



Data Explorers
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*US Equity Trading Signals
Backtest Results 2006 -09*

Overview

- ▶ Data Details
- ▶ Types of Signal
 - ▶ Different Frequencies, Events, Regimes
- ▶ Testing Methodology
- ▶ Results – US Equity
 - ▶ Large Cap
 - ▶ Mid Cap
 - ▶ Technology
 - ▶ Others: Sector based, Earnings based, Public Data based
- ▶ Regression
- ▶ Optimization
- ▶ Conclusions

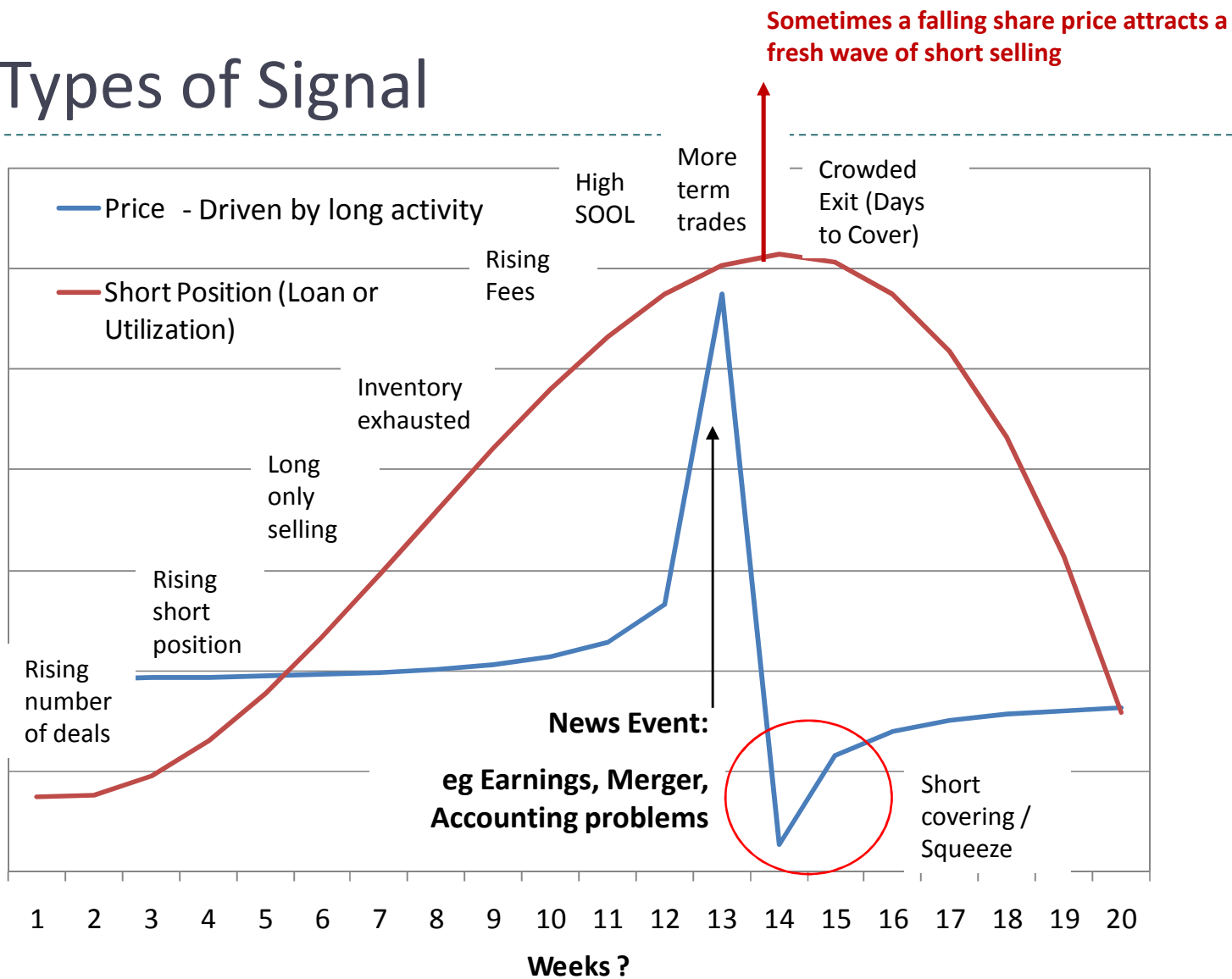
Data Details I

- ▶ Period: Aug 2006 – Oct 2009
- ▶ Sample:
 - ▶ market cap based
 - ▶ reset each month
 - ▶ survivor bias removed
- ▶ “Large Cap” = 500 largest stocks
- ▶ “Mid Cap” = 501-1500 largest stocks
- ▶ “Technology” = GICS Level largest 200

