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Roland Beck and Michael Fidora*

The Impact of Sovereign Wealth Funds on Global Financial Markets

If sovereign wealth funds act similarly to private investors and thus allocate foreign assets according to market capitalisation rather than liquidity considerations, official portfolios reduce their "bias" towards the major reserve currencies – the US dollar and the euro. As a result, more capital flows "downhill" from rich to less wealthy economies. In this scenario, the euro area and the United States would be subject to net capital outflows while Japan and the emerging markets would attract net capital inflows. The potential implications of a rebalancing of international capital flows for stock prices, interest rates and exchange rates remain uncertain, however.

Sovereign wealth funds (SWFs), broadly defined as public investment agencies which manage part of the (foreign) assets of national states, have recently attracted considerable public attention. While such national investment vehicles have been operated by many countries for decades, SWFs have only recently become important players in global financial markets. In fact, the history of SWFs dates back to at least 1953 when, according to the Kuwait Investment Authority, the "Kuwait Investment Board was set up with the aim of investing surplus oil revenues to reduce the reliance of Kuwait on its finite oil resource". The more recent rise of SWFs is mainly linked to the accumulation of sizeable foreign exchange reserves by emerging market economies as, over the past few years, an increasing number of such countries have created new SWFs to accumulate foreign assets and to improve the return on traditional foreign exchange reserves.¹

The policy issues arising from the emergence of SWFs as large global financial players range from concerns over a lack of transparency and a reversal in privatisations, to risks to global financial stability. For example, some observers have suggested that SWFs, through more return-oriented investment strategies, could contribute to an unwinding of global imbalances through a diversification out of US dollar-denominated government bonds in which the bulk of traditional reserves is invested. Another concern relates to the question of whether such funds might distort asset prices through non-commercially motivated purchases or sales of securities.

Although there is no commonly accepted definition of SWFs, three elements can be identified that are

common to such funds. First, SWFs are state-owned. Second, SWFs have no, or only very limited, explicit liabilities and, third, SWFs are managed separately from official foreign exchange reserves.² In addition, most SWFs share certain characteristics that originate in the specific nature of SWFs. For example, the lack of explicit liabilities (or the stretched-out maturity of liabilities) favours the pursuit of long-term investment strategies, as implemented by most SWFs.³ In this respect, sovereign wealth funds differ from sovereign pension funds that operate subject to explicit liabilities and a continuous stream of fixed payments, making sovereign wealth funds more similar to private mutual funds.⁴ Second, the absence of explicit liabilities also has a bearing on the willingness to take risk, as standard portfolio theory predicts a higher share of fixed income securities for funds that are subject to recurring payments. Finally, most sovereign wealth funds appear to have substantial exposure to foreign investments or are even entirely invested in foreign assets.

The main group of countries that have established SWFs are resource-rich economies which currently benefit from high oil and commodity prices. In these countries, SWFs partly also serve the purpose of stabilising government and export revenues which would otherwise mirror the volatility of oil and commodity prices.⁵ Another purpose of such funds in resource-rich countries is the

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¹ For an overview of foreign exchange reserve accumulation, see European Central Bank: The accumulation of foreign reserves, ECB Occasional Paper, No. 43, 2006.

² The IMF Committee on Balance of Payments Statistics is currently working on a precise and operational definition in order to enhance the reporting in this area.

³ The lack of explicit liabilities is not a necessary condition for financial institutions to have a long-term investment horizon. For example, traditional banks often transform short-term liabilities into long-term assets. Nevertheless, from a balance sheet perspective, a low degree of short-term liabilities favours the pursuit of long-term strategies.

⁴ Pension funds often match their fixed liabilities that imply a stream of future payments with investments into fixed coupon-bearing bonds.

accumulation of savings for future generations as natural resources are non-renewable and are hence anticipated to be exhausted after some time.⁶ Prominent examples of such SWFs include Norway's Government Pension Fund, investment agencies set up by member countries of the Gulf Cooperation Council (GCC), such as the Abu Dhabi Investment Authority (ADIA) which manages the foreign assets of the Emirate of Abu Dhabi in the United Arab Emirates (UAE), and the Russian oil stabilisation fund which has recently been partly transformed into a fund for future generations.

A second group of countries, most notably in Asia, has established SWFs because reserves are being accumulated in excess of what may be needed for intervention or balance-of-payment purposes. The source of reserve accumulation for these countries is mostly not linked to primary commodities but, rather, related to the management of inflexible exchange-rate regimes. As the authorities have become more comfortable with reserve levels, foreign assets have been moved to specialised agencies which often have explicit return objectives and may invest in more risky assets than central banks. Prominent examples include funds that have been operating for decades, such as the Singapore Government Investment Company (GIC), but also more recently established funds such as the Korea Investment Corporation (KIC), and the investment portfolio of the Exchange Fund managed by the Hong Kong Monetary Authority. Recently also China established a new investment agency, the China Investment Corporation (CIC), responsible for the management of a portion of Chinese foreign reserves.⁷

Sovereign Wealth Funds in Global Financial Markets

Based on a combination of private and official sources, SWFs are estimated to have accumulated between at least US \$ 2 and 3 trillion, compared with around US \$

6 trillion in traditional foreign exchange reserves.⁸ However, even this range estimate is subject to considerable uncertainty as only a small fraction of SWFs report on the size of their portfolio.

Comparing the level of traditional foreign exchange reserves with assets managed in SWFs, two observations stand out. Some countries have been accumulating foreign assets in SWFs for a long time and therefore hold relatively modest levels of foreign exchange reserves (e.g. members of the Gulf Cooperation Council like the UAE and Kuwait). In contrast, other countries have accumulated sizeable holdings of traditional foreign exchange reserves – most likely in excess of precautionary levels – but only recently created SWFs with relatively modest levels of assets under management (e.g. China and Russia). Therefore, many observers expect that these countries may in the future increasingly accumulate foreign assets in SWFs or even shift traditional reserve assets into such funds.

