
**The Sovereign Wealth Fund Initiative
Summer 2012**

On the Need to Rethink the Endowment Model...Again

**Patrick J. Schena
Eliot Kalter¹**

It has, it seems, become *de rigueur* to attribute a certain legitimacy to stylized models of sovereign investment strategies. While a convenient means to conceptualize and catalog investment programs, such efforts often mask the complexities which actually drive investment strategy, including the allocation decisions across asset classes and maturities and the more critical matter of liability structures, whether explicit or contingent. Recent commentary concerning the evolution of the so-called “endowment” model is a case in point.² The crux of this comparative exercise was based originally on evidence of long-term out-performance by large endowments attributable to a propensity to investment in less liquid investments with relatively higher return structures. Certainly, these investment strategies warranted and received careful examination by sovereign wealth funds (SWF).

While it is true that SWF’s have been attracted to university endowments as models of institutional investment, this interest has not been relegated exclusively to sector and class allocation, especially in alternative assets, but rather also extended to organizational and governance structures as they might support or enhance the investment process. However, in the aftermath of the recent financial crisis and especially poor performance, with a particular focus on the Harvard endowment, these strategies have come under intense scrutiny. As Tony Tan, formerly deputy chairman of the GIC of Singapore noted over two years ago, the idea of the endowment model had become influential, but inherent challenges, related primarily to liquidity, required all investors to rethink the efficacy of the strategy.³

¹ Patrick Schena, PhD, is Adjunct Assistant Professor at the Fletcher School. Eliot Kalter, PhD, is President of EM Strategies. Both are Senior Fellows and Co-Heads the Sovereign Wealth Fund Initiative, The Fletcher School, Tufts University

² See for example: http://ai-cio.com/channel/RISK_MANAGEMENT/The_Norway_v_Yale_Models_Who_Wins_.html and <http://www.swfinstitute.org/swf-article/yale-vs-norway-swf/>.

³ Gillian Tett, “Singapore’s Lesson from the Harvard Model”, *Financial Times*, 8 April 2010,

A continuing dialog regarding the endowment model in and of itself has little practical benefit. However, we suggest here that the challenges posed by what we refer to as the three “L’s” – liabilities, liquidity, and the definition of long-term – are contributing to a more critical analysis of the inter-relationships between the nature and risks posed by liability structures of investment funds, the definition and price of liquidity risk⁴, and a fund’s investment horizon. The contemporary relevance of these inter-relationships is further accentuated by a market environment characterized by low returns on “safe assets” and higher volatility within and co-variance across asset classes.

In this short research note, we revisit the discussion of the endowment model again in order to explore an agenda for future research that will hopefully (and eventually) free us from a fascination with models in favor of a more balanced analysis of the critical factors which define investment allocation strategies, their monitoring and review, and their evolution based on changes in the behavior of global investors, our understanding of pricing and risk structures under stress, the inter-relationship between the two, and the impact for both on the liquidity of assets. The balance of this short note first establishes a baseline from which to rethink the endowment model; it next defines the three “L’s”, and then presents some recent evidence of the investment behavior of endowments relative to other investment vehicles – namely pension funds and SWF. It ends with some prescriptive comments on an agenda for future research. Our modest objective in this brief is to encourage the nascent intellectual/practitioner search for solutions to the liquidity risk puzzle.⁵

I. Defining the “Endowment Model”

An endowment, as the term is used here, refers to an investment vehicle (rather than a “donation”, i.e. the act of endowing). These vehicles may be funded by donations, as for example from university alumni, or other flows with the objective of generating return income to be used for specifically defined purposes. Thus generally, an endowment model will seek to preserve aggregate principle contributions, while using income generated through its investing activities to fund charitable expenditures, recurring operating expenses, and other expenses of the institution. That is there is a clearly defined relationship between the investment objectives and activities of the vehicle and its short term liabilities as defined generally by fund outflows. In the case of university endowments, it is important to establish from the outset that a key function of endowment returns is to fund campus operations, including operating and capital outlays. Thus, university endowments by design must support annual university spending requirements.

