



Rethinking Portfolio Construction and Risk Management

- A Third Generation in Asset Allocation

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Passion to Perform

Bradley A. Jones, Ph.D
Macro Investment Strategist
brad.jones@db.com

+852 2203 8170

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***“Dwell on history and you will lose an eye ...
... Ignore history and you will lose both”***

- Russian Proverb

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** This is a summarized version of a paper originally published on November 21, 2011, entitled "Third Generation Asset Allocation", Brad Jones, Deutsche Bank Global Markets Research*

A One Minute Synopsis on Diversification and Robustness

Build Portfolios of Risk Factors and Risk Premia's, Not Assets



- A lack of diversity and failure to adapt to a changing environment have been key contributors to extinction in the animal kingdom. Bacteria are arguably the best exponents of adaptability and diversification – they have existed for 4.5bn years and outlived Dinosaurs by a factor of 24:1
- Like many investment strategies, Dinosaurs were short a regime shift – they were perfectly calibrated to a set of initial conditions but could not cope once the environment changed
- Risk Factors vs. Asset Classes – allocating capital across asset classes and investment styles represents *superficial* diversification if payoffs are exposed to the same set of risk factors. Diversification based on underlying risk factors or return sources, not historical correlations over a select sample period plugged into a MV optimizer, should be the building blocks of portfolio construction. Beware a 60/40 equity/bond portfolio is 100% exposed to unexpected inflation or sovereign risk, while 14 different HF strategies had their worst ever drawdown in the 2008/09 crisis (all were short systemic liquidity risk)
- *The only insurance against regime shifts, black swans, the peso problem and drawdowns is to seek out multiple sources of risk premia across a host of asset classes and geographies, designed to harvest different features (value, momentum, illiquidity etc.) of the return generating process, via a large number of small, uncorrelated exposures*

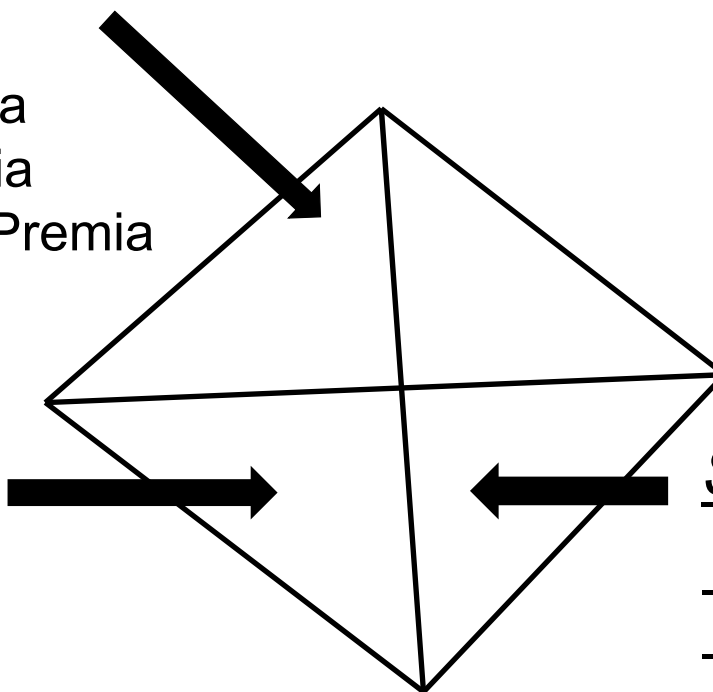
Three 3-Dimensions of Risk Exposure

Beta Risk Premia, Style Risk Premia and Systemic/Macro Risk



Beta Risk Premia

- Bond Duration
- Credit Risk Premia
- Equity Risk Premia
- Commodity Risk Premia
- Alternatives



Style Risk Premia

- Value Premium
- Carry Premium
- Momentum Premium
- Volatility Premium
- Illiquidity Premium
- Size Premium

Systemic/Macro Risk

- Growth Risk
- Inflation Volatility Risk
- Liquidity Risk
- Sovereign Risk

Source: Deutsche Bank



Part I.

First Generation Asset Allocation

- The Peril of the 60/40 Policy Portfolio

1st Generation Asset Allocation – the 60/40 Policy Portfolio

The Underlying Assumptions ...

- Rebalancing back to fixed weights constitutes the best form of risk management as it imparts a value bias in an otherwise efficient and unpredictable world
- Markets are largely efficient – returns are distributed randomly over time, regime dependence and valuation bubbles either don't exist or cannot be monetized
- Active Management has a dubious record (after costs) and the future is unknowable, hence long-term average returns are a reliable guidepost for the future (the 60/40 portfolio in the US has generated a 4% average annual real return back to 1900, a period spanning wars, depressions, currency, oil and political crises)
- Stocks and bonds (reliably) diversify one another (ie. correlations are stable)
- Intertemporal path dependency risk is vastly subordinate to end-of-horizon wealth and shortfall considerations, so long-term investors can ignore it
- *BUT - if you were sailing from New York to Bermuda, would you rely only on long-term average weather conditions, with no ability to adjust to deviations from average conditions during the voyage?*

US Stock, Bond and 60/40 Portfolio Returns Since 1900

At First Glance, Why Worry - the Policy Portfolio has Generated Real Returns of 4% p.a. for More than a Century!

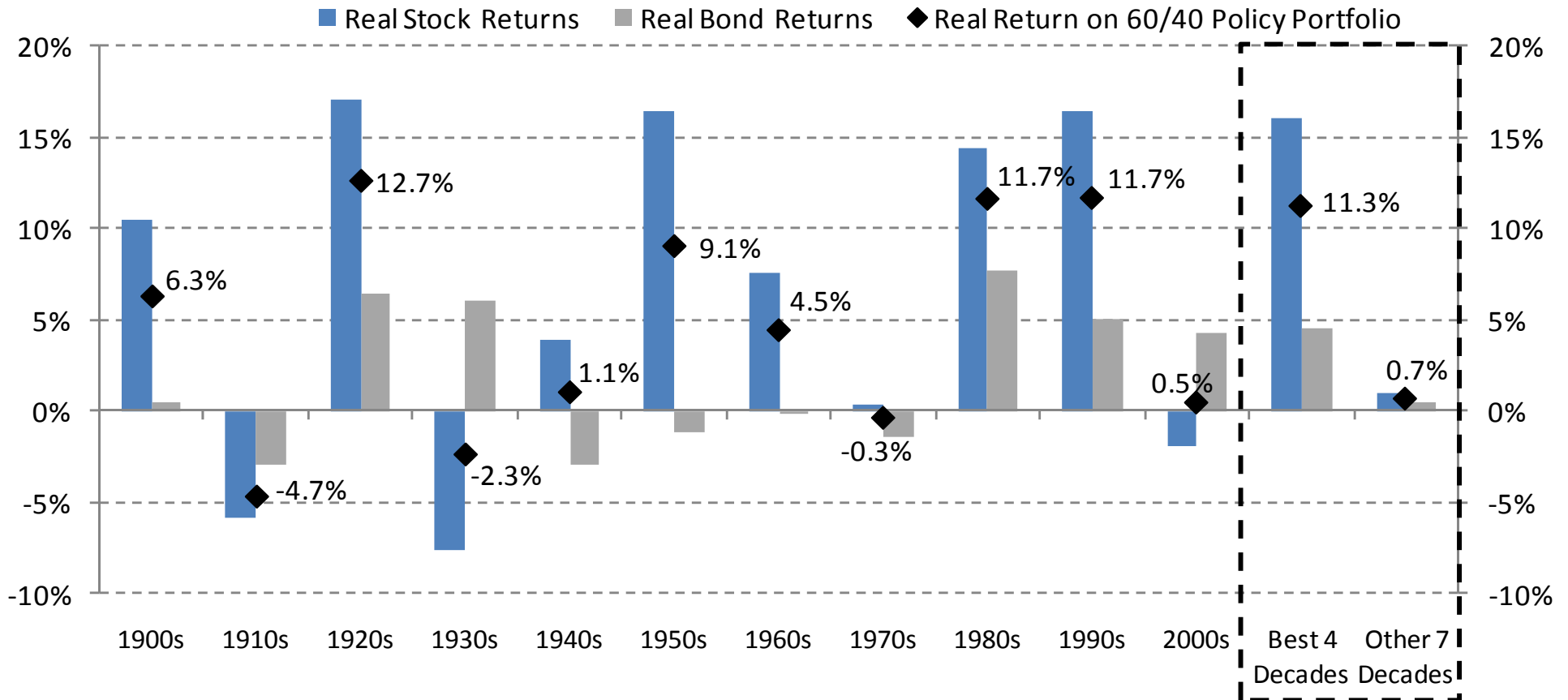


	Nominal Bonds	Nominal Stocks	Nominal 60/40	Real Bonds	Real Stocks	Real 60/40
Arithmetic Average Annualized Returns	4.9%	9.0%	7.3%	1.9%	6.0%	4.3%
Compound Annualized Returns	4.8%	7.8%	6.9%	1.7%	4.7%	3.8%
Standard Deviation of Monthly Returns	4.7%	15.5%	9.6%	5.6%	15.5%	9.8%
Compound Return Per Unit of Volatility	1.02	0.50	0.72	0.31	0.31	0.39
Ratio of Downside to Upside Volatility	0.97	1.54	1.44	0.88	1.49	1.38
Compound Return Per Unit of Downside Volatility	1.27	0.56	0.83	0.47	0.36	0.48
Maximum Drawdown	-15%	-90%	-73%	-57%	-86%	-66%
Length of Maximum Drawdown (Yrs)	3.3	21.3	20.3	45.2	24.9	24.3
Calmar Ratio (Yrs)	3.1	11.5	10.6	32.9	18.2	17.1
% Up Months	80%	63%	65%	57%	60%	61%
Monthly Return Skew	1.2	-0.9	-0.8	0.5	-0.8	-0.6
Monthly Return Kurtosis	10.7	9.3	8.2	5.9	8.7	6.9
% Up Years	88%	70%	74%	63%	65%	67%
Best Year	37%	100%	53%	32%	98%	51%
Worst Year	-7%	-54%	-37%	-14%	-50%	-31%
% Time Incurring Negative Real Returns over 10yrs	0%	12%	7%	35%	24%	22%
% Time Incurring Negative Real Returns over 20yrs	0%	5%	1%	32%	13%	9%

Source: Deutsche Bank, Robert Shiller database. Based on monthly returns since 1900.

But All the Returns Were Concentrated in Four Decades

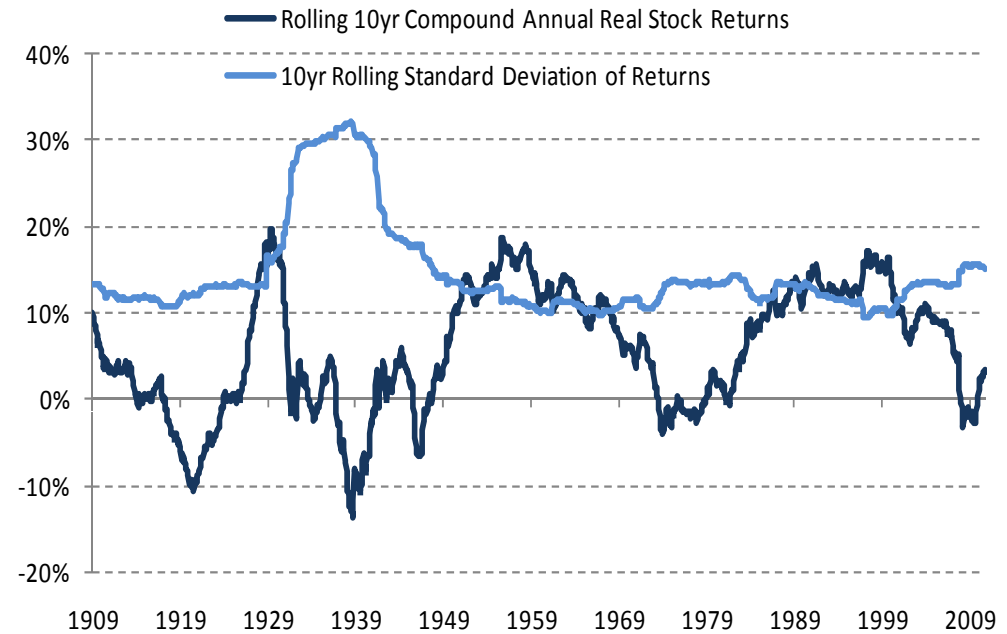
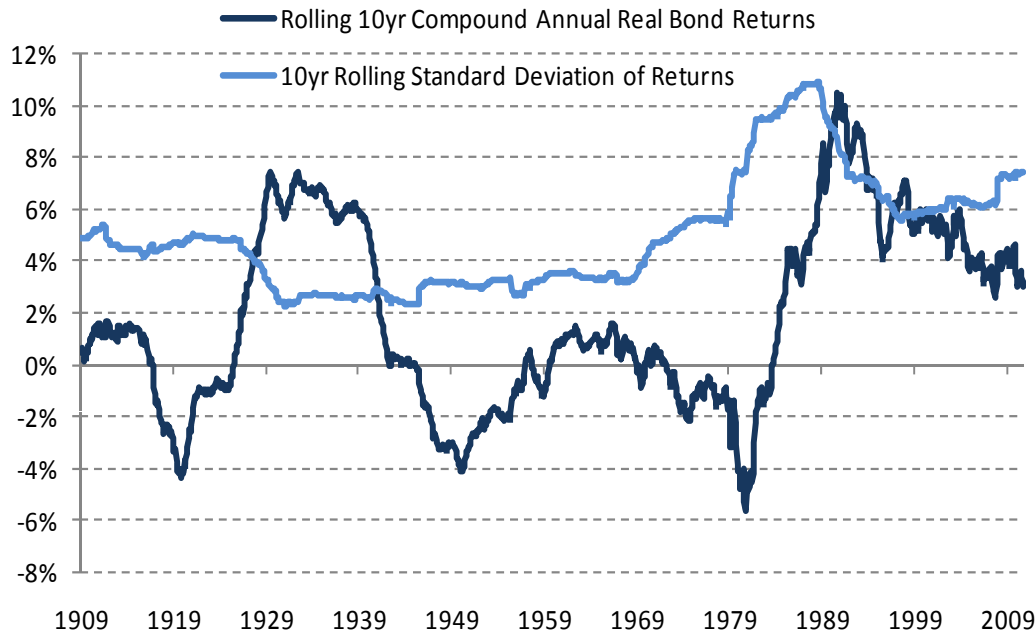
... Each of Which is Unrepeatable – the 1920s and '50s were Post-War Recoveries, while the 1980s and '90s were Windfall Gains



Source: Deutsche Bank, Robert Shiller database

Long Waves of Feast or Famine are the Rule for Returns

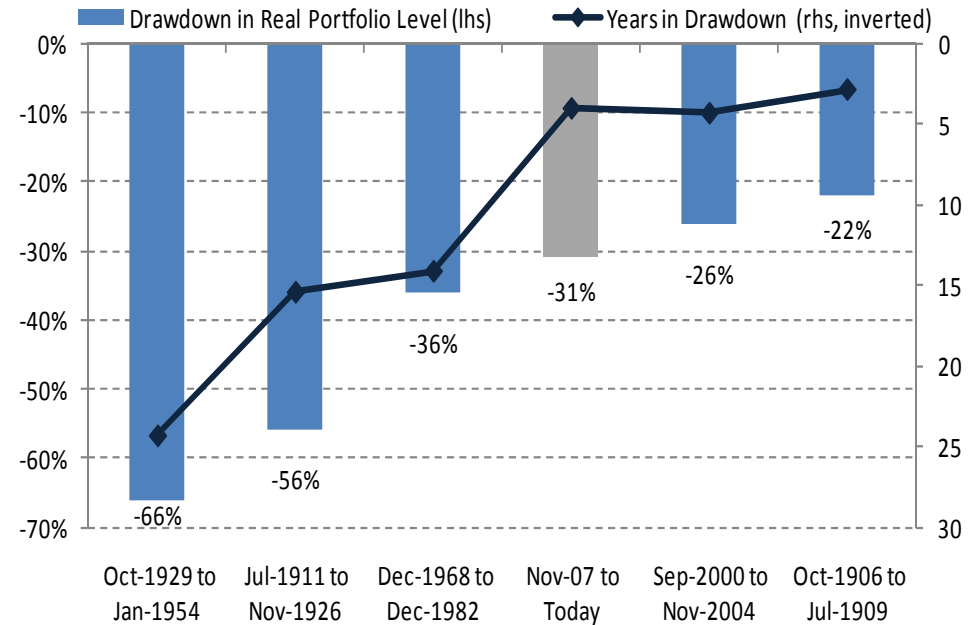
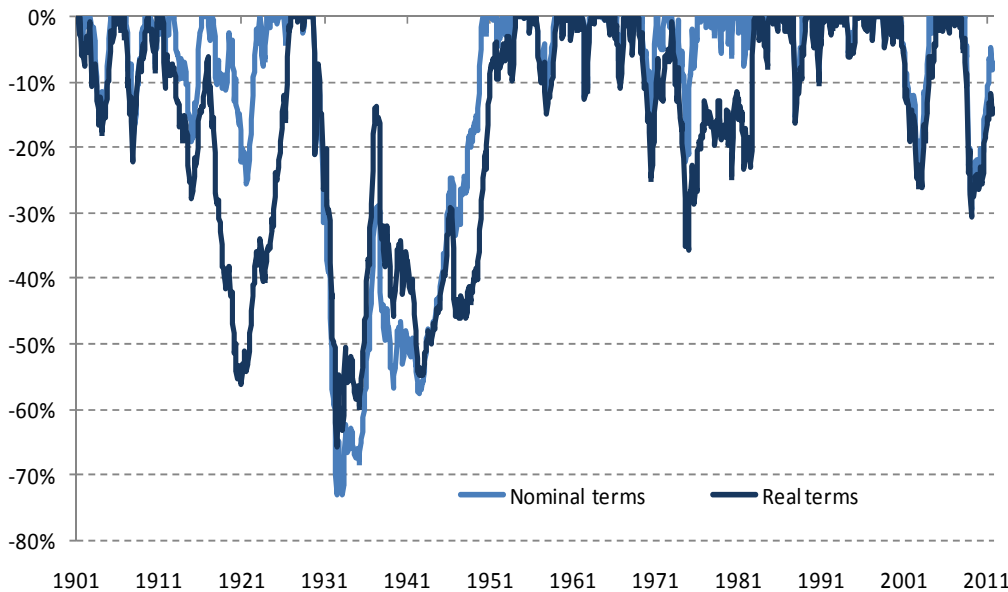
... Returns Are Regime Dependent, Not Randomly Distributed