Table 1 provides a breakdown of major SWFs with estimates of total assets under management. Oil exporters, mostly from the Middle East, but also Norway's sizeable Government Pension Fund, are estimated to account for the largest part of total assets managed by SWFs, probably between US \$ 1,200 and 2,200 billion, although this estimate is subject to large uncertainty. A smaller fraction, of around US \$ 600 billion, is accounted for by Asian emerging economies, most notably Singapore, which has been running SWFs since the 1970s. But also mature economies, other than Norway, have set up SWFs, mostly to save receipts from the exploitation of natural resources. In sum, a plausible estimate of total assets managed by SWFs ranges from US \$ 2 to 3 trillion.

Despite the scarce information available, two main traits of the portfolio composition of SWFs can be identified. First, the largest part of SWFs' holdings is accounted for by foreign investment, although some SWFs either restrict their portfolio to domestic assets or diversify across both foreign and domestic assets.

Second, the share of risky assets in sovereign wealth funds' portfolios appears to be substantial, most likely in excess of half the total assets. In fact, there is some evidence that SWFs have been concentrating their investments in the financial sector. Since 2007, the majority of major SWF investments that were made public were placed in financial institutions and five large international banking corporations alone received more than US \$ 45 billion from SWFs (see Table 2). In this respect, the large weight of financial institutions in SWF investments – while only to some extent reflecting the high weight of

⁵ For a discussion on the relation between oil stabilisation funds and fiscal policy, see, for example, S. Barnett, J. M. Davis, R. Ossowski and J. Daniel: Stabilization and savings funds for non-renewable resources: experience and fiscal policy implications, IMF Occasional Paper, No 205, 2001; S. Barnett, R. Ossowski: Operational aspects of fiscal policy in oil-producing countries, IMF Working Paper, No 02/177, 2002.

⁶ This is the case for many oil producers who, in order to avoid sharp adjustments of fiscal policy once oil reserves are depleted, accumulate financial assets during the period in which they produce oil. Thus, oil wealth is gradually transformed into financial wealth, leaving the country's overall wealth unchanged and preserving it for future generations.

⁷ In Japan – the second largest holder of official foreign exchange reserves of more than US \$900 billion – the effectiveness of traditional reserve management has also recently been discussed. Furthermore, South Korea has announced plans to double the size of the sovereign wealth fund that manages part of its reserves by 2010 and similar steps are being considered in a number of other countries in the region such as Taiwan, Vietnam and India.

⁸ We avoid double-counting by excluding funds which also qualify as official reserves. For example, Russia's current oil stabilisation fund is – in the form of government deposits – the balance sheet liability counterpart to the central banks' foreign assets which are counted as official foreign exchange reserves.

SOVEREIGN WEALTH FUNDS

Table 1
The World's Largest Sovereign Wealth Funds

(US \$ billion)				
Country	Fund	Assets in US \$ bn	Foreign investment	Equity investment
Oil exporters		1240-2220		
UAE	Abu Dhabi Investment Council	400-800	high	high
Norway	Government Pension Fund - Global	373	high	medium
Saudi Arabia	SAMA	300	high	low
Kuwait	Kuwait Investment Authority	213	high	high
UAE	Investment Corporation of Dubai	20-80	high	high
Qatar	Qatar Investment Authority	20-60	high	high
Libya	Libya Investment Authority	20-60	high	high
Brunei	Brunei Investment Agency	10-50	high	high
Norway	Government Pension Fund - Norway	~20	low	medium
Russia	Future Generations Fund	~24	high	high
Kazakhstan	National Oil Fund	22	high	low
Malaysia	Khazanah Nasional Berhad	~18	low	high
East Asia		~585		
China	China Investment Corporation	~200	high	high
Singapore	Government Investment Company	~130	high	high
Hong Kong	Exchange Fund Investment Portfolio	~112	high	low
Singapore	Temasek Holdings	~108	medium	high
Korea	Korea Investment Corporation	~20	high	high
Taiwan	National Stabilisation Fund	~15	low	high
Others		~138		
Australia	Government Future Fund	~49	medium	medium
United States	Alaska Permanent Fund	~38	medium	medium
United States	Permanent University Fund	~20	medium	medium
United States	New Mexico State Investment	~16	medium	medium
Canada	Alberta Heritage	~15	medium	medium
Total		1963-2943		

Notes: Figures are only rough approximations. "High" and "low" refer to shares above two-thirds and below one-third, respectively.

Sources: Authors' assessment based on various national sources.

this sector in global capital markets – might support the view that SWFs could act as a stabilising force in global financial markets. In fact, SWFs appear to have taken stakes in globally operating banks when their stock prices and CDS⁹ spreads were negatively affected by the financial market turmoil (see Table 3). This could be an indication that some SWFs pursue mean-reverting investment strategies. However, the stabilising market impact of these investments has been short-lived, as stock prices tended to decline further following the SWF acquisitions while CDS spreads narrowed moderately.

In addition, available data on some of the more transparent funds, such as Singapore's Temasek and US endowment funds, as well as anecdotal evidence on Middle East oil exporters' investment projects, indicate that private equity, real estate and emerging market investments account for a significant part of at least some SWF portfolios. Hence, the information available on the world's largest SWFs suggests that, with respect to in-

vestment style, these differ substantially from traditional foreign exchange reserves and are instead comparable to private asset managers, in particular mutual funds.

As regards the relative size of SWFs, total SWF assets are relatively small compared with the more than US \$ 50 trillion of funds managed by the private asset management industry. However, the largest SWFs already now manage portfolios that are in the order of magnitude of the biggest private investment companies and could in the future – to the extent that external surpluses are increasingly accumulated in SWFs or that existing reserves are shifted to SWFs – even exceed the largest private investment managers' portfolios.

The growing importance of SWFs raises a number of international policy issues. In fact, state-controlled foreign investments may be sensitive both from a political perspective and from an economic point of view, as the lack of transparency of SWFs gives room for concern about the motivation of these funds' investments and may hence, in turn, aggravate protectionist pressures.

