993) result quoted in Section 2.

These summary results do not apply to all countries. The UK sector has a higher actual return than a 50-50 portfolio, reflecting high levels of equity investment, while the US and Canada have comparable returns, given pension fund portfolios are typically close to this portfolio benchmark. Elsewhere, due to higher bond shares than 50%, returns and risks have typically been lower. Looking at comparable portfolios in terms of instruments (50-50 bonds and equities), the differing returns available in domestic financial markets are apparent. In Switzerland such a portfolio would return only 2.4%, while in Sweden it would offer 8%. Global portfolios minimise these extremes. Benefits of international investment are low in Germany, reflecting the appreciation of the currency, but are correspondingly high in the UK.

As regards the EMEs, the global portfolio would return much more than actual returns in Singapore and Malaysia over the 1970-95 period, at a cost of higher risk. In Chile, data for returns are only available from 1980, reflecting the date of introduction of the personal pension system. Returns there were higher than the global portfolio over the same period, and risks lower. However, this period may have been exceptional and indeed over 1996-9 average returns of Chilean funds were only 5.8% (Palacios and Palares-Millares 2000).

Table 10 uses the data from Table 9 to offer a comparison of the returns and risks for internationally diversified portfolios relative to actual portfolios and the 50-50 domestic benchmark. The "cleaner" comparison is the latter, reflecting as it does the location of the assets and not differences in portfolios in terms of instruments also. That said, it is clear than on average, OECD sectors could gain a markedly higher return by holding a 50-50 portfolio, and the cost in terms of risk is lowest for the 40%

foreign portfolio. For all the portfolios based on a 50-50 bond-equity split, the internationally diversified portfolios on average dominate the purely domestic one, with lower risk in all cases and (for the global portfolio) higher return. The corollary is that the same risk could have generated a higher return (via a higher share of equities).

Table 11 gives a third approach to the mean variance paradigm, by showing the Sharpe ratios on the differing portfolios. The measure is defined as the real return as a proportion of the standard deviation. As discussed in Bodie et al (1999) it shows the reward to total volatility trade-off; mean variance preferences lead to a desire to maximise this measure. We see that the actual portfolios have higher Sharpe ratios than those based on 50-50 bonds and equities. This is not solely the consequence of more conservative allocations, since it is also true for the more aggressive UK pension funds, as well as those in Chile – but is not for Australia, and Sweden. It may reflect wider diversification into assets such as real estate, liquidity and loans. There is still a benefit from international investment, with Sharpe ratios being markedly lower for the domestic 50-50 portfolio. In Australia, Sweden and the US the global portfolio has a higher Shape ratio than the actual portfolio, while in Canada, Japan and Switzerland it is virtually the same. For Chile and Singapore, Sharpe ratios are higher in actual than global portfolios, while this is not the case for Malaysia.

Table 12 gives an indication of the shortfall risks to which sectors would be exposed in adopting the different investment approaches. This is shown simply by the lowest real return achieved during the period 1970-95. (In most cases this was in 1973-4, when the oil crisis led to high inflation and collapses in securities prices.) Actual portfolios tended to be better protected against such contingencies than the dummy 50-50 ones. Average worst-cases within the sample are 21% for the actual portfolios as opposed to 29-30% for the benchmark ones. Similar results obtain for the EMEs. Of course, hedging could reduce the potential costs from such market falls. Some individual country results remain interesting. In Australia, Sweden and the UK the worst case for the actual portfolio is more adverse than for the constructed global portfolio. Note also that in the Asian crisis, domestic stock markets in the affected countries fell by 50% or more, while the exchange rates also fell 50% (Table 13). Ceteris paribus, foreign assets would thus have risen in value, offsetting losses on domestic stocks.

Table 14 shows a comparison of pension fund returns with average earnings, relevant for Asset-Liability Management. The figures in the table show the "headroom" over average earnings available from the different investment portfolios. On average, the headroom is much greater for the 50-50 portfolios than for the actual returns obtained. Indeed, in Australia Sweden and Switzerland, the returns are less than 1% above average earnings, a quantity which is easily absorbed by transactions costs. Comparing the portfolios with different levels of international investment, headroom is higher for the global portfolio. In the Emerging Market Economies, actual returns fall far short of average

earnings in Singapore and Malaysia – international investment in a global portfolio would have improved the situation considerably. This is not the case in Chile, however.

Table 15 shows the correlations between the real asset returns and average earnings and inflation. It is desirable to have a zero correlation with inflation (so inflation does not affect real asset returns), and a strong positive correlation with average earnings (to ensure asset growth is in line with liabilities). In fact, portfolios are negatively correlated with both. For inflation, this means that high inflation leads to a low return on assets. However, it is notable that the global portfolio suffers least from this problem, and the actual portfolios are much more vulnerable. As regards earnings, the correlation is close to zero, and is highest for the actual portfolio. Interestingly, the domestic 50-50 portfolio is less negatively correlated with earnings than is the global portfolio.

We suggest that results presented in this section is consistent with a nuanced view of the benefits of international investment. We find indeed that there are higher risk adjusted returns when portfolios are diversified internationally. On the other hand, shortfall risks are comparable and although the headroom over average earnings is higher for an internationally diversified portfolio, it is not the case that the correlation with average earnings is more favourable.

3.5   A perspective on Trinidad and Jamaica

With available data, we sought to assess what returns could have been obtained by global investment as opposed to domestic assets in Trinidad and Jamaica. Some outturns are shown in Table 16[25]. It can be seen that both domestic bonds and short term assets failed in both countries on average to keep pace with inflation over the period up to 1995, and this was also the case for Jamaican equities. Estimates in Hope (2001) also suggest that social security (NIS) funds also gained negative real returns. Over the same period, investment in a global portfolio could have returned significant positive real returns, albeit at higher risk and a lower absolute minimum return. Over 1980-95 the global portfolio could have obtained much higher average returns, while NIS funds again gave negative returns. The global portfolio would have returned 9 percentage points above the growth rate of real wages in Trinidad and Tobago.