Data Details II

- ▶ Demand for stock to Short Sell
 - ▶ = 'Loan' = SOOL
- ▶ Supply to support Short Selling
 - ▶ = 'Lendable' (Institution Activity)
- ▶ Demand / Supply = Utilization
- ▶ Price:
 - ▶ [US] Fee = Rebate = Benchmark Rate - Intrinsic Fee
 - ▶ [non US] Fee = Intrinsic Fee
 - ▶ Fees:
 - ▶ Paid to Lenders = Wholesale = DCBS (1 – 10) or VWAF
 - ▶ Paid by Borrowers = Retail = SAF

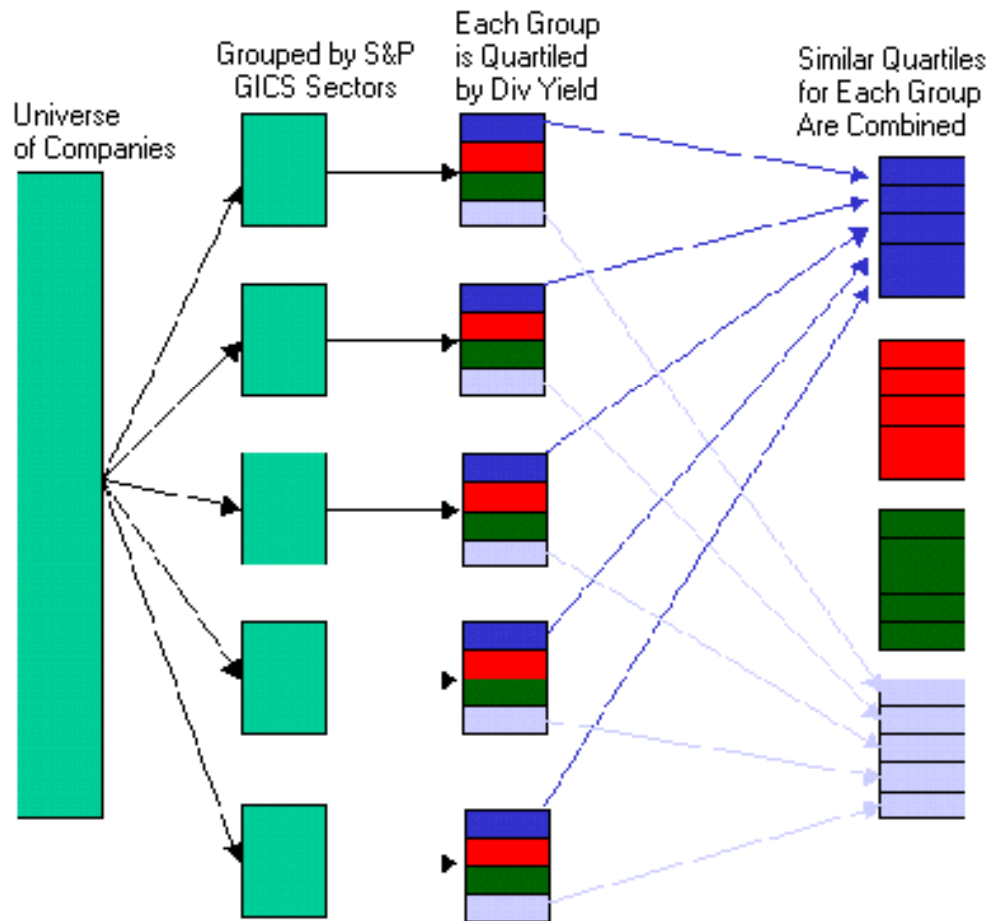
Types of Signal



Testing Methodology

- ▶ Rebalance = Monthly
- ▶ Look ahead bias = 2 days
- ▶ Sector Layering (see next)
- ▶ Portfolio Return = Long D1 – Short D10
 - ▶ no short constraint
 - ▶ D9 is sometimes stronger
- ▶ Returns scaled \cong high conviction long only portfolio
 - ▶ So ‘unleveraged’ i.e. 50% Long – 50% Short
 - ▶ Focus on Information Ratio

Sector Layering



Removes Sector bias; sector constituents are split by decile for each factor; the combined portfolio consists of top and bottom decile stocks in each sector.

Results Definitions I

- ▶ All summary statistics annualized
- ▶ Turnover = average of long and short turnover
 - ▶ based on 100% long and short; so data in table $\div 2$
- ▶ Information Ratio (IR) = Return / Standard Deviation
- ▶ Sharpe Ratio = [Excess Return – US 3m TB] / Standard Deviation
- ▶ IR can also be calculated relative to market neutral indices eg typical long short equity index
- ▶ Skewness = Normalized so symmetry \Rightarrow zero skew
- ▶ Autocorrelation – one month lag

Results Definitions II

- ▶ Hedge Fund index \approx Global Long Short Equity Index
- ▶ Standard market factors
 - ▶ Fama French 1: Index – Risk Free [$R_m - R_f$] – Excess Return
 - ▶ Fama French 2: Small Minus Big [SMB] - Size
 - ▶ Fama French 3: High Minus Low [HML] – Book Value vs Market Value
 - ▶ Quasi Carhart: Winners Minus Losers [WML] – Momentum