⁹ CDS = Credit Default Swap.

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Table 2
SWFs' Major Cross-border Equity Investments

Sovereign wealth fund	Acquired company	(2007–08Q1)	
		Transaction value (in US \$ bn)	(in % of firm value)
GIC of Singapore	UBS	9.8	8.6
undisclosed "Middle East investor"	UBS	1.8	1.6
Abu Dhabi Investment Council	Citigroup	7.6	4.9
GIC of Singapore	Citigroup	6.9	4.4
Investment Corporation of Dubai	MGM Mirage	5.1	9.5
China Investment Company	Morgan Stanley	5.0	9.9
Temasek (Singapore)	Merril Lynch	5.0	11.3
KIA (Kuwait)	Merril Lynch	3.4	7.0
KIC (Korea)	Merril Lynch	2.0	4.3
Qatar Investment Authority	Sainsbury	3.7	25.0
China Development Bank	Barclays	3.0	3.1
Temasek (Singapore)	Barclays	2.0	1.8
Others		0.0	na
Total		55.2	na

Source: Company websites and press reports.

In fact, the issue of SWFs has been discussed in various international fora. In its Heiligendamm declaration of September 2007, the G7 stated that any restrictions on SWF investments should be minimised and only "apply to very limited cases which primarily concern national security". In addition, the G7 called upon the OECD and the IMF to identify best practices upon the recipient and investor side and both organisations are currently developing principles for recipient countries and SWFs.

Sovereign Wealth Funds and Global Capital Flows

In order to gauge the impact of SWFs on global financial markets, it is useful to consider how an increasing accumulation of assets in SWFs could change the pattern of global capital flows. In fact, countries with large "excess reserves", i.e. reserves in excess of traditional balance of payments needs, may opt for a more return and less liquidity oriented portfolio allocation of these assets. Therefore, a comparison of traditional reserve portfolios and market capitalisation-based portfolios

can provide an indication of the direction of future capital flows.¹⁰

First, excess reserves of major emerging markets are identified using two traditional rule-of-thumb measures.¹¹ Table 4 shows that the magnitude of excess reserves is indeed substantial, estimated to exceed US \$ 3 trillion or more than half of total official foreign exchange reserves to date.

As for the portfolio allocation of reserves and SWF assets, we assume that foreign exchange reserves are allocated across currencies as reported in the IMF's COFER database (Table 5, Panel A). As a long-run benchmark portfolio for SWFs, we take a ten-year average of global market capitalisation weights, broadly in line with the available evidence discussed above (Table 5, Panel B).¹² A further rationale for taking market capitalisation as a benchmark allocation for SWFs follows the argument, discussed in detail above, that in principle SWFs aim to follow a portfolio allocation strategy similar to that of private asset managers, which in turn is broadly mirrored in market capitalisation shares, provided that the assumptions of the traditional international Capital Asset Pricing Model (CAPM) hold.¹³

A comparison of Panels A and B allows us to make a simple back-of-the-envelope calculation of the capital flows resulting from a potential shift out of foreign ex-

¹⁰ A similar approach is taken by S. Jen: Sovereign wealth funds: what they are and what's happening, in: World Economics, Vol. 8, No. 4, 2007.

¹¹ Excess reserves are defined as foreign exchange reserves in excess of both (i) the difference between actual foreign exchange reserves and the value of three months of imports; and (ii) the difference between actual foreign exchange reserves and total short-term external debt.

¹² In fact, taking into account that the new investments of SWFs would span a long time horizon, current market capitalisation weights are unlikely still to be accurate. In addition, SWFs may have an impact on market capitalisation weight through their own investment decisions, thus generating "second-round effects" which SWFs would ideally also factor into their optimal portfolio considerations.

¹³ See B. Solnik: An Equilibrium Model of the International Capital Market, in: Journal of Economic Theory, Vol. 8, 1974, pp. 500–524; R. Roll: A critique of the asset pricing theory's tests: Part I. On past and potential testability of the theory, in: Journal of Financial Economics, No. 4, 1977, pp. 129–176.

Table 3
Stock Prices and CDS Spreads of Selected Banks Around the Time of SWF Investment

	Stock price January 2006 - April 2008 (US dollar/euro)				CDS Spread January 2006 - April 2008 (basis points)			
	High	Low	Average	Announcement of SWF investment	High	Low	Average	Announcement of SWF investment
Citigroup ¹	56.4	18.6	45.0	30.7	226.6	6.8	35.7	95.5
Citigroup ²	56.4	18.6	45.0	26.9	226.6	6.8	35.7	83.7
Merril Lynch ³	97.5	39.9	74.2	53.9	338.8	15.3	60.9	132.9
Morgan Stanley ⁴	74.1	36.4	57.9	55.0	297.3	17.8	55.7	97.2
UBS ⁵	63.0	23.5	51.2	49.2	225.3	4.5	26.1	50.8

Note: The date of the investments and the respective SWFs are shown in the footnotes below.

¹ 26 Nov. 2007 (ADIA); ² 15 Jan. 2008 (GIC); ³ 24 Dec. 2007 (Temasek); ⁴ 24 Dec. 2007 (CIC); ⁵ 10 Dec. 2007 (GIC).

Sources: Bloomberg and author's calculations.

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Table 4
Excess Reserves in Emerging Asian and Oil-exporting Economies
(in US \$ billion)

	Reserves	3-months imports	Short-term external debt	Excess reserves
China	1559	254	231	1306
Russia	420	70	53	350
Saudi Arabia	276	34	22	242
Taiwan	261	67	26	194
Korea	244	109	3	135
India	202	72	15	129
Brazil	175	37	66	110
Algeria	99	10	0	90
Libya	79	6	1	73
Singapore	149	85	40	64
Top 10	3464			2691
Others	959			332
Total	4423			3023

Note: Excess reserves are computed as the difference between foreign exchange reserves and the maximum of three-month import values and total short-term external debt.