4   Policy issues

In this final section we assess some of the policy issues arising from international investment of pension funds. The focus is on two aspects, first whether regulations should be set to limit

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[25] I am grateful to Dennison Noel of the Central Bank of Trinidad and Tobago for his assistance in providing these data.

international investment and second whether international investment can help protect against future capital market turbulence as the population ages in OECD countries.

4.1 Portfolio regulations bearing on international investment

Two main issues arise in deciding on whether limits on international investment are appropriate (Davis 2002b). First there is the question whether such limits reduce risks, taking a broad view of the investment needs of pension funds. Second, there is the issue whether, abstracting from risk, there is a benefit to restricting international investment to stabilise the macroeconomy or develop the capital market.

The general case against portfolio regulations on international investment are parallel to those against restrictions on portfolios more generally. As summarised by European Commission (1999), they are "in the way of optimisation of the asset allocation and security selection process, and therefore may have led to sub-optimal return and risk taking". Focusing on pension funds, foreign asset restrictions have a number of adverse consequences:

In terms of risk and return optimisation, they are likely to enforce holdings of a portfolio below the efficient frontier, because they typically insist on high proportions of bonds and domestic assets. They focus unduly on the risk and liquidity of individual assets and fail to take into account the fact that, at the level of the portfolio, default risk and price volatility can be reduced by diversification. They hence increase risk for a given return by reducing the extent to which the diversification benefits of international investment may be attained. For pension funds, the degree to which such regulations actually contribute to benefit security is open to doubt. This relates to the link of liabilities to average earnings growth (as well as the vulnerability of liabilities to regulatory changes)[26], besides the fact that appropriate global diversification of assets can eliminate idiosyncratic risk,

For defined contribution funds, it is hard to argue a sound case for such rules, given the superior alternative of prudent person rules. They can even be said to expose beneficiaries to currency risk, given that they will want to spend some of their income on foreign goods and services, and the domestic currency may depreciate. There seems little evidence that defined contribution investors need "protecting from themselves" i.e. prevented from taking high risks by quantitative restrictions. Indeed, in practice, experience suggests that US investors in individual defined contribution funds at least historically tended to be too cautious to develop adequate funds at retirement, while companies running defined contribution funds may invest excessively cautiously to avoid lawsuits. A case could be made (as in Chile, see Davis (1998c)) that a danger with unrestricted investments would be that

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[26] Indeed, in several countries, a false parallel seems to be drawn by regulators between life insurers and pension funds.

firms providing pension contracts would seek to boost yield to attract clients, at a cost of excessive risk which could ultimately be borne by the government. But these tendencies could also be dealt with by a prudent person rule.

Portfolio limits would also appear to be inappropriate for defined benefit pensions, given the "buffer" of the company guarantee for the beneficiaries and risk sharing between older and younger workers, and if benefits must be indexed. Clearly, in such cases, portfolio regulations may affect the cost to companies of providing pensions, if it constrains managers in their choice of risk and return, forcing them to hold low yielding assets, and possibly increasing their risks and costs by limiting their possibilities of diversification. Indeed, restrictions on foreign assets may prevent appropriate account being taken of the duration of the liabilities (which may differ sharply between funds, as well as over time), and related changes in risk aversion. They also render difficult or impossible the application of appropriate asset-liability management techniques for maturity matching, because such techniques may require sharp variations in the portfolio between domestic and foreign equities to bonds, and use of derivatives. If portfolio regulations limit use of derivatives, abstracting from other operative limits, they will force the institution either to hold low-yielding assets or expose itself to unnecessary risks, notably in international markets;

For all systems, restrictions encourage national governments to treat pension funds as means to finance budgetary requirements (by enforcing high portfolio shares of government debt), in a way that could not occur under a prudent person rule where international diversification is permitted. Holdings of government debt are vulnerable to monetisation as government creates inflation to reduce its debt burden. Taking a broader view, in the case of restrictions which explicitly or implicitly[27] oblige pension funds to invest in government bonds, which must themselves be repaid from taxation, there may be no benefit to capital formation and the "funded" plans may at a macroeconomic level be virtually equivalent to pay-as-you-go.

As we noted, international investment will forestall the point at which pension fund investment becomes so large as to face diminishing returns domestically, so restrictions bring this point closer[28]. Also there may be a benefit at a national level if national income is subject to frequent terms-of-trade shocks owing to the position of being largely dependent on commodities for export earnings, while export earnings account for a large proportion of GDP, as is common in developing countries. Hence, holdings of assets offshore can actually help to contribute to greater stability of national income (Fontaine 1997).

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[27] For example, by closing down all alternative investment strategies such as international diversification.

[28] Other policies are to invest in human capital, which is complementary to physical capital, to shift labour to the formal from the informal sector and to encourage capital-intensive technological change (James and Vittas 1995).

Some additional points apply more broadly to institutional investors:

Asset restrictions such as those on foreign assets are inflexible and typically cannot be changed rapidly in response to changing conjunctural economic circumstances and movements in domestic or international securities, currency and real estate markets; they also may find it difficult to adapt to structural changes in financial asset markets, such as EMU.

If enforced strictly, they may give incentives to asset managers to hold proportions of risky assets which fall well short of the limits, to avoid breaching them when markets perform well and prices rise. This compounds the loss of potential risk reduction for a given return. They may limit tactical asset allocation - there is no incentive for the institutional investor to nominate investment managers with skills to achieve higher return and lower risk, by equity and international investment, and competition among asset managers is discouraged if their main function is to meet quantitative asset restrictions;

We noted in Section 2.2 that the case for international diversification applies particularly strongly to emerging market economies. Nevertheless, some possible exceptions are often suggested to the argument for liberalisation, which also apply notably in emerging market economies:

Some issues arise in the context of capital outflow controls in developing countries. As noted by Fontaine (1997), exchange controls have in the past been - justifiably - imposed during foreign exchange crises to deal with capital flight, to avoid a sharp and costly overshooting of the currency, but often kept in looser form once normal conditions were re-established. On the other hand, Bodie and Merton (2001) show that it would be feasible to gain the diversification benefits of international investment without risk of capital flight by use of appropriate swap contracts.

