Undergraduate Student Investment Management Fund

Semi-Annual Presentation

Friday December 4th, 2015

Meet the Fund

Overview of Investment Thesis

Arbitrage Asymmetry and the Idiosyncratic Volatility Puzzle
Stambaugh, Yu, Yuan (2015)

Invest in securities with two key features:

Underpriced

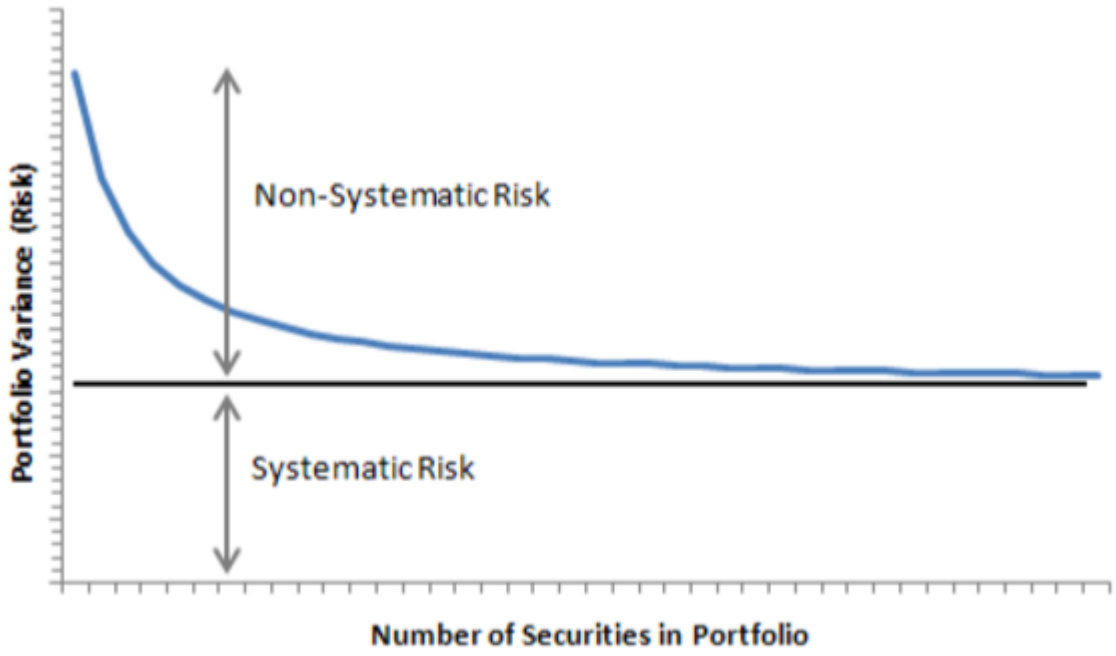
- Determined by ranking securities along eleven pricing anomalies

High Idiosyncratic Risk

- Individual risk of a stock after removing effects (in excess) of market/systematic risk

CAPM and Idiosyncratic Risk

- CAPM assumes the market is in equilibrium and all investors are fully diversified
- Idiosyncratic risk is not priced/ compensated



1964: CAPM

1968: Levy

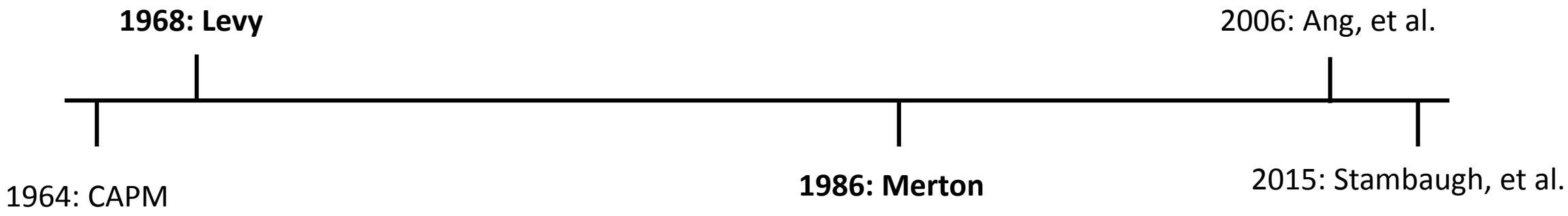
1986: Merton

2006: Ang, et al.

2015: Stambaugh, et al.

