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Edited by Arjan B. Berkelaar, Joachim Coche and Ken Nyholm

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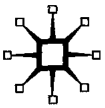

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Hens Steehouwer studied Econometrics at the Erasmus University of Rotterdam. From 19972005 he held various consultancy, R&D and management positions at ORTEC Finance in Rotterdam, the Netherlands. During that time he worked for many pension funds and insurance companies, both in the Netherlands and other countries. In the same time he also worked on his Ph.D. thesis *Macroeconomic Scenarios and Reality: A Frequency Domain Approach for Analyzing Historical Time Series and Generating Scenarios for the Future* on empirical macroeconomics and the modelling of economic scenarios (free download from www.ortec-finance.com). In 2005 he received his Ph.D. in Economics at the Free University of Amsterdam. Since 2006, he has been head of the ORTEC Centre for Financial Research (OCFR). The objective of the OCFR is to be the linchpin between the applied models and methodologies of ORTEC Finance on the one hand and all worldwide (academic) economic and financial research on the other. An important current project at the OCFR is the implementation of a new scenario model according to the principles of the aforementioned Ph.D. research. This new model will be released in 2009. Hens Steehouwer is affiliated with the Econometric Institute of the Erasmus University Rotterdam, a member of the Program Committee of INQUIRE Europe (www.inquire-europe.org) and a member of the Editorial Board of NETSPAR (www.netspar.nl). His research interests include Time Series and Frequency Domain Analysis, Filtering Techniques, Long Term Growth, Business Cycles, Market Consistent and Value Based Asset and Liability Management, Scenario Analysis and Modelling, Monte Carlo Valuation and Embedded Derivatives in Pension and Insurance contracts.

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Preface

On 24–25 November 2008, a conference on Strategic Asset Allocation for Central Banks and Sovereign Wealth Funds was held, jointly organized by the Bank for International Settlements, the European Central Bank, and the World Bank Treasury. A total of 35 speakers presented their perspectives on asset allocation, quantitative investment strategies and risk management.

The proceedings of that conference are published in two books. This book contains chapters on the themes of Interest Rate Modelling and Forecasting, Portfolio Optimization Techniques, and Asset Class Modelling and Quantitative Techniques.

Papers on the themes of Reserves Management and Sovereign Wealth Fund Management are collected in the book *Central Bank Reserves and Sovereign Wealth Management*, edited by Arjan B. Berkelaar, Joachim Coche and Ken Nyholm and published by Palgrave Macmillan 2009 (ISBN 978-0-230-58089-3).

Introduction

Reserves and asset accumulation

Over the past decade public entities, i.e. governments, central banks and other public intuitions, have accumulated significant investable assets, especially in the areas of central bank foreign exchange reserves, commodity savings funds, and pension reserve and social security funds.

Foreign exchange reserves (excluding gold) have grown to about USD seven trillion by the end of 2008. While a discussion about reserves adequacy in the context of recent market events is ongoing, there continues to be a view that reserves in many countries are in excess of what is deemed adequate to protect against exogenous shocks or adverse external financing conditions. Consequently, some countries have therefore officially established reserves investment corporations out of excess central bank reserves to seek higher returns. In other countries central banks have notionally split the reserves portfolio into separate tranches, including an investment tranche that might be invested in a broader set of asset classes that goes beyond the traditional investment universe of central bank reserves managers (covering just government instruments, agencies and instruments issued by supranational institutions). An enhanced investment universe allows for additional exposures to credit risk obtained, for example, via asset classes such as agency bonds, mortgage backed securities (MBS), and in some cases even idiosyncratic risk in the form of corporate bonds and equities. While risk aversion globally (including that of central banks) has increased as a result of the recent global financial crisis, the longer-term trend of reserves diversification will likely continue.

With rising commodity prices in the past couple of years, several commodity-exporting countries have accumulated large amounts of foreign currency assets. Many countries have established commodity funds to form a buffer against volatile commodity prices and manage their new-found riches more efficiently. By some estimates, commodity funds have accumulated about USD two trillion. These funds serve different purposes, including stabilization of fiscal revenues and inter-generational saving. Stabilization funds typically invest in high-grade fixed income instruments, while savings funds seek to invest in investment-grade fixed income, public and private equity and hedge funds.

Finally, as a result of aging populations and demographic shifts, many countries have established pension reserve funds and social security funds to support pay-as-you-go pension systems. Pension reserve funds are established

and funded by the government through direct fiscal transfers. Social security funds are part of the overall social security system. Inflows are mainly surpluses of employee and/or employer contributions over current payouts, as well as top-up contributions from the government through fiscal transfers. According to estimates by the Organisation for Economic Co-operation OECD, pension reserve and social security funds total around USD two trillion (excluding the US social security trust fund, which does not have investable assets).