Results – US Large Cap

Annual Returns	5.5%	-0.7%	1.1%	-4.8%	10.6%	0.4%	15.4%	5.7%	8.5%	0.1%	-3.2%	4.6%	-5.4%	3.5%	-3.6%	-14.2%
Annual Volatility	10.5%	8.7%	5.6%	4.4%	12.4%	8.2%	10.1%	7.7%	7.9%	6.3%	23.9%	6.4%	19.4%	8.8%	18.5%	26.9%
Information Ratio	0.52	-0.08	0.20	-1.08	0.86	0.05	1.53	0.74	1.08	0.01	-0.13	0.73	-0.28	0.40	-0.20	-0.53
Skewness	-0.25	-1.60	-1.21	0.26	-0.24	-0.27	1.44	-0.29	-1.50	-1.79	-0.36	-1.08	-0.85	1.70	1.41	-2.29
Autocorrelation	0.12	0.00	0.00	-0.08	0.16	-0.06	0.17	0.18	0.05	0.10	0.09	0.37	0.42	-0.10	0.23	0.32
Annual Turnover	7.5	19.8	20.9	20.5	7.3	20.3	8.5	8.9	3.3	20.5						

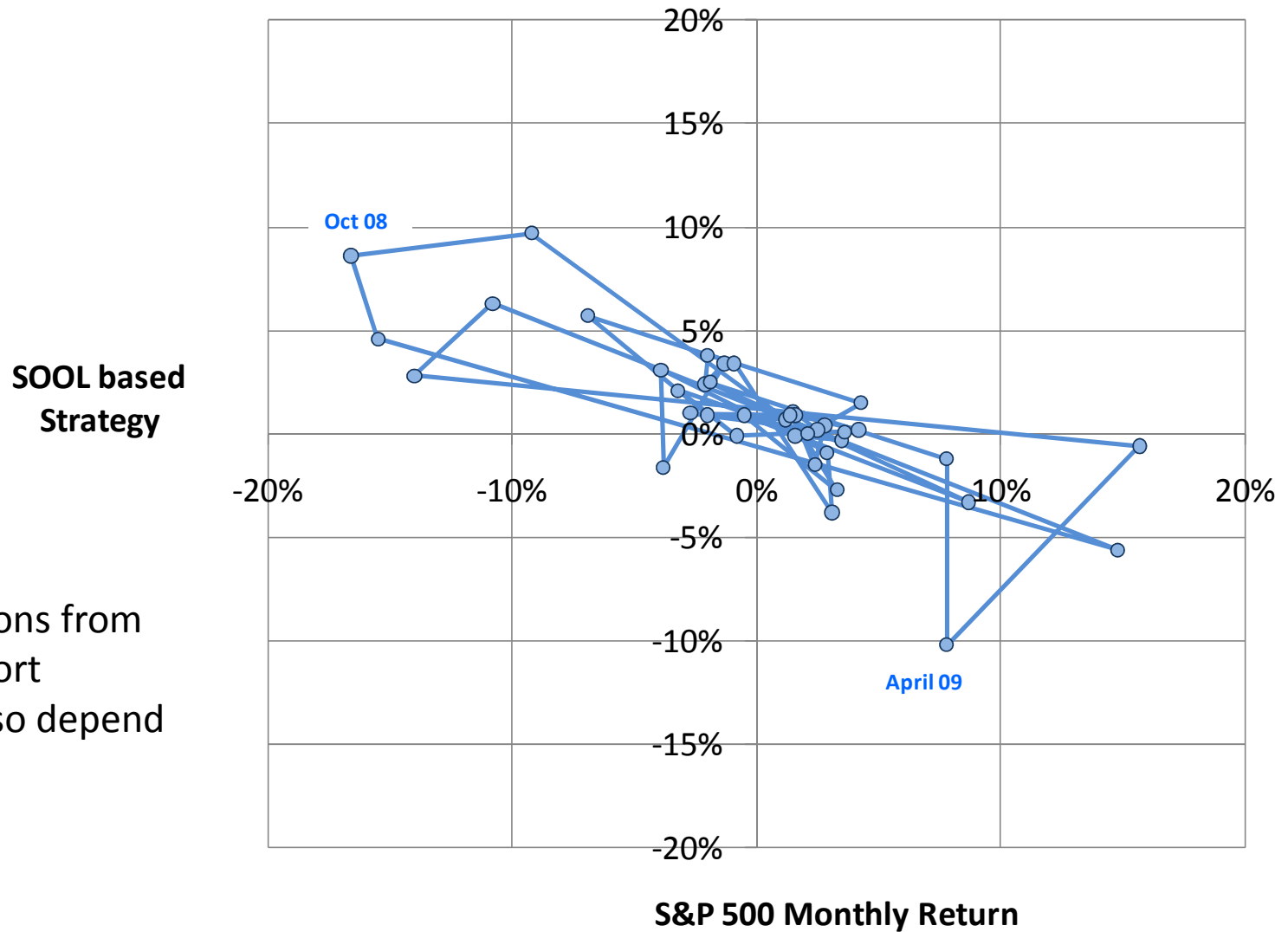
[Contrarian]