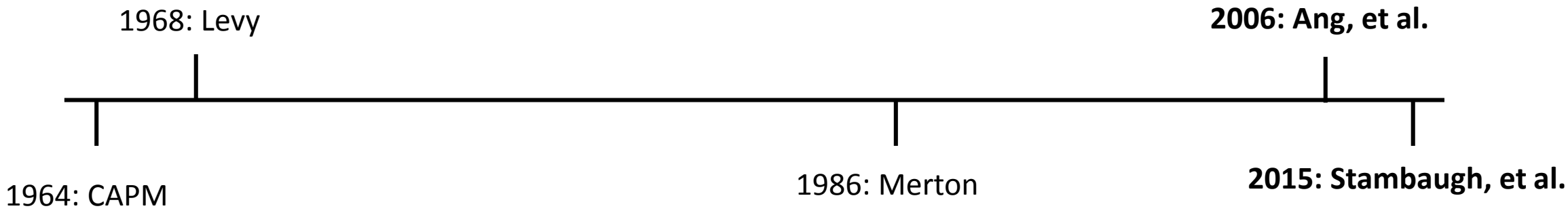
CAPM and Idiosyncratic Risk

- Disagreement: The real-world market has frictions that prevent full diversification (Levy 1968, Merton 1986)
  - Diversification has costs (obtaining information, trading costs)
  - Behavioral reasons
- Result: the market is in a state of disequilibrium; idiosyncratic risk is priced and has a **positive return**



The Idiosyncratic Risk Puzzle

- Ang, et al. (2006) found that idiosyncratic risk actually has a **negative premium**
- This doesn't make sense either under CAPM or the Levy/Merton imperfect market model
- Instead, Stambaugh, et al. explain it using a combination of **mispricing** and **constraints on arbitrage**

