



## Asset Allocation, Risk Appetites, And Flight-to-Safety

**QWAFAFEW San Francisco** 

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#### Work is joint with Paul Pfleiderer at Stanford

Reference: "Flight to Quality and Asset Allocation in a Financial Crisis," *Financial Analysts Journal*, 69 (4), July-August 2013, 43-57

#### Not-so-Happy Hour -> circa March 2009





Confidential Information

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#### "Better Off with Bonds?"



#### Asset Class Risk and Return, Ten Years Ended 2/28/2009

Quantal International

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#### **Basic Point is Simple**





#### **Key Assumptions: Base Case**



- Market clearing in the presence of revealed risk appetites and consistent expectations
- Asset Allocation amongst typical "bucketing" into asset classes with fixed supplies, no QE effects and the like
- Ignore impact of shifts in uncertainty about non-traded assets, etc.





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#### **Pre-Crisis: Market Environment: Assumed Risk-**Return Structure, Market Index Weights Quantal International

		_		_			
	Market	Standard	US	Dev	Em		Equilibrium
	Weights	Deviation	Equity	Equity	Equity	Bonds	Exp Return*
US Equity	20.00%	18.00%	1.00	0.50	0.35	-0.15	5.36%
Dev Equity	22.00%	16.00%	0.50	1.00	0.50	-0.05	5.30%
Em Equity	18.00%	20.00%	0.35	0.50	1.00	-0.05	5.66%
Bonds	30.00%	4.00%	-0.15	-0.05	-0.05	1.00	3.06%
Cash	10.00%	0.00%					3.00%**

\* Average Risk Tolerance = 0.5

\*\* Borrowing Cost = 3.50%

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#### Aside: Varying Correlation between Equity and Fixed Income: Pre-Crisis



FIGURE 5.2 Realized Correlation Between U.S. Large-Cap and Small-Cap Equity Returns and Bond Returns over the Last Decade

Source: Marsh, Terry, 2006, "Correlation in Daily & Fixed Income Returns: Implications for Cross-Asset Factor Model," in Innovations in Investment Management, Ed: H. Gifford Fong, Bloomberg Press

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#### **Pre-Crisis: Investor Clienteles and Market-Clearing** Allocations (Optimal for each Clientele)

	Clientele	(1)	(2)	(3)	(4)	(5)	(6)	(7)	
	<b>Risk Tolerance</b>	0.2	0.3	0.4	0.5	0.6	0.7	0.8	
	% of Total Wealth	5.00%	10.00%	20.00%	30.00%	20.00%	10.00%	5.00%	
	US Equity	8.31%	12.47%	16.63%	20.56%	23.55%	26.55%	29.54%	
Optimal Allocations	Dev Equity	8.93%	13.39%	17.86%	22.23%	26.21%	30.19%	34.17%	
	Em Equity	7.29%	10.94%	14.58%	18.16%	21.47%	24.77%	28.07%	
	Bonds	17.10%	25.65%	34.20%	39.05%	28.77%	18.49%	8.21%	
	Cash	58.36%	37.54%	16.72%	0.00%	0.00%	0.00%	0.00%	
	Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	
									Total
	US Equity	0.42%	1.25%	3.33%	6.17%	4.71%	2.65%	1.48%	20.00%
V Holdings in Economy	Dev Equity	0.45%	1.34%	3.57%	6.67%	5.24%	3.02%	1.71%	22.00%
% Holdings in Economy	Em Equity	0.36%	1.09%	2.92%	5.45%	4.29%	2.48%	1.40%	18.00%
	Bonds	0.86%	2.57%	6.84%	11.72%	5.75%	1.85%	0.41%	30.00%
	Cash	2.92%	3.75%	3.34%	0.00%	0.00%	0.00%	0.00%	10.00%
		5.00%	10.00%	20.00%	30.00%	20.00%	10.00%	5.00%	100.00%

#### **Post-Crisis: Realized Allocations After Huge Price** Changes, Before Allocation Adjustments Quantal International

	Clientele	(1)	(2)	(3)	(4)	(5)	(6)	(7)	
New Level of F	Risk Tolerance	0.1	0.2	0.3	0.4	0.5	0.6	0.7	
New % o	of Total Wealth	6.22%	11.51%	21.17%	29.27%	18.67%	8.92%	4.25%	
	US Equity	5.46%	8.85%	12.83%	17.20%	20.59%	24.30%	28.38%	
Allocations after 40%	Dev Equity	5.86%	9.50%	13.77%	18.60%	22.91%	27.63%	32.82%	
Decline in Equity, 10%	Em Equity	4.79%	7.76%	11.25%	15.20%	18.77%	22.67%	26.96%	
Decline in Bonds and 5%	Bonds	16.84%	27.29%	39.57%	49.01%	37.73%	25.39%	11.84%	
Gain In Riskless	Cash	67.05%	46.60%	22.58%	0.00%	0.00%	0.00%	0.00%	
	Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	
									Total
	US Equity	0.34%	1.02%	2.71%	5.03%	3.85%	2.17%	1.21%	16.33%
% Holdings after 40%	Dev Equity	0.36%	1.09%	2.92%	5.44%	4.28%	2.46%	1.39%	17.96%
Decline in Equity, 10%	Em Equity	0.30%	0.89%	2.38%	4.45%	3.50%	2.02%	1.15%	14.69%
Decline in Bonds and 5%	Bonds	1.05%	3.14%	8.38%	14.34%	7.05%	2.26%	0.50%	36.73%
Gain In Riskless	Cash	4.17%	5.36%	4.78%	0.00%	0.00%	0.00%	0.00%	14.29%
	Total	6.22%	11.51%	21.17%	29.27%	18.67%	8.92%	4.25%	100.00%