	Utilisation	DeltaUtil	Delta Loan Qty	Delta Supply Qty	SOOL	DeltaSOOL	Sector Layered SOOL	Sector Layered Util	Supply as a % of Shares	Delta Supply as a % of Shares	S&P 500 Proxy	Sample Hedge Fund Equity Index	Rm- Rf	SMB	HML	WML	
Utilisation																	
DeltaUtil	0.2																
Delta Loan Qty	0.2	0.8															
Delta Supply Qty	-0.2	0.2	0.2														
SOOL	0.9	0.2	0.3	-0.2													
DeltaSOOL	0.5	0.4	0.6	-0.1	0.6												
Sector Layered SOOL	0.8	0.0	0.2	0.0	0.9	0.5											
Sector Layered Util	0.9	0.2	0.2	-0.1	0.9	0.5	0.8										
Supply as a % of Shares	0.5	0.1	0.2	-0.4	0.7	0.5	0.6	0.5									
Delta Supply as a % of Shares	-0.1	-0.3	-0.1	-0.6	0.3	0.4	0.2	0.2	0.6								
S&P 500 Proxy	-0.8	0.0	0.0	0.3	-0.8	-0.4	-0.6	-0.7	-0.7	-0.4							
Sample Hedge Fund Equity Index	-0.5	-0.1	-0.2	0.0	-0.5	-0.4	-0.6	-0.5	-0.3	0.0	0.6						
Rm- Rf	-0.8	-0.1	-0.2	0.3	-0.8	-0.4	-0.6	-0.7	-0.5	-0.1	0.9	0.8					
SMB	-0.5	-0.2	-0.3	0.1	-0.5	-0.3	-0.4	-0.6	-0.4	-0.1	0.4	0.2	0.5				
HML	-0.7	-0.4	-0.3	0.1	-0.7	-0.3	-0.4	-0.6	-0.4	0.0	0.5	0.2	0.6	0.5			
WML	0.7	0.5	0.4	0.0	0.7	0.3	0.5	0.7	0.4	-0.1	-0.5	-0.3	-0.6	-0.6	-0.9		