As used in a contemporary investment context, the “endowment model” has come to refer to a strategy of investment allocation popularized by large university endowments, primarily Harvard and Yale. Accordingly, we look to both (as have SWF and other institutional

⁴ Perhaps more appropriately we should refer to the risk of converting assets into cash as “illiquidity” risk.

⁵ We define this as solving for the optimum level of liquidity risk at the portfolio level relative to a fund’s liability structure and opportunity cost of liquidity as proxied by prevailing illiquidity risk premia.

investments) for definitional guidance. Interestingly, the Harvard Management Company defines the “endowment model” “a theory and practice of investing...[that] is characterized by highly-diversified, long-term portfolios that differ from a traditional stock/bond mix in that they include allocations to less-traditional and less-liquid asset categories, such as private equity and real estate as well as absolute return strategies.”⁶

Seconding and extending this definition, the Yale University Investment Office adds that the allocation to nontraditional asset, i.e. alternative, classes is a function of return potential and diversification benefits. In addition, as the Yale team stresses, because alternative assets are less liquid and exhibit less efficient pricing relative to traditional marketable securities, when considered in light of the endowment’s long horizon, they provide a justification for more active management styles.⁷ As a result, both the Harvard and Yale programs have had allocations to asset classes such as hedge funds, private equity, and real assets in excess of 50% of total portfolio holdings.⁸ Testifying to the efficacy of this approach both the Harvard and Yale programs have enjoy strong investment performance over both 10 and 20 year investment horizons. We refer the reader to Box Case 1 for a description of Harvard’s endowment management model and horizon returns.

Box Case 1: Harvard Management Company and the Harvard University Endowment

The Harvard Management Company was established in 1974 to serve as the manager of the Harvard University endowment. HMC’s stated mission is to “produce long-term investment results to support the educational and research goals of the University.”

HMC describes its investment approach as a “hybrid model” whereby it employs both internal and third party managers in an active management style to allow it “to be nimble and responsive to changing market conditions”.

The underlying framework for HMC’s asset allocation decisions is the use of a Policy Portfolio, “a theoretical portfolio allocated among asset classes in a mix that is judged to be most appropriate for Harvard University from both the perspective of potential return and risk over the long term.” In addition to liquid assets, the Policy Portfolio less-liquid assets, including private equity, real estate and absolute return strategies. The Policy Portfolio is set by the HMC Board and management team and reviewed periodically based upon changes in market circumstances and the University’s overall risk profile. Since 1995 the Policy Portfolio has seen an especially heavy increase in allocations to absolute return and real asset strategies as both together have grown from 13% to 39% of the Policy Portfolio. Allocations to private equity remained relative constant during the same period at 12%.

Arguably aggressive, the Policy Portfolio is the basis for HMC’s investment allocation decisions and so drives the return and risk profile of the endowment. Over long horizons, HMC has significantly outperformed the policy portfolio benchmark, returning 9.4% (versus a benchmark return of 6.7% over the last 10 years) and 12.9% (versus 9.8%) over a 20 year horizon.

Source: Harvard Management Company’s website at <http://www.hmc.harvard.edu>

⁶ See Harvard Management Company Endowment report, October 2010\

⁷ See The Yale Endowment update (2011) at http://www.yale.edu/investments/Endowment_Update.pdf

⁸ See Timothy Keating, “The Yale Endowment Model of Investing Is Not Dead”, RIABiz at <http://www.riabiz.com/a/776012>

Certainly the size and scale of the Harvard and Yale programs dwarf those of many smaller colleges and universities. Nonetheless, the general allocation strategy prevails among endowments. The National Association of College and University Business Officers (NACUBO) reports, for example, that allocations to alternative assets progressively grew from 4.3% of member institution endowments in 1993 to 25% by 2008.⁹ In fact, when defining alternative assets to include hedge funds, PE, and real assets, allocations among all university endowments averaged about 45% of total holdings.¹⁰ With respect to performance, for the 10 year period 2002 to 2011, the average annual return of NACUBO member endowments was 5.24%¹¹. This compares relatively favorably to an annualized return of 4.3% for a 60/40 stock/bond portfolio for the same period.¹²