Foreign asset restriction can ease the fiscal cost of moving from a pay-as-you-go to a funded scheme. For example in Chile, Fontaine (1997) notes that pension fund development facilitated internal resource transfers, enabling the Chilean government to service its international debts without extreme fiscal adjustment which was elsewhere damaging to the real economy, by providing a domestic source of borrowing without requiring excessively high interest rates (in fact the debt was generally CPI-indexed). Later, the demand of pension funds enabled debt conversion - by both private and public institutions - to occur smoothly. He argues that the process would have been less smooth if international investment had been permitted.

Some would also argue that restrictions are needed to boost development of domestic capital markets and hence growth. Most Latin American countries with recent pension reforms restrict international investment. This is a complex, threefold issue: Do capital markets contribute to economic growth? Do pensions contribute to capital markets? And is this the case only if foreign investment is restricted?

The evidence on the first point is fairly clear, both for capital markets and banks (see Levine and Zervos (1998) and the summary in Tsuru (2000)). There is some support for the link to pension funds to capital market development; most is based on Chilean experience (Holzmann 1997), although some work also suggests benefits for a range of EMEs (Walker and Lefort 2001) as pension funds are seen to increase the supply of long term finance, financial innovation, infrastructure modernisation and possibly increase household saving. On the other hand Kotlikoff (1998) highlights the fact that besides requiring fixed costs of set-up, development of pension and insurance industries, or even capital markets, is contrary to the comparative advantage of EMEs.

However, even if pension funds can aid growth of capital markets, openness to foreign investment may also achieve this objective. Assuming sound and transparent economic policy, competition and financial regulation, this would itself be encouraged by allowing international investment by domestic institutions, because it would give foreign investors confidence that the repatriation of their portfolios will not itself be restricted in future. Meanwhile, following Section 2.3, home bias even in the absence of such restrictions would lead to ample inflows to domestic instruments (Reisen 1996)[29].

There could be a rationale for portfolio regulations (albeit not minima) if fund managers as well as regulators are highly inexperienced and the markets volatile and open to manipulation by insiders. They in a sense ensure portfolio diversification in a rough and ready way, and avoid risk becoming excessive in such cases. A corollary is that restrictions may justifiably be eased as expertise develops, and such arguments do not support international investment restrictions. This point applies more generally where regulators have initial doubts about internal controls in institutions, as well as about the industry's capacity for self-regulation and related governance structures. Moreover, compliance with portfolio limits is more readily verified and monitored by supervisors than for prudent person rules. The latter requires a high degree of transparency of institutions, and strict supervisory controls on investor malpractice (such as occurred in the Maxwell case) as well as on self-regulatory bodies. Even if this argument is accepted, rules should be eased or switched to prudent person once experience is gained.

On balance, we consider the liberal approach to be best both for OECD countries and EMEs.

4.2 Some longer term risks

Before concluding, it is important to assess what will happen to asset returns when ageing takes place (Davis 2002a). Will international investment help? Various predictions can be made.

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[29] Singapore, where pension assets are managed by public bodies, is an exception.

During the transition phase as the working population ages while accumulating for retirement, there will be considerable demand for securities, notably in the form of equities (where regulations permit) and bonds. This will be enhanced as more countries currently dependent on pay-as-you-go switch relatively to funding (as witness recent steps by Germany and Italy). Given the contrasting portfolios of institutional investors and households, and the evidence of a lack of offsetting shifts in portfolios when institutional investment increases (King and Dicks-Mireaux 1988), relative demand for deposits is likely to decline. Over time, there will be a shift within demand for securities from equity to bond-related instruments because the growing maturity of pension schemes, and the increased demand for annuities per se would necessitate holding of shorter duration assets.

Such flows arising from funding will again not be purely domestic, to the extent that ageing occurs at different rates in different countries. Net flows will arise from balance of payments surpluses in countries which are ageing most rapidly, offset by deficits in slower ageing countries (Boersch Supan et al 2001), although such flows could arise via banking flows or FDI as well as pension portfolio flows. Reflecting desire for diversification, and subject to portfolio regulations, it seems likely that there will be much greater gross capital flows between OECD countries and from OECD to EME countries during this phase, in the form of bond and equity finance. These are likely to exceed considerably the amplitude of net flows (i.e. arising from saving-investment imbalances and consequent balance of payments disequilibria), see Reisen (1998)[30].

Experience suggests that a large share of OECD pension saving in EMEs can lead to bubbles and financial stability risks in the latter owing to institutional behaviour. This supports the need for pension funds in EMEs to invest globally rather than solely concentrating on the home market. Owing, for example, to autonomous shocks affecting profitability and creditworthiness, there may be periodic flights of investable funds back to the OECD or to other EMEs. In this context, note that securities are in principle much easier to repatriate than bank loans. Indeed, behaviour of OECD institutional investors is already widely considered to destabilise EMEs, not least owing to their tendency to invest in EMEs as a bloc rather than focusing closely on individual countries' fundamentals (Buckberg 1996). These patterns of volatility are underpinned by the sharp difference in relative size of EMEs and OECD institutional investors, whereby according to 1995 data, 1% of domestic equity holdings by institutional investors in the G-7 countries is equivalent to slightly over 1% of global stock market capitalization but would be equivalent to 27% of market capitalization of the emerging Asian economies and 66% of Latin American ones. Hence if portfolio shifts on the scale of only 1% of domestic equities were to be focused solely on the emerging markets, the effects would be very

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[30] Reisen (1998) points to both the offsetting patterns of saving and the diversification benefits arising from EMEs as helpful in ensuring adequate returns on OECD pension funds that invest in EMEs, not least in the light of the tendency for returns in OECD countries to fall in coming decades. Blommestein (1998) on the other hand, points to the low returns and high risks of EMEs, in combination with increasing correlations with the OECD markets, which suggest that EME investment is not a panacea.

disruptive. The relative growth of EME market capitalisation and OECD institutional investors suggests that this size differential is likely to be maintained for some decades ahead.