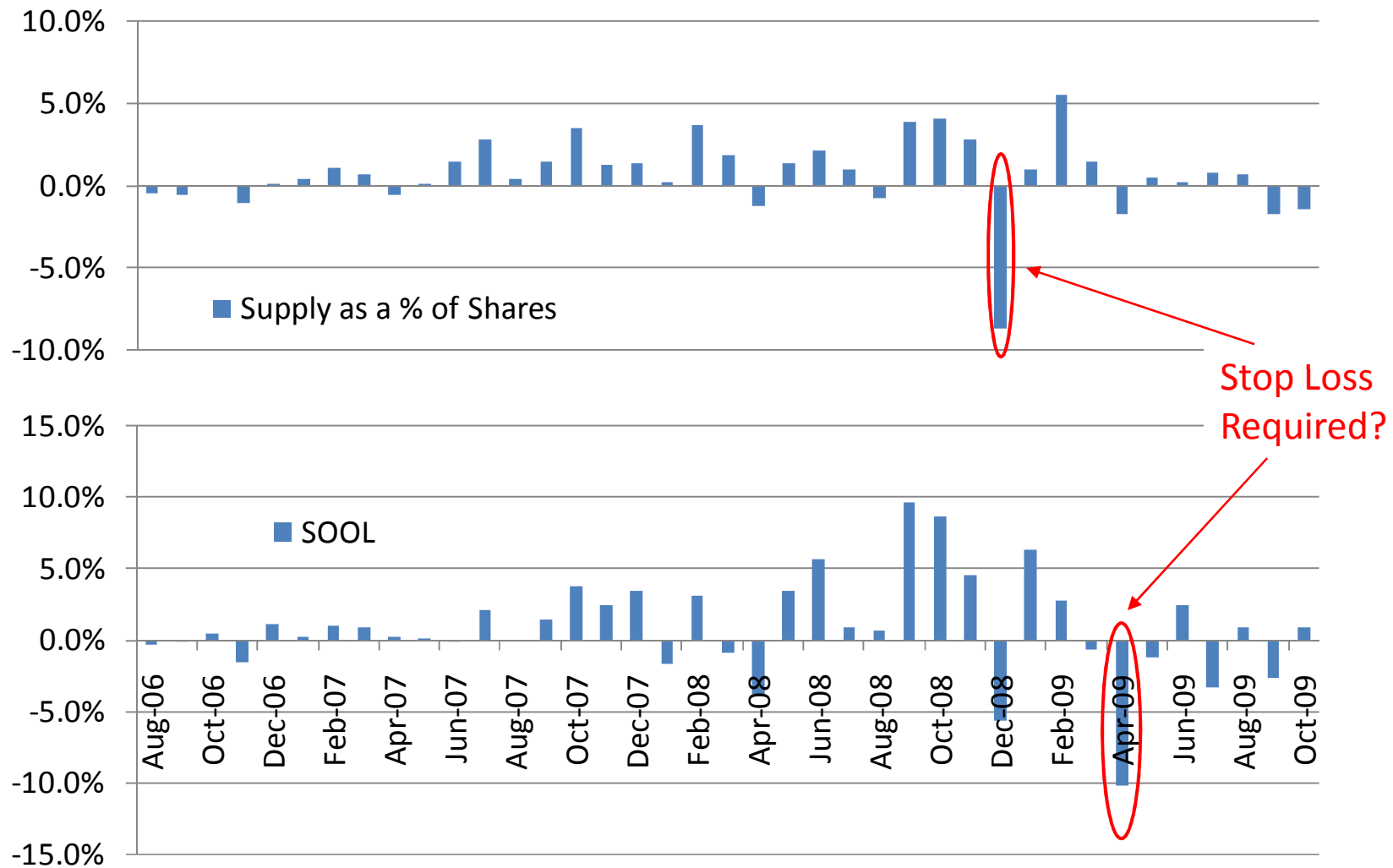
Results – Summary – US Large Cap

- ▶ Highest Return = Sector Layered Demand (SOOL)
- ▶ Lowest Volatility = Weekly change in Supply (-ve return)
- ▶ Highest Information Ratios:
 - ▶ Sector Layered Demand (SOOL) = 1.5
 - ▶ Level of Supply (much lower turnover) = 1.1 [Contrarian]
- ▶ Highest IR vs Hedge Fund = Sector Layered Demand (SOOL)
- ▶ Lowest Turnover = Level of Supply [Contrarian]
- ▶ Significant Negative Correlations for most measures with indices and Fama French factors

Regime Specific Results



Time Series of Supply and Demand based strategies



Results – US Mid Cap

Annual Returns	4.5%	0.1%	0.9%	-3.8%	5.5%	-1.3%	3.0%	4.3%	5.3%	3.0%	-2.6%	4.6%	-5.4%	3.5%	-3.6%	-14.2%
Annual Volatility	6.7%	5.5%	3.7%	3.8%	7.2%	4.7%	5.0%	5.0%	8.5%	3.9%	30.0%	6.4%	19.4%	8.8%	18.5%	26.9%
Information Ratio	0.67	0.02	0.24	-0.98	0.76	-0.29	0.61	0.86	0.62	0.76	-0.09	0.73	-0.28	0.40	-0.20	-0.53
Skewness	-0.16	-1.50	-0.32	-0.36	-0.63	-0.38	0.05	0.13	-0.12	0.66	-0.25	-1.08	-0.85	1.70	1.41	-2.29
Autocorrelation	0.09	0.09	0.31	-0.26	-0.12	0.46	0.05	0.28	-0.24	-0.14	0.10	0.37	0.42	-0.10	0.23	0.32
Annual Turnover	6.4	20.4	19.8	20.9	5.2	20.1	6.4	7.5	3.3	20.8						

[Contrarian]

	Utilisation	DeltaUtil	Delta Loan Qty	Delta Supply Qty	SOOL	DeltaSOOL	Sector Layered SOOL	Sector Layered Util	Supply as a % of Shares	Delta Supply as a % of Shares	US Mid Cap 1000 Proxy	Sample Hedge Fund Equity Index	Rm- Rf	SMB	HML	WML	
Utilisation	1.0																
DeltaUtil	0.4	1.0															
Delta Loan Qty	0.5	0.7	1.0														
Delta Supply Qty	-0.1	0.0	-0.2	1.0													
SOOL	0.8	0.3	0.4	-0.1	1.0												
DeltaSOOL	0.3	0.6	0.7	-0.2	0.2	1.0											
Sector Layered SOOL	0.8	0.3	0.4	-0.1	0.9	0.1	1.0										
Sector Layered Util	0.9	0.4	0.5	-0.2	0.7	0.4	0.7	1.0									
Supply as a % of Shares	0.5	0.0	0.1	0.1	0.7	-0.2	0.6	0.3	1.0								
Delta Supply as a % of Shares	0.2	-0.2	-0.1	-0.7	0.2	0.0	0.3	0.3	0.2	1.0							
US Mid Cap 1000 Proxy	-0.6	-0.1	-0.2	0.0	-0.4	0.1	-0.5	-0.5	-0.3	-0.2	1.0						
Sample Hedge Fund Equity Index	0.0	0.0	0.0	0.1	0.2	0.1	0.1	0.0	0.3	0.1	0.6	1.0					
Rm- Rf	-0.5	-0.2	-0.2	0.2	-0.3	0.1	-0.4	-0.5	-0.1	-0.1	0.9	0.8	1.0				
SMB	-0.5	-0.4	-0.3	-0.2	-0.4	-0.3	-0.4	-0.5	-0.2	0.1	0.5	0.2	0.5	1.0			
HML	-0.6	-0.5	-0.3	0.1	-0.6	-0.1	-0.6	-0.5	-0.4	-0.1	0.6	0.2	0.6	0.5	1.0		
WML	0.6	0.6	0.4	-0.1	0.5	0.3	0.5	0.5	0.2	0.1	-0.6	-0.3	-0.6	-0.6	-0.9	1.00	

