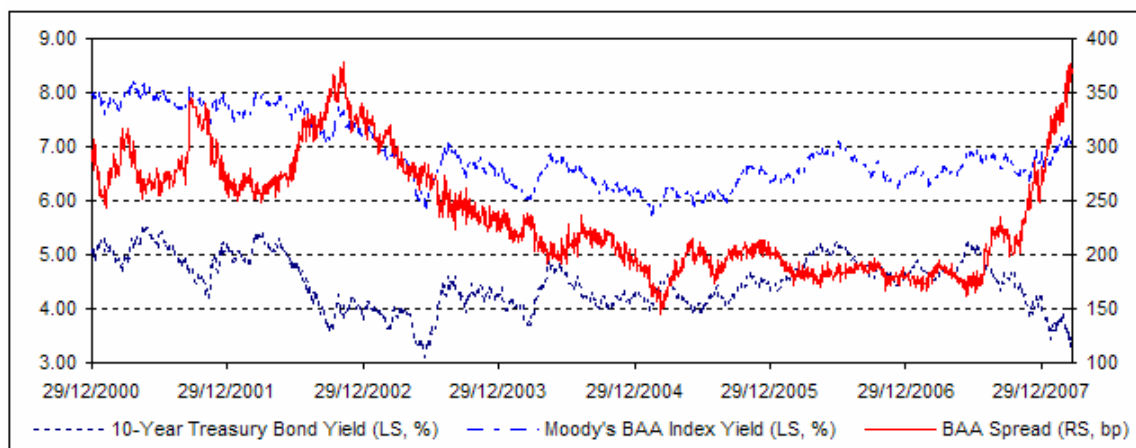


## Anatomy of Factor Returns During Aggressive Interest Rate Cutting Phases

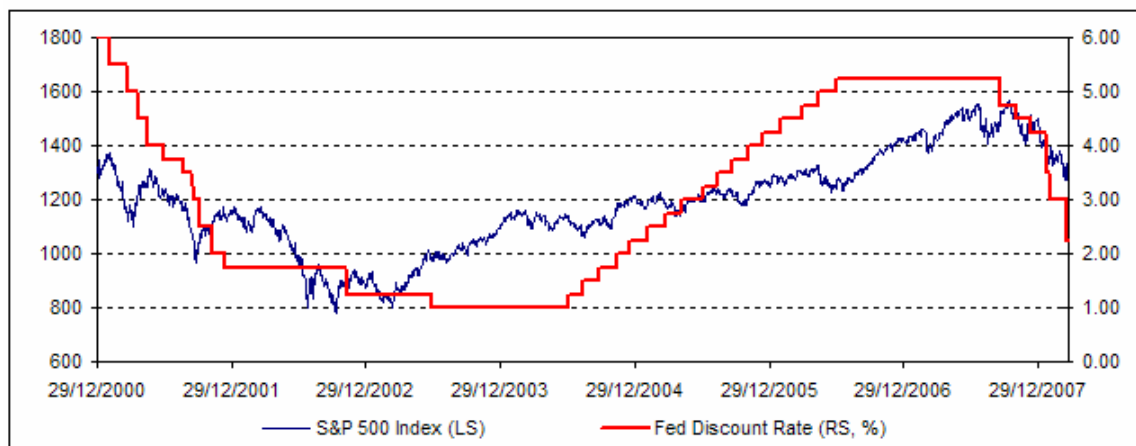
The bursting of the equity market bubble in 2000 and the terrorist attacks in 2001 prompted the Fed to cut interest rates aggressively from 6.50% to 1.75% during 2001. The bursting of the credit market bubble last year and the collapse of a major US investment bank last week resulted in similarly aggressive rate cutting action from 5.25% to 2.25% during the last six months.

Aggressive interest rate cutting phases typically coincide with extreme events, heightened macro economic uncertainty, increasing market volatility, rising risk aversion, falling Treasury bond yields, widening credit spreads, general flight to quality, and negative equity market returns. Chart 1 shows that the yield on the 10-year Note declined and BAA spreads rose significantly in the last two aggressive rate cutting phases. Chart 2 shows that the equity market declined during both recent rate cutting phases, with the S&P 500 falling by 13% in 2001 and by 11% in the last six months. Looking at what happened after the previous aggressive rate cutting cycle of 2001, there was a further rate cut in November 2002 (Enron) and the S&P fell by 23% during that year. However the market rallied in the next three years (2003-2005) with the S&P rising by 42%.

