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Navigating the Long-Run

A Strategic Asset Allocation Framework for Pensions, Endowments & SWFs

The core objective functions of longer-term investors like pension funds, insurers, endowments and sovereign wealth funds (SWFs) can differ widely, and policy prescriptions should be tailored accordingly. Notwithstanding this diversity, there are important areas of commonality across this broad investor group. This paper binds together these areas of mutual interest in presenting a general framework, comprised of five elements, in which longer-term investors might look to nest their strategic asset allocation programs.

First, strategic asset allocation (SAA) objectives should ideally be established in the context of a comprehensive and integrated policy framework, accounting for the broader economic and asset-liability structure of the parent corporate or sovereign. In other words, asset allocation programs established with no regard to the economic or liability profile of the sponsor, might inadvertently 'double down' on a source of risk to which the parent's fiscal accounts are already heavily exposed. To date, corporate pension plans have generally made more progress in immunizing against unwanted risk concentrations than their SWF brethren.

Second, SAA plans should be diversified across risk factors and risk premiums, rather than conventional asset class silos (which are simply bundles of risk factors). Moreover, long-term investors with relatively stable risk preferences and a higher tolerance for (intertemporal) path dependency risk, are particularly well suited in opportunistically absorbing risks that most other investors pay often sizable premiums to avoid – for instance by engaging in counter-cyclical and market-stabilizing liquidity provision during crises, with a strong value bias. This is especially relevant for official sector institutions charged with the dual mandate of generating long-term returns and maintaining broader financial market stability. In general, SAA programs should seek to lean against the wind of time-varying risk premia.

Third, a market-based risk management process should be multi-dimensional with a counter-cyclical bias. Standard applications of the VaR methodology are inherently pro-cyclical, calling for an increase in leverage when markets are complacent and risk premiums unusually thin. This is inconsistent with most long-term SAA objectives. **Fourth, institutions should build a defense against the harmful externalities arising from pro-cyclical decision-making, by institutionalizing counter-cyclical behavior.** A valuation-based rebalancing rule, and a process which distinguishes price volatility from long-term valuation risk, may constitute helpful steps in this direction. **Fifth, agency risk should be addressed with effective contract design,** focused on minimizing the wedge of principal-agent time inconsistency. The behavior of FX reserve managers during the financial crisis serves as a shot across the bow in this respect.

Finally, we leave for future research a treatment of the unintended consequences of the forced structural de-risking of some long-term private investors (insurers and pension funds). As their assets continue to swell in coming years, SWFs may have a critical counterbalancing role to play in leaning against the retreat of these investors from assets like equities that exhibit high short-term price volatility, but also present high long-term risk premiums and are essential for the healthy functioning of the global economy and international financial system.

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Navigating the 'Long Run' – A Strategic Asset Allocation Framework for Pensions, Insurers, Endowments and Sovereign Wealth Funds

Introduction

The concept of 'the long-run' as an investment horizon can elicit wildly different responses. To some it is the only relevant horizon over which carefully considered rational decision-making should be calibrated; for others, it is a nefarious concept consisting simply of a series of short-runs, and moreover, is typically only appealed to by investment managers as a shelter after a period of poor performance. The venerable late financial and economic historian Peter Bernstein declared, "the long-run as an investment destination is and always has been an impenetrable mystery" [1].

For our purposes, a treatment of 'the long-run' is further complicated by the material differences in investor types seeking to preserve and grow capital over this (perhaps somewhat abstract) time horizon. While pension funds, insurers, endowments and sovereign wealth funds (SWFs) are frequently grouped together under the banner 'strategic investors', a closer inspection reveals a striking degree of heterogeneity, both across and within these groups[2]. Take the global pension fund community as a case in point (Figure 1). Japan, with the world's second-largest stock of assets under management, stands at one end of the risk spectrum with 98% of assets in defined benefit schemes, mostly held on behalf of the public sector, with the highest (relative) exposure to bonds and lowest weighting to non-traditional asset holdings. At the other end, Australia and the US are characterized by largely defined contribution and private sector schemes, and the highest allocations to both equity and alternative assets. Meanwhile SWFs are typically classified under four broad categories: i.) macro-stabilization funds, ii.) national savings funds, iii.) pension reserve funds and iv.) reserve investment funds. Yet some SWFs have multiple objectives (typically savings and stabilization-based), while some countries have multiple SWFs each with a different objective. A stabilization-based SWF in a small open commodity-exporting economy with large short-term external liabilities will clearly have a different objective function (i.e. that of volatility-smoothing, in the spirit of Friedman's Permanent Income Hypothesis) vis-à-vis intergenerational savings-based sovereign wealth funds with no contingent cash calls, a high pain tolerance and distant starting liabilities.

[1] "The Flight of the Long Run", Peter Bernstein, Financial Times, February 25, 2009.

[2] The term Sovereign Wealth Fund can mean different things to different people. For the purposes of this paper we adopt the SWF definition as per the 2008 SWF International Working Group. A SWF is a special purpose investment fund arranged, owned and created by the general government for macroeconomic purposes. SWFs hold, manage or administer assets in order to achieve financial objectives.

Figure 1: Global Pension Fund Assets – Significant Cross Country Dispersion

	AuM ($US tn)	AuM (% of GDP)	% Defined Benefit (vs. DC)	% Private (vs. Public) Sector	% Equity	% Bonds	% Cash	% Other
Australia	1.3	103	19	86	49	14	12	25
Canada	1.1	73	95	38	41	36	2	21
Japan	3.5	64	98	30	37	56	3	4
Netherlands	1.0	134	94	70	33	50	1	16
Switzerland	0.7	126	40	71	28	35	8	29
UK	2.3	101	60	90	55	35	3	7
US	15.3	104	43	71	49	27	0	24
Average	*3.6*	*101*	*64*	*65*	*42*	*36*	*4*	*18*
Median	*1.3*	*103*	*60*	*71*	*41*	*35*	*3*	*21*

Source: Towers Watson (Global Pension Asset Study, 2011). Data are as at end-2010.

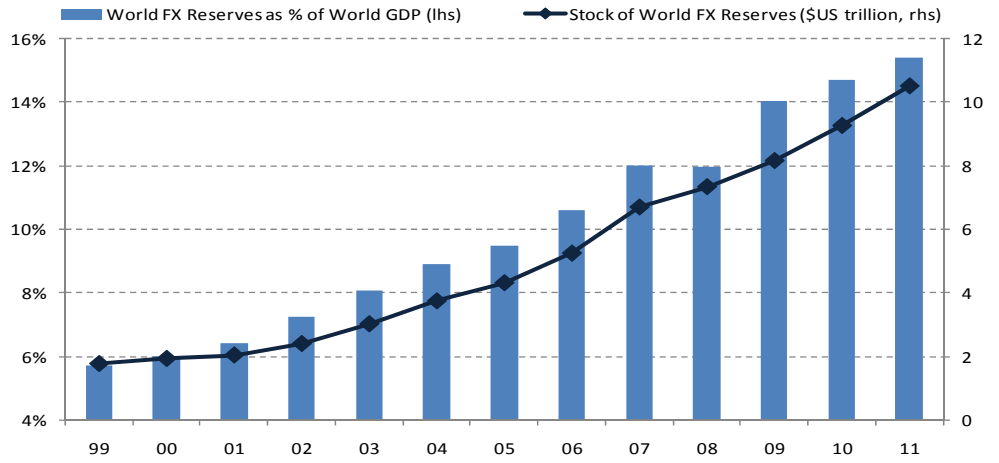
Figure 2: Classification of Sovereign Wealth Funds