Source: IMF (WEO) estimates for 2007 and authors' calculations.

change reserves into SWFs. In a first step, we estimate the amounts invested in the various markets by applying the shares reported in Panel A to our estimate of global excess reserves. In a second step, we compute an alternative asset allocation by applying the benchmark weights of Panel B. The difference between the amounts invested in each market under the two allocations yields a back-of-the-envelope estimate for potential net capital flows. Our benchmark results are presented in Scenario A of Table 6.

Three main findings stand out. First, a reallocation of excess reserves would trigger net capital outflows out of US assets at an order of magnitude of around US \$ 500 billion. This net outflow is entirely due to the large reduction in demand for US bonds, which currently are still the main investment target of most official foreign exchange reserve managers. However, as SWFs shift capital from less risky bond markets to more risky equity markets, the outflow out of the US bond market is partly offset by an inflow into US equity markets, given the large size of US equity markets, which currently account for roughly 45% of world stock market capitalisation.

Second, this simple exercise also suggests net capital outflows out of euro area assets. This may at first seem surprising as many observers believe that the rise of SWFs may imply a shift from US dollar assets into euro area assets. However, as Table 6 shows, the net inflow into euro area equities of around US \$ 200 billion would be more than offset by net outflows from euro area bonds of around US \$ 400 billion. In other words, official reserve assets are currently more overweighted in euro area bonds than underweighted in euro area eq-

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Table 5
Benchmark Allocations for Foreign Exchange Reserves and SWFs
(percentages)

Panel A: Actual allocation of emerging economies' foreign exchange reserves					
	USA	Euro area	Japan	UK	Others
Stock market	0	0	0	0	0
Bond market	60.5	28.6	2.6	5.9	2.4
Panel B: SWFs (assumed to be invested according to market capitalisation)					
	USA	Euro area	Japan	UK	Others
Stock market	44.5	15.1	9.5	7.7	23.2
Bond market	41.7	24.9	15.9	4.3	13.2

Sources: IMF (COFER) and authors' estimates.

uities, when taking portfolios based on market capitalisation as a benchmark.

Third, the counterpart of these net outflows from the United States and the euro area are mainly Japan and emerging economies, reflecting the relatively large weight of these countries in global capital markets compared with their negligible role as reserve currencies. In fact, aggregating net capital flows of developed countries (i.e. the United States, the euro area, the UK and Japan) shows that capital would flow from developed to "other", i.e. emerging and developing, countries. This finding is in line with standard neoclassical predictions according to which capital should indeed flow from rich to poor countries because of higher returns to capital in the latter. In fact, one element of the "Lucas paradox" according to which capital tends in reality to flow "up-hill" has in recent years been the accumulation of foreign exchange reserves by emerging and developing countries.¹⁴ Such purchases of foreign exchange generate – when invested in the major reserve currencies – a capital outflow from developing to developed countries. The resulting "reserve portfolio bias" stems from the fact that emerging and developing countries have so far played only a negligible role as issuers of reserve currencies due to a lack of financial development – in particular in terms of large and liquid capital markets. In a situation in which SWFs behave as CAPM-type¹⁵ investors and thus allocate foreign assets according to risk and return rather than liquidity considerations, official portfolios lose this "bias" towards the major reserve currencies. As a result, more capital flows "downhill". In fact, anecdotal

¹⁴ This observation has already been made by E. S. Prasad, G. R. Rahan, A. Subramanian: Foreign Capital and Economic Growth, in: NBER Working Paper 13619, 2007; T. Bracke, M. Bussière, M. Fidora and R. Straub: A Framework for Assessing Global Imbalances, ECB Occasional Paper, No. 78, 2008. The broader academic literature on the Lucas paradox has mainly focused on private capital flows and the fact that risk-adjusted returns to capital in developing countries may not be as high as suggested by a low capital/labour ratio. The latter may stem from private capital flows, referring to institutional deficiencies in developing countries such as repeated defaults on government debt or the risk of expropriation.

¹⁵ CAPM = Capital Asset Pricing Model.

Table 6
Simulation of Net Capital Flows For Reallocation
of Reserves towards SWFs

(in US \$ billion)

Scenario A: Benchmark results for diversification across regions and markets

	USA	Euro area	Japan	UK	Others	Total
Stock market	538	183	115	93	281	1209
Bond market	-1073	-413	210	-100	167	-1209
Total	-534	-230	325	-7	447	

Scenario B: Share of US/euro securities in bond holding unchanged

	USA	Euro area	Japan	UK	Others	Total
Stock market	538	183	115	93	281	1209
Bond market	-732	-346	-31	-71	-29	-1209
Total	-193	-163	83	22	252	

Scenario C: Diversification only between US and euro area bond markets

	USA	Euro area	Japan	UK	Others	Total
Stock market	0	0	0	0	0	0
Bond market	-142	142	0	0	0	0
Total	-142	142	0	0	0	

Scenario D: Diversification only between US and euro area

	USA	Euro area	Japan	UK	Others	Total
Stock market	804	273	0	0	0	1077
Bond market	-817	-260	0	0	0	-1077
Total	-13	13	0	0	0	

Source: Authors' calculations.

evidence as well as some available data on Singapore's Temasek suggest that many SWFs indeed have an already high exposure to emerging markets.¹⁶

An alternative scenario accounts for the fact that under a fixed exchange-rate regime the optimal weight of anchor-currency denominated bonds may be higher as these tend to reduce the volatility of the portfolio.¹⁷ In order to account for this effect, Scenario B of Table 6 assumes that the fraction that remains invested in bond markets is not reallocated according to market capitalisation weights but continues to be invested across currencies like traditional foreign exchange reserves, i.e. roughly two-thirds in US and one-third in euro area securities. However, this assumption does not qualitatively change the findings with respect to the previous scenario, as outflows from the euro area bond market still offset the inflow in the euro area equity market. Hence, even modest shifts out of bonds and into equities by official investors could trigger an outflow out of euro area

assets given that the euro area accounts for a smaller share of the global stock market.