Looking further ahead, when an increasing proportion of the population retires in the rapidly ageing OECD countries and begins to live on the accumulated assets, domestic demand for securities in OECD countries could fall sharply. There would also be withdrawal of financing from EMEs. Schieber and Shoven (1994) point out that decumulation is an ineluctable process for defined benefit pension funds, and suggest that they will cease to contribute to US net saving around 2024. They note however that this effect is unlikely to occur for defined contribution funds in the foreseeable future. Given the need to finance annuities, demand for equities would fall more than demand for bonds (Brooks 2000). Poterba (1998) focuses on extant information on age-specific asset holdings (excluding defined benefit pension funds), corrected for cohort effects in order to evaluate this issue. He concludes that asset demands may indeed rise as households age, and notes that surveys suggest that there is a decline in risk tolerance at ages over 65, but suggests that there is less evidence of a downturn in asset holdings at the end of the life cycle. He thus considers that a sharp fall in demand for securities is unlikely to arise in coming decades[31].

Even if there were to be net decumulation of securities by OECD investors, global demand will also depend on the degree to which other countries, e.g. in the Far East or Latin America, experience slower demographic ageing and thus provide a countervailing factor in the context of globalised financial markets. Note however that maintaining global demand for securities would require them not only to substitute for capital inflows from OECD countries, but also to generate substantial surpluses to cover declines in demand for securities in OECD countries themselves. The more EMEs that fund pensions, and the more rapid their economic development, the more likely this is.

What will be the effect on asset prices? The asset flows from pension saving are popularly considered to be already having an upwards effect on asset prices, in driving the bull market in equities in countries such as the US. Certainly, work on savings flows such as Poterba (1998) does imply that current high levels of retirement saving in the form of securities may have driven up market prices. It may be the case that the institutionalisation of saving has boosted equity prices via a fall in the risk premium (Blanchard 1993), reflecting better diversification and lower risk aversion of collective investment vehicles. On the other hand, most work on the relation of equity prices to mutual fund flows suggests that direct effects of inflows on prices are hard to detect (Fortune (1998), Engen et al (2000)).

Correspondingly, there are also arguments suggesting that asset prices will fall during the process of ageing itself, as it interacts with pension funding. A fundamental aspect is that the return on capital

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[31] He admits however that his analysis fails to cover defined benefit pension funds.

may fall in OECD countries as a consequence of a lower labour supply and lower growth during ageing. Cutler et al (1990) see the real return on capital halving. An issue for funding is whether it can generate offsetting increases in efficiency and resource allocation, e.g. via growth of capital markets, that may help to offset this by boosting productivity and investment.

Besides the return on physical capital, a key issue is whether global asset prices will also be put under downward pressure in coming decades by declining saving in OECD countries implicitly affecting the real interest rate or the risk premium, which could also affect EMEs. Schieber and Shoven (1994) note that given the correlation of ageing in OECD countries, and the likely decumulation of defined benefit pension fund assets, there could be widespread falls in asset prices, linked to high real interest rates. Supporting this, Erb et al (1997) find a positive correlation in the US between the fraction of the population 25-45 and 65+ to stock returns, and thus a negative effect on prices while those 45-65 have a negative effect, and an effect of average age in a wider range of countries. Brooks (2000) focuses on the relation between ageing and the demand for equities and bonds, and suggests that there will be excess demand for bonds and excess supply of equities in coming decades, with a marked decline in the returns on the retirement savings of baby boomers.

Poterba (1998) on the other hand suggests there is no strong likelihood of a "baby bust" effect depressing asset returns markedly around 2020-2030[32], even if the recent rise in baby boom savings may have had a positive effect. Neuberger (1999) argues that the increase and subsequent decrease in savings flows will be balanced by rises and falls in equity issues, with little effect on prices and returns. Also the increase in the ratio of pensioners to workers is already underway, and will continue steadily rather than abruptly, again casting doubt on the idea of a cycle. Or at least, the market will take on board such gradual future shifts without major and abrupt adjustments in prices. Furthermore, OECD countries are ageing at different rates and there may be offsetting demands for securities from EMEs.

Despite these counter arguments to the "baby bust", there are grounds for caution as a consequence of these projected patterns. They clearly justify a retention of some element of pay-as-you-go as a form of insurance against a future crisis in global capital markets. However, it is evident that international investment will be beneficial in reducing the risks from ageing as compared to purely domestic investment, given that countries will age at different rates in the coming decades. And indeed, in many countries balance of payments surpluses due to ageing will market liberalisation of international investment essential. EMEs should develop domestic pension fund sectors also as a bulwark against eventual withdrawal of OECD funds. Meanwhile central banks need to be aware that the trends

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[32] Commenting on Poterba's work, Abel (2001) points out that an elastic supply of capital as the population ages could generate a fall in asset prices, even if the demand for assets falls little as baby boomers retire.

highlighted in this section may have important financial stability consequences, not least given the likely volatility of future asset prices and credit flows (Davis 2002a).