It has become accepted practice to contrast the endowment model – whether Harvard or Yale – with its presumed antithesis, frequently defined as the so-called “Norway” Model.¹³ [Norway’s Government Pension Fund Global](#) (GPFG) is among the world’s largest institutional investors at over \$500B (and well over 10 times the size of the largest university endowments). Established in 1990 as one of the earliest SWFs, the GPFG, unlike an endowment, is funded through petroleum revenues, net of financial transactions related to petroleum activities and other expenditures required to balance the state’s non-oil budget deficit.¹⁴ Transfers from the fund are only made to Norway’s state budget to cover the annual oil-adjusted budget deficit. Thus, the fund’s outflows in any year will be a function of state tax receipts and the overall performance of the Norwegian economy.¹⁵ Like endowments, the fund maintains a long investment horizon. However, philosophically the GPFG maintains that markets are largely efficient and so relies heavily on traded securities with a focus on beta, versus alpha, returns. Additionally, the fund operates transparently under strict rebalancing rules and so is relatively more tolerant of short-term volatility and short-term capital losses.¹⁶ Interestingly, the fund’s rebalancing rule in some respects enforces the GPFG’s harvesting of illiquidity premia by forcing the management to buy equities when prices decline relative to bonds, then selling when prices rise.¹⁷

⁹ See Andrew Ang, “Liquidating Harvard”, Columbia Case Works, ID#100312, June 25, 2012, Exhibit 9, p 37

¹⁰ Keating, “Yale Endowment Model”

¹¹ Calculated from annual return data from the 2011 NACUBO Commonfund Study of Endowments. See: http://www.nacubo.org/Documents/research/2011_NCSE_Public_Tables_Annual_Average_and_Median_Investment_Rates_of_Return_Final_January_17_2012.pdf

¹² See <http://www.hmc.harvard.edu/investment-management/performance-history.html> as cited by Harvard Management Company.

¹³ While there are many descriptions of the investment practices of Norway’s Government Pension Fund Global (GPFG), among the best analytically is David Chambers, Elroy Dimson, and Antti Ilmanen, “The Norway Model”, *The Journal of Portfolio Management*, Winter 2012, Vol. 38, No. 2: pp. 67-81

¹⁴ See <http://www.nbim.no/en/About-us/Government-Pension-Fund-Global/>

¹⁵ Chambers et al, “The Norway Model”, p 3

¹⁶ Ibid, p 7

¹⁷ See Andrew Ang, “Harvesting Illiquidity Premiums”, presentation to the Investment Strategy Summit 2012 of Norway’s Government Pension Fund Global, November 2011 as accessed here <http://www.regjeringen.no/pages/35828564/ang8nov2011.pdf>

On the surface then, the primary differentiator of the endowment model would appear to be its approach to investment strategy and asset allocation and so its heavy reliance on alternative assets. While this remains the basis for the juxtaposition, Norway's benchmark portfolio itself has evolved over time. In 2008 in fact the GPF's investment mandate was expanded to include up to a 5% allocation to real estate. The rationale for real estate is based upon a turn to absolute returns, albeit slight and narrowly circumscribed in the case of Norway.¹⁸

We believe that the expansion of the GPF's investment mandate reflects a broader strategy among long-term institutional investors, including pension funds, sovereign wealth funds, and endowments, to meet investment objectives in an environment of low "risk-free" returns, increased volatility of asset returns, and higher co-variance across markets. This has manifested itself in managers' search for higher returns and greater portfolio diversification through increased allocation to alternative assets, while simultaneously managing liquidity requirements. We return to this theme in Section III below.