Results – US Technology

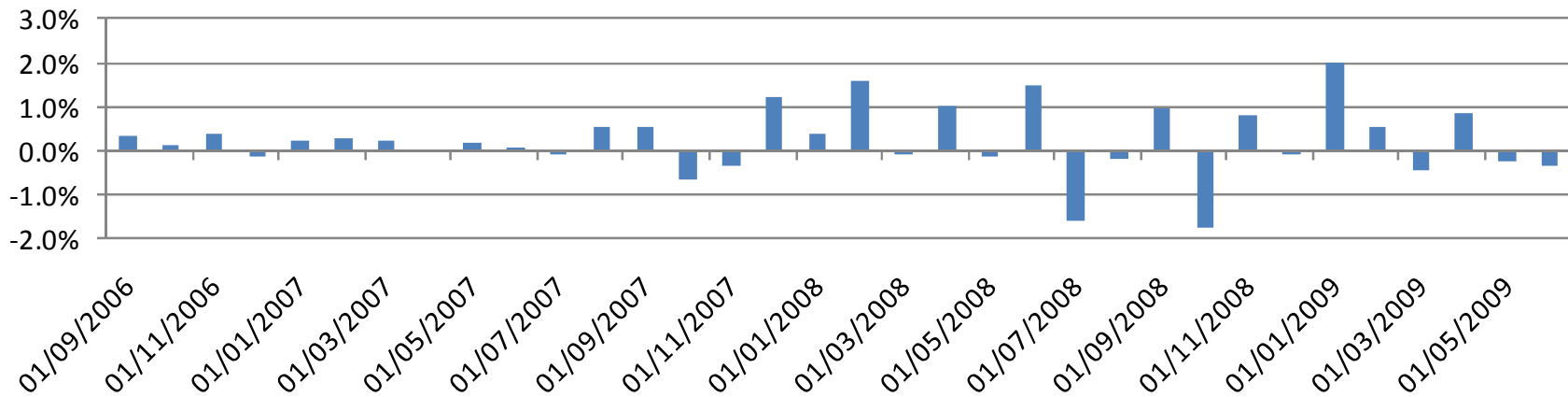
Annual Returns	4.4%	-6.0%	8.4%	-2.3%	7.0%	-6.8%	10.0%	0.3%	-2.5%	6.2%	4.6%	-5.4%	3.5%	-3.6%	-14.2%
Annual Volatility	9.3%	10.7%	8.6%	11.3%	8.3%	9.2%	9.5%	10.5%	9.9%	26.1%	6.4%	19.4%	8.8%	18.5%	26.9%
Information Ratio	0.48	-0.56	0.98	-0.20	0.85	-0.74	1.06	0.03	-0.25	0.24	0.73	-0.28	0.40	-0.20	-0.53
Skewness	-1.05	-0.46	-0.35	0.65	0.02	-0.96	-0.27	0.38	-0.92	-0.43	-1.08	-0.85	1.70	1.41	-2.29
Autocorrelation	-0.02	0.07	-0.28	0.07	0.00	0.11	-0.01	-0.12	0.22	0.21	0.37	0.42	-0.10	0.23	0.32
Annual Turnover	6.3	19.8	20.2	20.8	5.4	20.6	6.8	3.4	20.8						

[Contrarian]

	Utilisation	DeltaUtil	DeltaLoan	DeltaSupply	SOOL	DeltaSOOL	Div Filtered SOOL	Supply as a % of Shares	Delta Supply ratio	US Tech 200 Proxy	Sample Hedge Fund Equity Index	Rm- Rf	SMB	HML	WML	
Utilisation	1.0															
DeltaUtil	0.1	1.0														
DeltaLoan	-0.1	0.3	1.0													
DeltaSupply	0.3	0.2	0.2	1.0												
SOOL	0.5	-0.2	0.0	0.1	1.0											
DeltaSOOL	-0.1	0.6	0.3	0.0	-0.1	1.0										
Div Filtered SOOL	0.4	0.0	0.0	0.1	0.8	0.2	1.0									
Supply as a % of Shares	-0.5	-0.2	-0.1	0.0	0.1	0.1	0.1	1.0								
Delta Supply ratio	-0.3	-0.2	-0.1	-0.6	-0.1	0.1	-0.1	0.2	1.0							
US Tech 200 Proxy	-0.2	0.1	-0.2	-0.1	-0.3	0.1	-0.1	0.4	0.3	1.0						
Sample Hedge Fund Equity Index	-0.3	0.0	-0.2	0.0	-0.4	0.2	-0.2	0.4	0.2	0.7	1.0					
Rm- Rf	-0.3	0.0	-0.1	-0.2	-0.5	0.1	-0.3	0.2	0.2	0.9	0.8	1.0				
SMB	-0.2	0.1	-0.1	-0.1	-0.4	0.0	-0.4	-0.2	0.2	0.5	0.2	0.5	1.0			
HML	-0.1	-0.1	0.0	-0.1	-0.5	-0.1	-0.5	-0.2	0.0	0.4	0.2	0.6	0.5	1.0		
WML	0.2	0.1	0.0	0.1	0.5	0.0	0.5	0.1	-0.1	-0.5	-0.3	-0.6	-0.6	-0.9	1.0	