In reality, major shifts in the composition of sovereign portfolios will only occur gradually over a longer run. In fact, SWFs may find it difficult to fully diversify across regions according to market capitalisation weights and may hence, in the short run, only invest in the largest and most liquid markets. Therefore, Scenario C in Table 6 illustrates how an initially limited diversification could play out on global bond markets over the short run if SWFs invest only in US and euro area bond markets while it is assumed that the other regions receive no additional capital flows. In this case, the overweight US dollar assets in foreign exchange reserves would lead to net outflows of the US bond market of around US \$ 150 billion, which would have to be absorbed entirely by the euro area bond market, given the relatively larger market capitalisation of euro area bond markets than reflected in the actual allocation of foreign exchange reserves. The magnitude of capital outflows from the United States into the euro area, however, depends largely on the assumption that additional funds are not invested in equity markets. Scenario D of Table 6 shows that, to the extent that funds are invested partly in equities, capital flows into the euro area are much smaller. Assuming that 40% are invested in equities, the simulation suggests virtually no net flows from the United States to the euro area.

Obviously, the asset allocation of SWFs may also reflect other considerations. For example, oil-exporting countries may want to use their SWF assets to hedge against oil price fluctuations. In this case, standard portfolio theory would suggest that the SWFs should underweight assets that are strongly correlated with oil prices. For example, returns on energy stocks are correlated with oil price returns. Therefore, an investment strategy that underweights energy stocks would reduce the variance of a typical SWF portfolio.

Underweighting energy stocks would also have an important implication for the geographical portfolio allocation of SWFs, since the share of energy companies in total market capitalisation differs widely across regions. Therefore, such a strategy would tend to raise the portfolio shares of Japanese, euro area and, to a lesser extent, US stocks at the expense of UK and other (mostly emerging market) stocks. More generally, SWFs may also wish to exploit other positive or negative correlations between assets in their national balance sheet and marketable assets such as company stocks.

Our simulations are subject to overly simplifying assumptions and several caveats. First, diversification strategies as simulated above may be incompatible with some countries' macroeconomic and exchange-rate policies. In fact, large shifts out of US dollars could trigger an appreciation of domestic currencies against the US dollar, requiring increased intervention to stem this

¹⁶ In the case of Temasek, emerging economies are even clearly overweight, accounting for 40% of the total portfolio against a portfolio weight of only 20% of OECD economies excluding Korea.

¹⁷ See R. Beck, E. Rahbari: Optimal reserve composition in the presence of sudden stops: The euro and the dollar as safe haven currencies, ECB Working Paper No. 916, 2008; M. Fidora, M. Fratzscher, C. Thimann: Home bias in global bond and equity markets: The role of real exchange rate volatility, in: Journal of International Money and Finance, Vol. 26, No. 4, June 2007, pp. 631-655.

appreciation.¹⁸ In addition, liquidity considerations may still be of relevance for some SWFs.¹⁹ In particular funds that have been established for macroeconomic stabilisation objectives could continue to invest in highly liquid instruments and hence remain overweight in US dollar and euro bonds. As a result, inertia in the currency composition of foreign assets could play out more notably than assumed in Scenario B. Also, reference currency considerations could lead to different allocations by sovereign wealth funds – in particular in countries which have increased the share of the euro in their exchange rate baskets (e.g. Russia). For example, using the local currency as the reference currency in countries with pegged or managed exchange rates leads to large optimal portfolio weights of foreign assets denominated in the respective anchor currency.²⁰

The Impact on Exchange Rates and Asset Prices

The question as to whether capital flows triggered by the investments of SWFs can impact financial market prices is extremely difficult to answer or even quantify. So far, no rigorous study has been performed to address this question. A review of related literature suggests that SWFs could have an impact on asset prices and exchange rates through price pressures or a change in risk aversion.

A direct impact on asset prices or exchange rates through price pressures triggered by SWF demand (e.g. equities) or supply (e.g. government bonds) is only conceivable if the demand curve in the respective markets is downward-sloping. While there is some empirical evidence for price pressures in certain markets, it remains controversial how persistent such effects are. According to the efficient market hypothesis, demand curves for financial assets are horizontal. However, a large body of empirical literature has documented the existence of downward-sloping demand curves and “price pressure” in financial markets. Conceptually, the price pressure hypothesis is closely related to the notion of imperfect substitutability between financial assets, as pointed out first by Scholes.²¹ In particular, it has been found that large block trades may have an impact on asset prices. Due to the difficulty of disentangling price pressure and information effects, empirical research on the issue has

often studied the price impact of announcements which are unlikely to contain new information about the assets.

In the earlier literature on price pressures, researchers have documented individual stock price reactions to large block trades.²² However, these price reactions may also reflect new information about the respective stocks. Therefore, subsequent “event studies” have examined the price impact of stock inclusions into major stock market indices and found significant price pressure effects in an environment where information effects probably play almost no role.²³ Several other earlier studies, however, find little support for the price-pressure hypothesis and a downward-sloping demand curve.²⁴ More recently, more convincing support for downward-sloping demand curves for stocks in a case which appears unambiguously free of information has been provided by Kaul, Mehrotra and Morck.²⁵ Outside the framework of event studies Levin and Wright²⁶ examine downward-sloping demand curves for stocks econometrically. In addition, Froot, O’Connell and Seasholes²⁷ find that portfolio inflows have positive forecasting power for future equity returns, in particular in the emerging markets.

Changes in government bond yields and the yield curve have traditionally been linked to the announcement of macroeconomic news.²⁸ A recent study shows

¹⁸ Cf. also M. P. Dooley, D. Folkerts-Landau, P. Garber: The revived Bretton Woods System: The effects of periphery intervention and reserve management on interest rates and exchange rates in center countries, NBER Working Paper 10332, 2004 on the “Bretton Woods II” system.