Many of the funds identified above have been classified as 'sovereign wealth funds' (SWFs) by the financial press. There is no single, universally accepted definition of an SWF, but one simple working definition is: 'an investment fund controlled by a sovereign and invested (at least partially) in foreign assets'. Table I.1 shows a list of various large public investment funds across the world, including central banks, sovereign wealth funds and pension reserve funds. Estimated assets under management by the largest 50 funds total over USD 11 trillion. A total of 44 funds are funds in emerging or developing countries managing over USD three trillion.

Out of the 50 largest funds listed in Table I.1, 23 are institutions other than central banks. Many of these sovereign wealth funds were established in the last ten years[1]. These new public funds' investment strategies are likely to follow the lead of established funds and other institutional investors, moving from fixed income investments into equities, and even hedge funds, private equity and other alternative investments.

Table I.1 The 50 largest public investment funds

Country	Name of the Fund	Estimated AUM (in USD bln)*
China	Central Bank Reserves	1530
Japan	National Reserve Funds	1218
Japan	Central Bank Reserves	974
UAE	Abu Dhabi Investment Authority (ADIA)	875
Russia	Central Bank Reserves	542
Saudi Arabia	Various Funds	433
Norway	The Government Pension Fund	401
Singapore	GIC	330
China	SAFE Investment Company	312
India	Central Bank Reserves	303
Kuwait	Kuwait Fund for Future Generations	264
Korea	Central Bank Reserves	258
Korea	National Pension Service	229
Euro area	Central Bank Reserves	222

Continued

Table I.1 Continued

Country	Name of the Fund	Estimated AUM (in USD bln)*
Brazil	Central Bank Reserves	206
China	China Investment Corporation	200
Singapore	Central Bank Reserves	177
China-HK	Hong Kong Monetary Authority	173
Hong Kong SAR	Central Bank Reserves	158
Russia	Reserve Fund	141
Algeria	Central Bank Reserves	141
Singapore	Temasek	134
Sweden	National Pension Funds (AP1-AP4 and AP-6)	133
Canada	Canadian Pension Plan	111
Malaysia	Central Bank Reserves	109
Thailand	Central Bank Reserves	100
Libya	Libya Investment Authority (includes LAFICO)	100
Mexico	Central Bank Reserves	99
Libya	Central Bank Reserves	87
Dubai	Dubai Investment Corporation	82
Turkey	Central Bank Reserves	77
China	National Social Security Fund	74
Poland	Central Bank Reserves	71
Nigeria	Central Bank Reserves	62
United States	Central Bank Reserves	61
United Arab Emirates	Central Bank Reserves	61
Qatar	Qatar Investment Authority	60
Indonesia	Central Bank Reserves	57
Norway	Central Bank Reserves	50
Algeria	Fonds de Régulation des Recettes de l'Algérie	47
Argentina	Central Bank Reserves	46
Switzerland	Central Bank Reserves	45
Spain	Fondo de Reserva de la Seguridad Social	45
Australia	Future Fund	44
Canada	Central Bank Reserves	43
United Kingdom	Central Bank Reserves	42
France	Fonds de Reserve pour les Retraites	42
Romania	Central Bank Reserves	39
Kazakhstan	National Fund	38
Ukraine	Central Bank Reserves	37

* Data reflect latest available figures as reported by individual entities or authoritative sources, with various reporting dates between 2004 and 2008.

Public investment funds: Objectives and liabilities

We cannot paint all public investment funds with the same broad brush. To better understand investment objectives, governance arrangements and investment behaviour, it is helpful to classify the funds according to their policy objectives and liability structure. As in Rozanov (2007)[2], we distinguish between five types of public investment funds:

- stabilization and buffer funds, and central bank FX reserves,
- reserves investment corporations,
- savings and heritage funds,
- pension reserve and social security funds,
- government holding management companies.

Stabilization and buffer funds as well as central bank reserves are typically invested with a focus on safety and liquidity. These funds face a contingent liability that is subject to volatile prices such as exchange rates and/or commodity prices. Stabilization funds may need to transfer significant money to the government budget when commodity prices drop precipitously. Central banks may need to intervene in the foreign exchange markets when the domestic currency comes under pressure. Capital preservation, either in nominal or in real terms, is therefore of paramount importance. The investment horizon in most instance ranges from one to three years and managing credit and liquidity risk are critical. We include traditional central bank reserves in the first category, while so-called excess reserves[3] are included under the category of reserves investment corporations – whether a country has actually established such an organization or not – as the asset allocation problem for both is the same.