Conclusions

International investment has been shown to allow superior investment performance ain terms of risk and return. We have shown that pension funds are well placed to take advantage of the benefits of international investment, to an extent that depends on the maturity of the fund and the investment approach. There are sizeable differences in international investment by the pension fund sectors in the countries studied. Whereas some degree of home bias is likely to occur naturally, it is undesirable for regulations to enforce tighter limits on foreign assets than these market forces would suggest. The arguments favouring such restrictions are weak. The future of funding itself seems likely to be turbulent given the growing scope of asset flows and the future decumulation when ageing accelerates in OECD countries. These developments do not negate the case for international investment, but they do suggest a need to retain elements of a pay-as-you-go system, as a form of insurance.

This paper has sought to present a global perspective and has not focused closely on conditions in the Caribbean nations. Nevertheless, it is noted that real returns obtainable in the domestic markets of Trinidad and Jamaica have generally been poor, suggesting that policies of restricting foreign investment, as is the case for private pension funds in Trinidad (20% maximum), has not only raised risk but significantly reduced return below those potentially available. Meanwhile Forde (2001) notes that in Jamaica private funds are implicitly subject to prudent person regulation but expresses concern about potential risks. NIS systems have tended to gain even lower returns than private pension funds, focusing closely on domestic assets and in most cases government securities. In Jamaica foreign investment is not permitted, according to Forde (op cit), while in Trinidad it is not customary.

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Table 1: Correlations of monthly percent changes in MSCI country stock indices

1970-2002	UK	US	France	Italy	Japan	Canada	Germany	Memo: EME 1987-2002	Memo: World
UK	1.00							0.33	0.68
US	0.51	1.00						0.49	0.85
France	0.55	0.46	1.00					0.36	0.64
Italy	0.34	0.26	0.47	1.00				0.28	0.45
Japan	0.37	0.31	0.40	0.35	1.00			0.37	0.68
Canada	0.51	0.72	0.46	0.31	0.31	1.00		0.52	0.73
Germany	0.44	0.41	0.63	0.42	0.37	0.37	1.00	0.37	0.60
1985-2002									
UK	1.00							0.33	0.78
US	0.64	1.00						0.49	0.81
France	0.60	0.53	1.00					0.36	0.72
Italy	0.37	0.32	0.57	1.00				0.28	0.53
Japan	0.46	0.33	0.46	0.39	1.00			0.37	0.76
Canada	0.55	0.77	0.49	0.36	0.36	1.00		0.52	0.72
Germany	0.54	0.49	0.76	0.52	0.30	0.46	1.00	0.37	0.64
Standard deviations									
1970-2002	6.76	4.47	6.59	7.52	6.59	5.60	5.96	6.97	4.17
1985-2002	5.21	4.50	6.11	7.54	7.37	5.31	6.39	6.97	4.37

Source: MSCI.com website, own calculations. Note: EME data are only available from 1987-2001 World/EME correlation is 0.54

Table 2: Relative importance of factors in explaining return on a stock

Average R-squared of regression on factors					
	Single factor tests				Joint test of all factors
Country	World	Industrial	Currency	Domestic	
UK	0.20	0.17	0.01	0.53	0.55
US	0.26	0.47	0.01	0.35	0.55
France	0.13	0.08	0.01	0.45	0.60
Italy	0.05	0.03	0.00	0.35	0.35
Japan	0.09	0.16	0.01	0.26	0.33
Canada	0.27	0.24	0.07	0.45	0.48
Germany	0.08	0.10	0.00	0.41	0.42
G-7 average	0.15	0.18	0.02	0.40	0.47

Source: Solnik and De Freitas (1988) cited in Bodie et al (1999)

Table 3: Returns on global stock indices, 1921-96

Index	Real Return (Arithmetic)	Standard Deviation	Real Return (Geometric)
United States	5.5	15.8	4.3
Non-US	3.8	10.0	3.4
Global	5.0	12.1	4.3
Survived markets	4.6	11.1	4.0

Source: Jorion and Goetzmann (1999).

Table 4: UK Pension Funds: Performance relative to benchmarks

	1981–1998		1981–1989		1990–1998	
Percentage points	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation
United States	–2.3	2.1	–3.7	2.0	–0.9	1.0
Japan	0.3	7.5	–2.0	9.9	2.5	3.2
Continental Europe	–1.0	3.1	-1.8	4.0	-0.2	1.6
World	-1.6	6.0	-3.1	5.1	-0.2	6.7
United Kingdom	-0.4	0.7	-0.4	0.9	-0.3	0.6

 Note: Before 1987, local indices for the United States and Japan, MSCI for Europe.
After 1987, FT-A indices. Source: WM (1999).