Source: Deutsche Bank, Robert Shiller database

The Risk Characteristics of 60/40 are Stomach-Churning

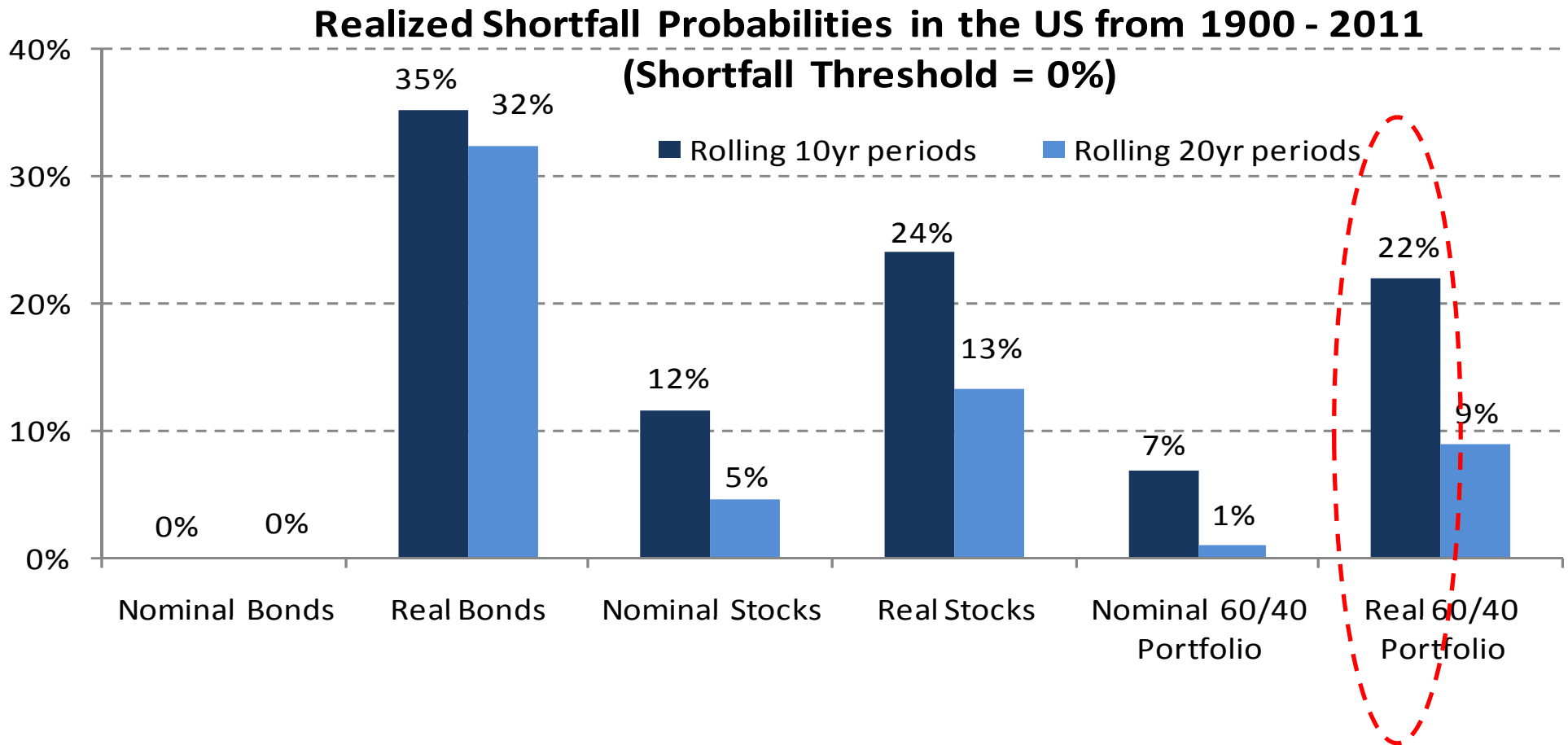
... Large and Lengthy Drawdowns are Par for the Course



Source: Deutsche Bank, Robert Shiller database

The Risk Characteristics of 60/40 are Stomach-Churning

... 60/40 Has Generated Negative Real Returns over a Rolling 10yr Holding Period for Almost a Quarter of the Sample!



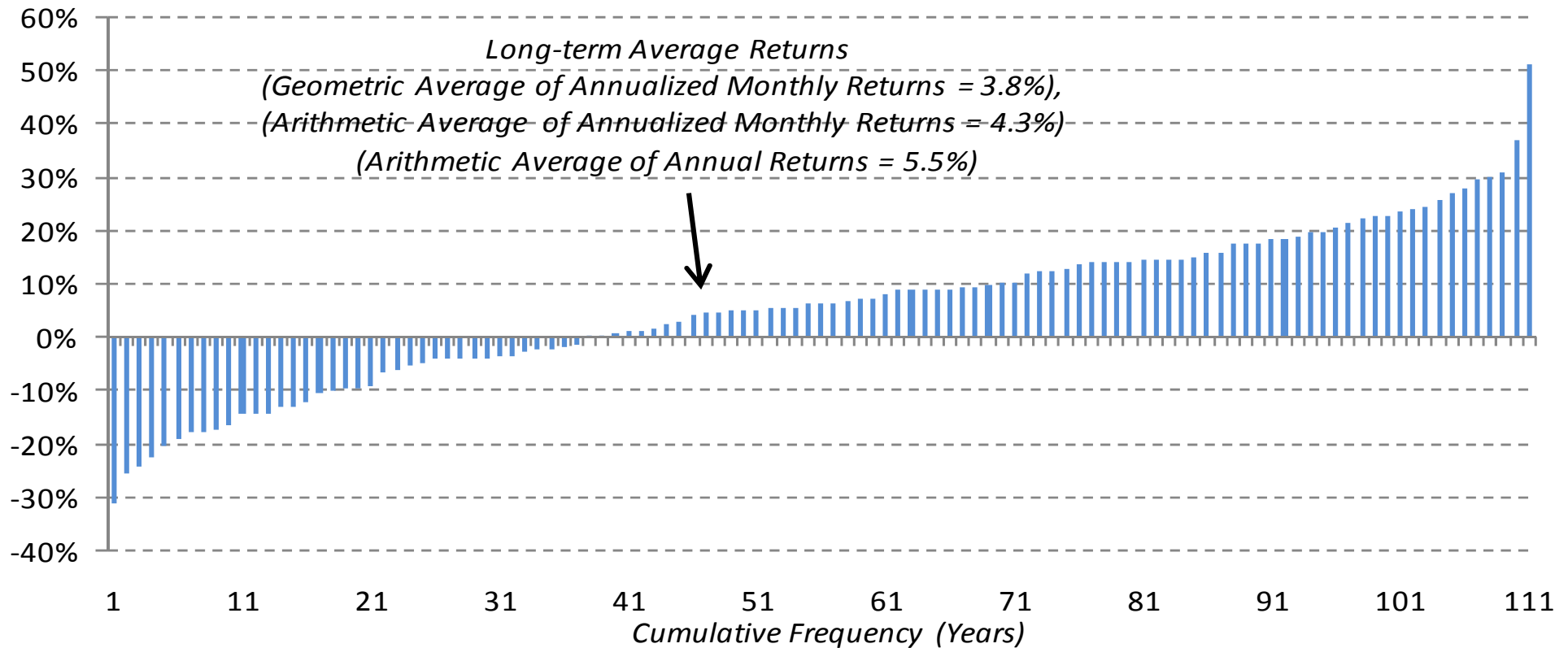
Source: Deutsche Bank, Robert Shiller database

The Mean is NOT the Message

4% Unconditional Average Returns – a Frail Reed to Lean Upon



Annual Real Returns to the 60/40 Portfolio in the US (1900 - 2010)



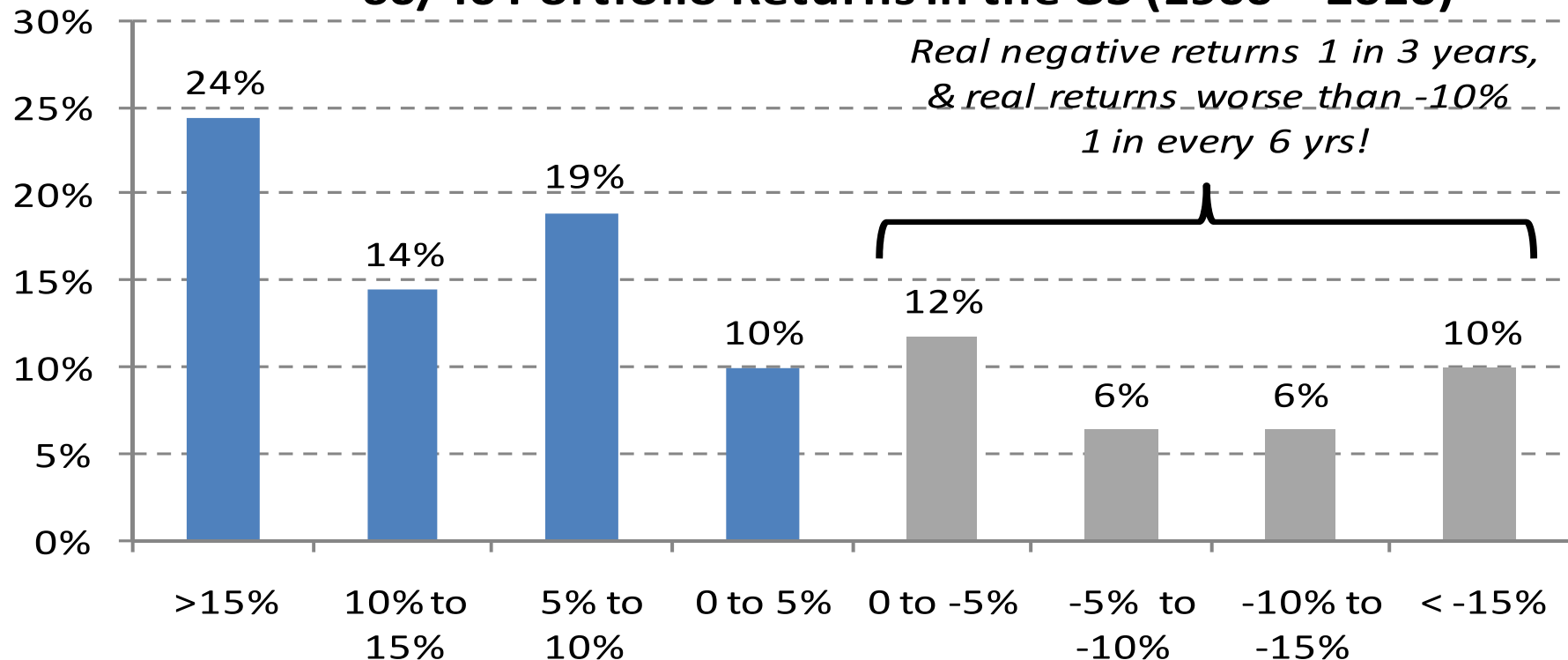
Source: Deutsche Bank, Robert Shiller database

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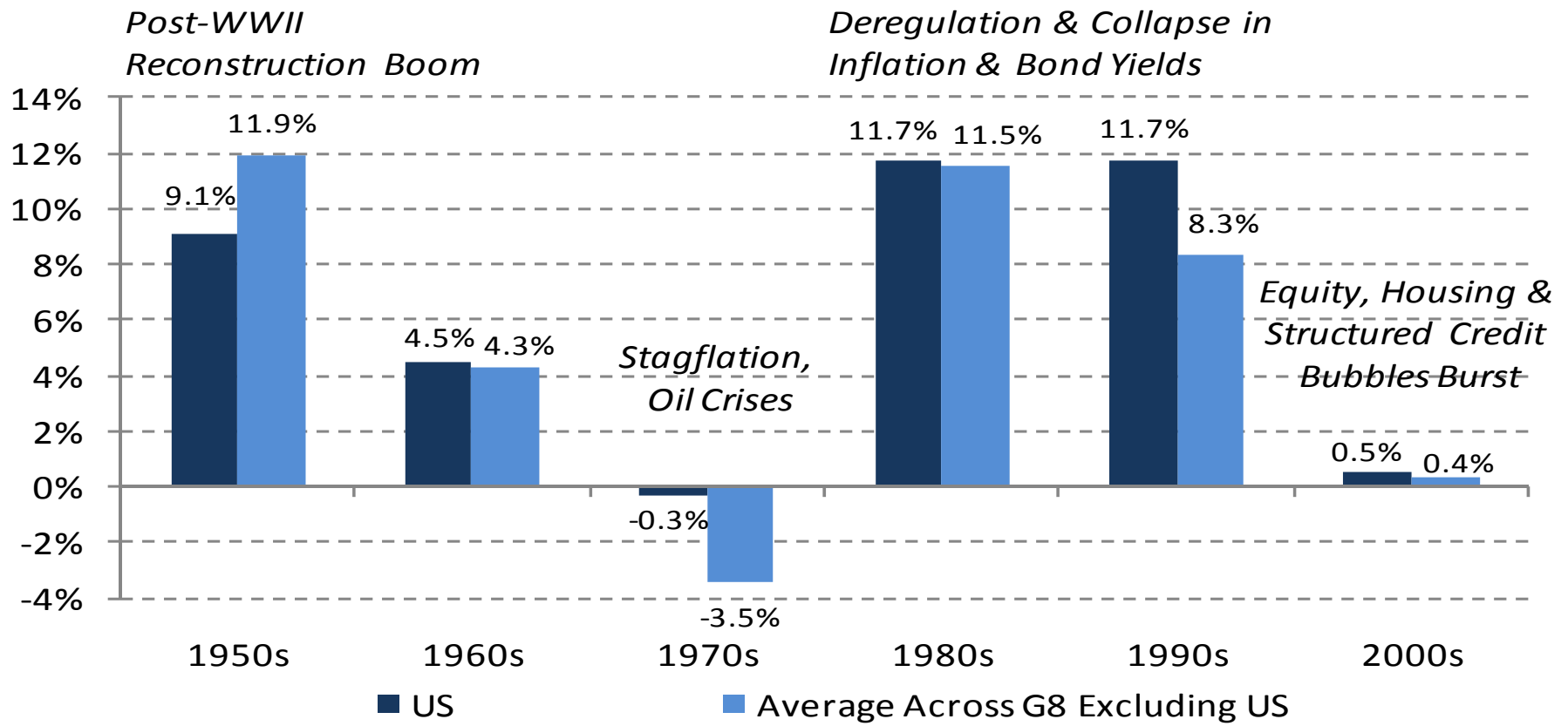
Distribution of Real Annual 60/40 Portfolio Returns in the US (1900 - 2010)



Source: Deutsche Bank, Robert Shiller database

Extreme Time-Variation in Returns is a Global Phenomena

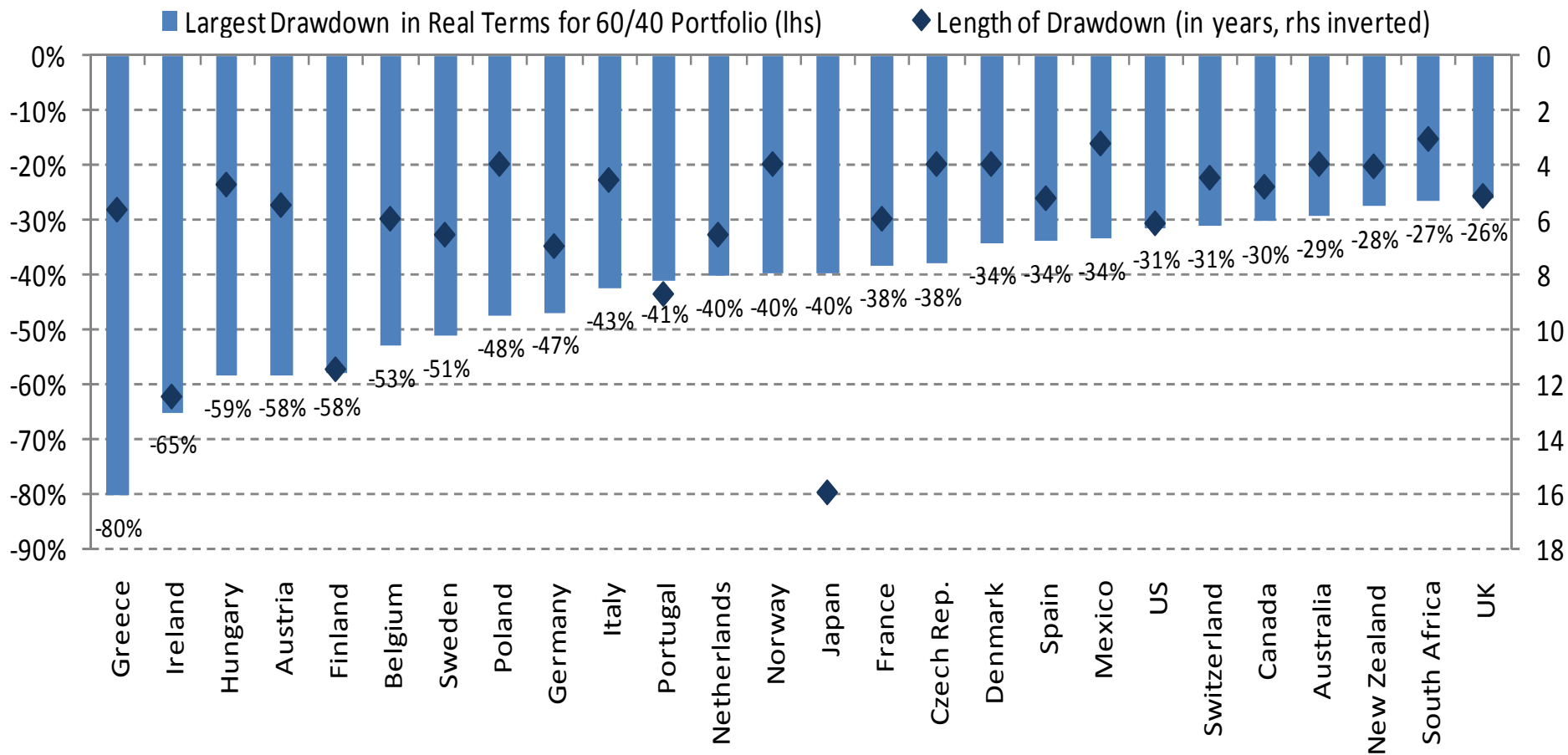
... Regime Dependence Matters (not Unconditional Averages)!



Source: Deutsche Bank, Robert Shiller database

Largest Drawdowns to 60/40 Portfolios Around the World

... 60/40 is Riskier Than You Think!



Source: Deutsche Bank, Datastream. Data since 1984 or earliest available.

Current 60/40 Drawdowns – A Long Time Between Drinks!