¹⁹ Cf. M. Chinn, J. Frankel: Will the Euro Eventually Surpass the Dollar as Leading International Reserve Currency?, in: Richard Clarida (ed.): G7 Current Account Imbalances: Sustainability and Adjustment, Chicago 2006, The University of Chicago Press, on the determinants of reserve currencies.

²⁰ Cf. R. Beck, E. Rahbari, op. cit.; M. Fidora, M. Fratzscher, C. Thimann, op. cit.

²¹ Myron S. Scholes: The Market for Securities: Substitution versus Price Pressure and the Effects of Information on Share Prices, in: Journal of Business, Vol. 45, No. 2, 1972, pp. 179-211.

²² Cf. Myron S. Scholes, op. cit.; R. Holthausen, R. Leftwich, D. Mayers: The Effect of Large Block Trades: a Cross-Sectional Analysis, in: Journal of Financial Economics, Vol. 19, No. 2, 1987, pp. 237-267; W. H. Mikkelsen, M. M. Partch: Stock Price Effects on Secondary Distributions, in: Journal of Financial Economics, Vol. 14, 1985, pp. 165-194.

²³ Cf. L. Harris, E. Gurel: Price and Volume Effects Associated with Changes in the S&P 500 List: New Evidence for the Existence of Price Pressures, in: Journal of Finance, Vol. 41, No. 4, 1986, pp. 815-829; as well as A. Shleifer: Do demand curves for stocks slope down?, in: Journal of Finance, Vol. 41, 1986, pp. 579-590.

²⁴ Cf. A. C. Hess, P. A. Frost: Tests for Price Effects of New Issues of Seasoned Securities, in: Journal of Finance, Vol. 37, No. 1, 1982, pp. 11-25; P. C. Jain: The Effect on Stock Price of Inclusion in or Exclusion from the S&P 500, in: Financial Analysts Journal, Vol. 43, 1987, pp. 58-65; A. Kalay, A. Shimrat: Firm Value and Seasoned Equity Issues: Price Pressure, Wealth Redistribution or Negative Information, in: Journal of Financial Economics, Vol. 19, 1987, pp. 109-126.

²⁵ A. Kaul, V. Mehrotra, R. Morck: Demand Curves for States Do Slope Down: New Evidence from an Index Weights Adjustment, in: Journal of Finance, Vol. 55, No. 2, 2000, pp. 893-912.

²⁶ E. J. Levin, Robert E. Wright: Downwards sloping demand curves for Stock?, in: Studies in Economics and Finance, Vol. 23, No. 1, 2006, pp. 51-74.

²⁷ Kennett A. Froot, Paul G. J. O’Connell, Mark S. Seasholes: The portfolio flows of international investors, in: Journal of Financial Economics, Vol. 59, 2001, pp. 151-193.

²⁸ Cf. M. J. Fleming, E. M. Remolona: What moves the bond market?, Federal Reserve Bank of New York Economic Policy Review, 1997, pp. 31-51; M. J. Fleming, E. M. Remolona: Price formation and liquidity in the U.S. Treasuries market: The response to public information, in: Journal of Finance, Vol. 54, 1999, pp. 1901-1915; M. Piazzesi: Bond yields and the Federal Reserve, in: Journal of Political Economy, Vol. 113, No. 2, 2003.

that “orderflow imbalances” significantly affect government bond yields on days without major macroeconomic announcements.²⁹ In addition, Warnock and Warnock³⁰ provide econometric evidence for foreign official purchases of US government bonds having a large and significant impact on US bond yields. Krishnamurthy and Vissing-Jorgensen³¹ study a case in which the aggregate demand curve for the convenience provided by Treasury debt (e.g. through high liquidity) is downward sloping. Changes in the supply of Treasury debt are used to trace out the demand for convenience. Interestingly, disaggregated estimates of convenience demand suggest that the demand for Treasury debt from foreign official holders (i.e. central banks) is very inelastic, consistent with the view that a stable demand for US assets has helped to finance the US current account deficit. An exit of foreign central banks from the US Treasury market would prompt US investors to buy these securities, but at a lower price, implying a rise in US government bond yields.

In foreign exchange markets, the early portfolio balance literature has motivated downward-sloping demand curves by postulating imperfect substitutability between domestic and foreign bonds. However, the traditional portfolio balance approach enjoyed little empirical support. The resilience of foreign exchange markets is also at the core of the literature on central bank interventions. While the conceptual case for the effectiveness of sterilised interventions has remained controversial, recent empirical studies do provide evidence for an exchange-rate effect of such interventions. Besides the traditional portfolio effect, central bank intervention may also have an impact on the exchange rates as it reveals information about future monetary policy through a “signalling effect”. Therefore, studies on central bank interventions have remained ambiguous about the nature of the exchange-rate effect. The surge in gross cross-border capital flows since the 1990s has triggered renewed interest in the portfolio channel for exchange rates.³² At the same time, the market microstructure literature has highlighted that currency order flows are strongly corre-

lated with exchange-rate returns.³³ Finally, recent event studies on foreign exchange markets also find indications for price effects. Hau, Massa and Peress³⁴ show that a redefinition of the MSCI international equity index – which has implied large changes in the representation of different countries – led to strong exogenous equity flows by index funds and an appreciation of the respective exchange rates.

The emergence of SWFs as the main managers of foreign assets could also have an impact on asset prices through a rise in global risk aversion, given their return-orientation and longer-term investment horizon. In the literature, the pricing of risky assets relative to safe assets, often phrased in terms of the “equity premium”, has been linked to the average level of risk aversion. In such an environment, growing SWFs could trigger a decline in risk aversion at the global level, which would lead to a rise in bond yields and a decline in the equity premium.³⁵

Most empirical estimates of the yield impact of US Treasury buying by foreign central banks range from around 20 to around 100 basis points (cf. Table 7). As discussed above, these flows could be reversed to some extent if excess reserves are transferred to SWFs. Therefore, such estimates can also be considered as an estimate of the possible rise in bond yields due to the emergence of SWFs.