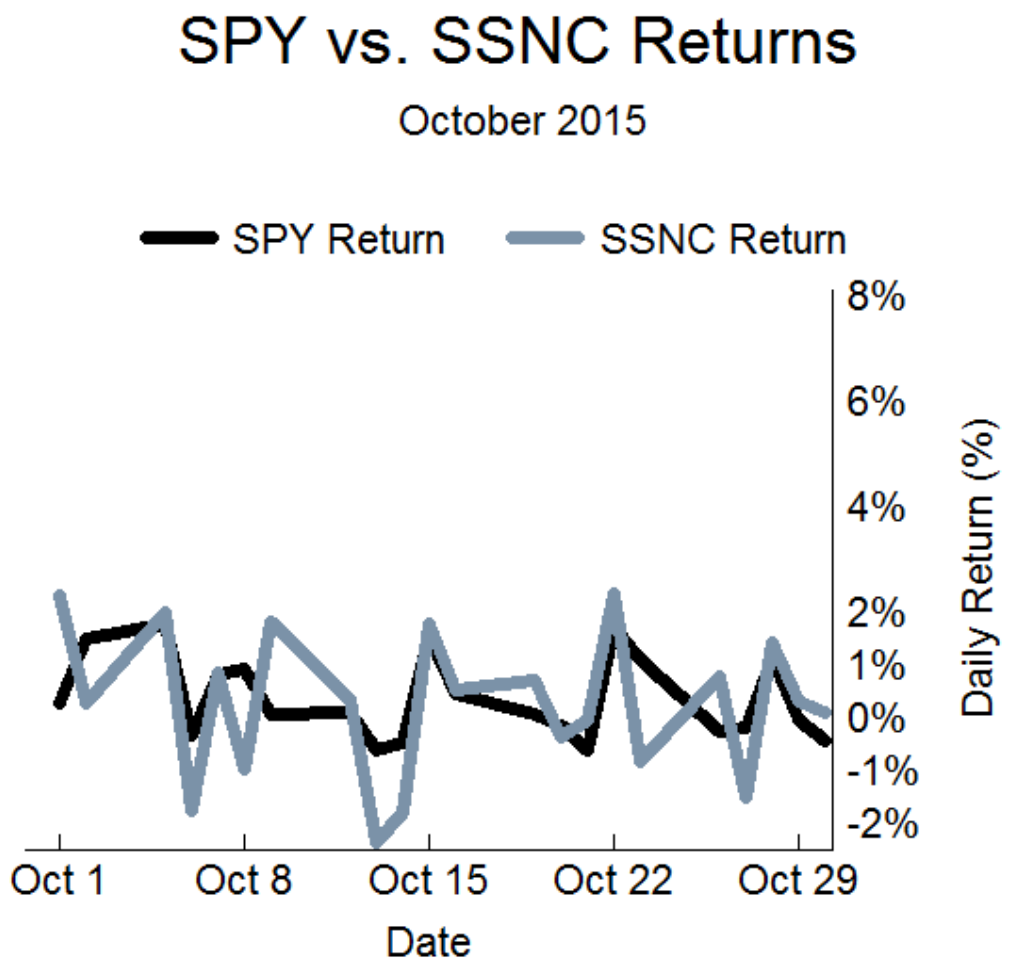


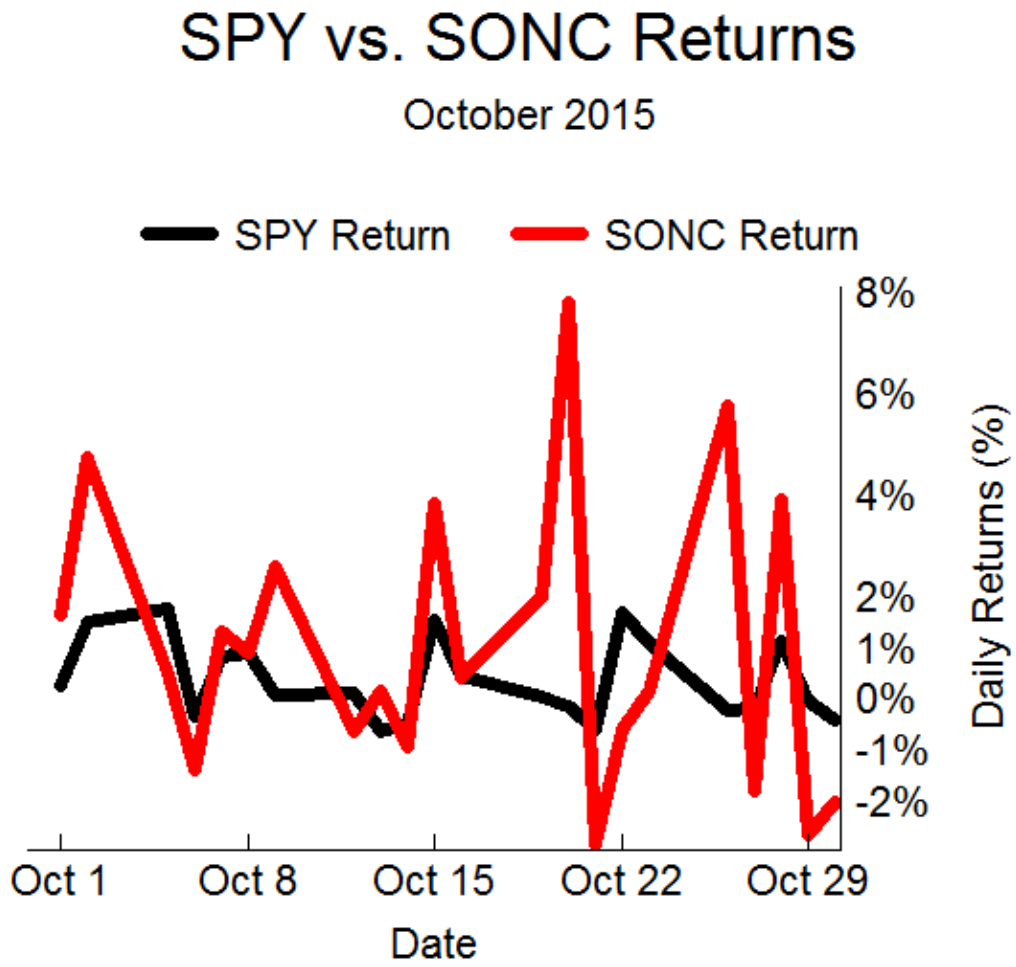
Idiosyncratic Risk Defined: IVOL

$$R_i = \alpha + \beta_i (R_{mkt} - R_i) + e_i$$

$$\text{IVOL} = \sum_{i=1}^{n} (e_i)^2$$

Idiosyncratic Risk Defined: IVOL





Mispricing

Overpriced Security

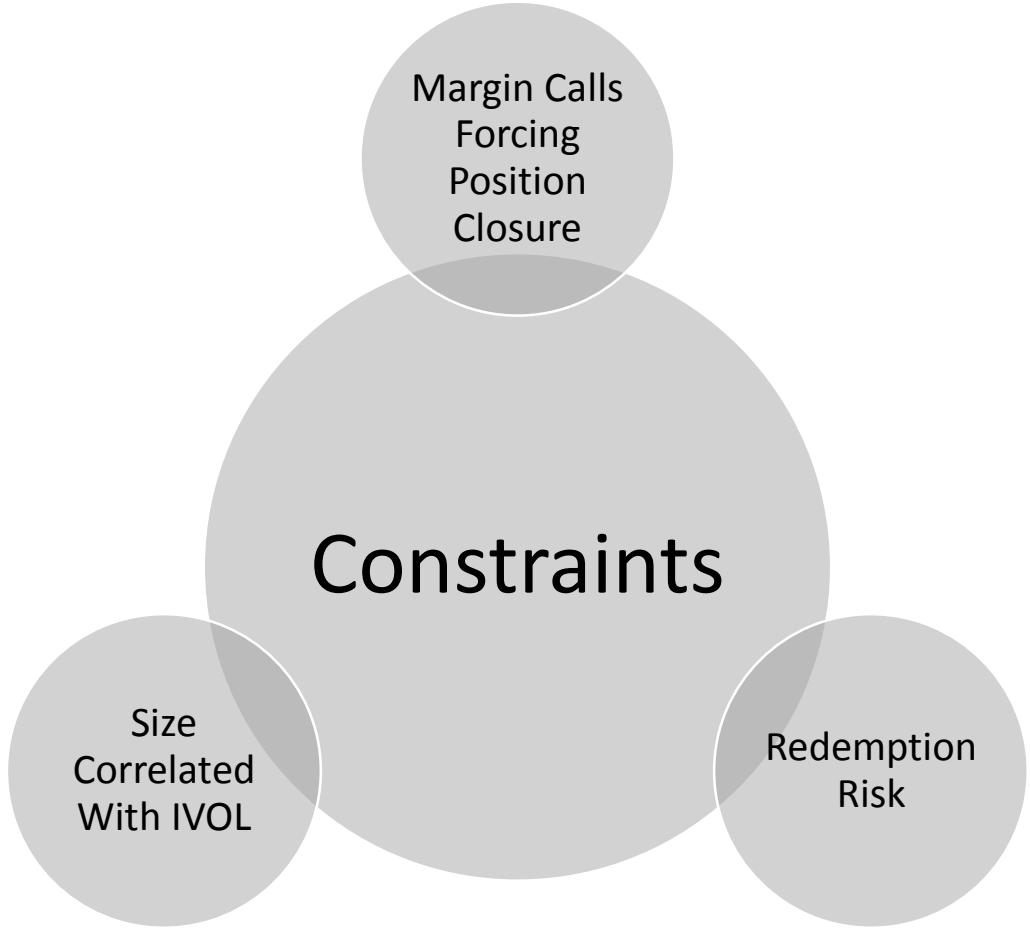
- Negative momentum
- High asset growth
- High net stock issuance
- Unprofitable
- High accruals