#### **Market Environment Before and After: Assumed** Risk-Return Structure, Market Index Weights Output International

				Correl	ations		
	Market	Standard	US	Dev	Em		Equilibrium
	Weights	Deviation	Equity	Equity	Equity	Bonds	Exp Return*
US Equity	20.00%	18.00%	1.00	0.50	0.35	-0.15	5.36%
Dev Equity	22.00%	16.00%	0.50	1.00	0.50	-0.05	5.30%
Em Equity	18.00%	20.00%	0.35	0.50	1.00	-0.05	5.66%
Bonds	30.00%	4.00%	-0.15	-0.05	-0.05	1.00	<b>3.06%</b>
Cash	10.00%	0.00%					3.00%**

\* Average Risk Tolerance = 0.5

\*\* Borrowing Cost = 3.50%

	Market	Standard	US	Dev	Em		Equilibrium
	Weights	Deviation	Equity	Equity	Equity	Bonds	Exp Return*
US Equity	16.33%	62.00%	1.00	0.45	0.50	0.10	<mark>33.20%</mark>
Dev Equity	17.96%	54.00%	0.45	1.00	0.85	0.45	<mark>36.37%</mark>
Em Equity	14.69%	60.00%	0.50	0.85	1.00	0.30	<mark>39.25%</mark>
Bonds	36.73%	18.00%	0.10	0.45	0.30	1.00	<mark>8.59%</mark>
Cash	14.29%	0.00%					1.00%**

\* Average Risk Tolerance = 0.386

\*\* Borrowing Cost = 3.00%

**BEFORE** 

**AFTER** 

#### **Optimal Allocations and Turnover**



	Clientele	(1)	(2)	(3)	(4)	(5)	(6	(7)	
	<b>Risk Tolerance</b>	0.1	0.2	0.3	0.4	0.5	0.6	0.7	
	% of Total Wealth	6.22%	11.51%	21.17%	29.27%	18.67%	8.92%	4.25%	
	US Equity	4.43%	8.85%	13.28%	17.70%	20.37%	23.54%	27.47%	
New Ontimal Allocations	Dev Equity	4.24%	8.47%	12.71%	16.95%	25.07%	32.05%	37.39%	
	' Em Equity	4.00%	8.00%	12.00%	16.00%	18.20%	20.92%	24.41%	
	Bonds	12.18%	24.35%	36.53%	48.70%	36.37%	31.18%	36.38%	
	Cash	75.16%	50.32%	25.48%	0.64%	0.00%	- 7.70%	-25.65%	
	Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	-
									Total
	US Equity	0.28%	1.02%	2.81%	5.18%	3.80%	2.10%	1.17%	16.33%
New % Holdings in	Dev Equity	0.26%	0.98%	2.69%	4.96%	4.68%	2.86%	1.59%	17.96%
Economy	Em Equity	0.25%	0.92%	2.54%	4.68%	3.40%	1.87%	1.04%	14.69%
	Bonds	0.76%	2.80%	7.73%	14.26%	6.79%	2.78%	1.55%	36.73%
	Cash	4.67%	5.79%	5.39%	0.19%	0.00%	-0.69%	-1.09%	14.29%
	Total	6.22%	11.51%	21.17%	29.27%	18.67%	8.92%	4.25%	100.00%
	US Equity	-1.03%	0.01%	0.45%	0.51%	-0.22%	-0.76%	-0.91%	
	Dev Equity	-1.63%	-1.03%	-1.07%	-1.65%	2.15%	4.42%	4.57%	
Change in Allocations	Em Equity	-0.79%	0.24%	0.75%	0.81%	-0.57%	-1.75%	-2.55%	
	Bonds	-4.67%	-2.94%	-3.05%	-0.31%	-1.36%	5.79%	24.54%	
	Cash	8.11%	3.72%	2.91%	0.64%	0.00%	- 7.70%	-25.65%	
	Total	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	

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#### **Optimal Allocations and Turnover** (cont'd.)