Source	Year established	Country	Policy Purpose			
			Macro stabilization	Saving	Pension reserve	Reserve investment
Oil and Natural Gas	1953	Kuwait	Kuwait Investment Authority, General Reserve Fund	Kuwait Investment Authority, Future Generations Fund		
	1976	Canada		Alberta Heritage Savings Trust Fund		
	1976	United Arab Emirates		Abu Dhabi Investment Authority		
	1976	United States		Alaska Permanent Fund		
	1980	Oman		State General Reserve Fund		
	1983	Brunei Darussalam		Brunei Investment Agency		
	1996	Norway	Government Pension Fund-Global	Government Pension Fund-Global	Government Pension Fund-Global	
	1999	Azerbaijan	State Oil Fund	State Oil Fund		
	2000	Iran, Islamic Republic of	Oil Stabilization Fund			
	2000	Mexico	Oil Revenues Stabilization Fund			
	2000	Qatar		Qatar Investment Authority		
	2000	Trinidad and Tobago	Heritage and Stabilization Fund	Heritage and Stabilization Fund		
	2001	Kazakhstan	National Fund			
	2002	Equatorial Guinea		Fund for Future Generations of Equatorial Guinea		
	2004	São Tomé and Príncipe		National Oil Account		
	2005	Timor-Leste	Petroleum Fund	Petroleum Fund		
	2006	Bahrain	The Future Generations Reserve Fund	The Future Generations Reserve Fund		
	2006	Libya		Libyan Investment Authority		
	2008	Russian Federation	Reserve Fund		National Wealth Fund	
Other Commodity	1956	Kiribati		Kiribati, Revenue Equalization Fund		
	1996	Botswana		Botswana, Pula Fund		
	2006	Chile			Pension Reserve Fund	
	2007	Chile	Economic and Social Stabilization Fund (ESSF)			
Fiscal Surpluses	1974	Singapore		Singapore, Temasek		
	1981	Singapore				Government of Singapore Investment Corporation
	1993	Malaysia		Khazanah Nasional BHD		
	2000	Ireland			Ireland, National Pensions Reserve Fund	
	2001	New Zealand			New Zealand Superannuation Fund	
	2004	Australia			Australia, Future Fund	
	2005	Korea, Republic of				Korea Investment Corporation
FX Reserves	1981	Singapore				Government of Singapore Investment Corporation
	2005	Korea, Republic of				Korea Investment Corporation
	2007	China				China Investment Corporation

Source: IMF Working Paper 11/19, "Investment Objectives of Sovereign Wealth Funds – A Shifting Paradigm", Kunzel, Lu, Petrova and Pihlman, January 2011.

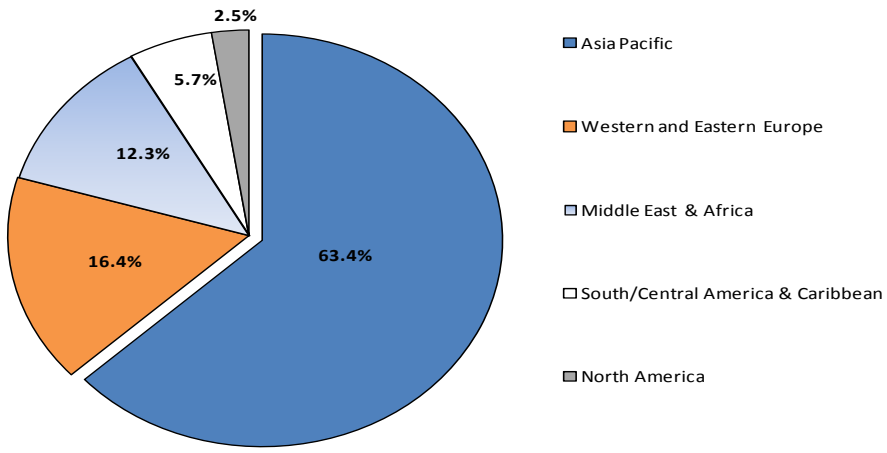
There are also significant shifts beginning to transpire between these investor groups in terms of the composition and size of assets under management. While pension funds remain veritable giants in the investment world with regard to assets under management ($US26.5 trillion as at end-2010[3], or more than ten times higher than SWFs), the need to incorporate SWF objectives into a broader dialogue on strategic asset allocation and capital flows is becoming increasingly pressing in light of the phenomenal growth in official sector assets in recent times. For instance, the stock of world FX reserves has risen at a compound annual growth rate of 15.9% since 1999 (from US$1.8tn to an estimated US$10.5tn as at end-2011), driving the reserve share of world GDP up from 5.7% to an estimated 15.4% (Figures 3 and 4). With sovereigns now holding more than US$10 trillion in foreign exchange reserves, well in excess of standard reserve adequacy requirements in many cases, it is likely at least a portion of these assets will be transferred from traditionally conservative FX reserve managers over to new or existing SWFs in the years ahead.

Figure 3: World FX Reserves Now Exceed US$10 trillion, or 15% of World GDP



Source: Deutsche Bank, IMF, Bloomberg Financial LP, World Bank. Full year figure for 2011 is based on the author's estimates.

Figure 4: Geographical Composition of World FX Reserves



Source: Deutsche Bank, IMF, Bloomberg Financial LP.

[3] Towers Watson Global Pension Asset Study, February 2011

While any discussion of the challenges confronting strategic investors must first acknowledge that there can be no 'one size fits all' universal policy prescription, there are however a number of issues of broad and common relevance. The analysis that follows is an attempt to bind together these areas of mutual interest in presenting a general framework in which longer-term investors might look to nest their strategic asset allocation decisions. There are five essential pillars to this framework.

Issue # 1. Strategic asset allocation objectives should ideally be established in the context of a comprehensive and integrated policy framework, accounting for the broader economic and asset-liability structure of the parent corporate or sovereign.

In the 1930s, American sociologist Robert Merton catapulted the concept of unintended consequences into mainstream discourse with his influential paper, "The Unanticipated Consequences of Purposeful Social Action". This might serve as an appropriate backdrop against which to address the issues associated with establishing a strategic asset allocation program without careful regard to the broad balance sheet structure of the sponsoring entity.

In short, in circumstances where long-term asset allocation plans are set in an informational vacuum, completely divorced from the parent structure, the specter of unintended risk concentration looms large[4]. For instance in cases where the investment portfolio is entirely unconstrained or has no regard for the economic or liability structure of the parent, it might inadvertently 'double down' on a source of risk to which the parent's fiscal accounts are already heavily exposed (such as falling commodity prices in the case of a small open commodity-exporting economy)[5]. In this regard, corporate pension plans have generally started to make more progress than their SWF counterparts in immunizing themselves against unwanted or diversifiable risk (through the application of LDI programs for instance). Interestingly, this is despite an extensive academic and practitioner-based literature having addressed issues pertaining to holistic sovereign asset and liability management over the past couple of decades (see for instance Cassard and Folkerts-Landau, 1997 and 2000).

The traumatic experience of a number of SWFs domiciled in oil-exporting countries in 2008 is a case in point where asset allocation policies were not nested within the broader parent balance sheet. Setser and Ziemba (2009) estimated losses of between 36% and 41% in some cases for GCC-based SWFs, owing to significant investment exposures to equity and equity-like risk with which oil prices and government fiscal revenues were correlated (both equity risk and oil prices load heavily onto 'growth' risk)[6]. Compounding matters, a number of other SWFs received unexpected contingent 'liquidity calls' (where macro-stabilization objectives were not originally in their mandate) from their principal over the same period, requiring a host of remedial actions under intense pressure. This principally involved the disposal of risky assets at depressed prices in order to shore up domestic commercial bank liquidity positions, the purchase of equity in domestic bank recapitalizations, the support of deposit insurance schemes, and assistance in fiscal stimulus programs (Pihlman and van der Hoorn, 2010). Events over this period constitute the most recent reminder that unintended risk concentrations can arise as a consequence of asset allocation programs run without due reference to the economics and contingent and explicit liabilities of the parent entity. Finance theory has long been grounded on the idea that diversifiable risk should go unrewarded.

[4] This should not be confused with the idea that SWFs should have operational independence in pursuing the objectives first set for them by their sponsor. See also Das, Lu, Mulder and Sy (2009).

[5] See Brown, Papaioannou and Petrova (2010) for a treatment of the macro-financial linkages of the strategic asset allocation of commodity-based SWFs.

[6] Between 1986 and 2007, the historical correlation between world equities and oil prices had oscillated around zero, perhaps lulling some investors into thinking they were genuinely orthogonal. This is reflective of a peso problem.

More generally, we present below a stylized conceptual model whereby the risk tolerance of a strategic asset allocation (SAA) plan is conditioned on a range of factors featuring in a hypothetical objective function (Figure 5). In the selection of conditioning variables below, we have attempted to strike a balance between generality and the idiosyncrasies across pension funds, insurers, endowments and SWFs. Ceteris paribus, we argue that a relatively *higher* level of plan risk tolerance will tend to be associated with the following characteristics: where there is a low covariance between the plan SAA and both parent liabilities and the source of the underlying endowment income; where the duration of explicit liabilities is long and/or commencing in the distant future; where there is low risk of being forced to absorb contingent liabilities of the parent in periods of stress; where liabilities are denominated in real terms; where managing exchange rate volatility is not a principal concern; where the funding ratio is well below 100%; where there is a low sensitivity of future funding support to short-term investment performance; where the institution has a comparative advantage in engaging in counter-cyclical liquidity provision when liquidity is scarce (i.e. in a crisis), and engaging in opportunistic volatility-selling and deep value strategies; where there is a large stock (that can be reliably estimated) of physical (as yet non-traded) wealth relative to financial (invested) wealth; where other non-financial constraints (i.e. social/ethical investing, reputational risk, foreign policy issues, etc.) on the prospective investment opportunity set are modest; and finally, where there is considerable in-house experience and sophistication in managing a SAA program, and the level of financial literacy across the ultimate fund owners is high.