*Today's Real Value of a 60/40 Portfolio,
vs. when Current Water Mark Was First Recorded*



- United States (first recorded in March 2000)
- Germany and Spain (February 2000)
- Hungary (December 1999)
- France (November 1999)
- Netherlands (April 1999)
- Finland (December 1998)
- Belgium (February 1998)
- Italy (December 1997)
- Portugal (April 1997)
- Ireland (March 1993)
- Japan (March 1987)

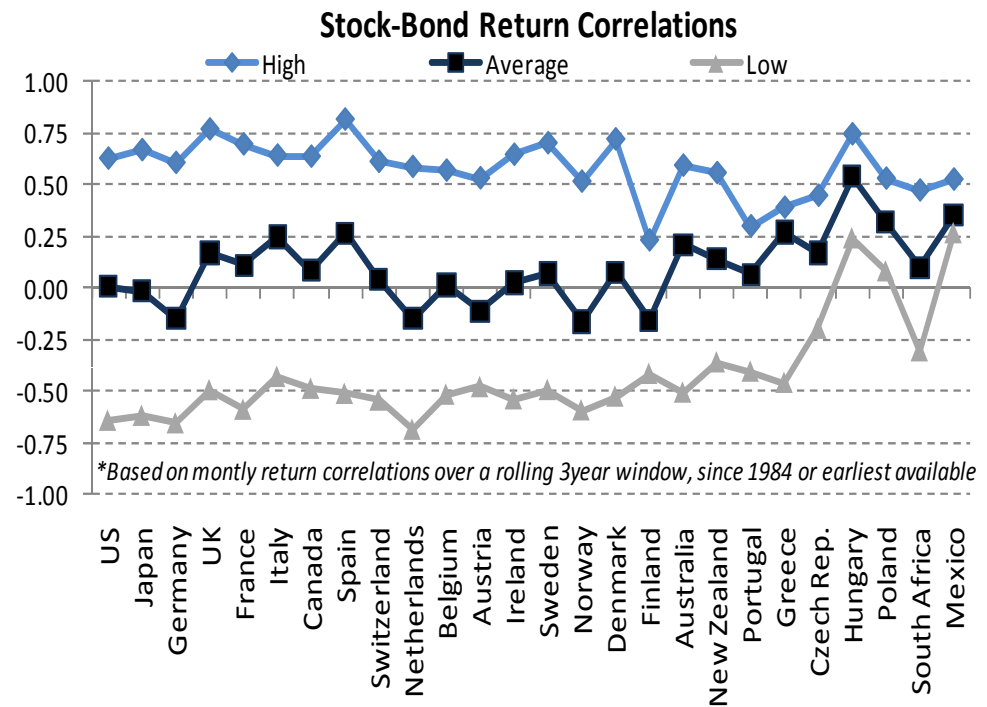
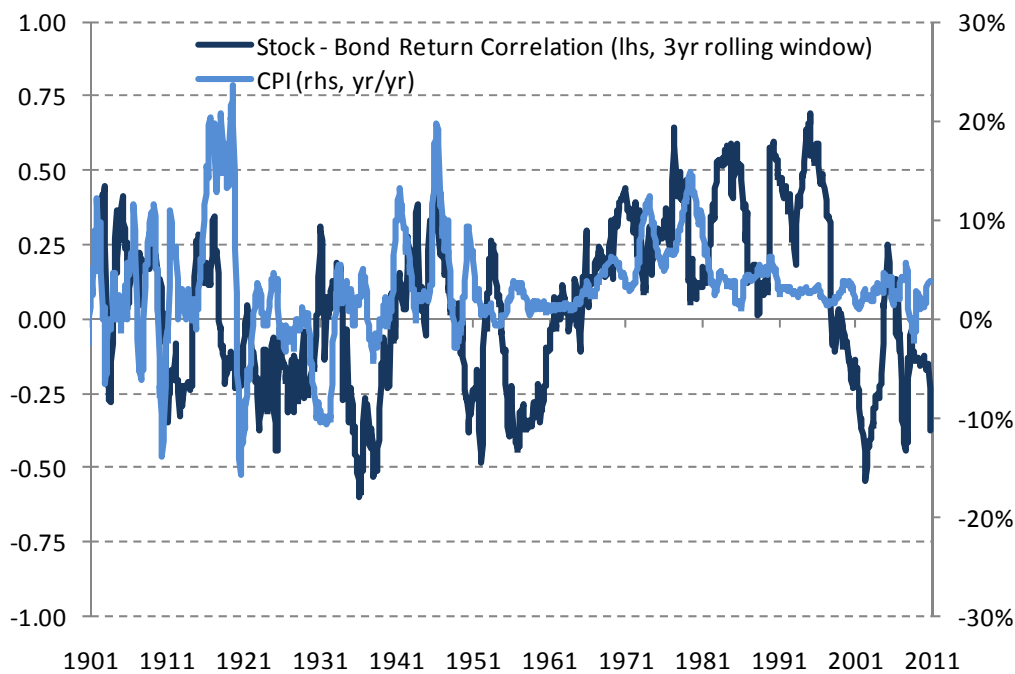
Source: Deutsche Bank, Datastream.

The Curse of Correlation Instability

... Stock and Bond Correlations are Highly Regime Dependent



Stock and Bond Return Correlation in the US (left) and Globally (right)



Source: Deutsche Bank, Robert Shiller database, Datastream. Non-US data since 1984 or earliest available.

60/40 Portfolios are Woefully Unbalanced

... Dollar Weights Do Not Represent Risk Contributions

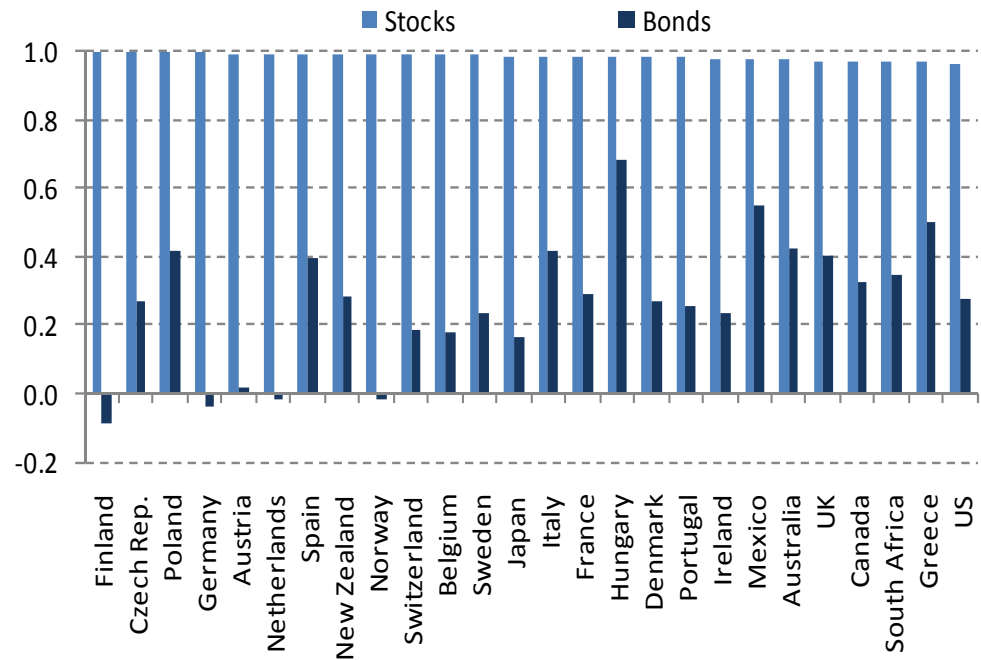
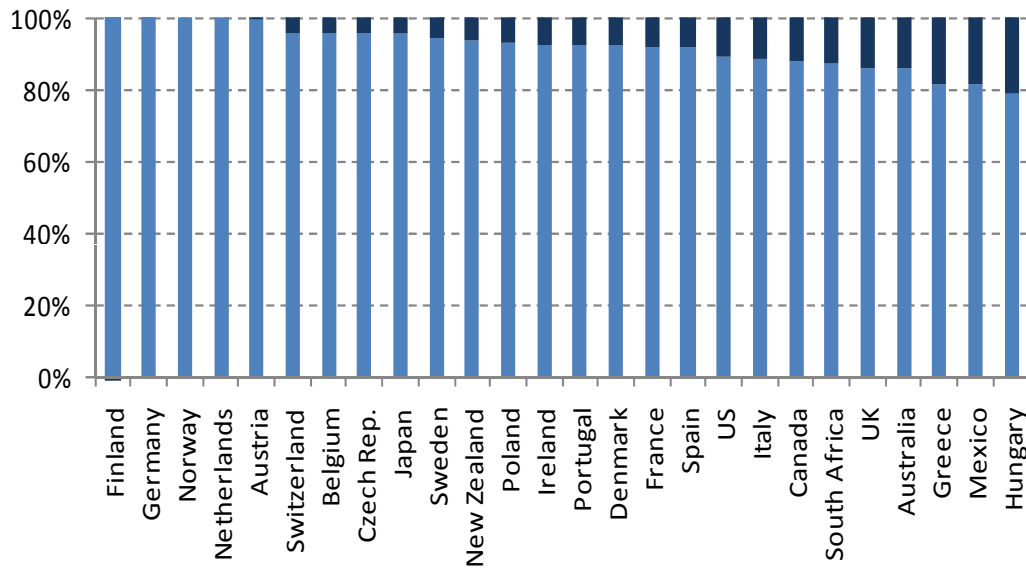


Stock and Bond Contribution to Total Portfolio Variability

Stock and Bond Return Correlation to Total Portfolio

Contribution to Portfolio Variability

■ Bond Contribution ■ Stock Contribution



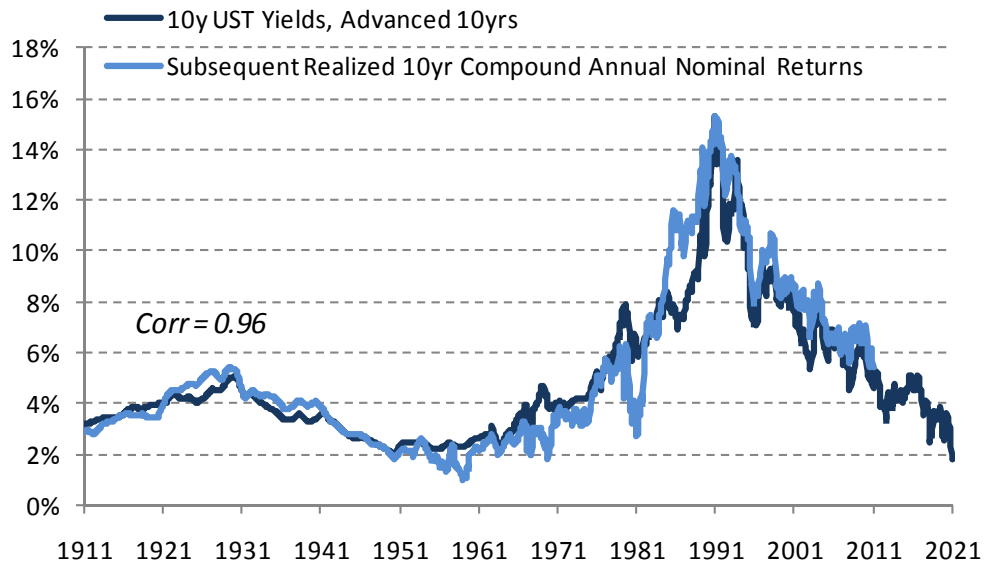
Source: Deutsche Bank, Datastream. Data since 1984 or earliest available.

Forward-Looking 60/40 Valuation Forecasts - Worrisome

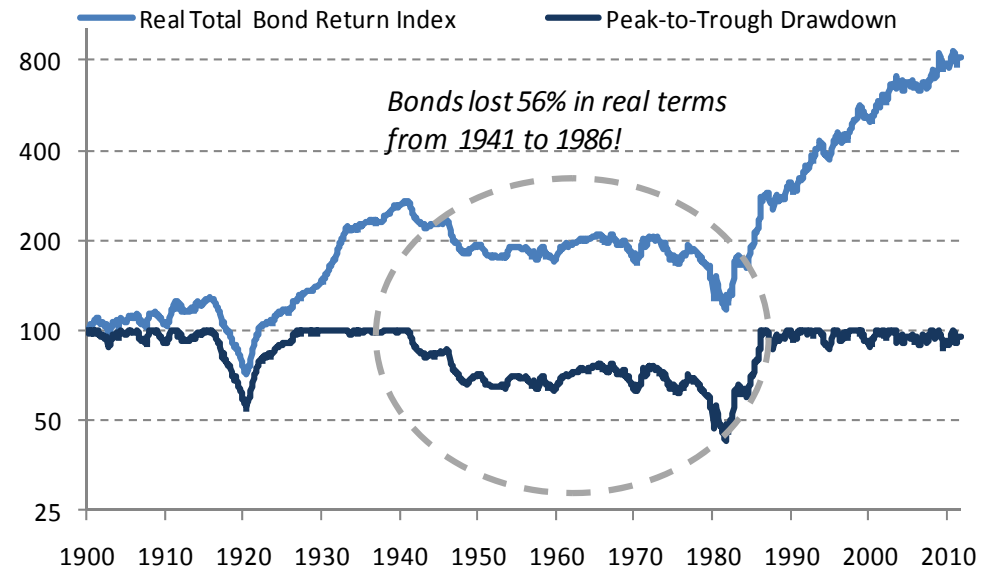
... Only Sustained Deflation Risk Can Keep Bond Yields Low



Starting Valuation Levels Forecast
Bond Returns Reasonably Well



The Last Occasion 10y USTs traded at
2%, a 45-year Bear Market Followed



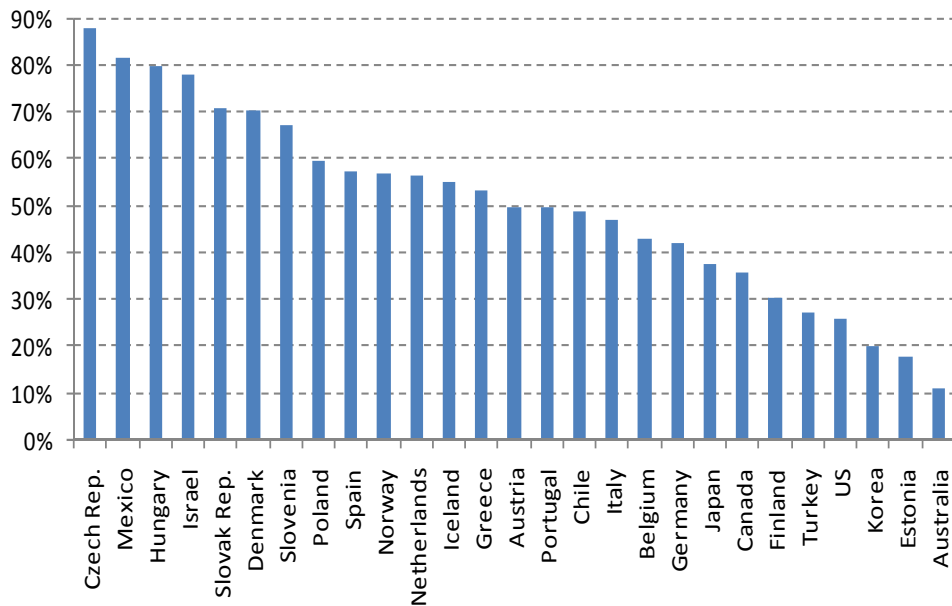
Source: Deutsche Bank, Robert Shiller database

Forward-Looking 60/40 Valuation Forecasts - Worrisome

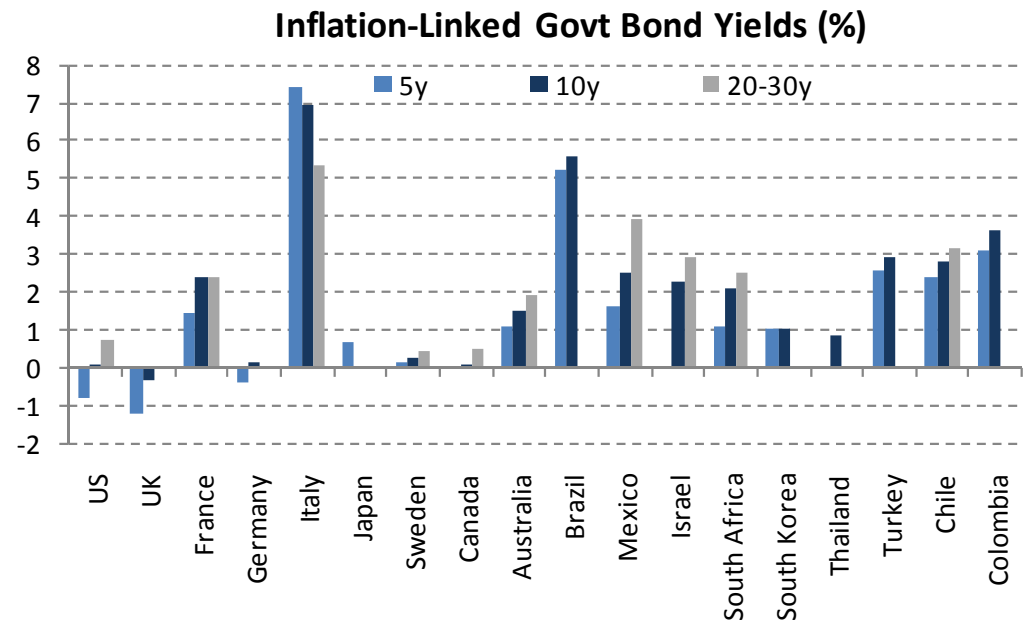
... In FI space, only Australian/EM Real Yields Look Interesting