Table 5: Annual real asset returns and risks over 1967–1995

Average Real Return (and *Standard Deviation*)	Short-Term Assets	Loans	Domestic Bonds	Domestic Shares	Real estate	Foreign Equities	Foreign Bonds	Memo: CPI Inflation	Memo: Average Earnings
Australia	1.8	4.8	–0.1	8.3	4.4	7.5	4.4	7.3	1.4
	4.3	*5.2*	*18.5*	*19.9*	*18.7*	*20.7*	*17.8*	*3.9*	*3.4*
Canada	2.7	4.2	2.0	5.0	9.4	8.2	5.1	5.7	1.5
	3.3	*3.1*	*13.3*	*15.8*	*8.3*	*17.8*	*15.0*	*3.4*	*2.3*
Denmark	2.3	6.6	4.4	5.9		5.2	2.1	7.1	2.6
	2.8	*3.5*	*19.1*	*25.6*		*21.4*	*17.7*	*3.5*	*3.4*
France	2.9	3.3	2.5	7.7	4.3	6.9	3.8	6.3	2.9
	3.4	*3.3*	*15.8*	*18.4*	*14.5*	*17.2*	*14.5*	*4.2*	*2.4*
Germany	3.1	6.8	3.9	10.8	10.9	5.5	2.4	3.5	3.0
	2.1	*2.0*	*15.7*	*23.8*	*11.5*	*21.4*	*17.4*	*1.9*	*2.8*
Italy	–0.3	4.3	–2.0	4.1		7.9	4.9	9.4	3.3
	4.4	*3.7*	*20.8*	*32.5*		*16.3*	*14.5*	*5.9)*	*4.4*
Japan	–0.2	1.4	3.1	8.5	11.5	7.8	4.4	4.7	3.5
	4.5	*4.7*	*19.5*	*20.9*	*19.4*	*20.4*	*12.8*	*5.1*	*3.7*
Netherlands	2.1	4.0	2.6	8.8	5.9	6.2	3.1	4.6	1.6
	3.8	*3.4*	*14.1*	*26.6*	*8.3*	*18.7*	*13.9*	*2.9*	*2.6*
Sweden	2.1	4.4	1.4	14.1	10.3	7.7	4.6	7.7	1.5
	3.9	*3.8*	*16.3*	*31.4*	*27.1*	*17.6*	*15.4*	*3.0)*	*3.5*
Switzerland	1.3	2.8	0.0	7.8	1.7	5.3	2.2	3.9	1.7
	2.0	*2.0*	*18.7*	*22.8*	*9.1*	*19.9*	*15.9*	*2.4)*	*2.0*
UK	2.1	1.7	1.0	8.3	1.5	8.0	4.1	8.1	2.8
	4.6	*6.1*	*14.9*	*17.8*	*15.3*	*17.7*	*15.7*	*5.4)*	*2.2*
US	2.0	3.8	1.2	2.0	5.6	8.5	5.5	5.5	-0.1
	2.3	*2.3*	*15.2*	*2.3*	*22.1*	*18.7*	*14.9*	*3.0)*	*1.8*
OECD	**1.8**	**4.0**	**1.7**	**8.0**	**6.5**	**7.1**	**3.9**	**6.2**	**2.1**
Average	*3.5*	*3.6*	*16.8*	*22.5*	*15.4*	*19.0*	*15.5*	*3.7*	*2.9*
Chile						10.4	7.8	17.6	3.2
(1980-95)						*22.0*	*20.0*	*6.4*	*5.7*
Singapore						6.2	3.9	4.0	6.9
						22.6	*18.3*	*5.6*	*3.3*
Malaysia						7.9	5.6	4.5	4.4
						21.5	*17.0*	*3.6*	*2.9*

Source: OECD, BIS.

Table 6: Pension funds' portfolio composition 1998

Percent of total	Liquidity	Loans	Domestic Bonds	Domestic Equities	Property	Foreign assets	Memo: pension provision	Memo: assets/ GDP
Australia	14	4	12	43	6	18	DC	42
Canada	5	3	38	27	3	15	DB/DC	47
Denmark	1	0	59	23	6	11	DC	22
Germany	0	33	43	10	7	7	DB	15
Japan	5	14	34	23	0	18	DB	17
France	0	18	65	10	2	5	DB	7
Italy	0	1	35	16	48	0	DC	2
Netherlands	2	10	21	20	7	42	DB	116
Sweden	0	0	64	20	8	8	DB/DC	49
Finland	13	0	69	9	7	2	DB	8
Switzerland	11	0	29	17	26	17	DC	111
UK	4	0	14	52	3	18	DB/DC	87
US	4	1	21	53	0	11	DB/DC	72
Chile	15	17	44	21	3	4	DC	45
Singapore	28	0	70	0	0	0	DC	60
Malaysia	24	27	32	18	1	0	DC	51

Sources: National flow of funds balance sheets, Mercer (1999). Chile: Palacios and Palares-Millares (2000) Singapore and Malaysia: Asher (2000)

Table 7: Foreign assets regulations for pension funds

	General approach to investment regulation	Foreign asset restrictions
Australia	Prudent person rules (PPR)	No currency matching limit but tax on income from foreign assets
Canada	PPR	No currency matching limit but foreign assets maximum of 30% of fund
Denmark	Quantitative asset restrictions (QAR)	80% currency matching limit; 50% limit on "high risk assets"
Finland	PPR/QAR	80% currency matching limit, 5% in non-EEA countries, 20% in currencies other than the euros
Germany	QAR	80% currency matching limit; 30% limit on EU equity, 6% on non EU equity, 5% non-EU bonds
Italy	PPR/QAR	67% currency matching limit. Securities of OECD countries not traded in regulated markets limited to 50%; non OECD securities traded in regulated markets limited to 5% (forbidden if traded in non regulated markets)
Japan	PPR	None (Since 1998 only)
Netherlands	PPR	None
Sweden	QAR	Currency matching required. Foreign assets limited to 5-10% of the fund
Switzerland	QAR	30% limit on foreign assets
United Kingdom	PPR	None
United States	PPR	None
Chile	QAR	80% currency matching limit
Singapore	[PPR]	Government invests assets at its discretion but holders are "credited" with returns equivalent to bank deposits
Malaysia	QAR	70% of assets in domestic government bonds

PPR: prudent person rules, QAR: quantitative asset restrictions. Sources OECD (2000) (2001) Note: Mexican law does not permit investment in foreign securities.

Table 8: Headroom relative to portfolio restrictions on foreign assets

	Percent of portfolio
Canada	15
Germany	13
Finland	18
Italy	33
Sweden	2
Switzerland	13
Chile	16
Malaysia	30

Source for OECD countries: Davis (2002b)

Table 9: Mean variance 1: estimated real returns and risks on pension funds' portfolios and on foreign assets (1970-95)