Underpriced security

- Positive momentum
- Low asset growth
- Low net stock issuance
- Profitable
- Low accruals

Arbitrage Constraints

- Arbitrage capital cannot fully correct mispricing
- Arbitrage is more constrained in securities with higher IVOL



Arbitrage Constraints

	Price 9/30/15	Shares	Short Sale Value	Initial Margin Requirement (50%)	Total Margin Requirement
SSNC	$70.04	143	$10,016	$5,007	**$15,023**
SONC	$22.95	436	$10,006	$5,003	**$15,009**

Arbitrage Constraints

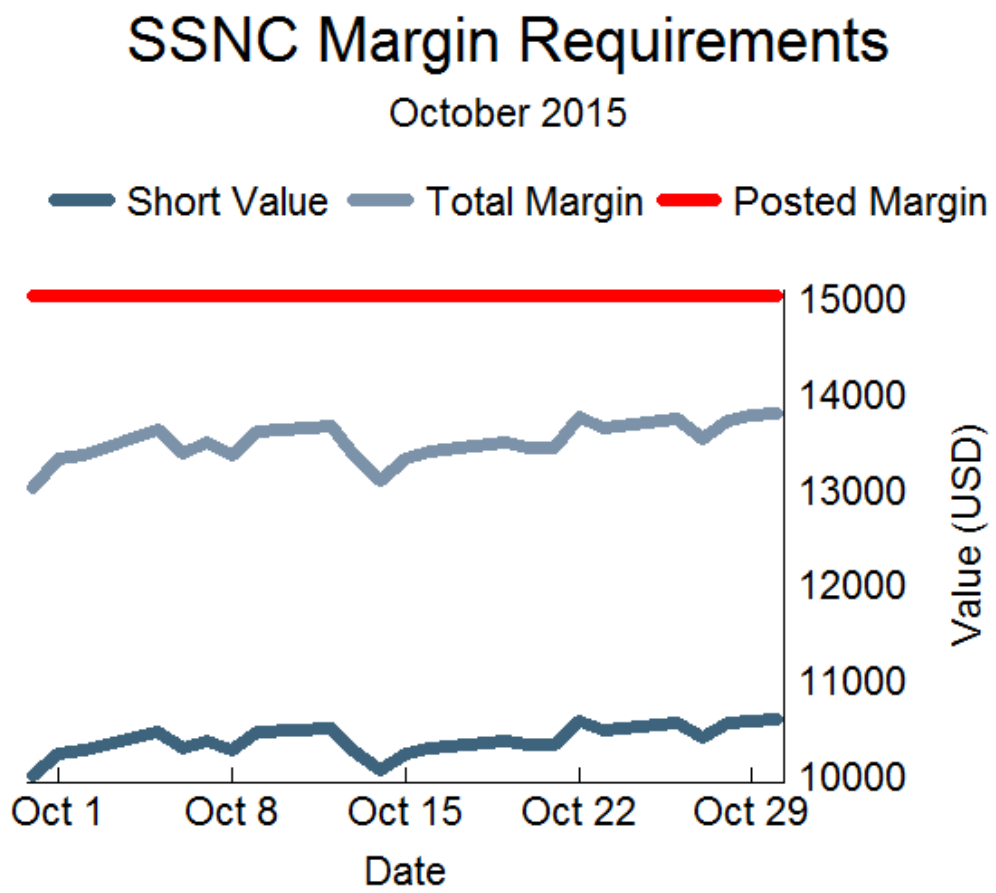
SSNC

	Price	Short Sale Value	Maintenance Margin (30%)	Total Margin Required	Margin Posted	Margin to Spare
9/30	$70.04	$10,015	$3,004	$13,020	$15,023	**$2,023**
10/7	$72.60	$10,381	$3,115	$13,496	$15,023	**$1,527**
10/12	$73.47	$10,506	$3,152	$13,658	$15,023	**$1,365**
10/19	$72.57	$10,378	$3,113	$13,491	$15,023	**$1,532**