Results – US Sectors

- ▶ **Markit index launched Q3 2009**
 - ▶ Monthly rebalance across GICS level 2 sectors
 - ▶ Trend following elements to sector weightings
 - ▶ Excess return = 2.7%
 - ▶ Tracking Error = 2.7%
 - ▶ Information Ratio ≈ 1
 - ▶ Low turnover

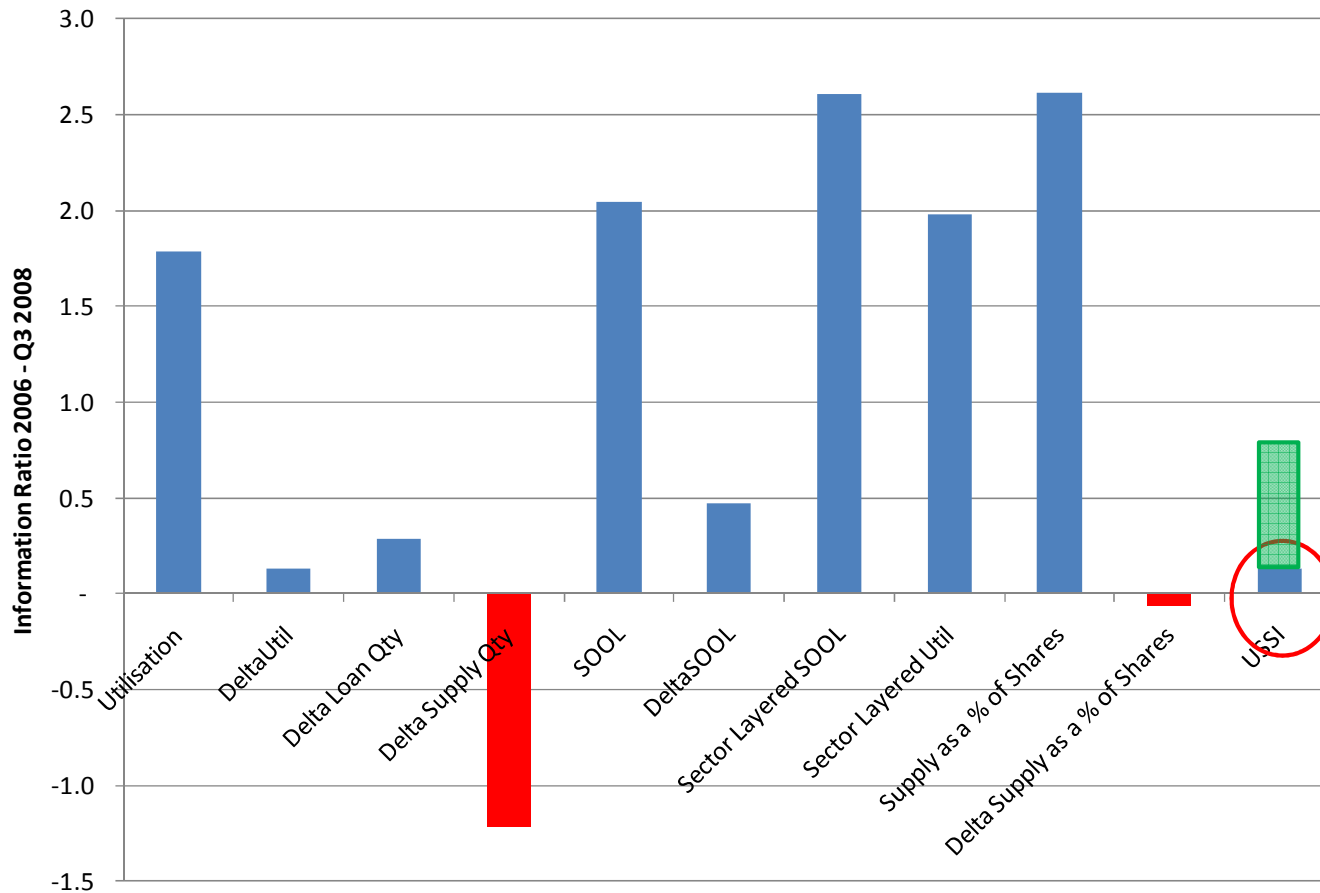


Results – US Earnings prediction

- ▶ Michael McKenzie study July 2009
 - ▶ S&P 500
 - ▶ Time horizon: variable, but c 5 days in advance and c 5 days with PEAD
 - ▶ Supply predicts earnings surprise **with no contrarian element**
 - ▶ Demand weakly predicts earnings surprise
 - ▶ Information Ratio pa ≈ 1 but highly variable
 - ▶ High turnover
 - ▶ Portfolio construction constraints – earnings are seasonal
 - ▶ Earnings reports are clustered in time, otherwise sparse
 - ▶ \Rightarrow limited breadth to apply this edge (so high IC may be constrained in its application)