Bond/Bill Share of Pension Fund Assets



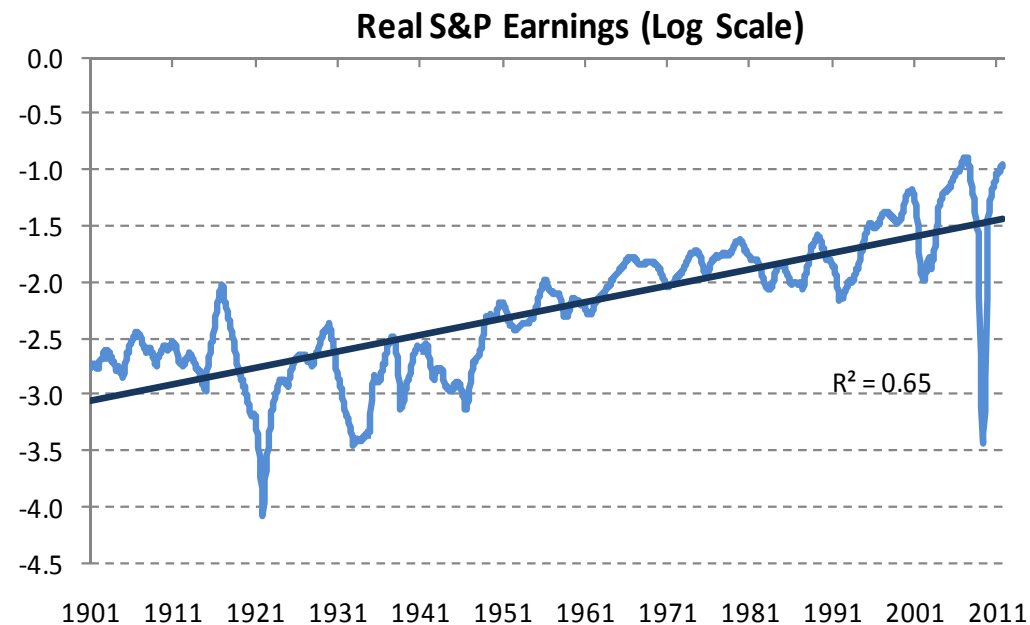
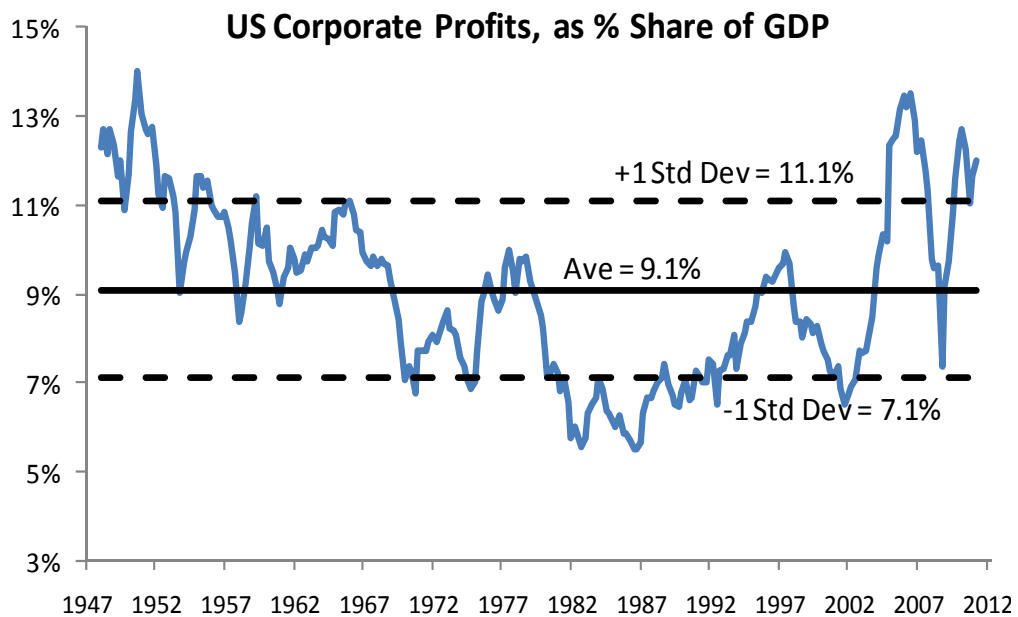
High Real Yields Compensate for Illiquidity Risk in Aust/EM



Source: Deutsche Bank, OECD, Bloomberg Finance LP

Forward-Looking 60/40 Valuation Forecasts - Worrisome

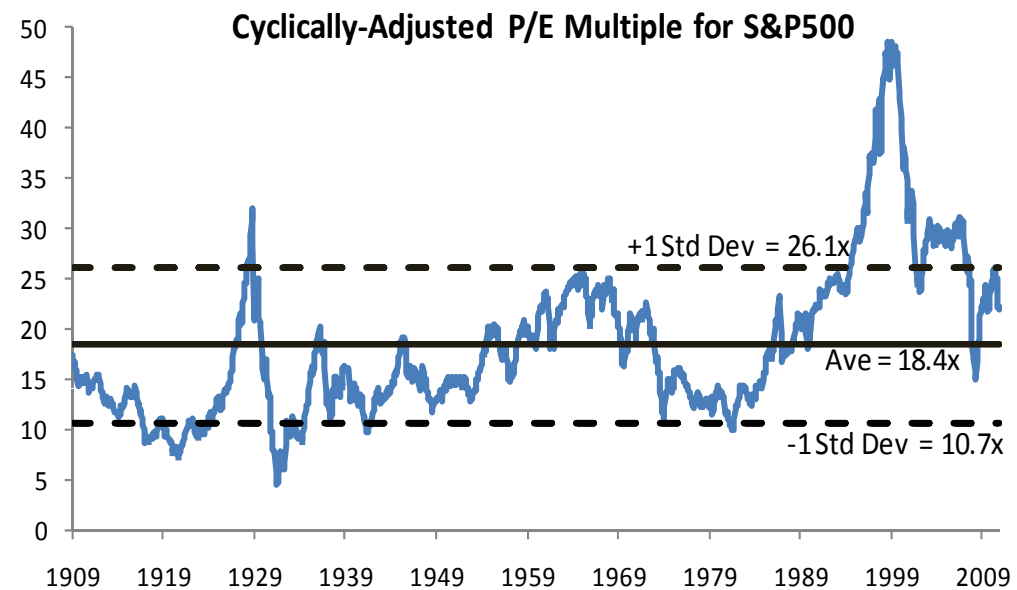
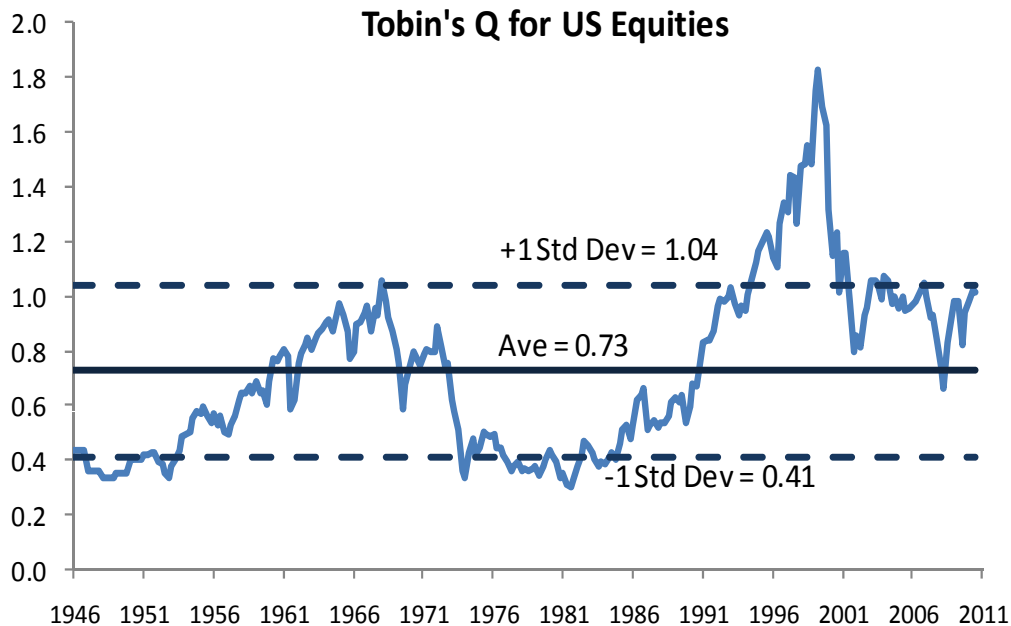
... Corporate Earnings are Already Way Above Trend, and the Low Labor Share of GDP is Fuelling Unrest Around the World



Source: Deutsche Bank, Bureau of Economic Analysis, Robert Shiller database

Forward-Looking 60/40 Valuation Forecasts - Worrisome

... Stocks Aren't Cheap on Replacement Cost or CAPE



Source: Deutsche Bank, Federal Reserve, Robert Shiller database

Forward-Looking 60/40 Valuation Forecasts - Worrisome



... We Estimate Real 10yr Stock Returns @ 2.1% and Real 10yr Bond Returns @ -0.3% ... 60/40 to deliver just 1.1% p.a.?

Probability-Weighted Scenario Analysis for 10yr Real US Stock Returns

Scenario	Dividend Yield	Real EPS Growth	Cyclically-Adjusted PE Multiple	E{Return}	Probability	E{R} * Prob
#1:	Constant (@2.1%)	Constant (growth @2.9% p.a.)	Contracts (@2% p.a. from 22x to 18x)	3.0%	25%	0.75%
#2:	Constant (@2.1%)	Decelerates (growth @1% p.a.)	Constant (22x)	3.1%	25%	0.78%
#3:	Constant (@2.1%)	Decelerates (growth @1% p.a.)	Contracts (@2% p.a. from 22x to 18x)	1.1%	50%	0.55%
				Sum	100%	2.1%

Source: Deutsche Bank, Robert Shiller database

One Eye on the Past, Another on the Future

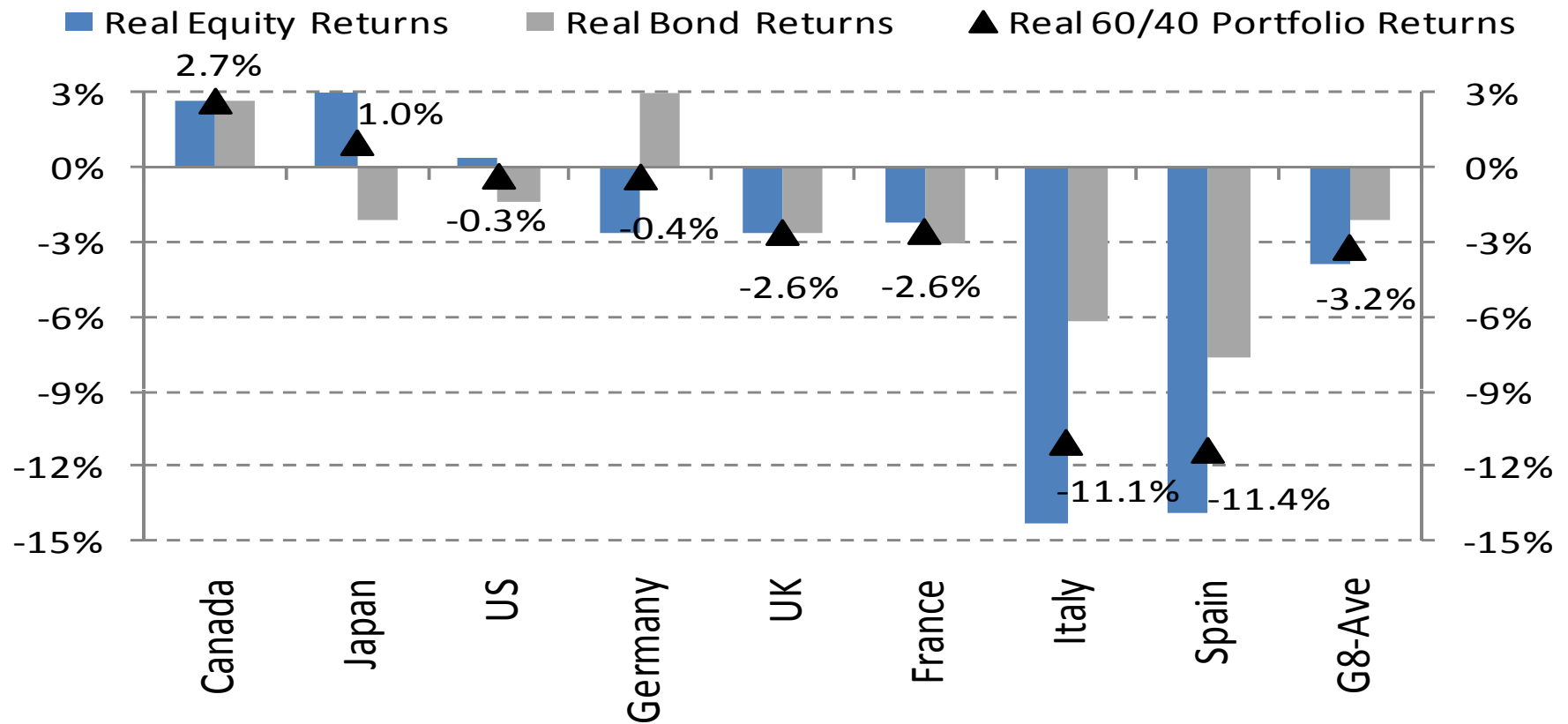
Salient Features of the 1970s Macro Environment



- High unemployment, yet sticky inflation (a high Misery Index)
- Widespread social unrest and political turmoil
- Elevated and volatile energy and commodity prices
- Elevated currency volatility and concern over reserve currency debasement
- Elevated inflation volatility
- Low real yields on government bonds
- Rising government regulation and involvement in the economy
- Decelerating productivity growth
- Heightened geopolitical instability

Stocks and Bonds Cannot Handle Stagflation

60/40 is Ill-equipped for a 1970s-like Macro Environment



Source: Deutsche Bank, Robert Shiller database

Key Takeaways for the 60/40 Policy Portfolio



- It ignores strong evidence of regime dependence, regime persistence, and time-variation in long-term asset returns (rendering unconditional averages misleading)
- It assumes rebalancing is the best form of risk management, ignoring a role for hedging strategies or bubble identification as alternative risk mitigation approaches
- It assumes stable stock/bond correlations and stable diversification benefits – it ignores the fact that stocks and bonds are positively correlated in 2 out of 3 macro states (bonds consume significant allocations without offering reliable equity hedges)
- Risk weights are not the same as dollar weights - equities account for around 95% of portfolio variability in a 60/40 mix of stocks and bonds
- Lengthy and severe 60/40 portfolio drawdowns are commonplace
- The 60/40 portfolio was grossly ill-equipped to handle the stagflationary macro environment of the 1970s, a period bearing many similarities to today
- *Forward-looking return projections suggest a 1% real return p.a. for the 60/40 portfolio over the next decade in the US*



Part II.

From Second Generation Asset Allocation
("More Asset Classes Means I'm Diversified")

... to ...

Third Generation Asset Allocation
("Diversification by Risk Factors")

Classic Portfolio Theory

... If It's Broken, Fix It – or Throw Out Your MV Optimizer !

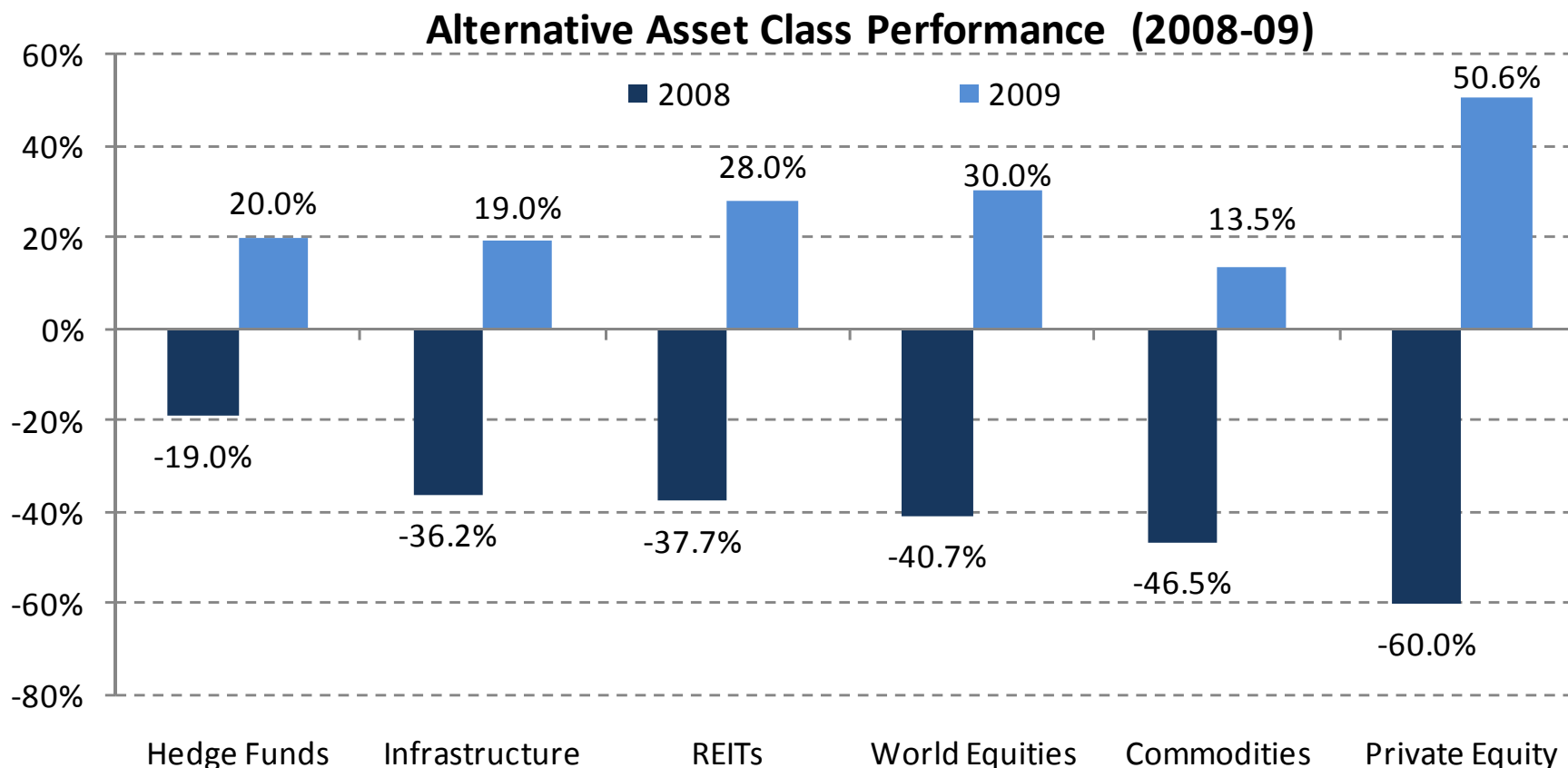


Classic Portfolio Theory	Reality
Investors are rational	Behavioral biases overwhelm analytical decision making (the pre-frontal cortex is especially overwhelmed when uncertainty is high); Psychologists have found > 100 biases
Investors maximize utility	Investors engage in 'satisficing' (we take shortcuts - near enough is good enough)
Investors have uniform risk tolerances	Risk tolerances differ across objectives, age, and beginning wealth levels
Investors view losses mathematically and smoothly	Financial losses are processed in the same area of the brain as mortal danger!
Investors care largely about end-of-period wealth	Intra-horizon path dependency dramatically impacts investor behavior
Returns are normally distributed	Almost all asset classes and securities exhibit significant skew and fat tails
Standard deviation defines the risk of a portfolio	Risk can include liquidity, solvency, vulnerability to extreme or permanent loss; Volatility in the left tail is perceived differently from volatility in the right tail
Expected returns, volatility and correlations are static	Return distribution parameters are dramatically time-varying and regime-dependent
Markets are largely efficient	Dramatically time-varying risk premia can be rational or reflect inefficiencies; Bubbles exist!