**Chart 1: 10Y Treasury Bond Yield and BAA Credit Spread between 31/12/2000 – 20/03/2008**



**Chart 2: S&P500 Index and Fed Official Discount Rate between 31/12/2000 – 20/03/2008**



In this note, we examine US industry and style factor returns from the Barra USE3S (U.S. Short-Term Equity) risk model during the two recent rate cutting phases. Before discussing the performance of various equity risk factors during rate cutting phases, it would be worth highlighting the definition and practical interpretation of Barra factor returns. These factor returns are estimated through daily cross sectional regressions of asset excess returns against asset exposures to industry and style factors. The resulting industry factor returns can be interpreted as the returns of long-short portfolios that have 100% net equity market exposure, 100% net exposure to a single industry, and zero exposure to all other industries and styles. Similarly, the resulting style factor returns can be viewed as the returns of zero investment long-short equity market neutral portfolios that have unit exposure to a single style and zero exposure to all other industries and styles.

Table 1 presents cumulative factor returns, annualized realized factor return volatilities, and average pair wise factor return correlations, for selected style and industry factors in the Barra USE3 risk model, during the six months to 18/03/2008 (recent aggressive interest rate cutting phase) and during the twelve months to 31/12/2001 (previous aggressive interest rate cutting phase). Even though we only show selected styles and industries in the table, the minimum, maximum, and average statistics were computed across all factors to provide a more complete picture.

**Table 1: Barra USE3S Model Factor Returns During the last Two Rate Cutting Phases**

Factor	Statistics (9/18/07-3/18/08)			Rankings (9/18/07-3/18/08)			Statistics (12/31/00-12/31/01)			Rankings (12/31/00-12/31/01)		
	Cumul Fac Ret	Realised Std Dev	Avg Pair Correl	Cumul Fac Ret	Realised Std Dev	Avg Pair Correl	Cumul Fac Ret	Realised Std Dev	Avg Pair Correl	Cumul Fac Ret	Realised Std Dev	Avg Pair Correl
Currency Sens.	1.5%	1.3%	-0.01	2	13	64	-0.8%	2.4%	0.01	9	8	60
Earnings Yld	-0.4%	2.6%	0.18	4	6	59	14.8%	3.4%	-0.27	1	6	66
Earnings. Var.	-1.9%	1.8%	-0.02	9	10	65	-2.2%	2.2%	-0.12	11	9	63
Growth	-2.5%	1.5%	-0.09	10	12	66	1.3%	2.2%	0.12	4	10	56
Leverage	-5.2%	2.0%	0.03	13	9	62	1.6%	1.7%	-0.25	3	13	65
Momentum	2.3%	5.0%	0.06	1	3	61	-12.6%	4.6%	-0.03	13	3	61
Size	-0.8%	2.9%	0.37	6	5	56	-9.0%	3.8%	0.08	12	5	57
Trading Act.	-2.7%	2.0%	0.23	11	8	57	-1.9%	3.3%	0.32	10	7	51
Value	-3.1%	2.2%	0.12	12	7	60	0.7%	2.1%	-0.18	6	11	64
Volatility	-1.4%	7.8%	0.62	7	2	10	-0.1%	13.1%	0.48	7	1	33
Yield	0.4%	1.8%	-0.21	3	11	67	3.8%	1.8%	0.06	2	12	59
Minimum	-5.2%	1.3%	-0.27				-12.6%	1.7%	-0.29			
Maximum	2.3%	10.6%	0.62				14.8%	13.1%	0.48			
Average	-1.2%	3.5%	0.08				-0.3%	4.2%	0.01			
Alcohol	-10.1%	24.4%	0.55	25	36	43	-8.5%	22.5%	0.40	16	48	45
Banks	-17.2%	37.3%	0.61	48	3	15	-15.1%	25.2%	0.54	24	34	7
Drugs	-10.4%	18.2%	0.54	27	54	44	2.7%	25.9%	0.40	7	31	46
Elec. Util.	-4.3%	21.7%	0.55	11	46	41	-33.7%	23.8%	0.39	51	43	47
Energy Res.	29.2%	27.2%	0.51	1	26	49	-21.8%	28.7%	0.25	40	21	54
Food & Bev.	-8.2%	20.2%	0.64	19	50	6	-2.7%	17.5%	0.50	11	54	25
Gas Util.	-6.7%	24.9%	0.60	15	35	18	-30.0%	24.0%	0.49	48	41	28
Gold	23.8%	42.3%	0.20	2	1	58	11.8%	36.3%	-0.05	2	4	62
Internet	-7.4%	22.5%	0.57	17	41	36	-34.5%	34.3%	0.37	52	6	49
Medical Prov.	-8.6%	19.3%	0.62	20	52	11	3.6%	19.2%	0.47	6	53	35
Mining	8.9%	29.5%	0.59	4	12	25	-23.6%	29.0%	0.51	43	20	20
Oil Svcs.	2.2%	29.4%	0.47	6	14	51	-39.5%	44.8%	0.06	54	3	58
Sec/Asst Mgt	-15.2%	38.5%	0.64	42	2	4	-18.6%	34.5%	0.53	31	5	9
Thriffs	-16.0%	35.6%	0.58	44	4	31	-17.7%	24.3%	0.49	28	39	27
Tobacco	1.2%	21.8%	0.53	7	45	46	9.5%	31.2%	0.27	4	12	53
Minimum	-31.9%	17.9%	0.20				-54.1%	17.5%	-0.05			
Maximum	29.2%	42.3%	0.65				12.1%	50.1%	0.57			
Average	-9.3%	26.6%	0.57				-15.8%	28.0%	0.46			