Results – Comparison with other Data Sources

▶ Comparison with public data (NYSE, Amex, NASDAQ)



This result is from a fixed sample study from one year ago so it is penalized by survivor bias, different sample, and lack of overlap between stock loan data and short sell data. The green bar is an approximate estimate of the scale of these effects

4-Factor Regression Results

Lower R-Squared

	Utilisation	DeltaUtil	Delta Loan Qty	Delta Supply Qty	SOOL	DeltaSOOL	Sector Layered SOOL	Sector Layered Util	Supply as a % of Shares	Delta Supply as a % of Shares
Large Cap	0.46%	-0.06%	0.09%	-0.40%	0.88%	0.03%	1.29%	0.48%	0.71%	0.01%
alpha	0.60%	0.16%	0.19%	-0.15%	1.04%	0.24%	1.64%	0.71%	0.83%	-0.11%
R-squared	69%	24%	17%	27%	69%	23%	54%	73%	32%	8%
Rm- Rf	0.25	0.17	0.07	0.20	0.24	0.13	0.41	0.26	0.08	-0.12
SMB	0.11	-0.05	0.00	0.23	0.08	0.18	0.48	0.24	0.07	-0.07
HML	0.06	0.09	-0.12	0.08	-0.01	-0.10	0.02	-0.10	-0.10	-0.17
WML	-0.29	0.08	0.03	0.08	-0.34	-0.15	-0.26	-0.19	-0.17	-0.06

	Utilisation	DeltaUtil	Delta Loan Qty	Delta Supply Qty	SOOL	DeltaSOOL	Sector Layered SOOL	Sector Layered Util	Supply as a % of Shares	Delta Supply as a % of Shares
Mid Cap	0.37%	0.01%	0.07%	-0.31%	0.46%	-0.11%	0.25%	0.36%	0.44%	0.25%
alpha	0.31%	0.23%	0.23%	-0.27%	0.27%	0.20%	0.10%	0.33%	0.18%	0.25%
R-squared	49%	37%	18%	10%	48%	29%	51%	39%	31%	3%
Rm- Rf	-0.07	0.17	0.11	-0.01	-0.19	0.20	-0.16	-0.04	-0.33	0.02
SMB	-0.24	0.05	0.10	0.02	-0.46	0.21	-0.33	-0.13	-0.58	0.00
HML	-0.19	-0.04	-0.02	-0.15	-0.19	-0.09	-0.15	-0.16	-0.25	0.09
WML	-0.06	0.08	0.00	0.05	0.01	0.08	-0.03	-0.06	0.04	-0.02

	Utilisation	DeltaUtil	Delta Loan	DeltaSupply	SOOL	DeltaSOOL	Div Filtered SOOL	Supply as a % of Shares	Delta Supply ratio
Technology	0.37%	-0.50%	0.70%	-0.19%	0.59%	-0.57%	0.83%	0.03%	-0.21%
alpha	0.51%	-0.49%	0.69%	-0.28%	0.67%	-0.71%	0.75%	-0.04%	-0.33%
R-squared	12%	7%	4%	6%	32%	12%	30%	32%	14%
Rm- Rf	0.21	0.10	-0.08	-0.14	0.04	-0.18	-0.09	-0.34	-0.20
SMB	0.27	-0.03	-0.02	-0.15	-0.03	-0.38	-0.30	-0.61	-0.39
HML	0.03	0.38	-0.13	-0.13	-0.19	-0.04	-0.34	-0.47	0.06
WML	-0.10	0.00	-0.09	-0.12	-0.12	0.13	0.02	0.26	0.16

Optimization

- ▶ Combinations of strategies give higher information ratios:
 - ▶ Demand (SOOL)
 - ▶ Supply (Lendable)
 - ▶ Sector (Markit)
 - ▶ Public data (USSSI)
 - ▶ Earnings Driven (Michael McKenzie)

Conclusions

- ▶ Levels > Changes
- ▶ Demand consistently predicts
- ▶ Supply is a variable contrarian indicator
- ▶ Weekly changes > monthly changes
- ▶ Large Cap > Small Cap
- ▶ Turnover high, lowest for supply
- ▶ Regime effect – low or negative betas
- ▶ Some negative correlation with Fama French
- ▶ Optimal combinations of DX factors can produce higher information ratios
- ▶ Different possible aggregation levels: sector, stock
- ▶ Different possible frequencies: monthly, weekly
- ▶ Different regimes: market direction, earnings season

Additional Information

- ▶ Strategy returns data available in Excel sheets
- ▶ Strategy summary tearsheets available as pdfs

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