Figure 5: Risk Tolerance as a Function of Issues Entering the Strategic Asset Allocation Objective Function

	Risk Tolerance:	
Issues Featuring in Strategic Asset Allocation (SAA) Objective Function:	**Aggressive / Risk-Seeking / Few Constraints**	**Defensive / Volatility-Minimizing / Heavily Constrained**
1. Covariance of Asset Allocation to Parent Liabilities	Low	High
2. Covariance of Asset Allocation to Source of Parent Endowment Income (country/industry)	Low	High
3. Duration of Explicit Liabilities	Long and/or commencing in the distant future	Short and/or commencing shortly
4. Risk of Absorbing Contingent Liabilities (and their characteristics) in an Exogenous Shock	Low	High
5. Liability Indexation Terms	Real	Nominal
6. Currency Risk Associated with Liabilities	Low	High
7. Funding Ratio	Under-funded	Over-funded
8. Sensitivity of Future Funding to Recent (Short-term) Performance	Low	High
9. Systematic Bias to Harvesting Sources of Style Risk Premia (based on comparative advantage)	Counter-cyclical liquidity provider; volatility seller, value buyer	Liquidity and tail-risk demander
10. Stock of Non-traded/Traded Wealth (with high certainty in estimate of non-traded wealth)	High	Low
11. Other Non-financial constraints (foreign policy, social/ethical investing, reputational risk etc)	Low	High
12. In-house Experience/Sophistication in Managing a SAA Program, & Constituent Financial Literacy	High	Low

Source: Deutsche Bank

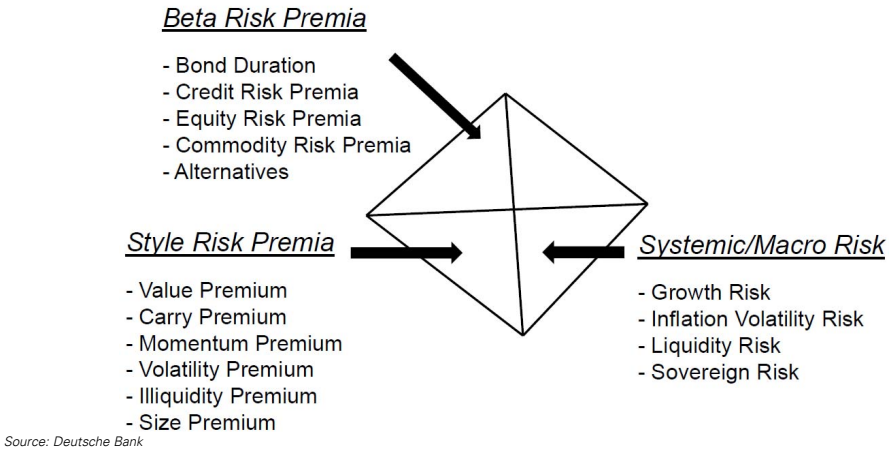
For the majority of funds, there will almost surely be competing 'loadings' within this stylized framework – that is, some constraints will be non-binding while others will be of tremendous importance; similarly some will tend to impart a gravitational pull toward lowering the risk tolerance, while other factors will push the SAA program toward adopting a more aggressive posture. The objectives of the SAA program, nested within the overarching economic and liability structure of the parent, will necessarily be different for each individual institution.

Issue # 2. Diversify across risk factors and risk premia (not asset classes *per-se*), and calibrate factor tilts to the comparative advantage of the institution.

Individual assets (and asset classes) comprise the sum of underlying risk factor exposures – in other words, assets are carriers of embedded factors. The relationship between underlying factors and observed asset returns might be considered analogous to that between underlying nutrients and the food we consume, where factors are the nutrients of the financial world (see Ang, 2010). It is not a food item *per-se* that provides sustenance, but rather the underlying nutrients embedded in food (water, carbohydrates, protein, fiber and fat). In short, assets are simply bundles of risk factors, just as food items contain different combinations of nutrients. A body of research has recently emerged to support the view that diversification across risk factors and risk premiums, rather than asset classes, constitutes a more robust approach to portfolio construction and risk management[7].

A stylized depiction of risk factors and return sources is presented below across i.) conventional sources of beta risk, ii.) style risk premia, and iii.) systemic risk (Figure 6). Consider for instance an investment committee meeting in which the addition of high yield credit exposure to a portfolio is the matter under discussion. Both economic theory and empirical analysis points to high yield returns loading onto bond duration, credit risk premia, equity risk premia, illiquidity premia and growth premia. If the fund already has high concentrations across these risk factors in its existing portfolio (despite not yet owning high yield credit), there should be a high hurdle for adding high yield assets to the portfolio mix.

Figure 6: The Three Dimensions of Risk Factor/Premia Exposure

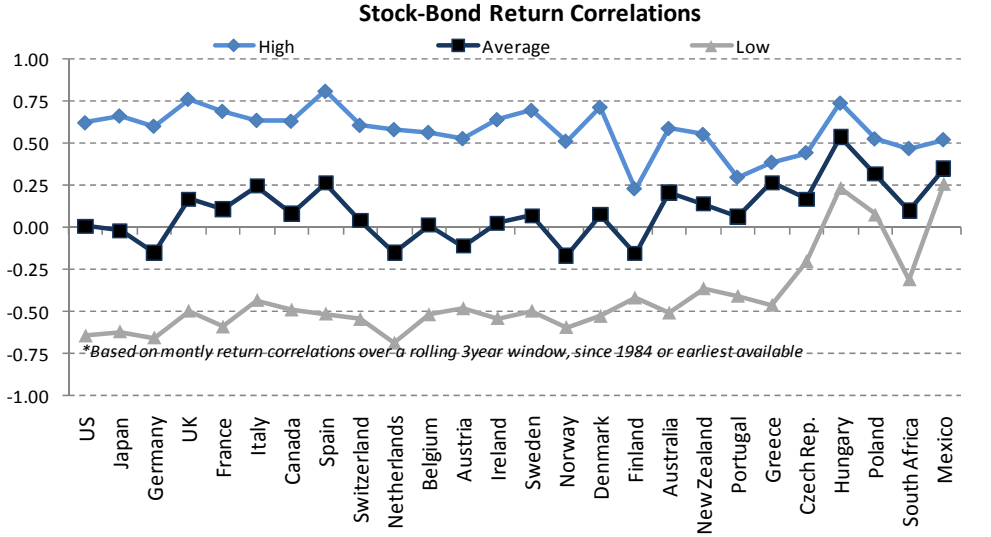


Source: Deutsche Bank

[7] See for instance Ang, Goetzmann and Schaefer (2009), Asness, Moskowitz and Pedersen (2009), Bender, Briand, Nielsen and Stefek (2010), Page and Taborsky (2011), Ilmanen (2011), and Jones (2011a, 2011b). This literature should not be confused with the risk parity concept, which is largely a statistical exercise relying less on intuitive economic underpinnings.

Another important context in which to examine the implications of risk factor-based analysis arises with the 60/40 policy portfolio benchmark, which continues to serve as the industry default setting for asset allocation mandates. While this portfolio is generally perceived to be embedded with reliable sources of diversification (bonds for recession, stocks for expansion), across a sample of 26 countries we find systematic evidence of highly time-varying stock and bond return correlations. While on average, correlations may be close to zero, over various points in time these correlations (measured over a rolling three-year window) have frequently been above 0.5 and below -0.5 (Figure 7). The rolling three-year stock and bond return correlation in the US has been positive for 57% of the post-1900 sample. The explanation for this correlation instability can be traced back to the underlying risk factors embedded in stocks and bonds. As a matter of first principles, we can consider stock and bond returns to load onto changes in growth expectations in the opposite direction, but load onto changes in inflation expectations and sovereign risk expectations in the same direction. In other words, in only one of three possible macro regimes do stocks and bonds move in the opposite direction – when perceived inflation and sovereign risk is well anchored, leaving innovations in growth expectations to be the dominant driver of stock and bond returns. This has essentially been the regime prevailing in the US since the late 1990s (where stock and bond return correlations have been sharply negative). But the empirical record on this matter is clear – it has not always been this way in the US, nor has it in a wide number of European or Emerging Market countries. Periods of heightened inflation volatility or sovereign risk have tended to drive stock and bond correlations sharply positive (Jones, 2011b). Put another way, a 60/40 portfolio effectively has 100% of its risk exposure short an adverse shock to either inflation or sovereign risk expectations[8]. We doubt that most trustees, plan sponsors and principals that adhere closely to a 60/40 benchmark have intentionally sought to take on aggressive factor exposure of this nature. Purely from a statistical perspective, it should also be noted that a 60/40 stock-bond portfolio has around 95% of its variability emanating solely from equity risk (Figure 8).