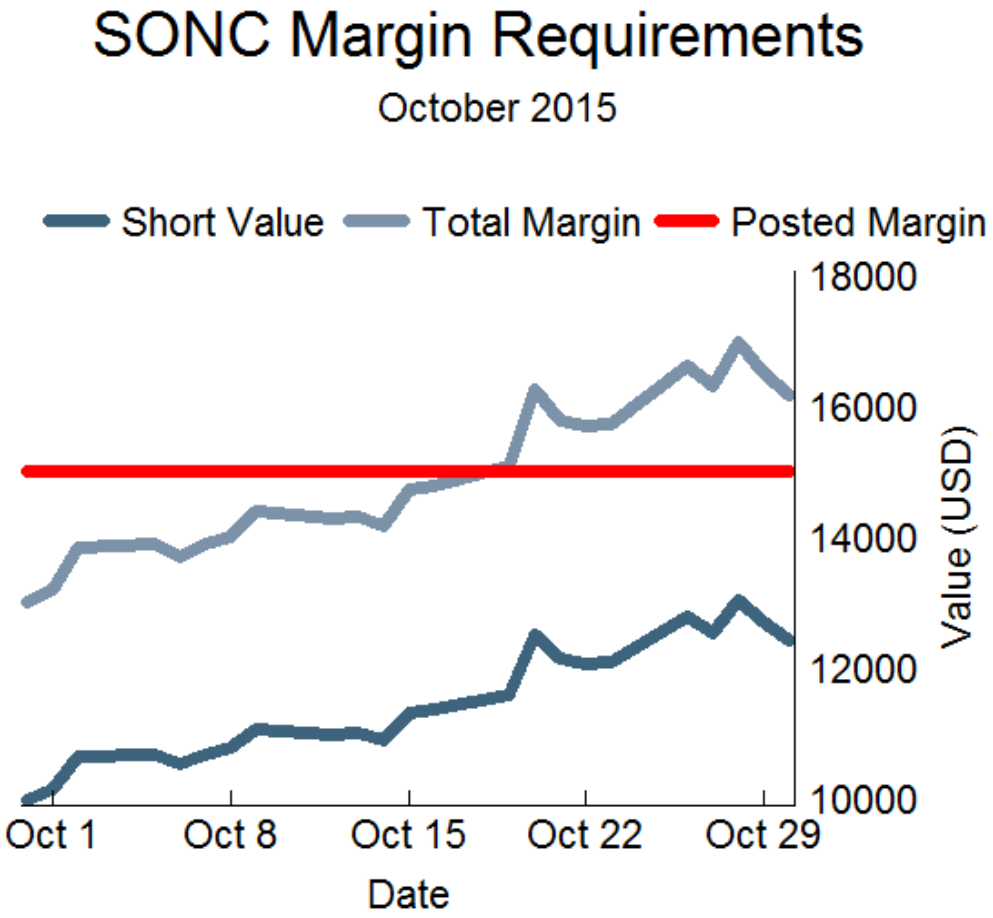
SONC

	Price	Short Sale Value	Maintenance Margin (30%)	Total Margin Required	Margin Posted	Margin to Spare
9/30	$22.95	$10,006	$3,002	$13,008	$15,009	**$2,001**
10/7	$24.53	$10,695	$3,209	$13,904	$15,009	**$1,105**
10/12	$25.23	$11,000	$3,300	$14,300	$15,009	**$709**
10/19	$26.62	$11,606	$3,482	$15,088	$15,009	**($79)**