A Case Study on Price Pressure: Norway's Government Pension Fund

We now examine the potential impact of portfolio rebalancing of SWFs on asset prices using data on Norway's SWF, for which information on the portfolio composition is available. In particular, we examine whether large-scale equity sales of the Government Pension Fund due to non-economic motives can have a significant impact on equity prices. Norway's Ministry of Finance has established Ethical Guidelines for the Government Pension Fund-Global that allow for the exclusion of a stock from the SWF's portfolio based on non-economic considerations. An “Advisory Council” within the Ministry of Finance has been mandated to review the fund's investments and assess whether these

²⁹ M. Brandt, K. Kavajecz: Price discovery in the US Treasury market: The impact of order flow and liquidity on the yield curve, in: *Journal of Finance*, Vol. 59, 2004, pp. 2623-2654.

³⁰ Francis E. Warnock, Veronica Cadedac Warnock: International Capital Flows and US Interest Rates, NBER Working Paper 12560, October 2006.

³¹ Arvind Krishnamurthy, Annette Vissing-Jorgensen: The Demand for Treasury Debt, NBER Working Paper 12881, 2007.

³² H. Hau, H. Rey: Exchange Rates, Equity Prices and Capital Flows, CEPR Discussion Paper No. 3735, Princeton University and CEPR, 2003; H. Hau, H. Rey: Can Portfolio Rebalancing Explain the Dynamics of Equity Returns, Equity Flows, and Exchange Rates?, in: *The American Economic Review*, Vol. 94, No. 2, Papers and Proceedings of the American Economic Association, San Diego, CA, 3-5 January, 2004, pp. 126-133; K. Froot, T. Ramadorai: Currency returns, intrinsic value, and institutional investor flows, in: *Journal of Finance*, Vol. 60, No. 3, 2005.

³³ M. Evans, R. Lyons: Time-varying liquidity in foreign exchange, in: *Journal of Monetary Economics*, Vol. 49, No. 5, 2002, pp. 1025-1051.

³⁴ H. Hau, M. Massa, J. Peress: Do Demand Curves for Currencies Slope Down? Evidence from the MSCI Global Index Change, CEPR Discussion Paper No. 4862, 2005.

³⁵ In the context of SWFs, S. Jen, D. K. Miles: Sovereign Wealth Funds and Bond and Equity Prices, Morgan Stanley Research Europe, 31 May 2007, argue that according to a modified version of the R. J Barro: Rare Events and the Equity Premium, in: NBER Working Paper, No. 11310, 2005 model, the growing importance of SWFs could considerably drive down global risk aversion, raising US government bond yields by 30-40 basis points and the price-earnings ratio by 5-10%.

Table 7
The Effect of Foreign Central Bank Buying
on US Treasury Yields
(in basis points)

Source	Estimated reduction
Banque de France (2005)	125
Bernanke et al. (2004)	50-100
BIS (2006)	~ 0
Goldman Sachs (2004)	40
IXIS (2005)	75
JP Morgan (2005)	30-50
Krishnamurthy and Vissing-Jorgensen (2007)	20-55
Merrill Lynch (2005)	30
Morgan Stanley (2005)	100-150
PIMCO (2005)	100
Roubini and Setser (2005)	200
Truman (2005)	75
Vanguard Group (2005)	~ 0
Warnock and Warnock (2006)	90

might “imply an unacceptable risk of complicity” in the violation of the ethical principles underlying the Fund’s Ethical Guidelines. Upon the Advisory Council’s recommendation, the Ministry of Finance can exclude a particular company’s stocks from the Fund’s investment universe.

The timing of the process of exclusion of a particular corporation’s stocks from the Fund’s investment universe is as follows. First, the Advisory Council issues a recommendation to exclude a particular stock from the Fund’s investment universe. This recommendation is initially not published. The Ministry of Finance then decides on whether to exclude the company from the portfolio and instructs Norges Bank to divest from the respective company within a deadline of, on average, around two months. Once the stocks have been excluded from the Fund’s portfolio the exclusion is announced to the public.

The Ministry of Finance has so far always followed the Advisory Council’s recommendations and instructed Norges Bank to exclude companies in 28 cases, mostly on account of their involvement in the diffusion of certain military armaments but also because of the violation of human rights and environmental considerations.³⁶

The exclusion of securities from the Fund’s investment universe constitutes a natural experiment that is particularly well-suited for analysing the potential impact of the investment behaviour of SWFs on financial markets for two reasons. First, the exclusion is based on purely non-economic criteria. Hence, the exclusion is unlikely to reflect the Fund’s expectations or private

information on future performance. Second, the timing and modalities of the exclusion enable two potential channels through which the exclusion might have an impact on the stock’s returns to be distinguished: (i) during the period within which Norges Bank divests from a particular stock, abnormal returns on the company’s stocks would reflect the pure impact of the decrease in demand; (ii) on the day of the public announcement of the exclusion, abnormal returns can be interpreted as a signalling impact due to the reaction of other market participants to the announcement.

We follow a simple methodology that allows for an identification of abnormally high or low returns that cannot be explained by overall market factors but are idiosyncratic to the stock. We employ an augmented capital asset pricing model (CAPM) that relates the return of a given equity r to two explanatory factors: (i) the return of a domestic equity index RM , capturing financial market developments in the economy, and (ii) the return of a sector-specific index RS , capturing sector-specific developments.³⁷

$$(1) \quad r_t = \alpha + \beta^M R_t^M + \beta^S R_t^S + \varepsilon_t$$

From the equation parameter estimates are obtained for a sample of daily observations ranging from 2000 up to the date of exclusion. From these, expected returns $E(r)$ are calculated for the period during which a particular equity was being removed from the Fund’s portfolio as well as for the day on which the exclusion was revealed to the public. In a second step, we test (i) whether the realised cumulated return over the period during which the equity was being excluded is significantly different from the expected cumulated return based on the econometric model; and (ii) whether the realised return on the day on which the exclusion was made public is significantly different from the expected return based on the econometric model.³⁸

Table 8 reports abnormal returns during the divestment period for the 20 stocks that have been excluded during 2005–06. Overall the results indicate no significant effect of the Fund’s divestment on the performance of the analysed stocks. Of the 20 stocks, only ten underperformed their respective benchmarks during the divestment period and only nine stocks recorded a negative excess return on the day the exclusion was made public. None of the negative excess returns is statistically significant.