Source: Deutsche Bank

Most Alternative Assets Are Short a Common Risk Factor

A Portfolio of Leverage-Sensitive Alternatives is Not a Hedge



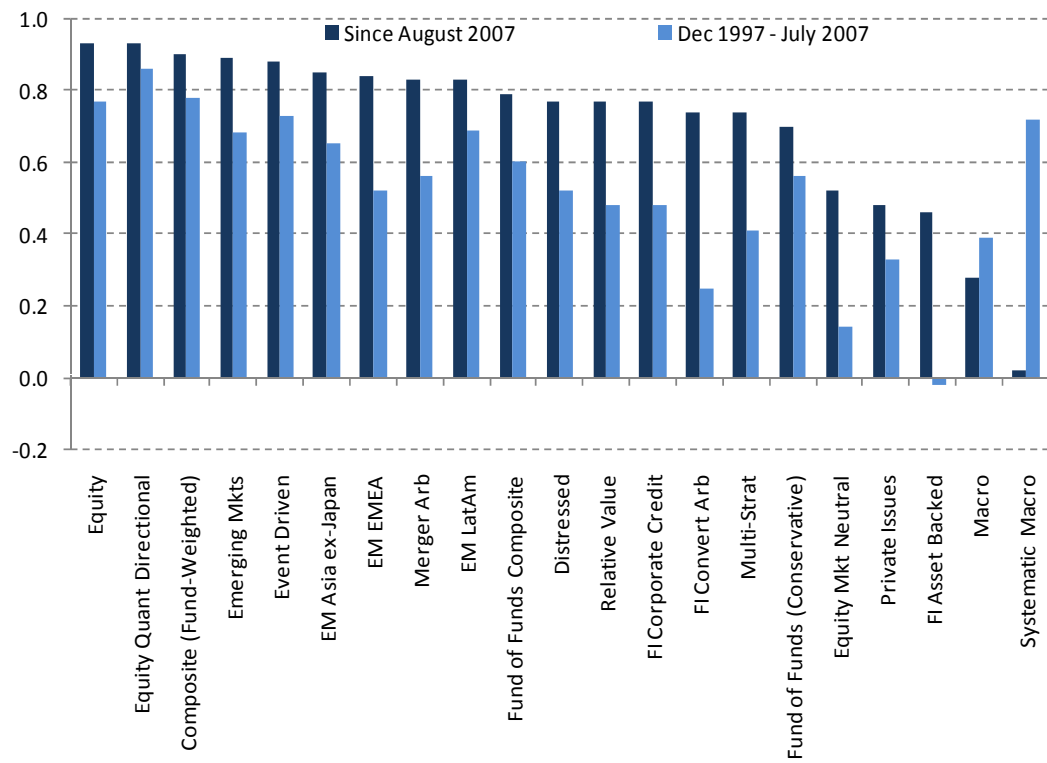
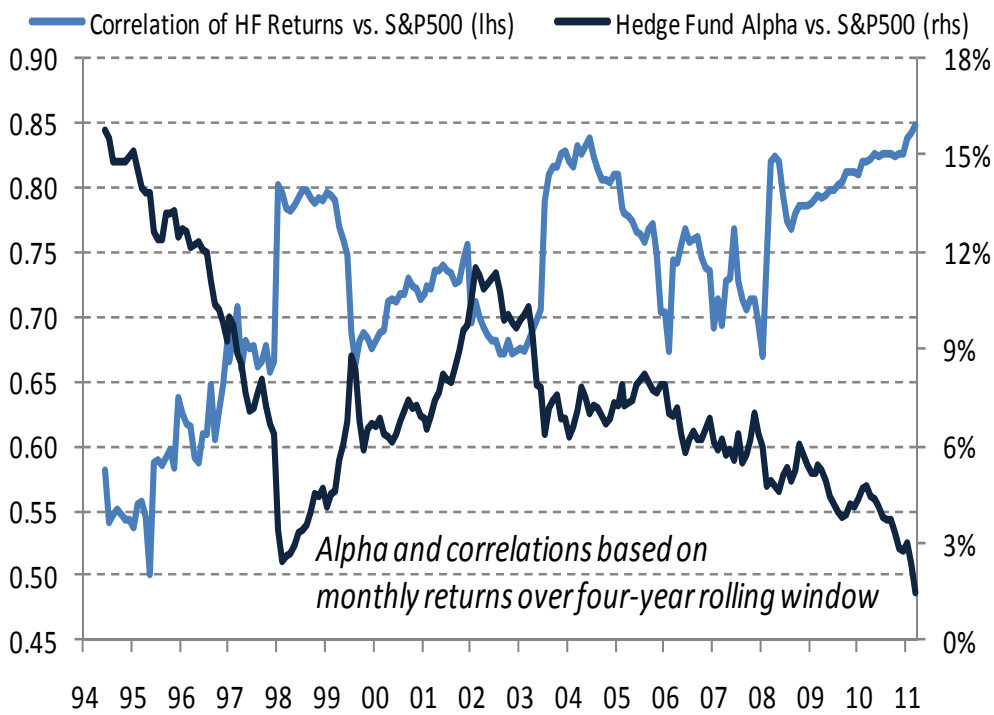
Source: Deutsche Bank, Bloomberg Finance LP. All returns are \$USD-based total returns. Hedge Fund returns represented by the Hedge Fund Research Index Fund Weighted Composite Index. Infrastructure returns represented by the UBS Global Infrastructure Equity Index. REITs represented by the FTSE NAREIT Equity Index. World Equity returns based on MSCI World Index. Commodity returns based on the GS Commodity Index. Private Equity returns depicted by the Red Rocks global listed private equity index

Hedge Fund Returns – Increasingly Equity Beta-Driven

... A Questionable Business Case for Many Hedge Fund Styles



Correlation of Hedge Fund Returns vs. S&P500 - On the Rise



Source: Deutsche Bank, Bloomberg Finance LP, HFRI.

Most Alternative Assets Are Short a Common Risk Factor

14 of 18 HF Strategies Simultaneously Suffered Their Worst Drawdown - 'Convergence' Strategies Need Benign Liquidity Conditions

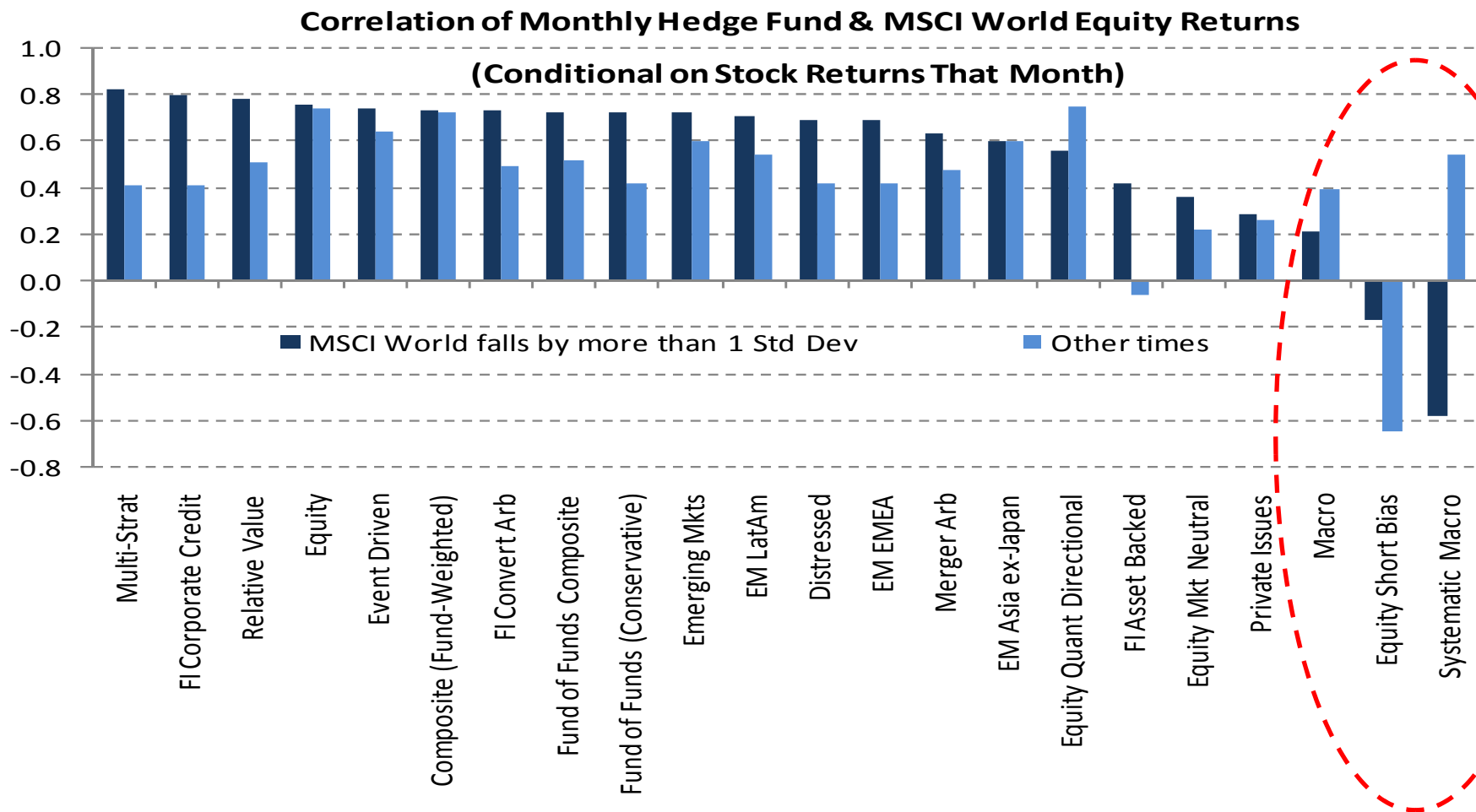


HF Strategy	Largest Drawdown	Date of Peak Drawdown
Equity Short Bias	-52.0%	Feb-00
Emerging Markets	-43.4%	Sep-98
Convertible Arbitrage	-35.3%	Nov-08
Equity Hedge	-30.6%	Feb-09
Equity Quant	-31.1%	Feb-09
Fixed Income	-28.2%	Dec-08
Distressed	-27.4%	Mar-09
Event Driven	-24.8%	Feb-09
Fund of Funds Composite	-22.2%	Dec-08
Fund of Funds Diversified	-21.8%	Dec-08
Multi-Strategy	-21.5%	Dec-08
HF Weighted Composite	-21.4%	Feb-09
Fund of Funds Conservative	-20.4%	Dec-08
Relative Value	-18.0%	Dec-08
Macro	-10.7%	Apr-94
Equity Mkt Neutral	-9.2%	Apr-09
Merger Arbitrage	-8.1%	Nov-08
Systematic Macro	-5.9%	Jun-11

Source: Deutsche Bank, Bloomberg Finance LP, HFRI. Data sample 1997-2011.

Most Alternative Assets Are Short a Common Risk Factor

... HF and Equity Correlations Are Higher in Stressful Times



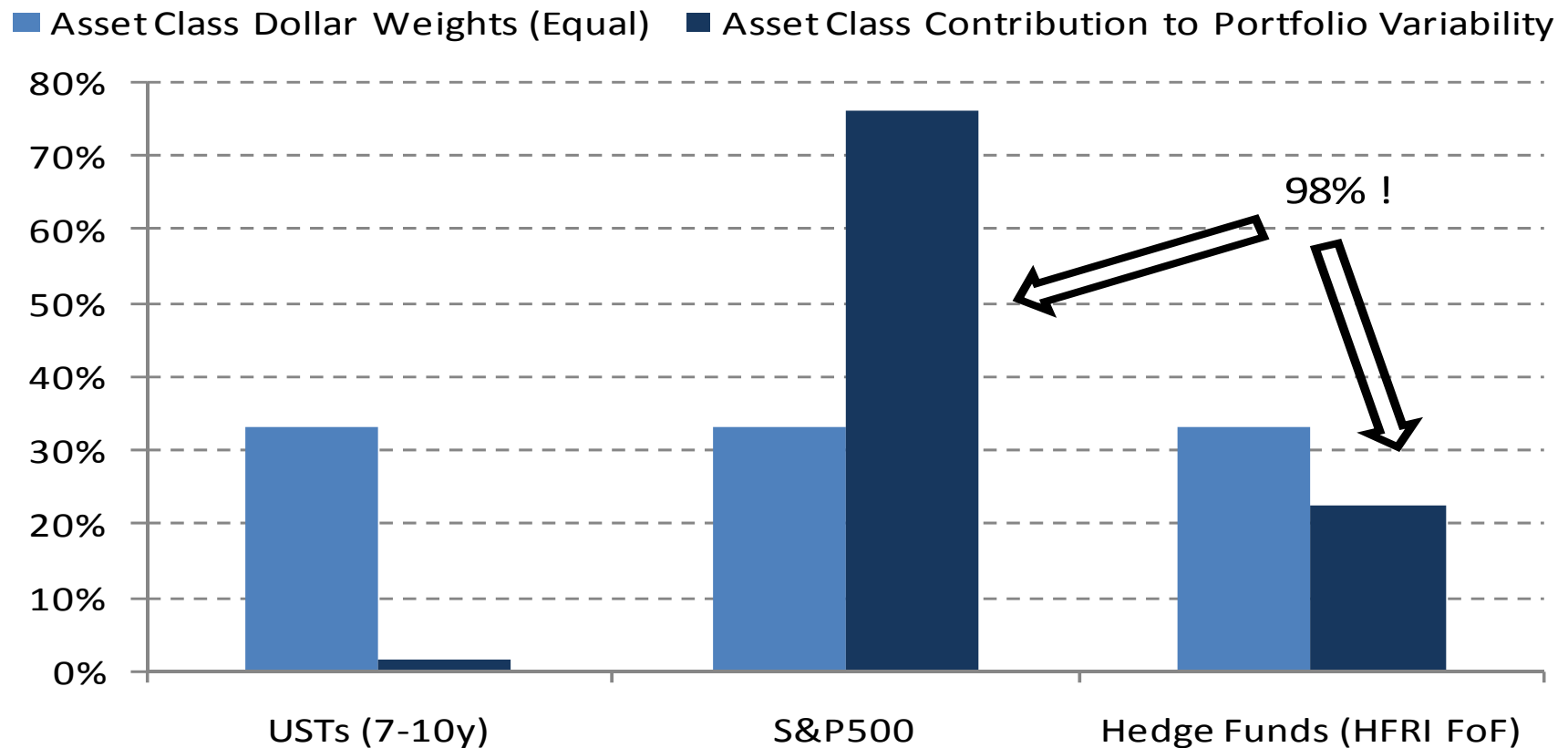
Source: Deutsche Bank, Bloomberg Finance LP, HFRI. Data based on monthly returns from 1997-2011.

Equities and Hedge Funds Load onto Similar Factors

... Equal Capital Contributions, Unequal Risk Contributions



A Portfolio with 1/3 of Capital Spread Across Bonds, Stocks and HFs is Not Diversified !



Source: Deutsche Bank, Bloomberg Finance LP, HFRI. Data sample 1997-2011.

Three 3-Dimensions of Risk Factor/Premia Exposure

Beta Risk Premia, Style Risk Premia and Systemic Risk Premia

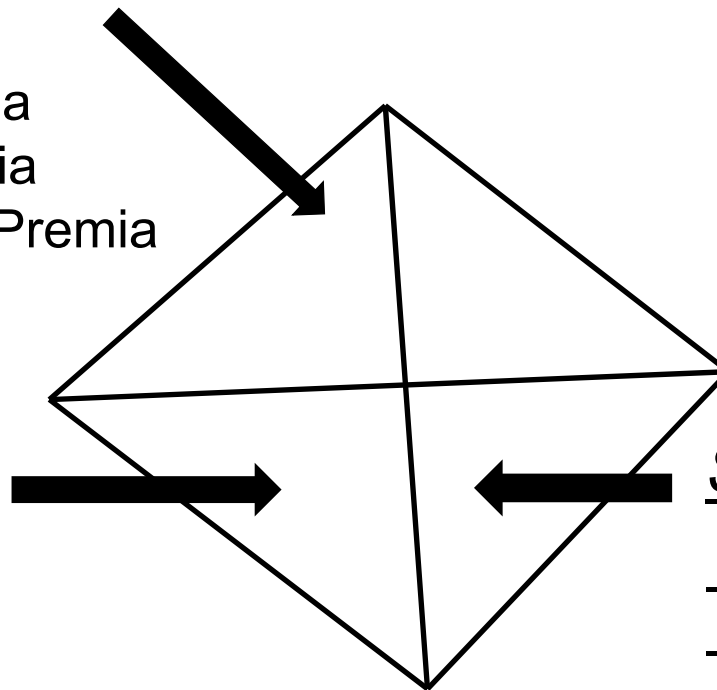


Beta Risk Premia

- Bond Duration
- Credit Risk Premia
- Equity Risk Premia
- Commodity Risk Premia
- Alternatives

Style Risk Premia

- Value Premium
- Carry Premium
- Momentum Premium
- Volatility Premium
- Illiquidity Premium
- Size Premium



Systemic/Macro Risk

- Growth Risk
- Inflation Volatility Risk
- Liquidity Risk
- Sovereign Risk

Building Portfolios of Risk Factors (... not Assets per-se)

An Example - Should I add High Yield to my Portfolio?



	<u>Risk Factor Exposure</u>
Beta Risk Premia	
Bond Duration	+
Credit Risk	+
Equity Risk	+
Commodity Risk	
Style Risk Premia	
Value	+
Momentum	
Carry	+
Illiquidity	+
Volatility	-
Size	
Systemic Risk Premia	
Liquidity	-
Growth	+
Inflation Volatility	-
Sovereign	-

Source: Deutsche Bank

Risk Factors Explain Stock/Bond Correlation Instability

Stocks and Bonds Diversify One Another Only in One State



Stocks Bonds

	Stocks	Bonds
Increase in E{Growth}	+	-
Increase in E{Inflation}	-	-
Increase in E{Sovereign Risk}	-	-

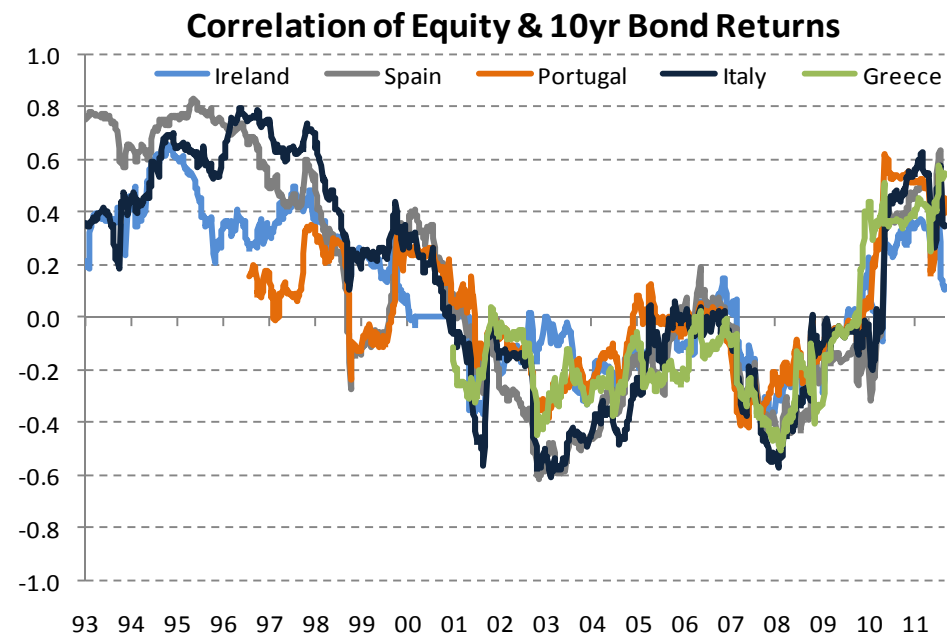
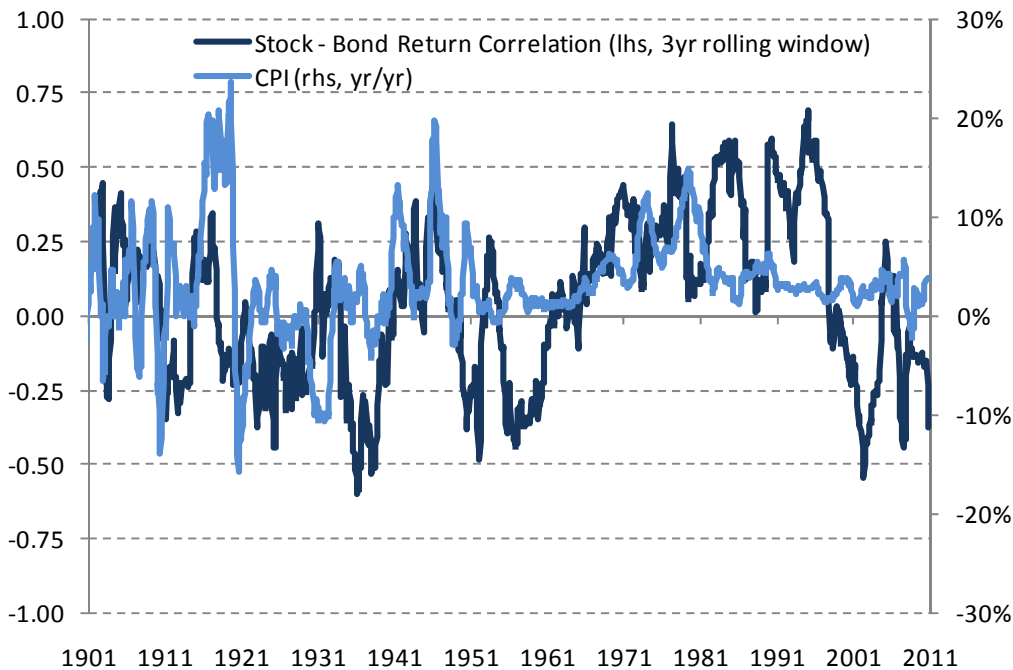
Source: Deutsche Bank

Risk Factors Explain Stock/Bond Correlation Instability

Both Stocks and Bonds are Short Inflation and Sovereign Risk



Stock and Bond Correlations (US left, Europe right)
 - Only Negative when Inflation and Sovereign Risk is Contained



Source: Deutsche Bank, Robert Shiller, Bloomberg Finance LP.