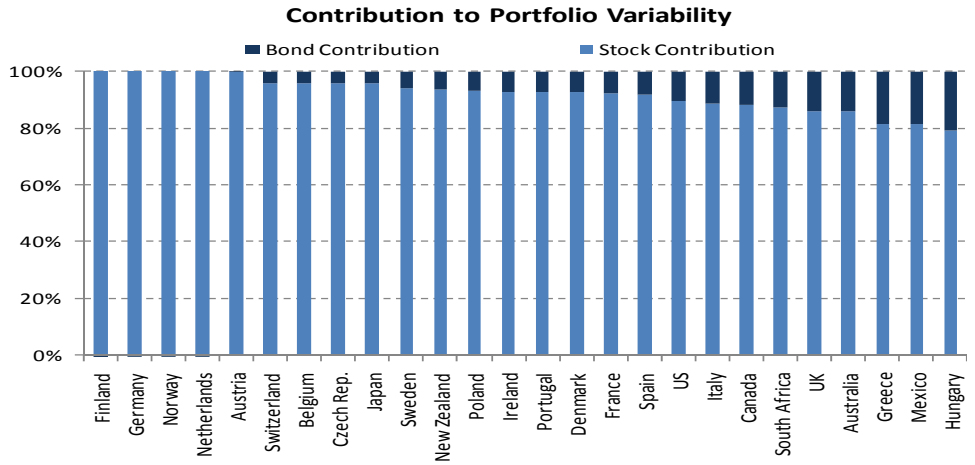
Figure 7: Factor Risk Explains the Correlation Instability for Stock and Bond Returns



Source: Deutsche Bank, Datastream, Bloomberg. Data in local currency terms, since 1984, except Denmark (1989), Spain, Sweden, Belgium (1990), Austria, Ireland, NZ (1992), Portugal, Finland (1994), Norway (1995), Czech Republic (1998), Greece, Hungary, Poland, South Africa (2000), Mexico (2003).

[8] The sensitivity of stock returns to inflation shocks is complicated. The empirical record tends to suggest that in the very long run, nominal stock returns do keep pace with inflation, as long as the threat of hyperinflation is kept at bay. In the short-run however, stock multiples tend to de-rate in response to adverse inflation shocks.

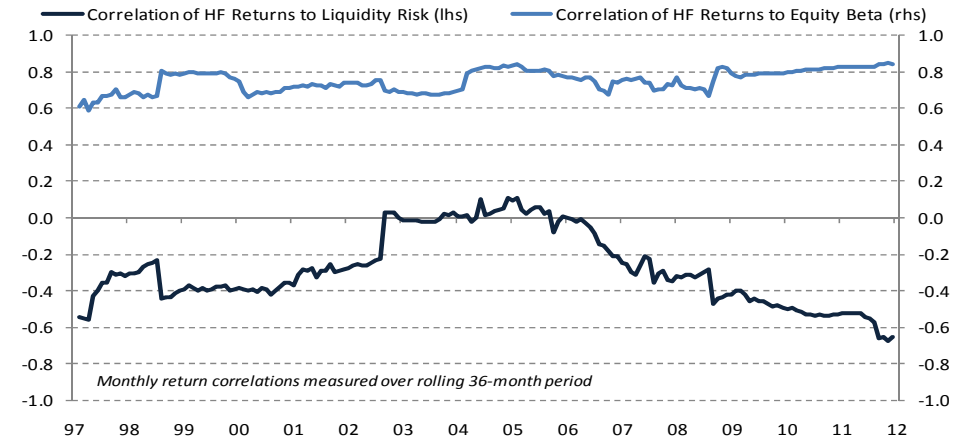
Figure 8: Contribution to 60/40 Portfolio Variability Emanating from Stocks and Bonds



Source: Deutsche Bank, Datastream, Bloomberg. Data in local currency terms, since 1984, except Denmark (1989), Spain, Sweden, Belgium (1990), Austria, Ireland, NZ (1992), Portugal, Finland (1994), Norway (1995), Czech Republic (1998), Greece, Hungary, Poland, South Africa (2000), Mexico (2003).

In response to some of the limitations posed by the conventional 60/40 benchmark, the 'second generation' approach to asset allocation (led by a number of high profile US endowment funds around a decade ago) began to see a substantial move into leverage-sensitive alternative assets, primarily private equity, venture capital, real estate and hedge fund strategies. However these alternative asset classes share a common risk factor exposure – they load aggressively onto systemic liquidity risk. This soft underbelly was revealed in rather dramatic circumstances over the course of 2008/09, catching many investors off guard after conventional alternatives generally held up well over the course of the 2000-02 global equity market downturn (as the latter event did not constitute a systemic liquidity crunch). For instance, Jones (2011b) found 14 of 18 hedge fund style strategies to have incurred their worst-ever drawdown over the same interval – during the liquidity drought of late 2008/early 2009 – despite these strategies operating in different asset classes and pursing seemingly disparate business models. Moreover, liquidity and equity risk alone explain 62% of the variability in monthly hedge fund returns over the 1992-2011 period (with both terms highly statistically significant).

Figure 9: Correlation of Hedge Fund Returns to Liquidity and Equity Risk Exposure



Source: Deutsche Bank, HFRI, Bloomberg Financial LP. Hedge Fund returns based on the HFR Fund Weighted Composite. Liquidity risk depicted by an equally-weighted rolling 1y z-score of the 3m TED spread and 2yr US swap spreads. Equity risk depicted by S&P500 returns.

In short, most 'second generation' alternative assets have return profiles with high 'stress betas' and which load strongly onto conventional risk factors which could arguably be replicated in a more timely and cost-efficient fashion. Diversification by asset class silos alone is not just highly inefficient, both also potentially dangerous in masking the underlying risk concentrations embedded in a portfolio. The construction of robust 'all-weather' portfolios needs to begin by looking beyond the prism of conventional asset class buckets and toward harvesting multiple forms of risk premia.

Moreover, strategic asset allocations should attempt to calibrate their exposure to style-based risk premia based on their comparative advantage in the market place. Large strategic investors with secure funding, no short-term contingent liabilities, few constraints and relatively more stable risk preferences over time than shorter-term investors are uniquely well suited to engaging in counter-cyclical, market-stabilizing liquidity provision. This essentially takes the form of harvesting the value premium, the illiquidity premium and the volatility premium (all of which can be very noisy in the short-run)[9]. A bias towards counter-cyclical value strategies should be self-evident for a long-term investor given the extensive literature which has documented 'the value effect' to prevail across asset classes, particularly over long holding periods (Asness, Moskowitz and Pedersen, 2009). Ideally, exposure to illiquidity and volatility risk premia – effectively selling catastrophe insurance to cover risks the market is unwilling to bear – should be harvested opportunistically and with a good deal of care (not passively). Implicit in this approach is a recognition that risk premiums are highly time-varying. Practically, this may mean that the sale of catastrophe insurance is confined to periods *after* a large disturbance has already struck, and insurance premiums have been pushed out to unusually elevated levels. Unusual market microstructure dynamics (for instance where structured product issuance creates supply/demand mismatches) may also present abnormally large risk premiums on an opportunistic basis.