Arbitrage Constraints



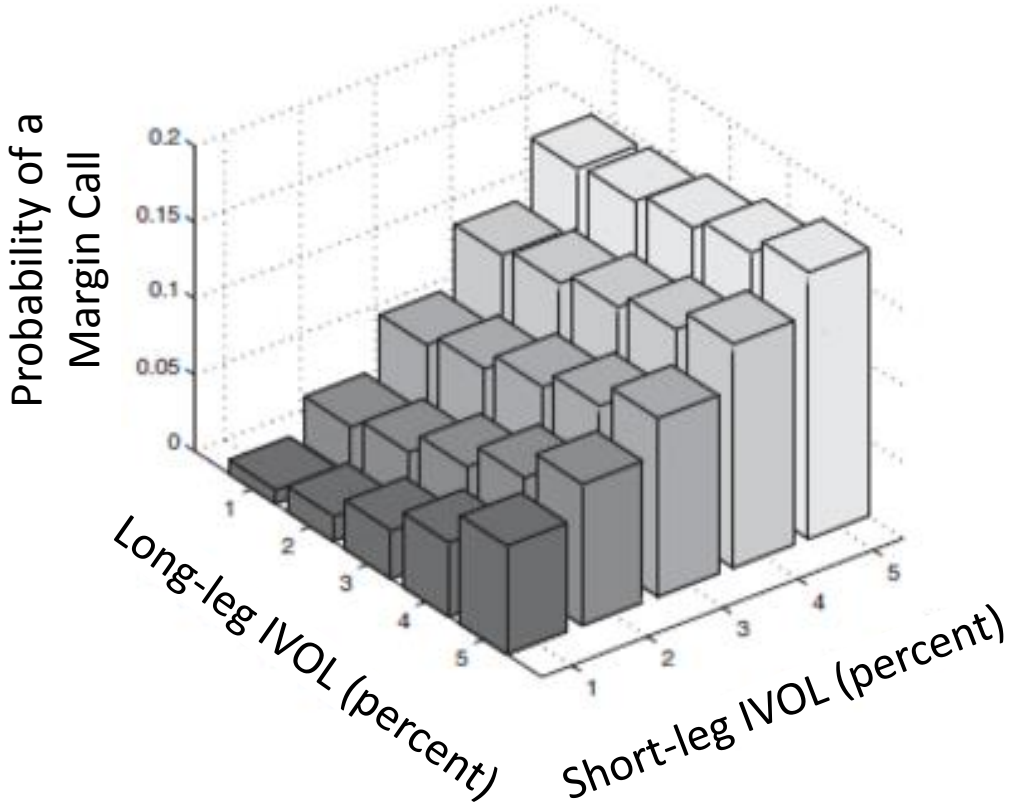
Assumes 50% initial margin, 30% maintenance margin



Assumes 50% initial margin, 30% maintenance margin

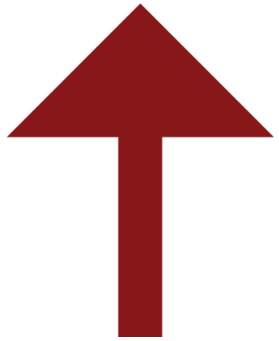
Arbitrage Constraints

- The restrictions are not the same on both sides: going long is cheaper than and less risky going short
  - Inherent margin calls (long requires leverage)
  - Outright restrictions in many funds

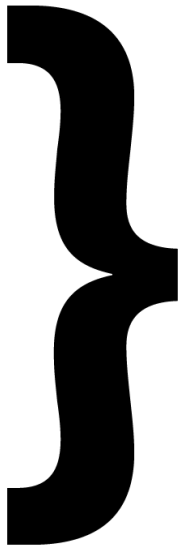


Asymmetric Arbitrage

Overpriced Securities
+ Unable to Short
=
Negative Expected Return



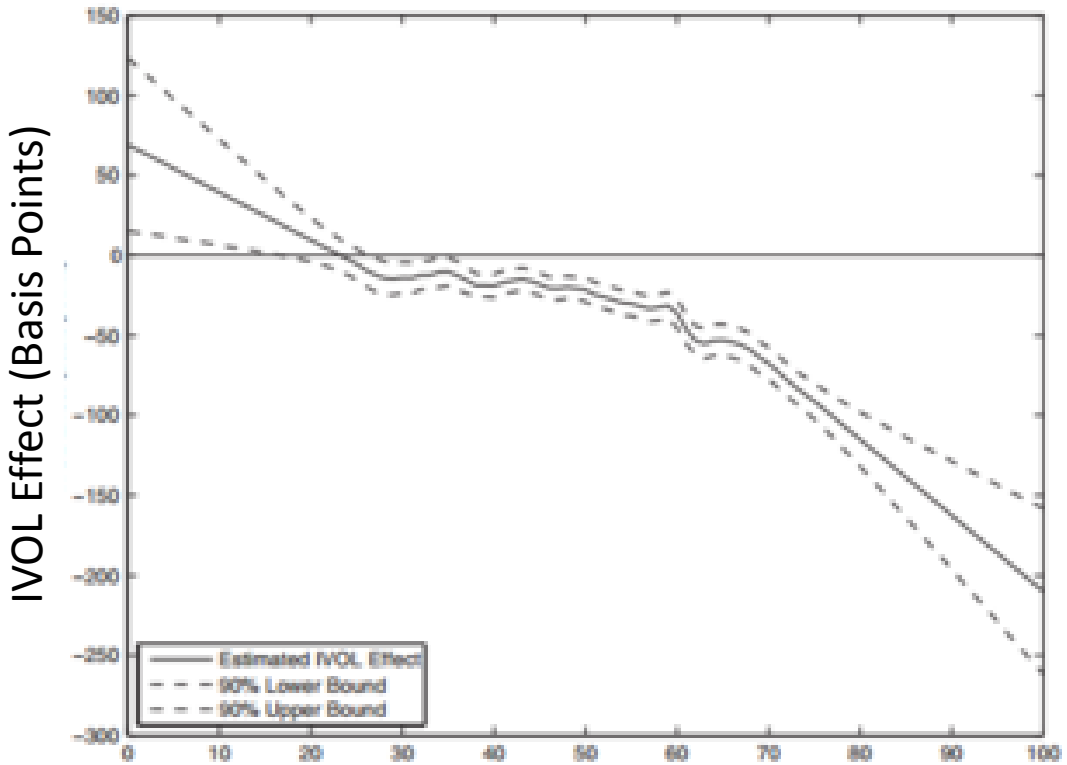
Underpriced Securities
+ Unable to Long
=
Positive Expected Return