	Actual portfolios	50-50 domestic bonds and equities	20% foreign	40% foreign	Global portfolio
Australia	1.8	3.5	4.0	4.6	6.1
	11.4	17.5	16.5	16.1	18.2
Canada	4.8	4.0	4.6	5.3	7.1
	10.0	12.1	11.7	11.8	14.7
Denmark	4.9	6.1	5.6	5.1	3.7
	11.0	19.0	17.6	16.7	18.5
Germany	6.0	6.4	5.9	5.4	3.9
	5.9	17.7	16.1	15.3	18.4
Japan	4.4	6.1	6.2	6.4	6.9
	10.2	16.9	15.5	14.6	16.0
Netherlands	4.6	5.5	5.4	5.2	4.8
	6.0	*18.3*	*17.2*	*16.2*	*14.7*
Sweden	2.1	8.0	7.6	7.3	6.3
	13.2	20.1	17.7	15.8	14.8
Switzerland	1.8	2.4	2.6	2.9	3.7
	7.7	18.1	16.9	16.2	17.0
UK	5.9	4.7	4.9	5.2	5.9
	12.8	*15.4*	*14.8*	*14.4*	*15.0*
US	4.5	4.4	5.0	5.6	7.5
	11.8	*13.3*	*12.8*	*12.8*	*15.2*
OECD	**4.4**	**6.3**	**6.3**	**6.3**	**6.6**
Average	***9.6***	***15.7***	***14.7***	***14.1***	***15.3***
Chile	13.0				9.1
(1980-95)	*9.5*				*19.1*
Singapore	1.3				5.1
	5.4				*18.4*
Malaysia	3.0				6.7
	3.9				*17.2*

Source, Davis and Steil (2001), own calculations.

Table 10: Mean variance 2: comparing pension fund real returns and risks with foreign asset benchmarks (1970-95)

	Actual risk/return less:				Domestic 50-50 less:		
	50-50	20% foreign	40% foreign	Global portfolio	20% foreign	40% foreign	Global portfolio
Australia	-1.7	-2.2	-2.8	-4.3	-0.5	-1.0	-2.6
	-6.1	*-5.1*	*-4.7*	*-6.8*	*1.0*	*1.4*	*-0.7*
Canada	0.8	0.2	-0.5	-2.3	-0.6	-1.2	-3.1
	-2.1	*-1.7*	*-1.8*	*-4.7*	*0.4*	*0.3*	*-2.6*
Denmark	-1.2	-0.7	-0.2	1.2	0.5	1.0	2.4
	-8.0	*-6.6*	*-5.7*	*-7.5*	*1.5*	*2.3*	*0.5*
Germany	-0.4	0.1	0.6	2.1	0.5	1.0	2.5
	-11.8	*-10.2*	*-9.4*	*-12.5*	*1.6*	*2.4*	*-0.7*
Japan	-1.6	-1.8	-2.0	-2.5	-0.2	-0.3	-0.9
	-6.7	*-5.2*	*-4.4*	*-5.7*	*1.4*	*2.3*	*0.9*
Netherlands	-0.9	-0.8	-0.6	-0.2	0.2	0.3	0.8
	-12.3	*-11.2*	*-10.2*	*-8.7*	*1.1*	*2.1*	*3.6*
Sweden	-5.8	-5.5	-5.2	-4.2	0.3	0.7	1.6
	-6.9	*-4.5*	*-2.6*	*-1.6*	*2.4*	*4.3*	*5.3*
Switzerland	-0.6	-0.8	-1.1	-1.9	-0.3	-0.5	-1.3
	-10.4	*-9.2*	*-8.5*	*-9.3*	*1.2*	*1.9*	*1.1*
United Kingdom	1.2	1.0	0.7	0.0	-0.2	-0.5	-1.2
	-2.6	*-2.0*	*-1.6*	*-2.1*	*0.6*	*1.0*	*0.5*
United States	0.1	-0.5	-1.1	-3.0	-0.6	-1.3	-3.1
	-1.5	*-1.0*	*-1.0*	*-3.5*	*0.5*	*0.5*	*-1.9*
OECD	**-1.9**	**-1.8**	**-1.9**	**-2.2**	**0.0**	**0.0**	**-0.3**
Average	***-6.1***	***-5.1***	***-4.5***	***-5.7***	***1.0***	***1.6***	***0.4***
Chile				3.9			
(1980-95)				*-9.5*			
Singapore				-3.7			
				-13.2			
Malaysia				-3.8			
				-13.0			

Source, Davis and Steil (2001), own calculations

Table 11: Mean variance 3, Sharpe ratios (real return/standard deviation) (1970-95)

	Actual portfolios	50-50	20% foreign	40% foreign	Global portfolio
Australia	0.16	0.20	0.24	0.28	0.33
Canada	0.48	0.33	0.40	0.45	0.48
Denmark	0.44	0.32	0.32	0.31	0.20
Germany	1.01	0.36	0.36	0.35	0.21
Japan	0.43	0.36	0.40	0.44	0.43
Netherlands	0.78	0.30	0.31	0.32	0.33
Sweden	0.16	0.40	0.43	0.46	0.43
Switzerland	0.23	0.13	0.15	0.18	0.22
United Kingdom	0.46	0.30	0.33	0.36	0.39
United States	0.38	0.33	0.39	0.44	0.49
OECD average	**0.45**	**0.30**	**0.34**	**0.36**	**0.35**
Chile (1980-95)	1.37				0.5
Singapore	0.78				0.39
Malaysia	0.23				0.27

Source: Own calculations

Table 12: Shortfall risk: comparing pension fund minimum real returns with those on diversified and global portfolios (1970-95)

	Actual portfolios	50-50	20% foreign	40% foreign	Global portfolio
Australia	-33	-42	-40	-38	-31
Canada	-17	-21	-22	-23	-26
Denmark	-15	-29	-29	-28	-33
Germany	-9	-20	-19	-23	-34
Japan	-22	-31	-34	-37	-45
Netherlands	-10	-27	-26	-25	-29
Sweden	-36	-25	-22	-20	-23
Switzerland	-11	-28	-29	-30	-31
United Kingdom	-36	-46	-42	-38	-26
United States	-21	-22	-23	-24	-26
OECD average	**-21**	**-29**	**-29**	**-29**	**-30**
Chile (1980-95)	-3				-22
Singapore	-11				-34
Malaysia	-16				-43