II. Grasping the Three "L's": Liabilities, Liquidity, and the Definition of Long-Term

A prevailing fascination with such "models" of asset allocation notwithstanding, we contend that the central analytical focus of institutional investment strategies should rather be to advance the understanding of the critical inter-play between investment horizon, the nature and risks posed by the liabilities of funds, and the way liquidity risk is defined, priced, and eventually managed. We propose therefore to move beyond discussions of allocation strategies per se to a deeper understanding of what we refer to here as the three "L's" – liabilities, liquidity, and the definition of "long-term".

The role of liabilities and other contractual outlays of capital is a critical factor in defining portfolio strategy. In a structural sense these are not within the control of management to impact or influence. However, this is not necessarily always the case. In fact, investment selection by managers can create both explicit and contingent liabilities, as well as contractual demands on funds. For example, heavy use of derivatives can result in margin calls and so increases in committed collateral. Similarly, sizeable commitments to private equity can be accompanied by capital calls which will require managers to increase their positions. Inherently there is a fundamental link between liabilities and capital requirements and the liquidity required to service them.

Broadly defined liquidity risk arises in the inability of a fund to efficiently meet a third-party, contractual demand for a cash payment or to promptly and effectively convert a security holding into cash. The means by which one measures and manages liquidity risk is therefore

¹⁸The mandate made no provision for investments in other alternative assets. See Investment Mandate – Government Pension Fund Global (GPF) at <http://www.nbim.no/Global/Documents/Governance/CEO%20Investment%20Mandate%20Government%20Pension%20Fund.pdf>

contextual. However, this is further complicated by the environmental sensitivity of liquidity risk to exogenous factors. For example, in periods of abundant liquidity, premiums fall as investors search for yield. In crisis periods, liquidity becomes very dear, as investors demand considerable premia to hold less liquid assets. These assets can be acquired cheaply for those in a position to hold such securities. However, if investors are forced to sell securities prematurely (e.g. in the case of a "tail event"), they may realize significant holding period losses.¹⁹ Thus, the challenges of illiquidity can encourage more risk-averse investor behavior with respect to both liquid and illiquid assets. As noted, this risk aversion will be influenced by market conditions, including the behavior of other investments, and so is time varying.²⁰ Furthermore, such behavior complicates the investment decision-making of long horizon investors particularly as they are exposed to the vagaries of co-investors with shorter horizons or under the pressure of "mark-to-market" triggers, i.e. what Gillian Tett refers to as "a contagion of investor style".²¹ (The experiences of Harvard Management during the 2008 financial crisis, highlighted in the Section III, are a case in point.)

Though long-horizon investors are certainly still subject to short-term investment pressures, they nonetheless retain the flexibility to invest in illiquid asset classes and so have the advantage of being less subject to liquidity calls resulting from *short-term* liabilities.²² However, as Ang notes, a long investment horizon does not itself justify an investment strategy with high allocations to illiquid assets. Rather, investment allocations to illiquid asset classes should be a function of the opportunity cost of liquidity, which is defined by the demands created by the liabilities of the fund, its governance structure, and its capacity to harvest premia.²³

According to Ang, there are several ways to harvest illiquidity premia. Certainly as endowments and some SWF have done, one can simply establish a static allocation to an illiquid asset class such as real estate or natural resources at the portfolio level. Alternatively, funds may employ dynamic strategies at the portfolio level by serving as a "seller" of liquidity through the purchase of risky assets offered by other funds or serve as a market maker. Lastly, managers can employ more selective strategies by absorbing liquidity premia on securities within an asset class that are more illiquid.²⁴

¹⁹ Spiegel, "Which Financial Benchmarks and Other Incentives Work for Long-Term Investing" in Bolton et al.

²⁰ Andrew Ang and Knut N. Kjaer, "Investing for the Long Run", in Bolton et al

²¹ Tett, "Singapore's Lessons from the Harvard Model"

²² Spiegel defines long-term investors as a function of the liability structure of the fund: long-term investors have long-term liabilities, so less need to raise liquidity in the short-term to meet short-term obligations or as a function of short-term incentives, such as performance. Shari Spiegel, "Which Financial Benchmarks and Other Incentives Work for Long-Term Investing" in Patrick Bolton, Frederic Samama, and Joseph E. Stiglitz, *Sovereign Wealth funds and Long-Term Investing* (Columbia University Press, 2012)

²³ Andrew Ang, "Harvesting Illiquidity Premiums"

²⁴ Ibid.