	Clientele	(1)	(2)	(3)	(4)	(5)	(6)	(7)	
	<b>Risk Tolerance</b>	0.1	0.2	0.3	0.4	0.5	0.6	0.7	
	% of Total Wealth	6.22%	11.51%	21.17%	29.27%	18.67%	8.92%	4.25%	
									Total
Change in % Holdings in Economy	US Equity	-0.06%	0.00%	0.10%	0.15%	-0.04%	-0.07%	-0.04%	0.00%
Change in % Holdings	Dev Equity	-0.10%	-0.12%	-0.23%	<mark>-0.48%</mark>	<mark>0.40%</mark>	<mark>0.39%</mark>	<mark>0.19%</mark>	0.00%
in Economy	Em Equity	-0.05%	0.03%	0.16%	0.24%	-0.11%	-0.16%	-0.11%	0.00%
In Economy	Bonds	-0.29%	-0.34%	-0.64%	-0.09%	-0.25%	0.52%	1.04%	0.00%
	Cash	0.50%	<mark>0.43%</mark>	<mark>0.62%</mark>	0.19%	0.00%	<mark>-1.09%</mark>	<mark>-1.09%</mark>	0.00%
	Total	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

 $\Sigma(|%Changes in Holdings|) / 2 = 4.95\%$ 

#### **Variations on Base Case**



- No Leverage
- Wealth Equally Distributed Across Clienteles
- No Decrease in Risk Tolerance in Crisis
- "Very High" Correlations among Asset Class Returns
- "Target Weight" Allocation Policy => Naïve Rebalancing
- Differential Return Expectations

#### **Variations on Base Case**



	Base case	No Leverage (A)	Equal Wealth Clienteles (B)	No Decrease in Risk Tolerance (C)	Naive Rebalancing (D)	Differential Expectations (E)
Before	0.500	0.500	0 500	0.500	0.500	
Average RISK TO	0.500	0.500	0.500	0.500	0.500	0.500
US Equity	5.36%	5.36%	5.43%	5.36%	5.36%	5.32%
Dev Equity	5.30%	5.30%	5.37%	5.30%	5.30%	5.26%
Expected Em Equity	5.66%	5.66%	5.73%	5.66%	5.66%	5.62%
Returns Bonds	3.06%	3.06%	3.13%	3.06%	3.06%	3.02%
Cash	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Sharpe Ratio	0.174	0.174	0.181	0.174	0.174	0.170
After						
Average Risk Tol	0.386	0.386	0.377	0.485	0.386	0.385
US Equity	33.20%	33.64%	34.50%	26.46%	29.94%	25.86%
Equilibrium Dev Equity	36.37%	36.81%	37.75%	28.95%	33.30%	28.31%
Expected Em Equity	39.25%	39.69%	40.70%	31.25%	35.86%	30.53%
Returns Bonds	8.59%	9.08%	9.30%	6.93%	7.22%	6.63%
Cash	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
Sharpe Ratio	0.732	0.747	0.767	0.578	0.656	0.562
Total Turnover	4.95%	3.23%	17.25%	3.88%	10.82%	26.24%



- Flight to Quality ⇔ "Flight to Risk"
- Optimal Investor Response = f (Risk Tolerance relative to Average)
- Turnover: Around 5% without "extended" assumptions
- Extensions:
  - Liquidity, <u>relative to Average</u>
  - Investment Horizon, <u>relative to Average</u>
  - Taxes, <u>relative to Average</u>

#### Implications of Same Basic Point => Market-Clearing



- A Good Company is not necessarily a Good Investment
- Low Property Taxes don't, all else equal, translate into lower housing costs for a shopper (housing prices capitalize the tax savings)
- Being able to buy a share of Fortress or Blackstone won't give "Everyman" a piece of the Private Equity "action."



- Require Predictability of Conditional Volatility and Covariance Structure
  - Asset Groupings are poor: Do at factor level => Quantal
- Differential Return Expectations
  - Over time, do assets earn higher premiums in periods of higher volatility? If not (Ang et. al.), we DO KNOW how to sell off most of the "black swan" risk: See next 3 slides
  - If risk-appetites change over time ("risk appetite" can include say c-VAR limits), as in our example, the wise market will infer this from net trade flows. Some traders try to beat the market by looking at fund flows.

# S&P 500 Returns and VIX: January 2, 1990 – May 2, 2011



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#### Scale Daily S&P 500 Returns by <u>Constant</u> Volatility (top) and by 1-day lagged VIX as proxy for <u>Conditional</u> Volatility (bottom)



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### Moments of <u>Conditional</u> Distribution of Daily

#### S&P 500 Returns

Quantal International

	S&P 500 Returns Scaled by	S&P 500 Returns Scaled by
<u>Standa</u>	rd Deviation Measured over Entire Period	VIX on Preceding Day
Mean	0.018302	0.017289
Median	0.044372	0.048046
Standard Deviation	1.000000	0.776764
Sample Variance	1.000000	0.603362
Kurtosis	11.963779	4.473268
Skewness	-0.200296	-0.361824
Minimum	-8.059105	-5.031819
Probability of Seeing Minimum or Less if Normal	0.0000000017166268407%	0.12512451075820100000%
Maximum	9.325208	3.307484
Probability of Seeing Maximum or More if Normal	0.000000000000000000%	91.16557201094780%