Source: Own calculations

Table 13: Asset price changes in Asian markets, 1 July 1997 to 18 February 1998 (percent)

	Equity market	US$ exchange rate
Indonesia	-81.2	-73.5
S Korea	-32.3	-48.1
Thailand	-47.9	-43.2
Malaysia	-59.0	-33.2
Singapore	-45.0	-13.2
Hong Kong	-36.6	0

Table 14: Asset-Liability Management 1: comparing pension fund real returns and global portfolio with real average earnings (1970-95)

	Real average earnings	Actual portfolios	50-50	20% foreign	40% foreign	Global portfolio
Australia	1.0	0.8	2.5	3.0	3.5	5.1
	3.4	*8.0*	*14.1*	*13.1*	*12.7*	*14.8*
Canada	1.3	3.5	2.7	3.3	3.9	5.8
	2.4	*7.6*	*9.7*	*9.3*	*9.4*	*12.3*
Denmark	2.4	2.5	3.6	3.2	2.7	1.2
	3.5	*7.5*	*15.6*	*14.1*	*13.3*	*15.1*
Germany	2.7	3.3	3.7	3.2	2.7	1.2
	2.7	*3.2*	*15.0*	*13.4*	*12.6*	*15.7*
Japan	2.4	2.1	3.7	3.9	4.0	4.5
	3.0	*7.2*	*13.9*	*12.5*	*11.6*	*13.0*
Netherlands	1.4	3.2	4.2	4.0	3.9	3.4
	2.6	*3.4*	*15.7*	*14.6*	*13.6*	*12.1*
Sweden	1.4	0.8	6.6	6.3	5.9	5.0
	3.5	*9.7*	*16.6*	*14.2*	*12.3*	*11.3*
Switzerland	1.5	0.2	0.8	1.1	1.3	2.1
	2.1	*5.6*	*16.0*	*14.8*	*14.1*	*14.9*
United Kingdom	2.8	3.0	1.8	2.1	2.3	3.1
	2.3	*10.5*	*13.1*	*12.5*	*12.1*	*12.6*
United States	-0.2	4.8	4.6	5.3	5.9	7.8
	1.9	*9.9*	*11.4*	*10.9*	*10.9*	*13.4*
OECD	**1.7**	**2.7**	**4.6**	**4.5**	**4.6**	**4.9**
Average	***2.7***	***6.9***	***13.0***	***12.0***	***11.4***	***12.6***
Chile	3.2	9.8				5.9
(1980-95)	*5.7*	*3.8*				*13.4*
Singapore	6.9	-5.6				-1.8
	3.3	*2.1*				*15.1*
Malaysia	4.4	-1.4				2.3
	2.9	*1.0*				*14.3*

Source, Davis and Steil (2001), own calculations

Table 15: Asset-Liability Management 2: correlations of returns with inflation and average earnings

		Actual portfolios	50-50	20% foreign	40% foreign	Global portfolio
Australia	Inflation	-0.49	-0.44	-0.41	-0.37	-0.17
	Earnings	-0.45	-0.40	-0.43	-0.46	-0.45
Canada	Inflation	-0.42	-0.39	-0.40	-0.38	-0.38
	Earnings	-0.24	-0.27	-0.24	-0.19	-0.06
Denmark	Inflation	-0.29	-0.11	-0.13	-0.14	-0.14
	Earnings	-0.37	-0.12	-0.19	-0.27	-0.43
Germany	Inflation	-0.17	-0.25	-0.21	-0.15	-0.15
	Earnings	-0.16	-0.38	-0.45	-0.51	-0.51
Japan	Inflation	-0.62	-0.50	-0.54	-0.58	-0.58
	Earnings	0.04	0.05	0.04	0.02	-0.03
Netherlands	Inflation	-0.53	-0.40	-0.40	-0.40	-0.40
	Earnings	0.04	-0.07	-0.11	-0.16	-0.32
Sweden	Inflation	-0.33	0.02	-0.01	-0.06	-0.06
	Earnings	-0.03	-0.17	-0.16	-0.15	-0.06
Switzerland	Inflation	-0.40	-0.29	-0.31	-0.32	-0.32
	Earnings	-0.10	-0.24	-0.25	-0.25	-0.20
United Kingdom	Inflation	-0.49	-0.42	-0.44	-0.45	-0.45
	Earnings	0.14	0.07	0.09	0.10	0.14
United States	Inflation	-0.66	-0.64	-0.66	-0.65	-0.65
	Earnings	0.29	0.27	0.29	0.30	0.27
OECD	**Inflation**	**-0.41**	**-0.33**	**-0.34**	**-0.34**	**-0.32**
Average	**Earnings**	**-0.12**	**-0.15**	**-0.17**	**-0.18**	**-0.19**
Chile	Inflation	0.11				0.16
Singapore	Inflation	-0.97				-0.20
Malaysia	Inflation	-0.96				-0.55

Source: Own calculations

Table 16: Caribbean return estimates

1970-95	Trinidad and Tobago			Jamaica		
	Real return	Risk	Correla-tion with inflation	Real return	Risk	Correla-tion with inflation
Bonds	-4.6	7.0	-0.68	-9.8	19.8	-0.80
Equities	na	na	na	-8.2	31.4	-0.03
Short term assets	-6.0	5.8	-0.93	-5.9	13.8	-0.77
Inflation	11.1	4.5	-	20.8	16.5	-
50-50 domestic	na	na	na	-8.7	17.5	-0.5
Global portfolio	3.4	18.3	-0.48	2.6	26.9	-0.42
NIS funds	-2.5	na	na	-6.2	na	na
1980-95						
Average earnings	-2.2	5.3	-	na	na	-
Global portfolio	6.8	18.7	-	5.7	29.7	-
NIS funds	-1.3			-5.3		

Notes: Sources, IMF, National data, Forde (2001). Estimated Jamaican equity dividend yield is 2%.