III. A Brief Comparative Review of Institutional Allocation Strategies

Certainly managers of pension funds, sovereign wealth funds and endowments have common investment objectives and challenges, as these institutional investors aim to meet demands for strong performance to satisfy growing budgetary needs even as returns from low-risk assets reach historic lows. Pension funds in most industrial countries face an aging population with a rising proportion of workers reaching retirement age. Defined benefit pension programs face growing budgetary deficits while workers in defined contribution plans face lower retirement incomes. Similarly, university endowments, via an aggressive asset allocation strategy, have sought to provide higher returns over long periods of time in order to maintain the purchasing power of universities to meet expanding budgetary needs. As stated in Harvard Management Company 2011 Endowment Report, “given the University’s high degree of dependence on the endowment for its operations, we are ever-more convinced that strengthening the portfolio for steady growth over many years will yield the best long-term results for Harvard”.²⁵ Like pension funds and endowments, certain types of sovereign wealth funds also face demands on their capital, while being strapped with constraints on asset allocation and selection. SWFs have various mandates, including stabilization, savings, pension reserve, and investment reserve, which result in alternative liability structures. Generally speaking the challenge of SWF managers is to link allocation decisions to the fund’s short and long-term demands for liquidity.

In the current financial market environment, managers of pension funds, SWFs and endowments face record low returns and continuing high volatility among risky assets. Also, institutional investors are still recovering from the 2008 financial crisis, with assets levels only just reaching pre-crisis levels in some cases. One might, therefore, have expected institutional investors to selectively increase their asset allocation to alternative investments to gain higher risk-adjusted returns. We examine these investment programs, as we seek evidence of a convergence of strategies driven in large measure by historically low returns, higher structural requirements for liquidity, and a greater appreciation for the cross-correlation of liquidity risk between asset classes.

We begin with the “endowment model”, which has embraced alternative assets. During the 2008 financial crisis, many endowments, most especially among the largest, were forced to sell assets on unfavorable terms to meet the budgetary requirements of their institutions. These funds became caught between the proverbial rock of liquidity demands resulting from capital calls and collateral requirements and the “hard place” of rapidly deteriorating asset values. As Exhibit 1 demonstrates, the result among university endowments was a dramatic deterioration in the market valuation of fund holdings from -3% in 2008 to -18.7% in 2009. In fact, the 2009

²⁵ Harvard Management Company Endowment Report Message from the CEO, September 2011

losses of the Harvard and Yale endowments both significantly exceeded this average (at 27% and 25% respectively²⁶).

Exhibit 1

**Average and Median Annual Rates of Return*,
Fiscal Years Ending June 30, 2011-2002**

	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002
	%	%	%	%	%	%	%	%	%	%
Average	19.2	11.9	-18.7	-3.0	17.2	10.8	9.3	15.3	3.2	-6.2
Median	19.8	12.1	-19.1	-3.3	17.5	10.8	9.1	16.0	2.9	-6.4

Source: 2011 NACUBO-Commonfund Study of Endowments

Though returns rebounded, endowment managers were forced to revalidate the very foundations of their investment strategies. Harvard in particular experienced this illiquidity challenge in 2008 when large holdings of illiquid assets could not be immediately liquidated to raise cash to meet fund expenses and other short-term liabilities.²⁷ As demonstrated previously, the Harvard endowment's target allocation to alternative assets (defined as hedge funds, real assets, and private equity) was at 25% of total assets in 1995, rising to 48% in 2005. Since then (see Exhibit 2 below) the target allocation has risen to 51% (2012). However, allocations to cash, which were -5% in 1995 (and remained at -5% in 2005) were increased by 5% by 2012 to a new target allocation of 0%.