Style Risk Premia is Uncorrelated ...

... Within and Across Asset Classes

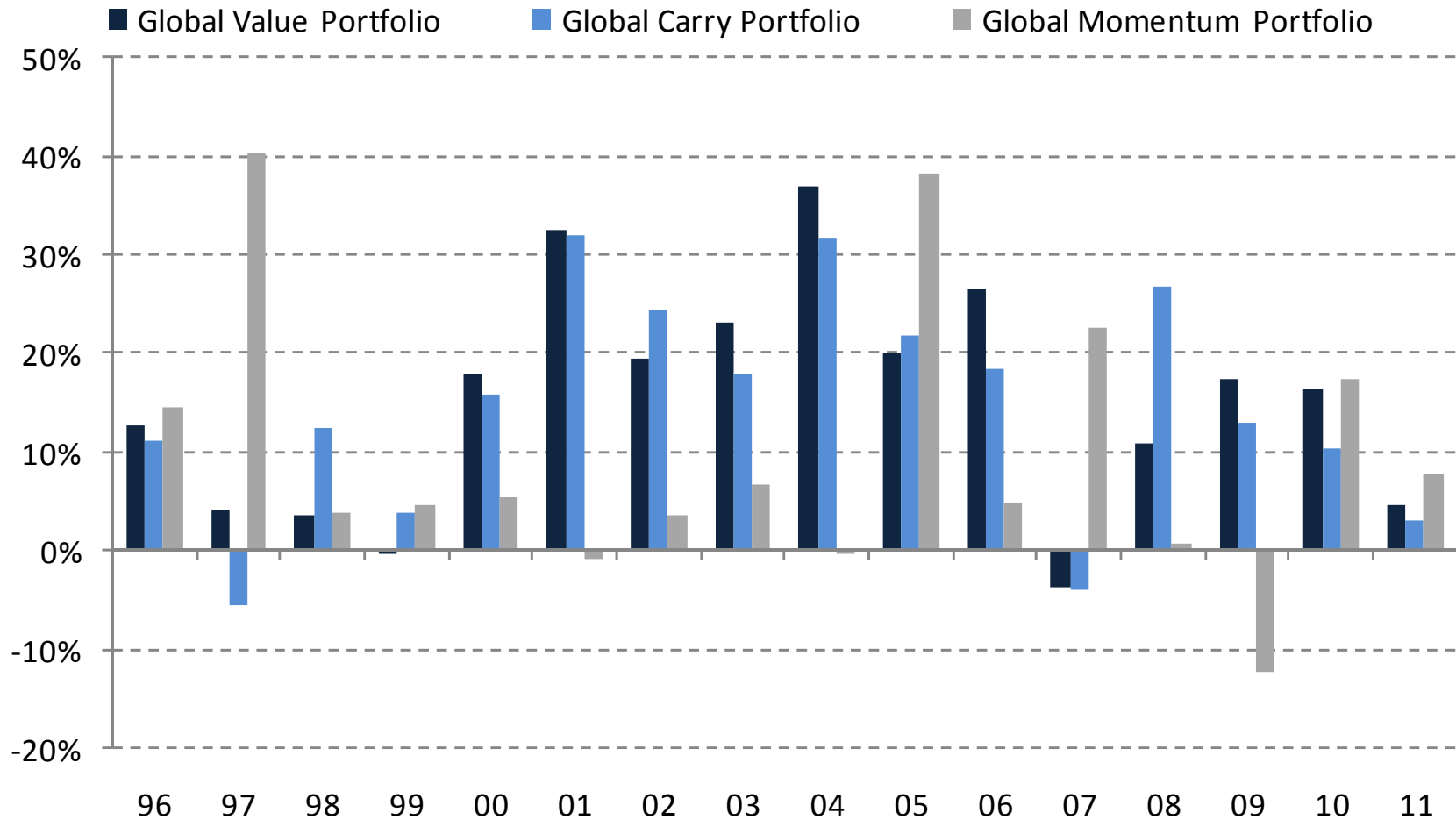


		VALUE							CARRY							MOMENTUM						
		FX	Rates	Comm	World Equity Indices	US Stocks	Japan Stocks	AxJ Stocks	FX	Rates	Comm	World Equity Indices	US Stocks	Japan Stocks	AxJ Stocks	FX	Rates	Comm	World Equity Indices	US Stocks	Japan Stocks	AxJ Stocks
VALUE	FX	1.00	-0.48	-0.02	-0.02	0.00	0.01	0.17	-0.51	-0.11	-0.05	0.21	0.00	-0.01	0.19	-0.26	-0.17	-0.02	-0.17	-0.04	0.02	-0.01
	Rates		1.00	-0.01	0.11	0.19	-0.05	-0.05	0.49	-0.01	0.08	-0.20	0.06	0.05	-0.05	0.03	0.04	0.02	0.06	-0.17	-0.07	0.06
	Commod			1.00	0.03	-0.06	-0.07	0.05	0.06	-0.04	-0.11	0.06	-0.03	-0.03	-0.01	0.00	-0.04	0.50	0.14	0.10	0.07	-0.09
	World Equity Indices				1.00	0.22	0.22	0.21	0.14	0.04	0.03	0.41	0.14	0.13	0.18	-0.08	-0.16	-0.01	-0.38	-0.13	-0.05	-0.05
	US Stocks					1.00	0.28	0.22	0.13	-0.02	0.10	0.14	0.47	0.18	0.09	-0.16	-0.16	-0.12	-0.24	-0.67	-0.28	-0.12
	Japan Stocks						1.00	0.21	-0.03	0.15	0.06	0.25	0.05	0.78	0.24	-0.14	-0.19	-0.01	-0.25	-0.21	-0.54	-0.21
	AxJ Stocks							1.00	-0.10	0.00	-0.02	0.25	0.12	0.19	0.48	-0.14	-0.08	-0.07	-0.24	-0.23	-0.27	-0.29
CARRY	FX							1.00	0.03	0.10	-0.17	0.02	-0.06	-0.12	0.17	-0.01	0.06	0.05	-0.29	-0.12	0.01	
	Rates								1.00	0.04	0.08	-0.13	0.08	0.08	0.12	0.08	0.07	-0.07	0.09	0.00	0.04	
	Commod									1.00	-0.05	0.06	0.02	-0.10	0.00	0.00	-0.09	-0.07	-0.17	-0.10	-0.08	
	World Equity Indices										1.00	0.11	0.27	0.47	-0.16	-0.14	-0.03	-0.54	-0.10	-0.13	-0.23	
	US Stocks											1.00	0.08	0.02	-0.06	0.02	-0.17	-0.11	-0.40	-0.11	-0.12	
	Japan Stocks												1.00	0.27	-0.22	-0.14	0.01	-0.24	-0.14	-0.66	-0.31	
	AxJ Stocks													1.00	-0.09	0.01	-0.01	-0.31	-0.14	-0.24	-0.27	
MOMENTUM	FX													1.00	0.59	0.03	0.19	0.18	0.22	0.19		
	Rates														1.00	0.05	0.22	0.21	0.12	0.04		
	Commod															1.00	0.19	0.11	0.04	0.01		
	World Equity Indices																1.00	0.33	0.27	0.31		
	US Stocks																	1.00	0.40	0.25		
	Japan Stocks																		1.00	0.37		
	AxJ Stocks																			1.00		

Source: Deutsche Bank, Datastream, Bloomberg Finance LP. Long/Short monthly portfolio returns in \$US-terms from 1995-2011. See, "The Role of Risk Factor Diversification", October 2011, Brad Jones.

Style Risk Premia is Uncorrelated ...

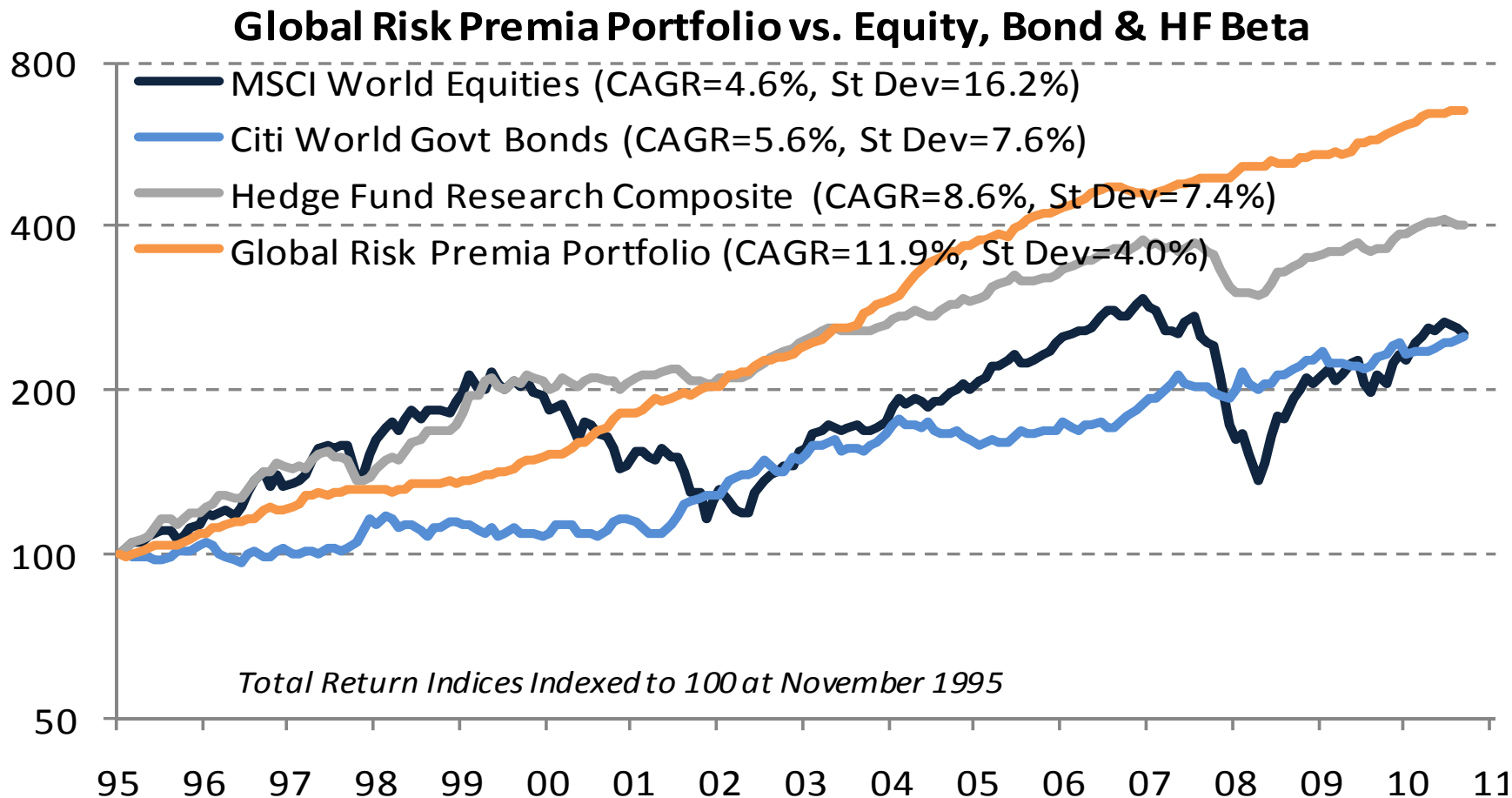
... Within and Across Asset Classes



Source: Deutsche Bank, Datastream, Bloomberg Finance LP. Long/Short monthly portfolio returns in \$US-terms from 1995-2011. The Value, Carry and Momentum Portfolios are volatility-weighted portfolios of long/short strategies across seven asset classes. See, "The Role of Risk Factor Diversification", October 2011, Brad Jones.

A Portfolio of Style Risk Premia vs. Beta Risk Premia

... Different Return Sources, Low Portfolio Drawdowns



Source: Deutsche Bank, Datastream, Bloomberg Finance LP. Long/Short monthly portfolio returns in \$US-terms from 1995-2011. The Global Risk Premia is a volatility-weighted portfolio of 21 long/short strategies (value, carry and momentum, across seven asset classes). See, "The Role of Risk Factor Diversification", October 2011, Brad Jones.

Two Tweaks in Harvesting Style Risk Premia

Is Constant Exposure to Risk Premia the Best We Can Do?



- ❑ Like traditional stock or bond risk premia, the ex-ante opportunity set across alternative risk premia's is highly time-varying – if this time-variation is not completely random, we may have a shot at improving on a constant/passive exposure to alternative risk premia

- 1. Exploit Factor Momentum – condition factor exposure on a rolling performance window:
 - Assumes asset returns are regime dependent and time-varying
 - Assumes there is persistence in regimes – long waves of factor outperformance are subsequently followed by long waves of 'factor decay' (the biology of capitalism)
 - Assumes turning points/regime shifts in returns to factors cannot be reliably predicted (ie. who knows when dividend yield will work again - but when/if it does, we will use it)

- 2. Take Factor Tilts - on the basis of conditional information which identifies the richness of the opportunity set, ex-ante:
 - Also assumes asset returns are regime dependent and time-varying
 - But assumes we can reliably measure the ex-ante opportunity set (ie. future value outperformance is conditional on high current valuation dispersion across stocks)
 - Assumes we have some ability in timing turning points in factor returns (be careful – this is easier done for some factors than others!)

Factor Tilts – Some Examples

Can Factor Exposure be “Conditioned” (without forecasting)?



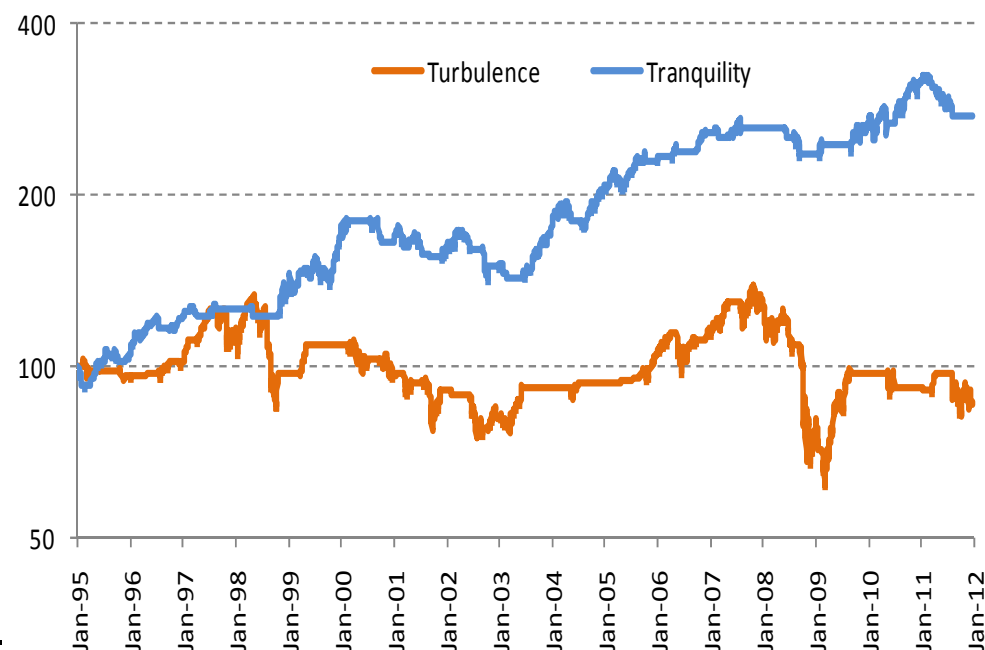
- ❑ The returns to value investing in equity markets tend to be higher than usual when:
 - Initial valuation dispersion between cheap and expensive stocks is unusually large
 - This dispersion cannot be explained away by long-term earnings projections
 - Liquidity risk is low (this helps to neutralize the bankruptcy/financial distress risk sometimes associated with cheap stocks, but can change quickly)
 - Note these initial conditions all held in 2000 – after which value significantly outperformed (around the world) for seven straight years

- ❑ The returns to carry trades in the currency market tend to be abnormally high when:
 - Currencies comprising the high (low) yielders are fundamentally cheap (expensive)
 - There is large dispersion in interest rate differentials across countries
 - High real rates in the higher yielding basket of currencies reflect strong domestic economic growth conditions (ie. monetary policy), and are not risk premiums reflecting elevated current account deficits, inflation or general sovereign risk
 - Broad global liquidity conditions are benign (incentivizing investors to write “financial catastrophe insurance” by participating in strategies with a high probability of steady returns, but a low probability of disaster)

Adapting to Regime Shifts (Part I) - Covariance Regimes

World Equity Returns are Drawn from Two Distributions – The Case for a Tactical Approach to Managing Covariance Regimes

	<i>Regime:</i>	Turbulence	Tranquility
Compound Annual Growth Rate		-1.5%	5.5%
Geometric (Annualized Daily) Return		-3.1%	10.6%
Standard Deviation		19.0%	10.9%
Reward/Risk Ratio		-0.16	0.97
Downside Standard Deviation		12.8%	6.7%
Average Downside Return		-0.4%	-0.2%
Daily Return Skew		-0.61	-0.16
Daily Return Kurtosis		5.7	3.5
% Up Days		54.5%	56.2%
Maximum Drawdown		-55.2%	-21.8%
Calmar Ratio		-0.03	0.25
Worst Day		-8.1%	-4.4%
Ratio of Worst Day to Best Day		1.1	0.8
95% Downside VaR		-2.0%	-1.1%
95% Downside C-VaR		-3.1%	-2.4%
<hr/>			
Average Length of Turbulent Regime (days)		37	
Longest Turbulent Period (days)		219	
Signal Switches Per Year		2.2	



Source: Deutsche Bank, Bloomberg Finance LP, MSCI. Daily \$US-based return data since 1995, across 42 countries, equally-weighted. "Turbulence" defined as periods where the covariance of daily country equity index returns is above the average of the past 252 trading days.