The main conclusions from the results presented in Table 1 can be summarized as follows:

- With respect to style factors, yield factors in particular (earnings yield, dividend yield) performed relatively well in both periods. A possible explanation might be that as interest rates decline, high yielding equity assets become more attractive to certain investors.
- With respect to industry factors, Gold, Drugs, Beverages, Alcohol, and Tobacco performed relatively well. Here, the popular interpretation is that these sectors may be largely unaffected by slowing demand and therefore provide a safe harbor in turbulent times.
- Style factors that performed particularly badly in the last two rate cutting phases include Trading Activity and Earnings Variability. Both factors reflect exposure to stocks that tend to be adversely affected during bear markets and deteriorating macro economic conditions.
- Industry factors that performed particularly badly in the recent rate cutting phase are primarily industry factors associated with the financial sector. On the other hand, in the earlier rate cutting phase, Energy, Commodities, Utilities, and Internet related industry factors performed relatively badly. The different performance of commodity related industries in the last two rate cutting phases may be associated with the different performance of commodity prices during these periods.
- Notable style factors that performed differently in the last two rate cutting phases include Momentum, Size, and Currency Sensitivity. These three factors performed well in the recent phase. The Currency Sensitivity factor reflects exposure to stocks with non-dollar assets and revenues, which may have benefited by the recent decline in the US dollar.

Table 2 presents forecast factor return volatilities and forecast average pair wise factor return correlations, for selected style and industry factors in the Barra USE3S risk model, at the start and at the end of the last two aggressive interest rate cutting phases. The main conclusions from the results presented in this table are as follows:

- Realized volatilities and correlations computed using daily factor returns over the respective rate cutting periods are consistent, both in magnitude and relative ranking, with the forecast volatilities and correlations produced by the model.
- Overall, although the level of forecast volatility is lower in the current crisis, we observe a substantial increase in forecast volatility relative to the beginning of the crisis: on average, forecast volatility has almost doubled in the last six months.
- The marked increase in forecast volatility in the last six months is in contrast to the previous aggressive rate cutting cycle in 2001, which came after the turbulent 1999-2000 period. During that rate cutting cycle, there was almost no change in forecast volatility levels between December 2000 and December 2001, but the level of volatility was much higher compared to the current crisis.
- Consistent with Table 1, the results presented in Table 2 show that average pair wise correlations, both forecast as well as realized, are significantly higher during the recent crisis, compared to the previous rate cutting cycle of 2001. Furthermore, Table 2 shows that average pair wise forecast correlations have been rising in the last six months, in contrast with the 2001 period when forecast correlations were lower and remained relatively stable.

In conclusion, we examined Barra USE3S model factor returns as well as forecast and realized factor return volatilities and correlations and identified commonalities and differences across the two recent rate cutting phases. Despite the different nature of the two events, the reaction of the Fed to the recent collapse of the subprime credit bubble and the subsequent financial sector fallout seems similar so far to the early reaction to the unwinding of the tech bubble and the equity market crash of 2001.

We close the note with a word of caution. We analyzed coincident changes in interest rates and equity factor performance without implying any causal or forecasting relationships between the various variables. Furthermore, we examined factor returns volatility and correlations. This does not in any way imply that we impose normality assumptions on factor returns. Looking at their second moments does not mean factor returns follow the bell curve or that higher moments should be ignored. Black swan fans (and skeptics) you have been warned!