Exhibit 2

	1995	2005	2012
Domestic Equities	38%	15%	12%
Foreign Equities	15	10	12
Emerging Markets	5	5	12
Private Equities	12	13	12
Total Equity	70	43	48
Absolute Return	0	12	16
Commodities	6	13	14
Real Estate	7	10	9
Total Real Assets	13	23	23
Domestic Bonds	15	11	4
Foreign Bonds	5	5	3
High Yield	2	5	2
Inflation-Indexed Bonds	0	6	4
Total Fixed Income	22	27	13
Cash	-5	-5	0
TOTAL	100%	100%	100%

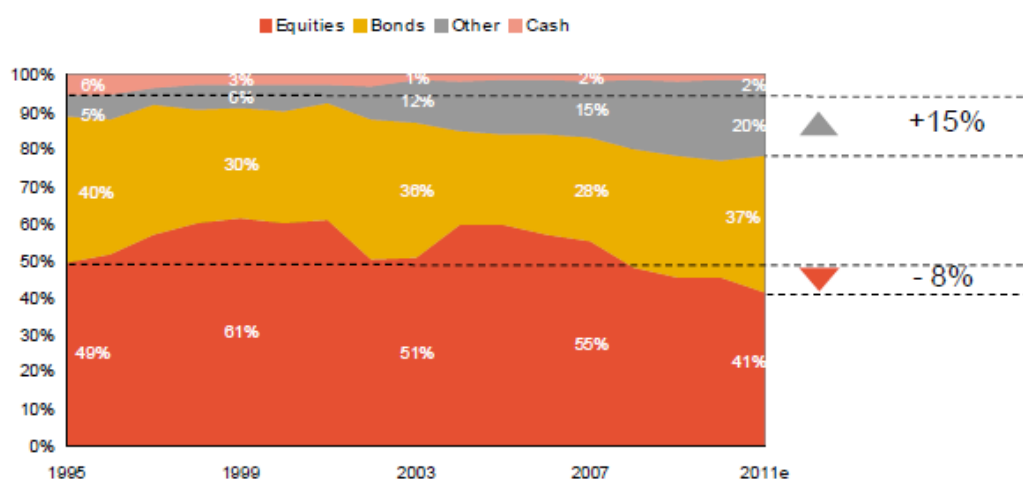
Source: Harvard Management Company

²⁶ See Keating, "Yale Endowment Model"

²⁷ For an interesting, detailed discussion of Harvard case, see Andrew Ang, "Liquidating Harvard" cited previously

In the period 1995 to 2012, pension funds have diversified across asset classes also with increasing allocation to alternatives. Exhibit 3 presents the changing landscape of pension allocations over this horizon. One notes that allocations to publicly traded equities (in particular emerging markets), bonds and cash have declined throughout the period while the allocation to alternatives has increased from 5% to 20%. A closer look also shows that following the financial crisis, the allocation to publicly traded stock declined, that to alternatives continued to rise, while the allocation to bonds increased by 9% to 37%.²⁸ Thus, it appears that pension managers have met their return and diversification objectives through increased allocations to alternatives²⁹ while meeting their liquidity and cautionary objectives by increasing their allocation to fixed income.

Exhibit 3



Source: Towers Watson and secondary sources

Trend data on SWF asset allocation is currently not adequate to draw definitive parallels. However, there is sufficient evidence to suggest that SWF allocations to alternative assets are also expanding (note Norway itself modestly). This was especially evident during the period between 2008 and 2010.³⁰ The type of SWF investments and extent of diversification of course vary greatly depending on mandate. Still, among SWF with savings and pension reserve mandates allocations to alternative assets exceed 20% of assets under managements.³¹ A case in point is that of Singapore's GIC. We reference Exhibit 4 below based on data derived from GIC annual reports for the fiscal years ending March 2008 through 2011. Of note, the GIC increased its allocation to alternatives during 2008 (fiscal year ending March 2009), only to moderate its

²⁸ Towers Watson, "Global Pension Assets Study 2012", January 2012, p 27

²⁹ See Alexandar Andonov, Rob Bauer, and Martijn Bremers "Pension Fund Asset Allocation and Liability Discount Rates: Camouflage and Reckless Risk Raking by US Public Plans, Working Paper, May 2012 for an interesting analysis of the trends toward more risk investment strategies among US public pension plans.