With the aid of relevant data spanning a quarter of century (June 1986 – January 2012) and multiple market cycles in the US, it may be possible to deduce the return and risk dynamics one might expect from a passive or constant short volatility position over the longer-term (we discuss this passive short volatility position for reference purposes only). As theory would suggest, we find evidence suggestive of a long-term risk premium to providers of insurance. For instance a constant short at-the-money put position on the S&P500 (fully collateralized, with the proceeds of the put sale invested at the risk-free rate) has returned 9.9% p.a. since 1986, 120 basis points in excess of the buy-and-hold return on the market (including reinvested dividends)[10]. As a likely consequence of the benefits of 'reinvesting the float', the short put position has incurred less volatility over the full sample, less severe drawdowns and a higher proportion of profitable months. On the flip side and also consistent with theory, the systematic short volatility position has significantly larger negative skew and kurtosis than the buy-and-hold strategy, and similar downside volatility risk, with very high covariance to the market. Opportunistically selling index volatility as opposed to single security volatility may appeal to large, longer-term investors with deep pockets for two reasons: it can be done in larger size at the index level, and moreover, may enable the seller to capture both the (implied less realized) volatility premium and the (implied less realized) correlation premium embedded in index volatility. At the bottom-up security level, opportunistic stock-lending (via global custodians) is one way in which to reap a liquidity premium. During the 2008 financial crisis for instance, stock lending rates frequently rose to well over 10% on highly-rated companies. Meanwhile in fixed income space, off-the-run bonds frequently trade at slightly higher yields than their on-the-run brethren during benign periods (despite containing the same credit and similar duration risk), but much wider spreads during stressful periods.

[9] For a related discussion in the context of Norway's Government Pension Fund, see Chambers, Dimson and Ilmanen (2011), and Ang, Goetzman and Schaefer (2009).

[10] Data presented in Figure 10 is based on the PUT and BXM indices constructed by the Chicago Board of Exchange.

Figure 10: The Volatility Insurance Premium in the US (1986-2012)

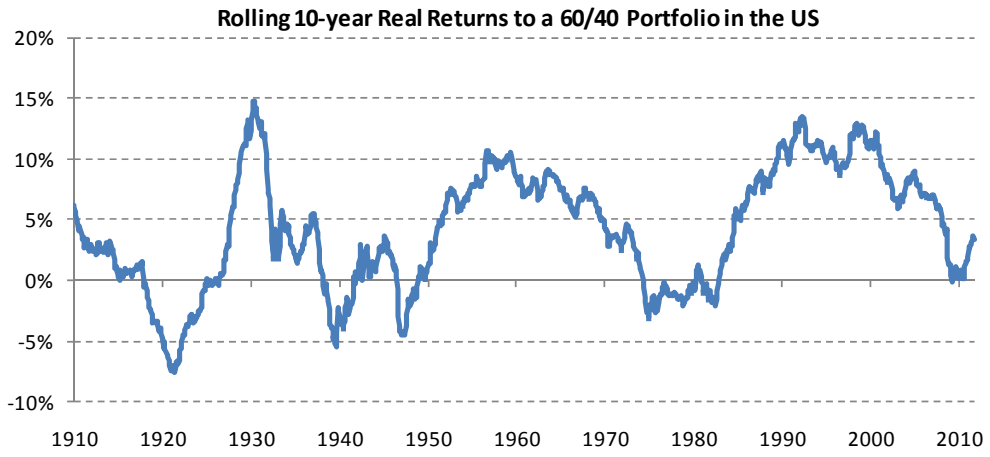
	Selling ATM Puts	Selling ATM Covered Calls	Buy-and-Hold S&P500
Compounded Annual Returns	9.9%	8.8%	8.7%
Standard Deviation	10.9%	11.6%	16.1%
Sharpe Ratio (rf = 4%)	0.54	0.41	0.29
Downside Std Deviation	13.7%	12.5%	13.2%
Sortino Ratio	0.73	0.70	0.66
Maximum Drawdown	-32.7%	-35.8%	-50.9%
Duration of Max Drawdown (Yrs)	3.3	4.3	6.1
Profitable Months	76.2%	70.7%	63.5%
Profitable Rolling 12mth Periods	84.1%	80.7%	77.7%
Monthly Return Skew	-2.5	-1.8	-1.0
Monthly Return Kurtosis	11.3	7.3	3.2
Months with Returns <-5%	5.2%	6.2%	10.1%
Worst Monthly Return	-19.4%	-19.1%	-23.9%
Best Monthly Return	8.6%	9.5%	12.5%
Ratio of Worst to Best Mthly Return	2.3	2.0	1.9

Source: Deutsche Bank, Bloomberg, CBoE. Based on monthly S&P500 total return data from June 1986 – January 2012.

In contrast to the value, illiquidity and volatility style risk premiums to which longer-term investors generally have a natural comparative advantage in harvesting (due to their higher tolerance for intertemporal path dependency risk), high frequency momentum-based strategies are much less likely to suit. Momentum-based strategies necessarily incur much higher turnover than value or illiquidity strategies, and slippage and execution terms will be worse (in some cases much worse) for larger institutions when trading in the general direction of the market. These strategies are likely better suited for smaller, more nimble investors with shorter time horizons and a lower tolerance for price volatility.

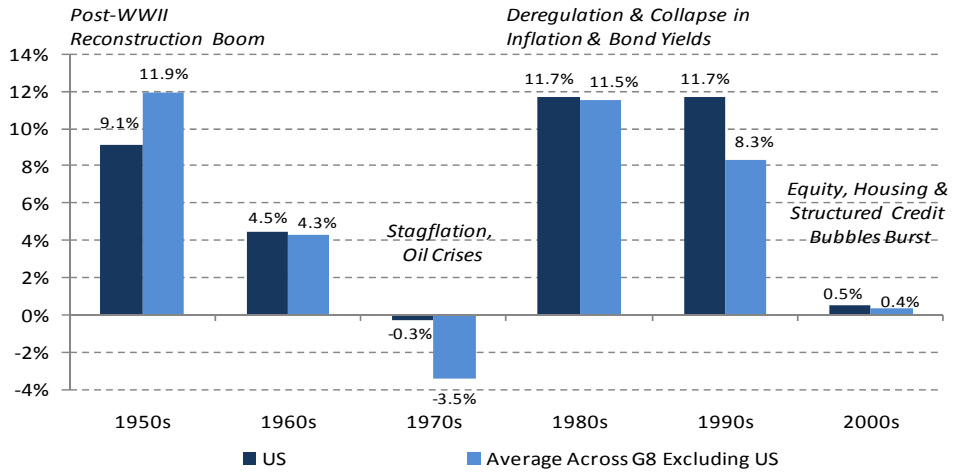
More generally, the recognition that risk premiums are strongly time-varying (and regime dependent) presents an opportunity for strategic asset allocation plans to lean against the wind. For instance, while a domestic 60/40 stock-bond portfolio for US investors has generated a 4.5% real annual average return from 1900-2011, the distribution of returns over time has been anything but constant (Figure 11). Long periods of feast followed by famine have been a notable feature of both the US and wider international experience (Figure 12).

Figure 11: Time-Varying Realized Risk Premiums to a Real 60/40 Portfolio in the US



Source: Deutsche Bank, Robert Shiller Database. 60/40 stock-bond portfolio returns are rebalanced monthly.

Figure 12: Time-Varying Realized Risk Premiums to a Real 60/40 Portfolio, Globally



Source: Deutsche Bank, Robert Shiller Database. Sample countries for the 'G8 excluding the US' are the UK, Japan, Germany, France, Italy, Spain and Canada, with data sourced from "A Roadmap for the Grey Age", Reid and Burns, Deutsche Bank (September 2011).

This is perhaps an appropriate juncture to acknowledge that while the academic community has documented the importance of factor exposures dating back to at least the 1970s (Ross, 1976), there are plausible explanations as to why the strategic investment community has been slow to move in this direction. We posit three possibilities here. First, the 1980s and 1990s were unusually generous to holders of conventional assets, delivering non-repeatable windfall gains in the form of large valuation re-ratings (i.e. real yield compression) for both stocks and bonds. For instance a 60/40 domestic equity-bond portfolio for US-domiciled investors generated compound annual returns of 11.7% p.a. after inflation in both the 1980s and 1990s, with only marginally lower returns on average across other industrialized countries (Jones, 2011b). Following such an extended bountiful period for the investing public, asset allocators seemingly had little incentive to complicate matters. Second, there are non-trivial analytical issues associated with constructing portfolios on the basis of risk factors. Some are easily observable and tradable, others may be one but not the other, and others again may be neither observable nor easily tradable. There may also be substantial degrees of correlation and overlap across factors that have to be addressed. Finally, a risk-factor based approach to portfolio construction may present difficult communication issues for managers who are tasked with explaining the approach to a constituency with a limited grasp of financial jargon. Notwithstanding the attendant difficulties associated with constructing portfolios along these dimensions, it is however worthwhile noting a number of large sophisticated institutional investors have recently begun to calibrate their investment approach along these lines. For instance Denmark's ATP, Canada's PPIB and Calpers are among large pension funds to have made strides in this direction (see Ang and Kjaer, 2011), while SWFs at various degrees of progress include Norway's Government Pension Fund Global, Singapore's GIC, Australia's Future Fund, New Zealand's Superannuation Fund and the Alaska Permanent Fund Corporation. The latter declare their risk factor exposures to the public via their website. For instance, just over a half of the weighting scheme for the Alaska Permanent Fund Corporation is allocated to 'company exposure'. This includes domestic and foreign equities, investment grade and high yield bonds, bank loans and private equity (Figure 13).