**Table 2: Barra USE3S Model Forecast Factor Return Volatilities and Correlations**

Factor	Forecast Factor Return Volatility			Forecast Pairwise Correlations			Forecast Factor Return Volatility			Forecast Pairwise Correlations		
	06/30/07	02/29/08	Difference	06/30/07	02/29/08	Difference	12/31/00	12/31/01	Difference	12/31/00	12/31/01	Difference
Currency Sens.	1.0%	1.2%	0.2%	-0.10	-0.13	-0.03	3.4%	2.3%	-1.1%	0.06	-0.01	-0.07
Earnings Yld	2.1%	3.3%	1.2%	-0.01	0.08	0.10	5.2%	4.1%	-1.1%	-0.06	-0.18	-0.11
Earnings. Var.	1.1%	1.9%	0.8%	-0.01	0.11	0.12	2.4%	2.3%	-0.2%	-0.03	-0.05	-0.01
Growth	0.9%	1.4%	0.5%	0.09	0.04	-0.05	2.5%	1.9%	-0.6%	0.19	0.14	-0.05
Leverage	1.1%	2.0%	1.0%	-0.02	0.09	0.11	2.0%	1.8%	-0.2%	0.00	-0.10	-0.10
Momentum	2.6%	5.4%	2.8%	-0.05	0.01	0.06	10.6%	6.5%	-4.2%	0.00	-0.05	-0.04
Size	1.6%	2.1%	0.5%	0.07	0.08	0.01	4.4%	3.1%	-1.4%	0.13	0.13	-0.01
Trading Act.	1.2%	1.9%	0.7%	0.34	0.36	0.02	4.1%	3.3%	-0.8%	0.42	0.45	0.02
Value	1.0%	2.2%	1.3%	-0.03	0.12	0.15	1.8%	1.9%	0.0%	-0.03	-0.10	-0.07
Volatility	3.5%	5.9%	2.4%	0.47	0.48	0.01	9.3%	12.3%	3.0%	0.38	0.46	0.08
Yield	1.0%	1.5%	0.5%	-0.11	-0.17	-0.06	2.1%	1.7%	-0.4%	-0.17	-0.19	-0.02
Minimum	0.9%	1.2%	0.2%	-0.11	-0.17	-0.06	1.8%	1.7%	-4.2%	-0.17	-0.19	-0.11
Maximum	4.4%	8.4%	3.9%	0.47	0.48	0.15	10.6%	12.3%	3.0%	0.42	0.46	0.08
Average	1.8%	3.1%	1.3%	0.05	0.09	0.04	4.8%	4.0%	-0.8%	0.07	0.04	-0.03
Alcohol	12.4%	19.7%	7.3%	0.41	0.44	0.03	19.7%	19.0%	-0.7%	0.43	0.48	0.05
Banks	11.8%	25.2%	13.4%	0.52	0.51	-0.01	27.9%	23.3%	-4.6%	0.51	0.52	0.01
Drugs	11.2%	15.6%	4.4%	0.39	0.39	0.00	20.7%	20.7%	0.0%	0.37	0.41	0.05
Elec. Util.	13.9%	19.0%	5.2%	0.43	0.41	-0.01	18.8%	22.0%	3.2%	0.36	0.42	0.06
Energy Res.	20.7%	24.1%	3.4%	0.28	0.27	0.00	30.3%	28.4%	-1.9%	0.22	0.31	0.09
Food & Bev.	9.2%	14.8%	5.7%	0.49	0.52	0.03	15.5%	14.6%	-0.9%	0.46	0.50	0.04
Gas Util.	13.2%	19.3%	6.1%	0.49	0.49	0.00	17.8%	21.3%	3.5%	0.46	0.49	0.04
Gold	28.2%	35.0%	6.8%	0.11	0.05	-0.06	35.7%	31.9%	-3.8%	0.06	0.01	-0.05
Internet	15.8%	19.7%	3.9%	0.36	0.41	0.04	50.5%	37.2%	-13.3%	0.34	0.34	0.01
Medical Prov.	9.4%	13.5%	4.1%	0.48	0.47	0.00	17.4%	16.5%	-1.0%	0.48	0.50	0.02
Mining	19.2%	25.3%	6.1%	0.44	0.47	0.04	27.5%	30.8%	3.3%	0.43	0.49	0.06
Oil Svcs.	21.6%	24.3%	2.7%	0.20	0.23	0.03	42.9%	42.5%	-0.5%	0.14	0.18	0.04
Sec/Asst Mgt	15.9%	26.5%	10.5%	0.52	0.54	0.03	33.1%	31.2%	-1.9%	0.50	0.54	0.04
Thriffs	12.8%	25.4%	12.6%	0.49	0.47	-0.02	25.9%	22.7%	-3.2%	0.49	0.49	0.00
Tobacco	15.0%	18.7%	3.7%	0.29	0.33	0.04	39.4%	30.7%	-8.7%	0.14	0.24	0.10
Minimum	9.2%	13.5%	2.7%	0.11	0.05	-0.06	15.5%	14.6%	-13.3%	0.06	0.01	-0.05
Maximum	28.2%	35.0%	13.4%	0.54	0.57	0.05	50.5%	52.6%	23.6%	0.53	0.56	0.10
Average	13.8%	21.2%	7.4%	0.44	0.46	0.02	27.2%	26.8%	-0.3%	0.42	0.46	0.04

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