Negative Overall Expected Return to IVOL

Asymmetric Returns

1922 *The Journal of Finance*



Returns

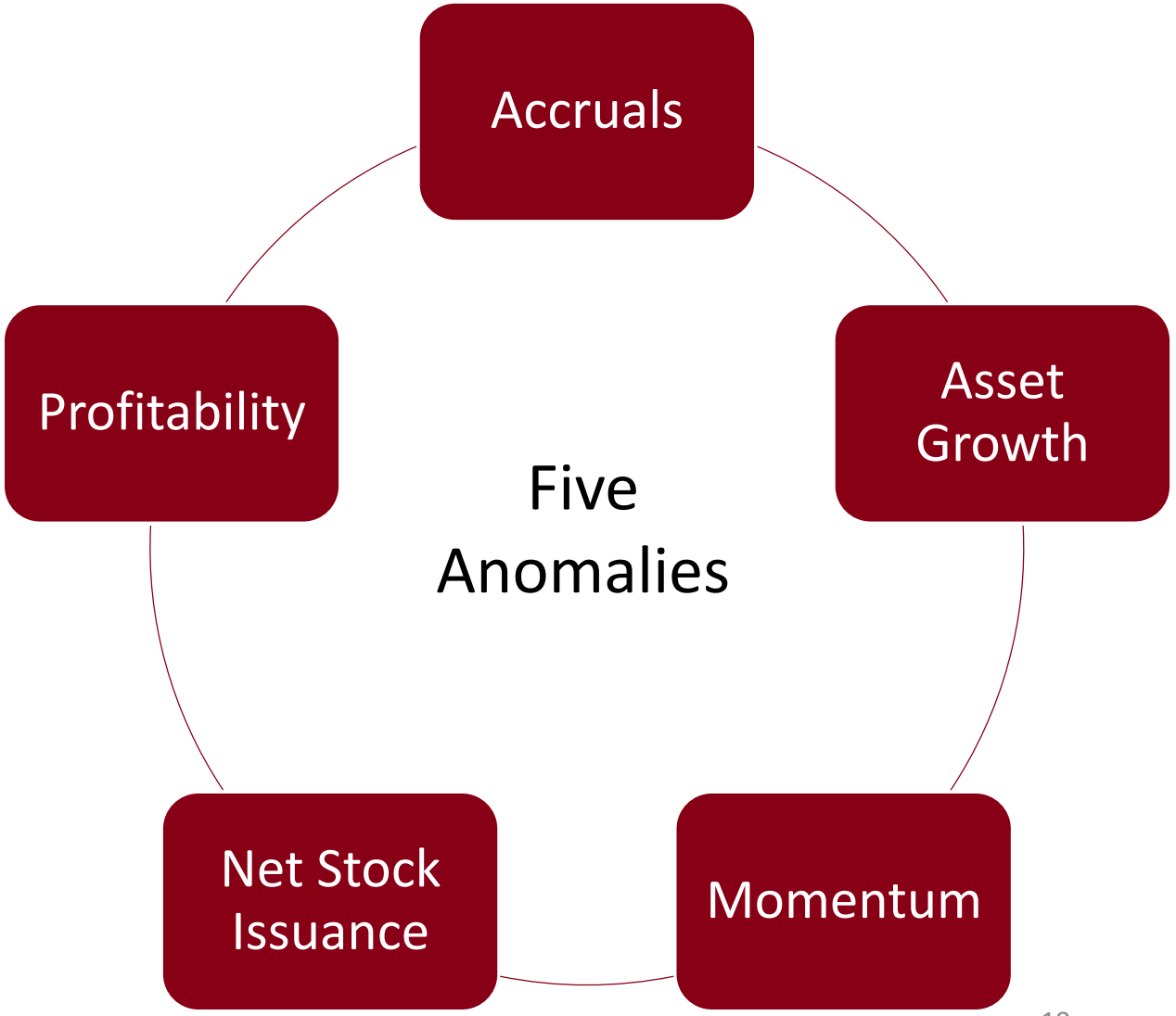
	Highest IVOL	Lowest IVOL
Most Overpriced 20%	-1.89% (-12.05)	-0.39% (-3.04)
Next 20%	-0.88% (-5.86)	*-0.04% (-0.44)*
Mid 20%	*-0.09% (-0.53)*	*0.02% (0.18)*
Next 20%	*-0.15% (-0.80)*	0.23% (3.22)
Most Underpriced 20%	0.56% (3.27)	0.14% (2.04)
Most Overpriced – Most Underpriced (Long/Short)	-0.44% (-11.07)	-0.53% (-3.43)