Figure 13: Alaska Permanent Fund Corporation – Risk Exposure

Risk Class	Weighting	Purpose	Components	Benchmark
Company Exposure	53%	Harvest risk premias tied to long-term economic growth	US and non-US equity, IG and HY bonds, bank loans, private equity	20% Barclays Global Corp Index & 80% MSCI All Country Index
Special Opportunities	21%	To take advantage of market mis-pricings/anomalies	Absolute return, distressed debt, CMBS, other	Company exposure benchmark
Real Assets	18%	Hedge inflation risk	Real estate, infrastructure and TIPS	75% NCREIF & 25% Barclays US TIPS Index
Interest Rates	6%	Provide insurance against deflation/market crises	US and non-US Govt bonds	Barclays Global Treasury Index
Cash	2%	Manage liquidity and meet expected liabilities	Liquid investments with duration <1yr	3mth T-bill

Source: Alaska Permanent Fund Corporation, Deutsche Bank

Before concluding our discussion on risk premiums, one final point bears mentioning. A long investment horizon can potentially benefit from a statistical concept known as the 'square root of time rule', sometimes used in conjunction with the term, 'time diversification' (the latter suggests that on a relative basis, more volatile assets become relatively less risky over time). The square root of time rule dictates that while drift (expected return) grows linearly with time, standard deviation grows more slowly at the square root of time. In other words, volatility dominates the return generating process over short periods of time, but in the long-run, drift eventually emerges as the more dominant factor as noise washes out (conceptually, it may help to think of volatility as a great sprinter, but drift as the superior marathon runner). To illustrate, take an asset with 15% p.a. expected return (drift component) and 15% annualized standard deviation (the volatility component). The ratio of drift/volatility, or equivalently, signal/noise, is just 6.3% at the daily frequency, but increases dramatically to 70.7% when measured at the semi-annual frequency. Put another way, the probability that an asset generates a positive return on any given day is just 52.5% (barely better than a coin toss), but 76% on a semi-annual basis. As an aside, it is also worth highlighting work in the field of behavioral finance suggesting that because investors tend to feel losses more intensely than gains of the same magnitude, high frequency performance assessment might impose significant emotional costs on staff over time. This suggests strategic investors holding volatile assets need to be aware that very high frequency-based decision-making is unlikely to best serve longer-term institutional objectives.

Issue #3. A market-based risk management process should be multi-dimensional and counter-cyclical.

Risk management encompasses an extraordinarily broad range of issues – not limited to market risk, credit risk, funding and liquidity risk, operational risk and reputational risk. An exhaustive treatment of the topic is beyond the scope of the present analysis, and so below we confine our attention to five issues relevant to the area of market risk. Two of these have already been addressed: First, strategic asset allocation decisions should ideally be taken in a holistic fashion, embedded within the broader economic and asset-liability structure of the sponsor balance sheet (that oil-based SWFs should refrain from buying stock in resource companies would seem self-evident). Second, diversification by underlying risk factors (rather than conventional asset class silos) can help reveal unintended risk concentrations and assist in the construction of 'all weather' portfolios that are robust to a variety of potential scenarios. The remaining three issues are as follows.

- *Embrace Pascal's Wager* – In situations where there is a great deal of uncertainty over the ex-ante probability of outcomes, the consequences of decisions and choices should dominate the probabilities. Put another way, careful attention should be paid to whether Type 1 errors (Errors of Optimism) are more grave than Type 2 errors (Errors of Skepticism). If ex-ante probability estimates are highly unreliable, but it is clear that errors of optimism will threaten one's financial survival more than errors of skepticism, risk management should focus on minimizing the former over the latter.

- *Stress-test on a Forward-Looking Basis* – Forward-looking stress tests, scenario analysis and 'pre-mortems' (a hypothetical analysis of all the possible ways an investment might cause harm to an institution) should form the overarching basis of risk management, at the expense of a pro-cyclical, backward-looking approach centered upon historical data which may not be representative of stressful market conditions (Value at Risk applied to the recent past is one such example). For a long-term investor, valuation and fundamental risk is also arguably a more important consideration than price risk in the recent past (we discuss this in further detail below). Standard applications of the VaR methodology are inherently momentum-based and pro-cyclical, suggesting ramping up leverage when markets are most complacent and risk premiums are unusually skinny. While VaR is still widely employed in one way or another in the industry, the standard application is generally inconsistent with the counter-cyclical objectives of most strategic investors. The search for (counter-cyclical) improvements to existing methodologies constitutes an ongoing and wide-spread research effort. Among the more promising of these is the application of a Bayesian-style framework, where unusually benign recent data are merged with a sample of covariances from highly stressful periods (regimes of tranquility are merged with regimes of turbulence[11]).

- *Manage Drawdowns and Tail-Risk, Consistent with Longer-term Objectives* – While investors with a long time horizon typically have a larger than usual capacity to absorb interim portfolio volatility, each institution should establish in advance a drawdown level at which any additional pain would be intolerable or threatening to its survival. After all, no investor has an infinite pain threshold. These levels could serve as attachment points for tail-hedging strategies. For obvious reasons, deliberations of this nature are best embedded in the investment policy in relatively calm periods, before the wolves are barking at the proverbial door.

  The non-linear mathematics of compounding losses vis-à-vis gains (and in particular the acceleration factor), might also feature in identifying potential attachment points for tail-hedging strategies. For instance while a 10% portfolio drawdown requires just an 11% subsequent recovery to return the portfolio level back to its watermark, a 50% drawdown requires a subsequent 100% recovery, and an 80% drawdown requires a subsequent 400% recovery (Figure 14).

  More generally, there are four ways in which strategic investors with sizeable but not infinite pain thresholds might approach this issue, cognizant of striking a balance between mitigating severe path dependency risk on the one hand, and not overly diluting long-term portfolio performance on the other. First, acknowledge that in the quest for earning higher risk premiums over the longer-term, interim portfolio drawdowns will be inevitable along the journey – attempting to hedge every blip (at or close to the money) will ultimately impart a serious drag on long-term performance and so be counter-productive[12]. Second, given most of the portfolio risk contribution for a large strategic investor will tend to originate from broad macro risk factors rather than bottom-up security selection, and bearing in mind correlations tend to increase (violently) in

[11] See for instance Kritzman and Li (2010)

[12] As at the time of writing, a one-year at-the-money put option struck on the S&P500 with a volatility reference of 20% costs around 9%. This is equivalent to the historical average annual return from holding stocks.

systemic shocks, hedging programs should focus on basis trades that have embedded 'long correlation' exposure. Third, tail-hedging is not immune to valuation considerations – long-term investors (who generally have a comparative advantage in selling rather than buying insurance) are best served in purchasing protection only on an opportunistic (rather than constant) basis, and at attachment points where their survival is threatened. In circumstances where systemic tail-hedges are already expensive, holding cash may be a superior option (we discuss this further below). Fourth and more broadly, assets that pay a small premium in normal times, and large premiums in a crisis, are especially valuable – though increasingly hard to find. While US Treasuries have generally filled this role in the past by nature of their superior liquidity characteristics, it is not written in stone this will always be the case. Hedges well placed to perform 'double or triple duty' by paying off in more than one adverse regime or potential scenario are similarly valuable but difficult to find[13].

Figure 14: Compounding Losses vis-à-vis Gains

Hypothetical Portfolio Drawdown	Subsequent Recovery Required to Restore Portfolio Level to Previous High Water-Mark	Acceleration Factor
10%	11%	
20%	25%	1.4
30%	43%	1.8
40%	67%	2.4
50%	100%	3.3
60%	150%	5.0
70%	233%	8.3
80%	400%	16.7
90%	900%	50.0

Source: Deutsche Bank. We define the Acceleration Factor here as the change in column two divided by the change in column one.

[13] From an empirical perspective, among most conventional and alternative asset classes, CTA hedge fund strategies are one of the very few found to have generally met this criteria.

Issue #4. Institutionalize counter-cyclical behavior.