To sum up, we find no evidence of a significant impact of non-economically motivated investment behaviour of SWFs on financial markets. However, it should

³⁶ This includes Singapore Technologies Engineering, which had been excluded by the Petroleum Fund Advisory Commission on International Law, the predecessor of the Advisory Council. The exclusion of Kerr McGee was revoked on 24 May 2006.

³⁷ Sectoral and country indices are taken from Standard and Poor’s.

³⁸ Assuming identically and independently normally distributed residuals in equation (1), i.e. $\varepsilon_t \sim N(0, \sigma^2)$, excess returns over the divestment period and on the day of publication of the exclusion follow a normal distribution.

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Table 8
Stock Performance during Divestment Period and upon Announcement of Exclusion

	Divestment period				Announcement day			
	Equity return	Benchmark return	Excess return	p-value	Equity return	Benchmark return	Excess return	p-value
Alliant Techsystems Inc.	9.9	4.4	5.5	0.65	0.2	-0.2	0.3	0.86
BAE Systems Plc	10.3	12.9	-2.6	0.76	2.6	2.4	0.1	0.93
Boeing Co.	3.4	5.6	-2.2	0.83	0.1	0.2	-0.1	0.99
DRD Gold Ltd.	-16.0	10.5	-26.4	0.37	2.3	1.6	0.7	0.91
EADS Co.	6.3	9.7	-3.4	0.81	0.2	2.3	-2.1	0.32
Finmeccanica Sp. A.	-1.2	3.9	-5.1	0.67	0.3	-0.1	0.5	0.77
Freeport McMoRan Copper & Gold Inc.	-0.4	1.4	-1.8	0.92	-0.6	0.9	-1.5	0.58
General Dynamics Corp.	4.1	2.8	1.3	0.89	0.2	-0.3	0.5	0.73
Honeywell International Corp.	3.8	4.4	-0.6	0.96	0.0	-0.1	0.1	0.98
Kerr McGee Corp.	-4.7	2.7	-7.4	0.36	-1.2	0.5	-1.7	0.49
L3 Communications Holdings Inc.	6.5	5.1	1.3	0.93	-0.3	0.0	-0.3	0.90
Lockheed Martin Corp.	-3.0	3.4	-6.4	0.56	-0.7	-0.3	-0.4	0.83
Northrop Grumman Corp.	11.7	4.3	7.4	0.54	-0.8	0.0	-0.8	0.72
Poongsan Corp.	8.0	3.8	4.2	0.80	-1.5	0.0	-1.5	0.53
Raytheon Co.	0.0	1.4	-1.4	0.92	0.3	-0.3	0.7	0.77
Safran S.A.	5.2	2.0	3.3	0.88	1.4	-0.2	1.5	0.58
Thales S.A.	10.0	7.5	2.4	0.86	0.9	1.7	-0.7	0.72
United Technologies Corp.	11.2	6.8	4.3	0.69	1.1	0.9	0.2	0.90
Wal-Mart de Mexico S.A.	1.0	-2.6	3.6	0.75	-0.1	1.1	-1.2	0.47
Wal-Mart Stores Inc.	-1.3	-13.2	11.8	0.17	2.1	3.3	-1.2	0.50

Note: p-values below 10%, 5% and 1% indicate statistically significant excess returns at the 10%, 5% and 1% level respectively.

Sources: Bloomberg, Standard and Poor's, and authors' estimates.

be recalled that the process of divestment by Norway's SWF is intentionally designed to avoid any downward price pressure in order to minimise the losses from divestment. As regards broader conclusions from this case study, it should be stressed that other SWFs could hold larger amounts of individual stocks than Norway's SWF.³⁹ The same applies to other large market players such as private asset managers.

Concluding Remarks

Sovereign wealth funds have been investing governments' foreign assets for decades. However, it is only in recent times that such funds have emerged as managers of large "excess reserves" and other foreign assets. A transfer of sizeable amounts of traditional foreign exchange reserves to these investment vehicles may have an impact on the global financial landscape since such funds are likely to pursue an investment strategy that differs considerably from that of central banks.

Whether a change in the global financial structure will have a significant impact on financial stability will depend critically on the motives underlying the investment decisions of such funds. In fact, SWFs may contribute to

a widening of the long-term investor base for risky assets such as stocks, corporate bonds, emerging market assets, private equity and real estate. In this regard, such funds could exert a stabilising effect on financial markets, in particular as SWFs are typically not leveraged. In addition, SWFs may contribute to a more efficient sharing and diversification of risk at the global level.

On the other hand, other investment motives (e.g. when SWF acquisitions are driven by political considerations) could potentially lead to excessive risk-taking and a distortion of asset prices. For instance, some observers have expressed a concern that certain SWFs may be prone to an abrupt selling of assets, thereby contributing to market volatility. Other observers have warned that some SWFs may acquire stakes in companies of sensitive industries, and possibly bail out or support local firms for non-economic reasons. However, so far there is no firm evidence of such investment patterns which would also negatively impact market integrity.

On balance, several potential channels through which the emergence of SWFs as large global players may affect the global financial system can be identified. In this respect, it is of particular importance that SWFs be sufficiently transparent on their size, asset allocation and investment motives so as to assuage concerns about potentially distorting the effects of SWFs and to reduce uncertainty in financial markets.

³⁹ Norway's Government Pension Fund held, on average, around 0.5% of the market capitalisation of the respective companies, roughly equivalent to the daily turnover of an average stock. In comparison, the combined value of global sovereign wealth funds may reach up to 3% of global financial assets.