It should be noted that the discipline of central bank reserves management is evolving dramatically with the tremendous growth of central bank reserves, stronger balance of payments positions and global capital flows. As emerging market reserves have increased – both in outright terms and beyond that needed for external financial stability – the investment return and negative carry[4] associated with holding reserves has become more of an issue. Central banks have pursued mainly two strategies to address this problem. Some countries have engaged in asset/liability management at the national level and used 'excess' reserves to pay down foreign denominated debt, thus reducing the cost of carry on the national balance sheet. Beyond debt repayment, central banks have also sought to increase long-term returns through more efficient or aggressive investment strategies to reduce the negative carry. This has been done by in various ways:

1. shifting excess reserves into an SWF (e.g. China Investment Corporation) in a swap arrangement with the Ministry of Finance;

2. setting up a separate investment agency to manage the long-term investment tranche of the foreign currency reserves (e.g. Korea Investment Corporation);
3. managing the investment tranche within the central bank (e.g. the Swiss National Bank, the Central Bank of Botswana).

The investment tranche is typically invested in broader investment instruments and over a longer investment horizon with less need for immediate liquidity. The implicit liability of Central Bank reserves is typically characterized by domestic short to medium-term debt that has been issued for sterilization purposes.

Savings and heritage funds are typically established out of commodity revenues and represent net wealth for a country – unlike central bank reserves which are borrowed. The objective of these funds is to sustain government spending after commodity resources have been depleted. Decision-makers are faced with two trade-offs that will, together, determine the ultimate size and life of the fund: the current versus future level of spending and the investment strategy for the fund's assets. Transfers to and from the fund are typically determined by a savings or spending rule.

Broadly, there are two types of savings and spending rules. The first is based only on fiscal considerations and any saving is a residual. In this case commodity revenues typically flow into the budget first and a portion is transferred to the fund. Transfer rules include balanced budget requirements whereby allocations to the fund are made only after balancing the budget and there is no cap on the amount of deficit financing available from commodity extraction and sales. Also included in this category are those rules that rely on an administrative oil price to divide oil revenues between the budget and savings. While these rules may stabilize the volatility of government revenues, they do not ensure any capital accumulation to support future spending needs. The second type puts an explicit cap on the spending of oil revenues ensuring some level of capital accumulation over time. In this case commodity revenues typically flow into the fund first and a portion is transferred to the budget. Various ad hoc spending rules have been devised, but a general principle is that if the fund is to have a permanent nature, the average real spending rate over time should not exceed the expected real return on the portfolio.

Savings and heritage funds tend to have a perpetual investment horizon: they are expected to provide for current and future generations for perpetuity. The asset allocation problem of savings and heritage funds is comparable to that of endowments and foundations, but there are important differences as well. Many savings and heritage funds are in emerging market countries. Typically commodity exporting countries receive commodity revenues in USD. When commodities represent a large portion of a country's economic base, commodity price volatility can easily be transmitted

to economic volatility and lead to the so-called Dutch disease[5]. One of the purposes of the commodity savings fund is to accumulate wealth in USD, so only a portion of the fund to be transferred to the government budget will be converted into the domestic currency. The bulk of the assets of the fund will therefore be kept in foreign currency. Consequently, most – if not all – of the assets will be in foreign investments. Managing exchange rate risk therefore becomes important, particularly if the domestic currency appreciates against e.g. USD. Savings fund are restricted, however, in their ability to hedge foreign currency risk exposure relative to the domestic currency[6].

Our fourth category is pension reserve and social security funds. Unlike savings funds and foreign reserves, these funds have explicit and clearly defined liabilities. Also these funds typically have a significant allocation to domestic assets. Some observers refer to such funds as sovereign pension funds and define them a separate group of sovereign wealth funds. This group is not well-defined, however. Pension reserve funds are funded by the government from general tax revenues and have been set up to partially or fully pre-finance future the pension liabilities of the government, particularly in light of an aging population. The purpose is to smooth the expected rising fiscal burden on the public pay-as-you-go system. The assets of these funds are owned by the government and fully at their disposal. These funds are rightfully labelled SWFs and are typically found in OECD countries where populations are aging rapidly.

Pension reserve funds are usually established with a finite horizon of about 40 to 50 years. The objective of these funds is to set aside and invest a significant portion of financial resources over the next 20 to 25 years during a so-called accumulation phase, making the accumulated assets gradually available thereafter during a so-called withdrawal phase that also lasts about 20 to 25 years at the discretion of the government or as mandated in applicable pension reserve laws. During the accumulation phase withdrawals from the fund are not allowed (typically by law). Consequently, pension reserve funds can allocate a significant portion of their assets to illiquid and risky investments. During the withdrawal phase managing liquidity becomes more important and the allocation should gradually be rebalanced to fixed income assets. Pension reserve funds have only been established in the last ten years and so all of these funds are currently in the accumulation phase.

Social security funds, on the other hand, are part of the overall social security system. These funds invest contributions from employers and/or employees and are not typically funded by government revenues[7]. In other words, the money does not belong to the government. The government or a separate arms-length agency is acting as fiduciary. These funds should therefore not be classified as SWFs. A third group that is sometimes (mistakenly) included under the label sovereign pension funds are pension plans