Unfortunately for any number of institutional and behavioral reasons, the principles of contrarian investment and risk management are substantially easier to articulate than to put into practice. Among the explanations as to why this may be the case, particular types of behavioral biases have attracted substantial academic and practitioner interest in recent years. An interesting thread of this analysis has been to highlight that in periods of heightened stress, the more considered, analytical and reflective decision making processes can be overwhelmed by impulsive fight-or-flight responses in the brain (see Kahneman, 2011). The dangers associated with 'group-think' and consensus-building on investment committees also loom large for institutions wishing to row against the tide and adopt a disciplined contrarian investment stance. There are however a number of ways in which institutions might begin to build a defense against some of the more debilitating negative externalities arising from pro-cyclical behavior. These generally fall under the banner of 'institutionalizing counter-cyclical behavior[14].

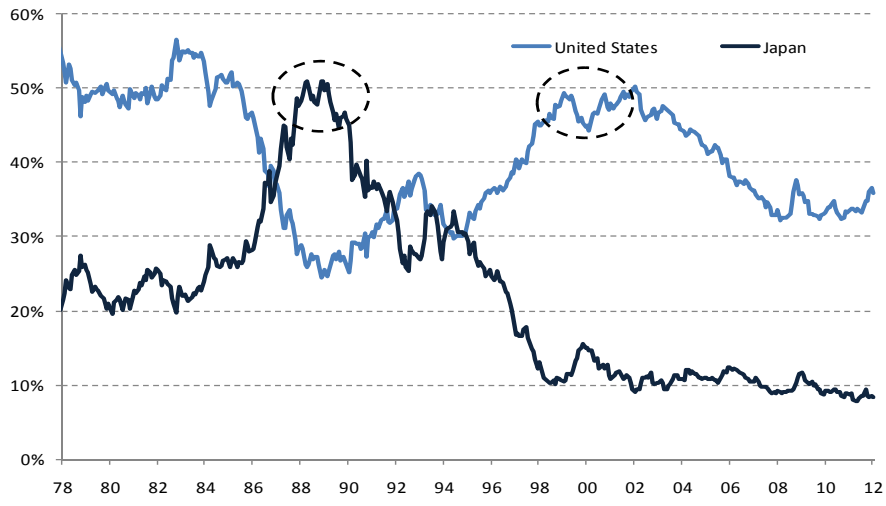
- *Managing Communication and Transparency* – A policy of communicating to the stakeholders a broad range of estimates of interim (unrealized) losses expected to be incurred by the strategic asset allocation plan in the course of harvesting various types of long-term risk premiums may help in advance of volatile periods. For instance, sponsors and trustees of US pension plans may be surprised to learn that while a (domestic) 60/40 stock-bond portfolio mix has compounded at a respectable 4.5% p.a. in real terms since 1900, the same portfolio has in fact generated a negative real annual return in one in every three years, a worst calendar year performance of -31%, and a negative rolling 10 year real return over almost a quarter of the sample (Jones, 2011b). If sponsors and constituents are equipped with some sense of the sort of interim risks that may be incurred from time to time in the pursuit of long-term objectives, periods of poor short-term performance may be less likely to invoke damaging knee-jerk and panicked responses. Similarly, annual fund performance statistics should ideally be reported and presented in the context of the long-term return target or broader objective function. For instance, the annual reports of Australia's Future Fund and Singapore's GIC explicitly couch performance in terms of their long-term return target (10 and 20-year moving average real returns respectively). Very high frequency and granular reporting standards may be counterproductive to long-term objectives in some circumstances (for instance by eliciting unhelpful media coverage after a difficult quarter or a politically-sensitive acquisition in the case of SWF).
- *Valuation-Based Rebalancing* – Reversion to the mean is a powerful anchoring concept for investors of a longer-term persuasion. In practice, rebalancing is usually conducted on a price-basis, though it is debatable this is the optimal course of action for most investors (the very largest investors will however naturally gravitate toward market-cap weighted holdings). Valuation-based rebalancing can serve a dual function both in reducing position sizes when the asset in question is in the midst of a bubble, while also keeping institutions from rushing back to 'buy-the-dip' as the valuation bubble subsequently unwinds. Consider for instance the experience of Japan's Heisei bubble market in the late 1980s, and the TMT-fuelled bubble in the US the following decade (Figure 15). Japan's share of the MSCI World equity market cap exploded from 21% in 1983 to a high of 51% by 1989, while the share of the US in the benchmark world index similarly rose from 30% to 50% between 1994 and 2001. In both cases, investors who ran tight tracking error to the world equity benchmark had half of their capital invested in underlying markets trading at 5.5 times book value and over 30x annual trailing earnings. In both cases, a decade-long period of substantial relative underperformance followed. Unquestioning adherence to market-cap weighted benchmarks is perhaps even more

[14] See also Ang and Kjaer (2011).

damaging in fixed income markets, where the most heavily indebted issuers receive the largest constituent weightings. Note that in any counter-cyclical rebalancing rule, accounting for potential 'regime shifts' and making quality-adjustments to passive benchmarks will be an important consideration, as will the frequency of rebalancing. We should stress again however that selling mania and buying despair does not come naturally to most institutions (if it did, bubbles would not exist in the first place), despite it seeming like a perfectly sensible way in which to conduct investment management.

- *Delineating Price Risk from Valuation and Fundamental Risk* – the term 'risk' in financial markets is frequently used interchangeably with price volatility, likely in response to some of the insights of modern portfolio theory. However price volatility is generally pro-cyclical and hence an incomplete measure of risk for the purposes of strategic asset allocation. Periods of low return variability often occur when valuations are high – in the eyes of a value investor, this will be a high risk period with low expected returns in the future, at the same time measures like VaR might be encouraging increasing use of leverage. Systematically reconciling conflicting price and valuation risk signals (and corresponding estimates of expected future returns) is a difficult, though not necessarily insurmountable challenge in formulating strategic asset allocation plans.
- *Holding Cash* – although the empirical record clearly shows that cash incurs a real opportunity cost over the long-term (note a number of high profile US endowment funds had negative cash positions in the lead up to the global financial crisis), there are a number of situations in which holding unusually large amounts of cash opportunistically may be an optimal strategy for a long-term investor: for instance in situations where the investor may be called upon to perform a stabilization role in absorbing contingent liabilities of the parent; where counterparty risk is unusually elevated; where conventional hedging strategies are unusually expensive; where conventional sources of beta risk are deemed to offer insufficient risk premiums (this was the case for Australia's Future Fund prior to the global financial crisis); or on a pre-emptive basis prior to an anticipated market dislocation, in which the investor could subsequently provide liquidity to a counterparty in search of a buyer of a distressed asset. It should be noted however that the term 'opportunistically' implies the investor has firm reason to believe it can successfully engage in a form of market timing, which may be difficult to institutionalize in a rules-based setting.

Figure 15: Share of the MSCI World Equity Benchmark Market Capitalization



Source: Deutsche Bank, MSCI, Datastream

Issue # 5. Managing agency risk.

Economists have long addressed the misalignment of interests between principals and agents. In a recent discussion of the depth and breadth of issue as it pertains to long-term investors, Swenson (2009) argued that virtually every aspect of the investment management process contains potentially significant conflicts between the interests of the institutional fund and those of the agents engaged to manage portfolio assets. This is most notable when external managers (typically with considerably shorter investment horizons than the principal) are involved[15]. Establishing a clear framework in which the interests of all key stakeholders are more closely aligned poses a significant challenge for every institution.

Effective contract design arguably constitutes the first and best line of defense against potentially damaging agency costs. Effective contract design should cover issues including the period over which performance will be assessed (ideally, over a multi-year horizon), the relative benchmarks against which performance will be assessed (to discourage style creep), and the scope of risks that can be incurred in attempting to generate performance (simply observing realized returns, without accounting for the risks taken along the journey, could lead to a sub-optimal long-term result for the principal). More generally, contract design should be consistent with the broader objection function of the institution.