³⁰ International Monetary Fund, "Global Financial Stability Report, September 2011, Ch 2; see especially p 29

³¹ Ibid.; see Figure 2.7

holdings in the asset class in the subsequent period. Nonetheless, the GIC's holdings in alternatives is believed to be at least 25% of its assets under management. Also, of note curiously is the GIC's contrarian *reduction* to its allocation to cash. (Unfortunately, we do not have sufficient data to analyze this decision in the broader context of the GIC's liquidity position.)

Exhibit 4

		Mar-11	%	Mar-10	%	Mar-09	%	Mar-08	%
Public Equities	Developed Markets	34	49	41	51	28	38	34	44
	Emerging Markets	15		10		10		10	
Fixed Income	Nominal Bonds	20	22	17	20	19	24	20	26
	Inflation-Linked Bonds	2		3		5		6	
Alternatives	Real Estate	10	26	9	25	12	30	10	23
	Private Equity & Infrastructure	10		10		11		8	
	Absolute Return Strategies	3		3		3		3	
	Natural Resources	3		3		4		2	
Cash & Other	3	3	4	4	8	8	7	7	

Source: Government of Singapore Investment Corporation, various annual reports

We return to the opening point of this section, namely the commonality among managers of pension funds, SWFs and endowments in meeting the challenges higher returns, reduced risk, and greater liquidity. Anecdotally, we suggest there is reasonable evidence of a convergence of management responses that include an emphasis on alternative assets for high returns and diversification, but with measured approaches to market risk and liquidity through increased allocations to both fixed income (pension funds) and cash (endowments).

Among endowment managers in particular, sizable allocations to alternatives very clearly established the need to maintain sufficient liquidity to accommodate *inclusively* budgetary (operating and capital) requirements, capital/investment commitments, collateral requirements, and the challenges posed by market volatility, including bouts of periodic contagion. Similarly, among pension and SWF managers, the liquidity constraints posed by increased allocations to alternative assets, in the broader context of the dramatic post-crisis declines in asset values, highlighted the need to reduce market risk, increase liquidity levels, and prepare for extreme market events. Complex challenges nonetheless remain regardless of one's asset allocation strategy: how to meet increasingly demanding return requirements, while managing the dual risks of illiquidity, under changing market conditions, and "fat tail" events.

IV. Toward a Research Agenda: Some Thoughts on a Way Forward

We believe that this nexus of return requirements, liability structures, and illiquidity risk has risen preeminently to among the critical strategic investment issues facing all institutional investors. Whether a central bank, sovereign wealth fund, pension fund, or endowment, managers are sensitive to their ability to meet the need for more reserves to affect currency

interventions or additional capital to fund larger budget gaps, to meet the reserve requirements of pensioners, or to satisfy the annual spending rates of university endowments.³²

A 2009 study by JP Morgan Asset Management observed that prevailing market conditions in the wake of the 2008 global financial crisis did not present investment opportunities that maximized the probability of meeting minimum return requirements, while minimizing the probability of negative returns. These market conditions generally persist and have forced managers to carefully evaluate the risk-return trade-off in the context of investment strategies that leverage high allocations to risk assets in order to improve the probability of meeting minimum return requirements at manageable levels of portfolio risk.³³

As we look forward, we posit that there is a basis for a unifying model of investment management that does not abandon the foundations of modern portfolio theory, but instead draws on and extends existing theory to inform the changing investment behavior of institutional investors under conditions of market stress, including the collapse of investment yields, a convergence of correlations among risky assets, and continuing bouts of illiquidity. To this end, we offer here several thoughts toward a broader research agenda that we hope will contribute to such a model, while also advancing definition and analysis of what we referred to above as the liquidity puzzle.