Adapting to Regime Shifts (Part II) – Factor Regimes



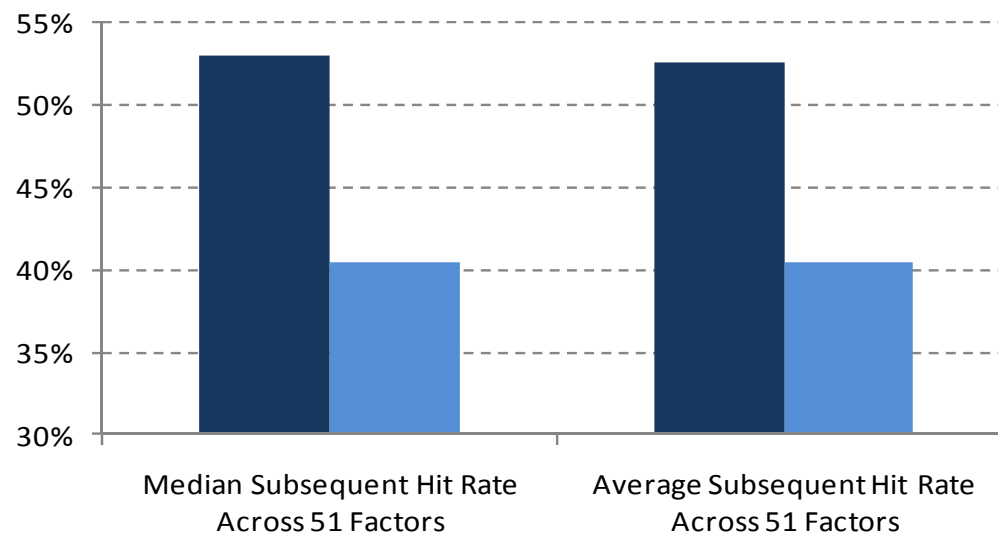
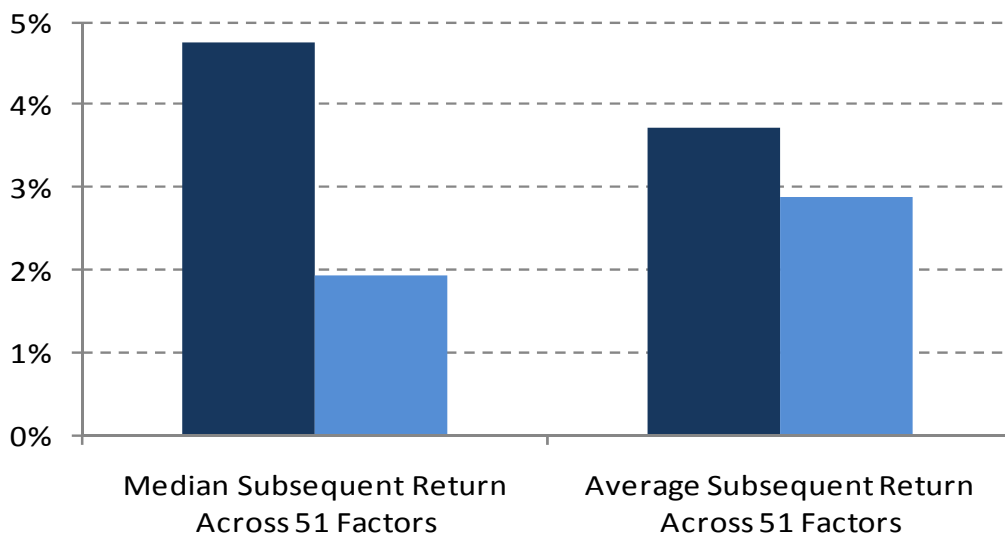
Long/Short World Equity Index Returns, Conditional on Whether a Factor Has Been Profitable in the Past Six Months ...

Long/Short World Equity Index Returns, Conditional on Past Factor Performance

Long/Short World Equity Index Hit Rate, Conditional on Past Factor Performance

■ When Factor Has Generated Positive Alpha in Prior 6mths
■ When Factor Has Not Generated Positive Alpha in Prior 6mths

■ When Factor Has Generated Positive Alpha in Prior 6mths
■ When Factor Has NOT Generated Positive Alpha in Prior 6mths



Source: Deutsche Bank, Bloomberg Finance LP, MSCI. Daily \$US-based return data since 1995, across 42 countries, equally-weighted.

Adapting to Regime Shifts (Part III) – Momentum Regimes

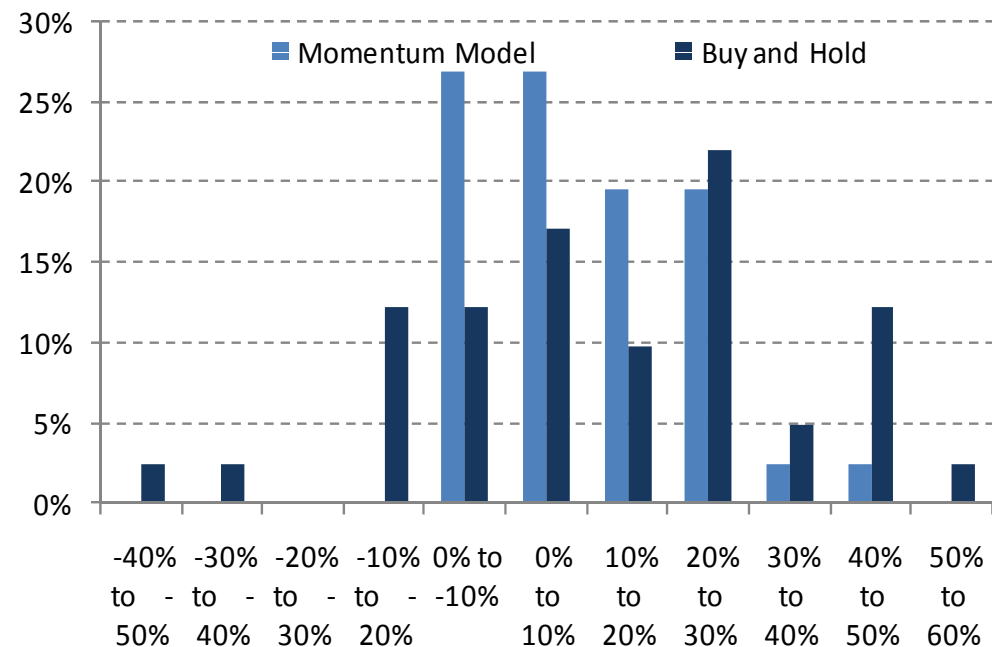
Play Defence First – Just Stay Clear of Big Bear Markets, and the Long-term Equity Risk Premium Will Look After You!



World Equity Index Returns: Buy-and-Hold vs. Long-or-Flat

Distribution of Annual World Equity Index Returns

	<i>Since 1970</i>		<i>Since 1999</i>	
	Model	Buy & Hold	Model	Buy & Hold
CAGR	9.3%	7.7%	7.2%	2.4%
St Dev	8.5%	14.4%	9.9%	18.1%
Return per unit of Std Dev	1.10	0.53	0.72	0.13
Downside Volatility	7.6%	13.0%	7.9%	16.0%
Return per unit of Downside Std Dev	1.23	0.59	0.90	0.15
Max Drawdown	-23%	-58%	-21%	-58%
Length of Max DD (yrs)	5.5	7.0	3.8	4.9
Calmar Ratio (DD/CAGR)	0.40	0.13	0.33	0.04
% Up Weeks	59%	59%	55%	56%
Average Down Week	-0.8%	-1.5%	-0.9%	-1.9%
Worst Week	-17%	-23%	-8%	-23%
Best Year	59%	68%	29%	45%
Worst Year	-9%	-49%	-9%	-49%



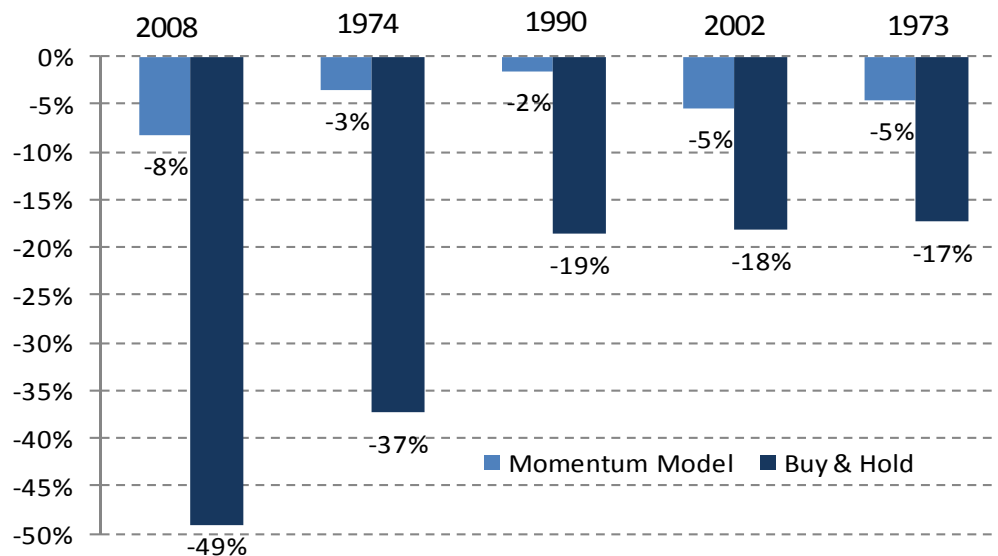
Source: Deutsche Bank, Bloomberg Finance LP, MSCI. Weekly \$US-based return data since 1970, across 42 countries, equally-weighted. The Momentum Model results are based on a simple medium-term trend following strategy where the investor is either fully invested or out of the market completely (but not short).

Adapting to Regime Shifts (Part III) – Momentum Regimes

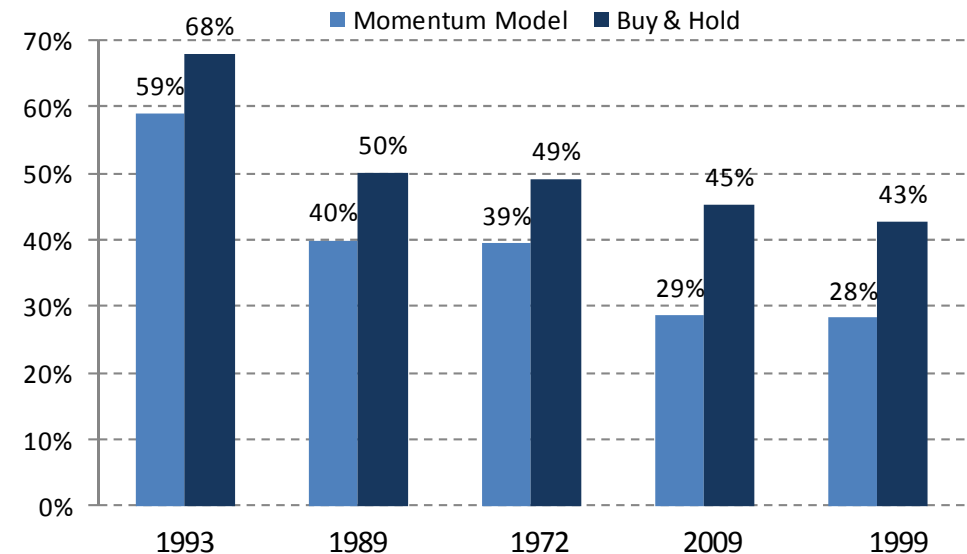
Momentum Overlays Can Preserve Capital in Bear Markets, While Offering Participation in Bull Markets (ie. Synthetic Calls)



Only 20% of the Downside in Big Bear Markets ...



... and 75% of Participation in Big Bull Markets



Source: Deutsche Bank, Bloomberg Finance LP, MSCI. Weekly \$US-based return data since 1970, across 42 countries, equally-weighted. The Momentum Model results are based on a simple medium-term trend following strategy where the investor is either fully invested or out of the market completely (but not short).

Adapting to Regime Shifts (Part III) – Momentum Regimes

Momentum Overlays - Don't Cede the Intellectual High Ground!

- ❑ Disciplined use of momentum overlays can defend against debilitating behavioral biases:
 - *Cognitive Dissonance* - the tendency to disregard evidence contrary to one's thesis;
 - *Overconfidence* – most fund managers believe they have above-average skill;
 - *Prospect Theory/Loss Aversion* - the tendency for investors to be risk-averse when faced with the potential for gain (ie. take profits early), but turn risk-seeking when faced with the prospect for loss (ie. let losing trades run in the hope they come back). This manifests in a kinked utility curve (flatter for profitable trades than losing trades).

- ❑ Three explanations for why the momentum effect is still a wide-spread source of return, long after it has been documented by academics:
 - *Economic rationale* – self-reinforcing positive feedback loops between the economy and financial assets (George Soros calls this 'reflexivity', while Hyman Minsky's 'Financial Instability Hypothesis' stresses the role of leverage in amplifying the pro-cyclical nature of business cycles);
 - *Institutional rationale* – investors tend to minimize career risk by clinging tightly to benchmarks which are biased to over-weight securities with good recent performance;
 - *Behavioral rationale* – investor risk reversion tends to be wealth dependent. Investors also tend to initially under-react to new information (cognitive dissonance) as they extrapolate the recent past, before extrapolating the new trend once it begins to form

Concluding Remarks – Evolution Ahead in Asset Allocation



- ❑ The 60/40 Policy Portfolio, still the industry default setting, is far riskier than most think:
 - It is subject to unacceptably large and lengthy drawdowns/shortfall risk
 - Has substantial embedded correlation risk (based on statistical/economic factors)
 - Ignores regime dependence, and is ill-equipped for a ‘stag-lite’ macro environment
 - At current valuation levels, offers virtually no prospect of realizing returns in line with the long-term average of 4% p.a. in real terms (more likely 1% p.a.)

- ❑ The Second Generation Approach has been to expand into more assets (ie. alternatives):
 - But most alternatives are short systemic liquidity risk, and so can compound losses of a equity-centric portfolio in a crisis (ie. alternatives have a very high ‘stress beta’)
 - New alternative sources of return will include genuinely orthogonal exposures like cat bonds, music/intellectual property rights, carbon/water credits, longevity swaps, etc.

- The Third Generation Approach to portfolio construction will likely rest on three pillars:
 - ❑ Risk factors and risk premias, rather than asset class silos, will be the building blocks
 - ❑ Risk management should be a tactical and multi-dimensional process, incorporating the biological concepts of regime dependence, regime shifts and adaptation
 - ❑ The best features of the Endowment Model (centered on long-term risk premia) and Macro Hedge Funds (focused on managing tail risk) will eventually be fused together



Appendix # 1.

Building an Investment Defense Against Behavioral Biases

Can A Process Triumph Over Behavioural Biases?

Defending Ourselves From ... Ourselves



- We roamed the African savannah for 130,000 years, but have been trading stocks and bonds on organized exchanges for just 400 years* - our biological processes have not kept pace with developments in our career paths!
- This leaves us vulnerable to an array of behavioural biases that while optimal for survival in the jungle, are sub-optimal for decision making under uncertainty
- 250 years ago, Adam Smith characterized the behaviour of humans as one of conflict between ‘passions’ and ‘an impartial spectator’, but for much of the past century, the assumption of rational expectations has dominated in economics
- Only in the past 15-20 years have we started to fuse findings from behavioural neuroscience and cognitive psychology into a new discipline that addresses suboptimal decision making – neuroeconomics, or behavioural finance
- We cannot cure systematic biases – these are generally efficient and helpful for daily life (our brains engage in ‘heuristics’, ‘satisficing’ and ‘boundedly rational’ decision making, preventing paralysis-by-analysis for trivial matters) ...
- ... But we can develop processes to ameliorate the debilitating effects of behavioural biases in investment decision making in the face of uncertainty

* *The Dutch East India Company was the first to issue stock and bonds to the general public in a limited liability structure via the Amsterdam Stock Exchange in 1602 (Exchange Handbook).*

The Case for Process over Discretion

Behavioural Biases Help in Life, But not in the Markets



- In response to the collapse of the South Sea Bubble, Sir Isaac Newton declared he could calculate the motion of heavenly bodies, but not the madness of people
- When faced with heightened uncertainty, behavioural biases trump rational thought
- Financial losses are processed in the same areas of the brain that respond to mortal danger - this only serves us well in running away from lions!
- Worse still, in the face of large potential losses we exhibit risk-seeking behavior, but turn risk averse when faced with gains – we let losses run, but cut short winners!
- It is the release of chemical compounds that affect our decision making:
 - Oxytocin is associated with the herding effect (and feelings of trust/security)*
 - Dopamine (affecting our pleasure/reward senses) is released when we anticipate the prospect of unusually large returns – the neural activity of a trader on a hot streak can be indistinguishable from someone on cocaine*
- Deep value investing is so difficult in practise because isolation from herds leads to stimulation of the amygdala (fight/flight) which can overwhelm the analytical brain (prefrontal cortex) - bucking the consensus can activate the same areas of the brain that are triggered by physical pain* – it literally hurts to be a deep value investor!

* "Source: *Your Money and Your Brain*" (2007), Jason Zweig

The Case for Process over Discretion

More than 100 Behavioural Biases Have Been Documented !



- Overconfidence bias - the majority believe they are superior to the average
- Cognitive dissonance - the tendency to seek only evidence supporting one's thesis
- Regret avoidance - a poor outcome in the past prevents objective appraisal in subsequent periods ("I will never buy tech stocks again")
- Disposition effect/Asymmetric loss aversion - we take large risks in attempting to avoid any loss, but are risk averse (take profits early) in the face of potential gains
- Hindsight bias (Monday morning quarterbacking) - ex-post rationalization makes events seem more predictable than was the case in real time ("it was so obvious")
- Self attribution bias - positive (negative) outcomes are due to us (exogenous events)
- Endowment affect – we value owned items higher than identical unowned items
- Sadness effect - in order to bring about change, it increases the value placed on unowned items, and decreases that of owned items (antidepressants have been prescribed for compulsive shoppers and traders!)
- Familiarity bias - gives a false impression of control
- Anchoring effect - placing too much weight on just one piece of information ("I won't swim in Australia as they have sharks in the water down there")



Appendix # 2.