A particularly interesting case study in this regard emerged by way of the behavior of FX reserve managers over the course of the 2008 global financial crisis. While reserve managers are attached to the central bank of a sovereign and invariably have the primary objective function of macro-stabilization (for instance in cushioning a country against balance of payment shocks), evidence has emerged suggesting the collective pro-cyclical actions of currency managers may have exacerbated the crisis (see Pihlman and Van der Hoorn, 2010). In response to the sharp deterioration in global credit conditions, reserve managers moved around US$500bn out of unsecured bank deposits during the flight to liquidity. The proportion of reserves invested in this asset class fell from 17% in July 2007 to 5% a year later. Besides compounding the funding conditions of the commercial banks in question, this pro-cyclical behavior also had the effect of transferring additional strain to the Federal Reserve and European Central Bank to shore up the broader financial system. This calls into question the conflict between reserve management and the financial stability mandate of the global central banking community. The conflict is unlikely to be resolved as long as reserve managers are assessed on short-term (annual) performance, against benchmarks that have embedded credit exposure. From a decision theory perspective, this behavior has its roots in the paradox of thrift, prisoner's dilemma and the fallacy of composition – essentially what may have been optimal for the individual was sub-optimal for the entire system. As noted by Pihlman and Van der Hoorn (2010), reserve manager performance benchmarks with longer-duration holdings of high-quality sovereign bonds (rather than short-dated credit exposure) may be one way in which to realign the interests of the agent with those of the principal sponsors (the central bank and sovereign). They could for instance expect to repo-out such paper in a crisis and hence make up for the opportunity cost incurred with holding (underperforming) quality paper during benign periods. In short, reserve managers should be incentivized to become less adventurous in normal times, but more so in times of crisis, in keeping with the broader objective of the central bank and sovereign in maintaining financial stability. Understandably, there is now momentum under way for the IMF to conduct a thorough review of its Guidelines for Foreign Exchange Reserve Management template.

[15] While external management presents its own challenges, particularly in respect to agency issues, these should be balanced against other benefits that it can bring. Large institutions are better placed than most to extract concessions from and gain access to high quality and otherwise closed external managers (as compensation for large ticket sizes and/or longer-than-usual lockups). Meanwhile smaller start-up pension, endowment and SWF operations with few internal resources and an inexperienced staff can benefit from both technology and intellectual transfers (for instance junior staff may be seconded out to shadow experienced external portfolio managers for a period of time).

Concluding Remarks

The core objective functions of longer-term investors like pension funds, insurers, endowments and sovereign wealth funds (SWFs) can differ widely, and policy prescriptions should be tailored accordingly. Notwithstanding this diversity, there are however important areas of commonality across this broad investor group. This paper attempts to bind together these areas of mutual interest in presenting a general framework, comprised of five elements, in which longer-term investors might look to nest their strategic asset allocation programs.

First, strategic asset allocation objectives should ideally be established in the context of a comprehensive and integrated policy framework, accounting for the broader economic and asset-liability structure of the parent corporate or sovereign. In other words, asset allocation should not be set in an informational vacuum divorced from the parent structure, as this raises the specter of unintended concentrations of risk. For instance in cases where the investment portfolio is completely unconstrained, it might inadvertently 'double down' on a source of risk to which the parent's fiscal accounts are already heavily exposed (such as falling commodity prices in the case of a small open commodity-exporting economy). In this regard, to date corporate pension plans have generally made more progress in immunizing against unwanted risk exposure than their SWF counterparts in our experience.

Second, the strategic asset allocation of an institution should be diversified across a wide number of risk factors and risk premiums, rather than conventional asset classes (which are simply bundles of underlying risk factors). Diversification by underlying risk factors can also reveal unintended risk concentrations and so assist in the construction of 'all weather' portfolios that are more robust. **Moreover, there is a strong case that risk factor tilts should be calibrated to the institution's source of comparative advantage in the market place**. Generally speaking, given their relatively more stable risk preferences and higher tolerance for intertemporal path dependency risk, longer-term investors are particularly well suited in absorbing the types of risks most other investors pay an often sizable premium to avoid. As such, counter-cyclical and market-stabilizing liquidity provision during crises, with a heavy value bias, should generally feature prominently. This explicitly acknowledges that risk premiums are not constant through time, but rather are time-varying. In the case of official sector institutions charged with the dual mandate of generating long-term returns alongside maintaining broader financial market stability, a counter-cyclical value and liquidity provision bias is especially appropriate, particularly during periods of elevated stress.

Third, the market-based risk management process should be established on multi-dimensional grounds with a counter-cyclical bias. Standard applications of the VaR methodology are inherently momentum-based and pro-cyclical, calling for an increase in leverage when markets are most complacent and risk premiums unusually skinny. This is generally inconsistent with the counter-cyclical objectives of most long-term investors. Forward-looking scenario analysis has a role to play in mitigating some of the limitations of conventional VaR approaches. The application of tail-risk insurance overlays will depend largely on the broader risk tolerance and objectives of the fund. Institutions with a particularly strong ability to handle intertemporal path dependency risk may look to sell this form of insurance (particularly when premiums are already elevated) to investors more sensitive to path dependency shocks.

Fourth, institutions should aim to build a defense against some of the more debilitating negative externalities arising from pro-cyclical decision making, by attempting to institutionalize counter-cyclical behavior where possible. A valuation-based rebalancing rule for the policy portfolio, and a process which distinguishes price volatility from longer-term valuation risk, may constitute helpful steps in this direction. The

communication and presentation of annual investment performance results should also be conducted in the context of the longer-term objectives of the fund.

Fifth, agency risks should be explicitly addressed so as to minimize the (time-inconsistency) wedge that often emerges between the interests of the agent, and those of the principal. Effective contract design constitutes arguably the first and best line of defense against agency costs, and should be consistent with the broader long-term objective function of the institution. The pro-cyclical behavior of FX reserve managers during the global financial crisis might serve as a shot across the bow in this respect.

Finally, we leave for future research a treatment of the unintended consequences of the forced structural de-risking of some long-term private sector investors (notably insurers and pension funds)[16]. The demographic and regulatory winds of change are now blowing against risky assets (not to mention the formidable economic challenges) in many developed nations[17]. While SWF assets currently comprise less than one-tenth of pension fund assets, sovereigns now hold more than US$10 trillion in foreign exchange reserves (almost 40% of pension fund assets), with nearly two-thirds of these held by Asian countries. As reserve holdings now comfortably exceed reserve adequacy requirements in a large number of countries, it is likely that SWF assets will continue to swell rapidly in the years to come. Might SWFs therefore have an important counterbalancing role to play in offsetting the retreat of some longer-term private investors from assets like equities that exhibit high short-term price volatility, but also tend to present high long-term risk premiums and are essential for the healthy functioning of the global economy and international financial system? On a related note, domestic stability concerns and those of the broader financial system can sometimes come into conflict (as the behavior of reserve managers recently demonstrated). Institutions and researchers charged with the responsibility of maintaining broad financial stability might be well placed to investigate further the conditions in which both the official sector and longer-term private investors could be incentivized to lean against the wind.

[16] A similar line of inquiry was proposed in the IMF's September 2011 Global Financial Stability Report.

[17] This is despite defined-benefit pension funds, which constitute around 56% of total pension fund assets under management globally, having a funding ratio of just 75% as at end-2010 (Source: Towers Watson).

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Appendix 1

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Additional information available upon request

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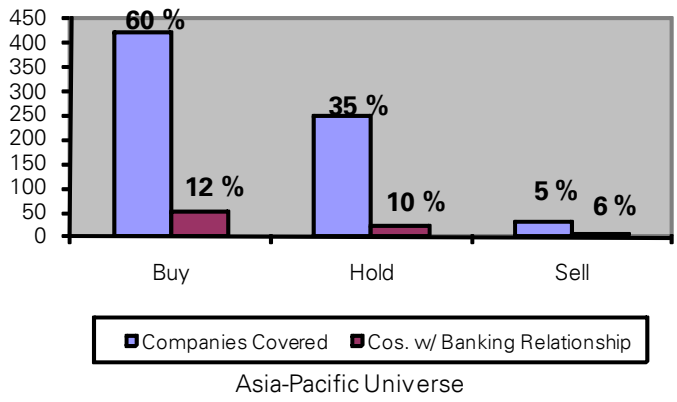
Equity rating key	Equity rating dispersion and banking relationships

Buy: Based on a current 12- month view of total share-holder return (TSR = percentage change in share price from current price to projected target price plus projected dividend yield) , we recommend that investors buy the stock.
Sell: Based on a current 12-month view of total share-holder return, we recommend that investors sell the stock
Hold: We take a neutral view on the stock 12-months out and, based on this time horizon, do not recommend either a Buy or Sell.
Notes:
1. Newly issued research recommendations and target prices always supersede previously published research.
2. Ratings definitions prior to 27 January, 2007 were:
Buy: Expected total return (including dividends) of 10% or more over a 12-month period
Hold: Expected total return (including dividends) between -10% and 10% over a 12-month period
Sell: Expected total return (including dividends) of -10% or worse over a 12-month period



Asia-Pacific Universe

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