First, institutional investors must develop investment and operations frameworks through which to observe and monitor not only their own liquidity requirements, but also the levels of liquidity that certain asset classes can provide.³⁴ The objective here is to carefully evaluate liquidity management in practice in order to ensure that portfolios maintain sufficient liquidity to mitigate future stresses, whether related to liquidity specifically or other stresses related to a rapid downward shift in asset values.³⁵

Second, with regard to portfolio stress, we highlight specifically a need to understand second order effects, for example such as those related to contingent liabilities, that may not be overtly apparent by a simple consideration of assets values and the covariance of security returns within and across asset classes. The work of Bodie and Briere³⁶, among others³⁷, is a case in point. They focus on the impacts of commodity price volatility on government revenues and conceptualize the role of a stabilization fund as a hedging vehicle designed to offset the price volatility of commodity revenue streams. They estimate the balance sheet of a sovereign entity in the broadest possible sense to include both explicit and contingent liabilities and "assets"

³² CS Venkatakrishnan, "Post-Modern Asset Management: The Credit Crisis and Beyond", JP Morgan, Asset Management, 2009

³³ Ibid.

³⁴ Ibid.

³⁵ Ibid.

³⁶ See Z. Bodie and M. Briere, "Sovereign Wealth and Risk Management", Boston University School of Management Research Paper Series, No. 2011-8, February 2011

³⁷ See also related presentations to the 2011 annual meeting of the International Forum of Sovereign Wealth Funds at <http://www.ifswf.org/pst.htm>

expressed as the present value of future tax streams from commodities still "in the ground". The logic is that commodity price volatility, specifically downward pressure on commodity prices, will cause a contraction on the sovereign's balance sheet and force a "de-leveraging", specifically in a reduction in the present value of planned future spending on social and economic development.³⁸ The objective of the SWF then would be to offset commodity price exposure by employing an asset allocation strategy which uses assets whose values are negatively correlated with the associated commodities. Under such circumstances, an investment program would consist of a minimum risk portfolio which matches assets and liabilities – both explicit and contingent- and that will be used as the principle hedging vehicle when paired with an efficient risky portfolio.³⁹

Third, the broader challenge of defining liquidity – rather illiquidity – risk remains. As relevant is a means to effectively estimate the price of providing liquidity to the market, i.e. the definition and estimation of liquidity risk premia in a portfolio context. Finally, and importantly, with respect to the asset allocation, a methodology to define the optimum portfolio allocation to liquid assets is necessary to systematically address the impact of holding illiquid assets in a broadly diversified portfolio. Here the evolving work of Ang, Papanikolaou, and Westerfield⁴⁰ serves as an example.

In a related fashion, fourth, we highlight the need for both theoretical and empirical work to incorporate liquidity premia into benchmarks, which when added to performance attribution models, permit review and analysis of managers' active harvesting of liquidity premia in pursuit of enhanced long-term performance.⁴¹

Fifth, we acknowledge the considerable agency issues associated with investment in illiquid assets, such as private equity, real estate, or hedge funds. Agency issues frequently arise as a result of asymmetric information or a misalignment of compensation incentives (e.g. "short-termism" accentuated by the structure of performance-based compensation) that may exist between asset owners and fund managers or between institutional managers and their external managers. In fact, owing to a degree of opacity in the management of alternative assets and the difficulty of definitively observing returns (particularly interim returns) contracts involving investment in illiquid assets can exacerbate, rather than mitigate, agency issues.⁴² When combined with the elements of our broader research agenda, a careful examination of performance-based incentive compensation schemes can yield effective constructs through which to link active investment strategies involving illiquid assets and the broader risk-return objectives of institutional portfolios.

³⁸ Briere, "Managing Commodity Price Volatility", in Bolton et al; see also Bodie and Briere

³⁹ Ibid.

⁴⁰ Andrew Ang, Dimitris Papanikolaou, Mark M. Westerfield, "Portfolio Choice with Illiquid Assets", Working Paper, July 25, 2011

⁴¹ Spiegel, "Financial Benchmarks for Long-Term Investing", Bolton, et al

⁴² Andrew Ang and Knut N. Kjaer, "Investing for the Long Run", in Bolton et al