Noise vs. Signal

- The (Non-Linear) Role of Time

Noise vs. Signal

Why Monitoring Your Portfolio Each Hour Won't Help Performance



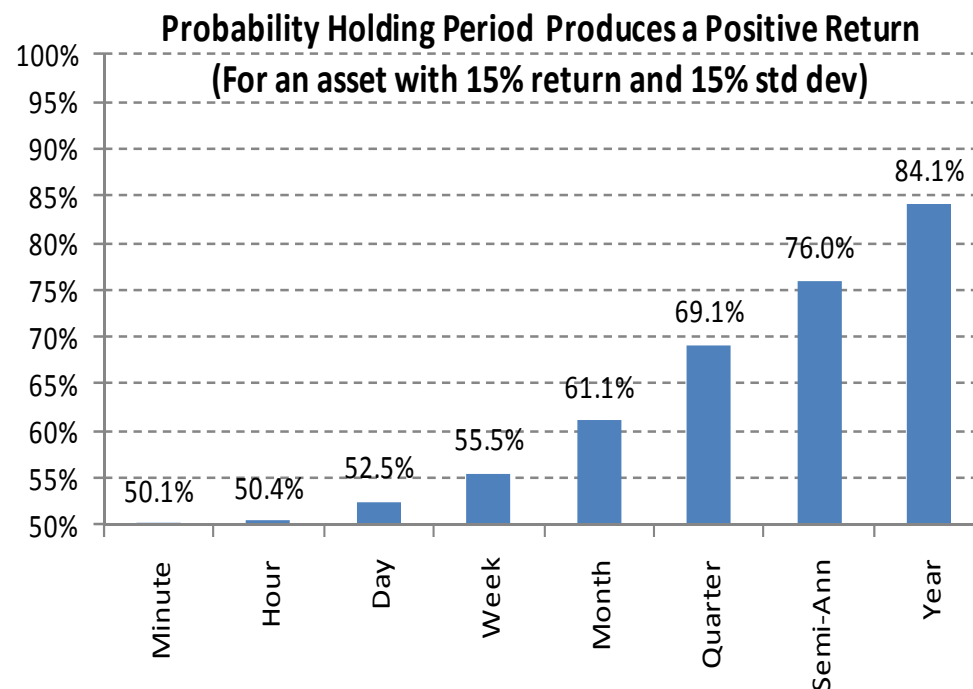
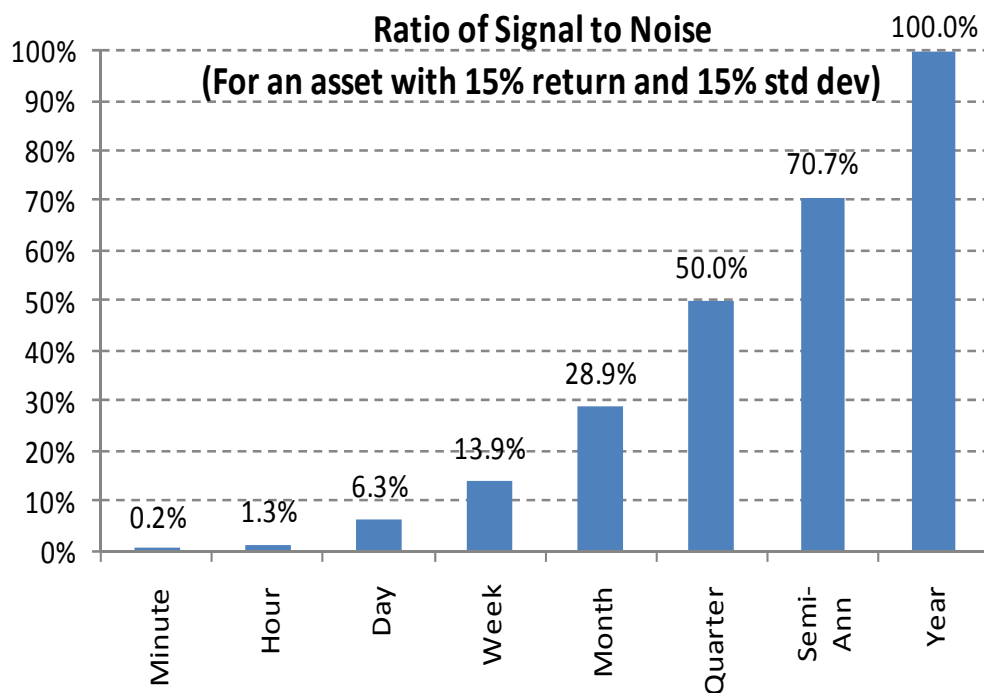
- The return generating process is a function of signal (return) and noise (volatility)
- The signal/noise ratio varies dramatically through time - return (or drift) grows as a linear function of time, but standard deviation grows more slowly (at the root of time)
- There are significant implications from this time-dependent non-linear relationship:
 - at high frequencies, volatility swamps the drift (you only observe noise!)
 - for instance in the case of an asset with 15% return and 15% volatility, the signal/noise ratio is just 1% at 1-hourly frequency, but 29% at monthly frequency
 - put another way, the probability of this asset being higher over any given 1-hr period is just 50.4% (a coin toss), but 61.1% over any given monthly period
 - because we feel losses more intensely than gains of the same magnitude, *high frequency trading will likely impose enormous emotional costs over time*
 - at high frequencies, the ratio of transaction costs/returns is also very large (an asset appreciating 15% p.a. will rise just 0.06% on average each day, < bid/ask!)
 - lowering the observation frequency increases signal/noise, but at the potential cost of missing big turning points (there is a trade-off or optimization problem)
 - the largest gains in statistical efficiency (and hence emotional benefit) likely occur when measuring volatility daily, but observing returns weekly or monthly

Noise vs. Signal

Why Monitoring Your Portfolio Each Hour Won't Help Performance



- Time is a natural filter for noise
- Drift can 'out-run' volatility only as the length of holding period increases (volatility is a sprinter and will dominate over short periods, drift is a marathon runner)
- Increasing the observation period (up to a point) can help save emotional calories!



Source: DB Global Markets Research, Bloomberg

Deutsche Bank

Brad Jones; brad.jones@db.com; +852 2203 8170

January 2012

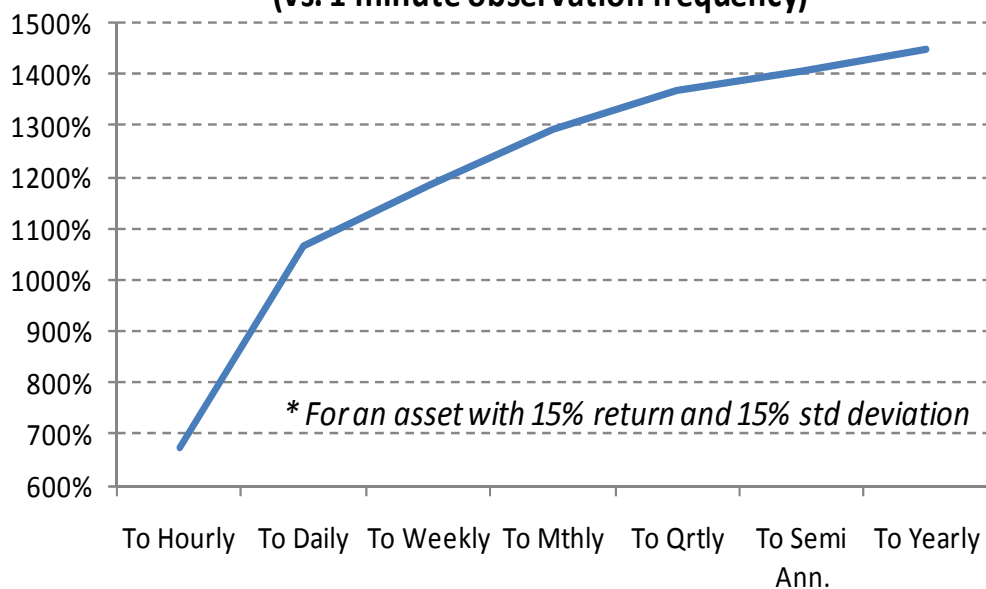
Noise vs. Signal

Why Monitoring Your Portfolio Each Hour Won't Help Performance

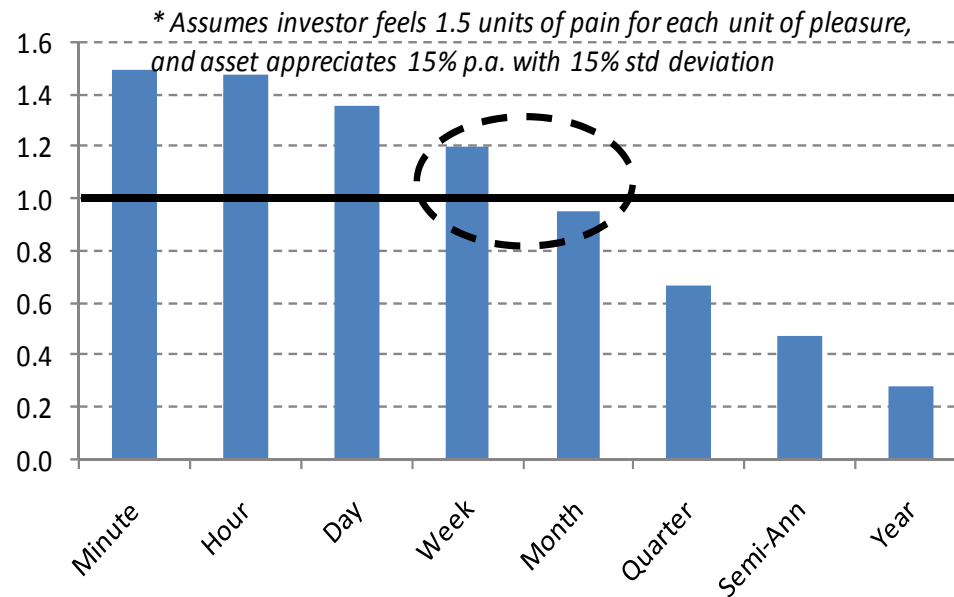


- The more volatile the asset, the longer time period typically required in order to observe a reasonable amount of 'signal'
- Incremental benefits from extending the observation period seem to level out beyond the monthly frequency (and may be overtaken by other considerations)

**Cumulative Increase in Signal/Noise Ratio
(vs. 1 minute observation frequency)**



Ratio of Pain to Pleasure Across Observation Periods



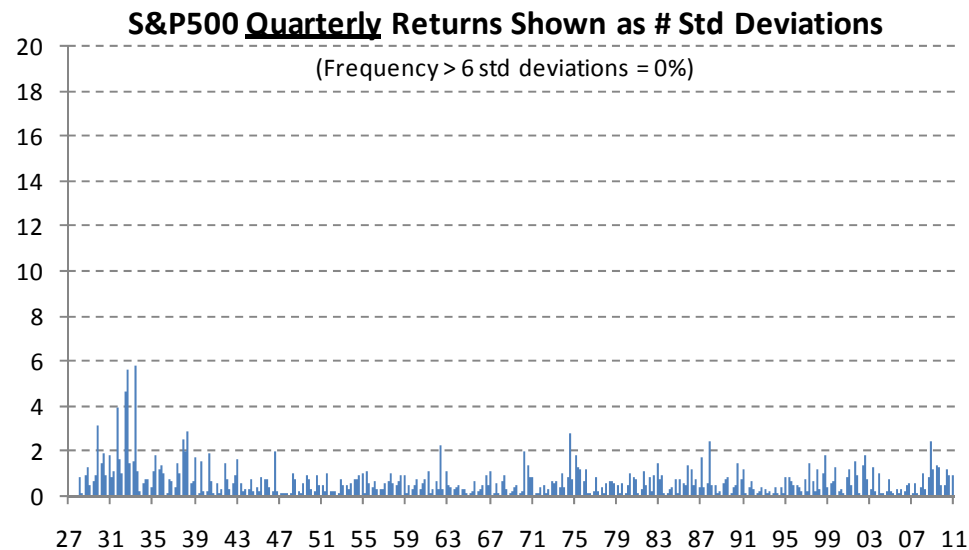
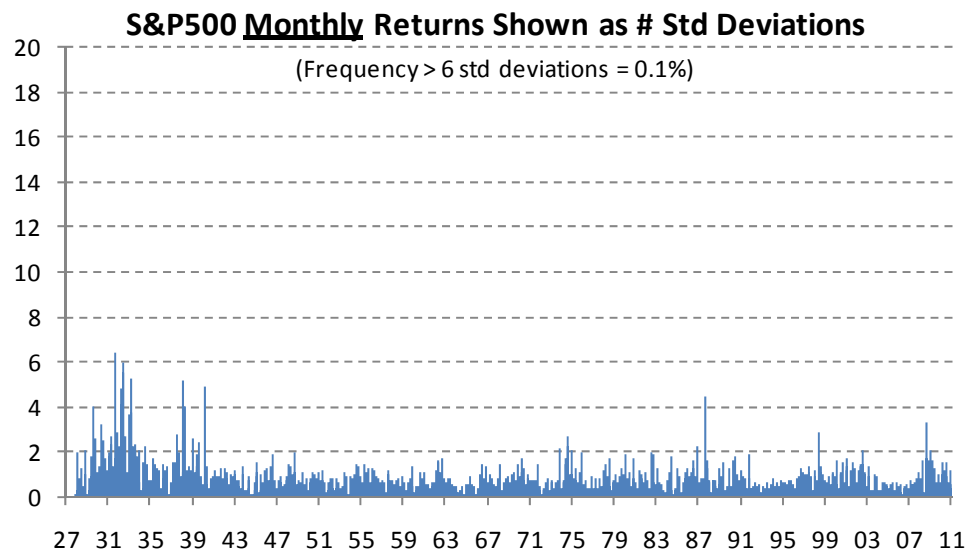
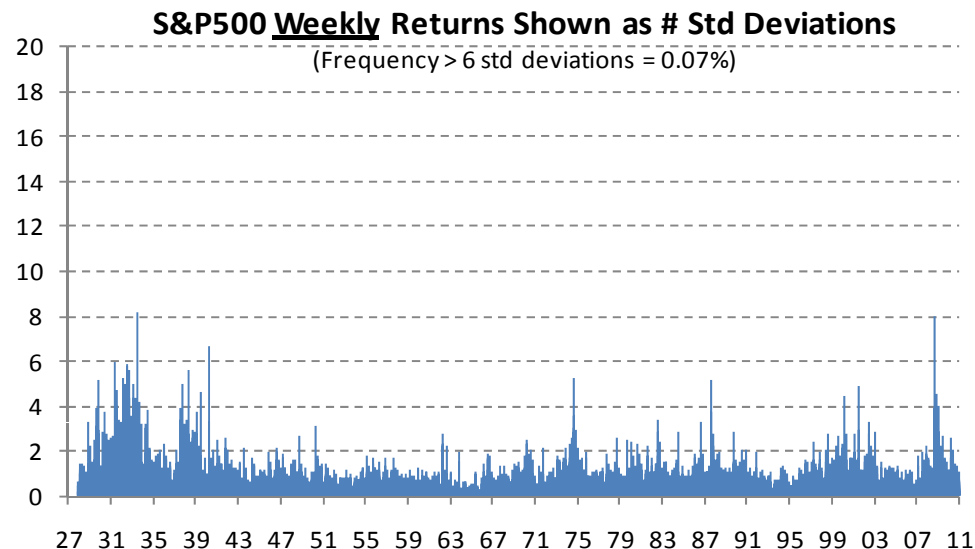
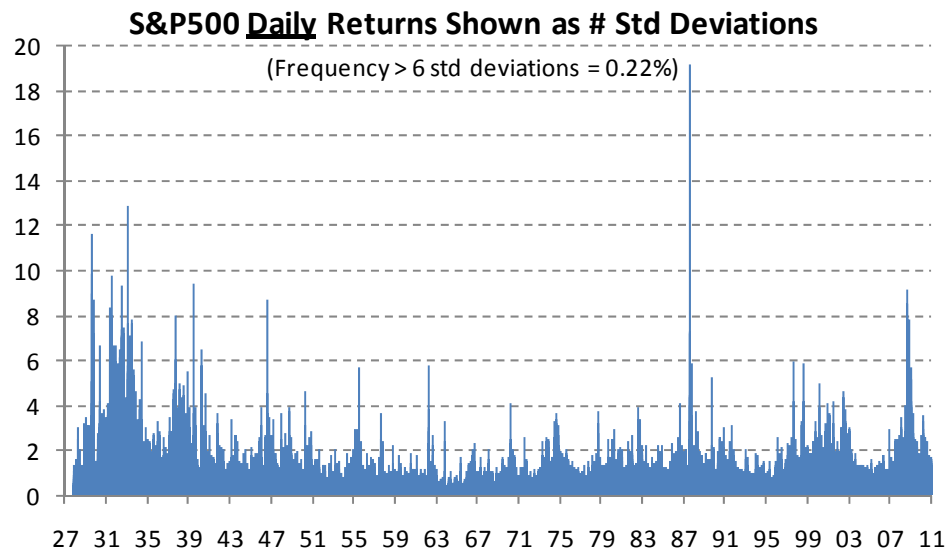
Source: DB Global Markets Research, Bloomberg

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Brad Jones; brad.jones@db.com; +852 2203 8170
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Noise vs. Signal

As the Holding Period Increases, Noise Eventually Washes Out



Source: DB Global Markets Research, Bloomberg

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Brad Jones; brad.jones@db.com; +852 2203 8170

January 2012

Appendix 1

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Buy: Based on a current 12-month view of total shareholder 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.

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Notes:

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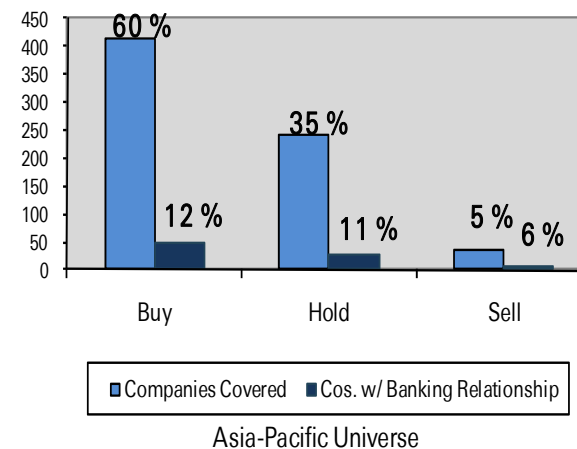
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Buy: Expected total return (including dividends) of 10% or more over a 12-month period

Hold: Expected total return (including dividends) between -10% and 10% over a 12-month period

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