Our Implementation

- Changes to mispricing metric
  - Five measures: asset growth, profitability, momentum, net stock issuance, accruals
- Long-only, no leverage

Anomaly Selection

- Goal: narrow down 11 mispricing anomalies from IVOL Theory to 5 to make mispricing forecasts more manageable
- Choose based on:
  - Confidence in supporting research & returns
  - Ease of calculation
  - Covariances



Advantages to SIM Fund Implementation

1. Long-only, no leverage = no risk of margin calls
2. Small investment size = no price impact
3. No redemption risk

IVOL Strategy Implementation

Portfolio Construction Process

1. Identify Data Sources and Charter Constraints
2. Choose Anomalies for Underpricing
3. Calculate and Rank Universe on Anomalies
4. Calculate and Rank Universe on IVOL
5. Select Securities from Intersection

Data Sources & SQL Server

Bloomberg	CRSP	Datastream	XBRL
• Equity Financial Data • Used for anomaly calculations	• Equity Universe Data • Used for universe screening, anomaly calculations	• Returns Data • Used for anomaly calculations	• Equity Financial Data • Possible Future Implementation

- Also created and implemented a SQL Server to store anomaly and portfolio data
- Will be used by future SIM Fund groups

Charter Constraints (Initial Universe)

- Firm domiciled in U.S.
- Price > $5.00
- Market cap > $1.2 billion
- Average Volume > 5,000 shares per day

Accruals

Do Stock Prices Fully Reflect Information in Accruals and Cash Flows About Future Earnings?
Richard G. Sloan (1996)

- Firms that have a lower accrual portion of their income (compared with the cash component of their income) generate abnormal higher returns
- Investors do not fully account for cash's predictive power for future earnings
- Used Bloomberg – Quarterly Data
  - 1,102 securities ranked and matched

$$\text{Accruals} = (\Delta CA - \Delta Cash) - (\Delta CL - \Delta STD - \Delta TP) - Dep$$

Asset Growth

Asset Growth and the Cross-Section of Stock Returns
Cooper, Gulen, and Schill (2008)

- Firms that invest more (higher asset growth) have lower expected future returns than those that invest less (lower asset growth) over the next five years
- Used Bloomberg data to find total assets in Q3 2015 and Q3 2014
  - 1,102 securities ranked and matched

$$\text{Asset Growth} = (\text{Assets}_{t-1}/\text{Assets}_{t-12}) - 1$$

Momentum

Returns to Buying Winners and Selling Winners: Implications for Stock Market Efficiency
Jegadeesh, Titman (1993)

- Momentum states that buying past short-term "winners" and selling past short-term "losers" provides excess returns
- Used Thompson Reuters Datastream for return data from October 31, 2014 – September 30, 2015 to calculate momentum factors
  - 1,239 securities ranked and matched
- Strategy has been used as a stand-alone for SIM Fund in several prior years

Momentum = Compound Returns from t-12 → t-2

Net Issuance

Share Issuance and Cross-sectional Returns
Pontiff, Woodgate (2008)

- Firms issue stock when management believes stock is overvalued and repurchases when management believes stock is undervalued
- Firms with lower net issuance numbers are ranked favorably, and strategy yields significant positive returns over holding periods from 3 months – 3 years
- Share data retrieved from CRSP
  - 1,428 securities ranked and matched

$$\text{Net Issuance} = \log(\text{Adj. Shares Out})_t - \log(\text{Adj. Shares Out})_{t-11}$$

Profitability

The Other Side of Value: The Gross Profitability Premium
Robert Novy-Marx (2013)

- Firms with higher gross profit numbers as a proportion of total assets are expected to generate abnormally high future returns
- Gross Profit and Total Asset data pulled from Bloomberg
  - 1,102 securities ranked and matched

Profitability = (Gross Profit) / (Total Assets)

Aggregate Anomaly Underpricing Rankings

- Every firm rated on each anomaly and captured in a table
- Simple average rank of all anomalies combined into final "aggregate underpricing ranking"
  - Firms with incomplete data for more than 1 anomaly were excluded

Simple Average

Ticker	Accruals	Asset Growth	Momentum	Net Issuance	Profitability	Aggregate
Company A	1	2	3	3	1	2
Company B	2	3	2	2	3	2.4 Worst
Company C	3	1	1	1	2	1.6 Best

Idiosyncratic Volatility (IVOL)

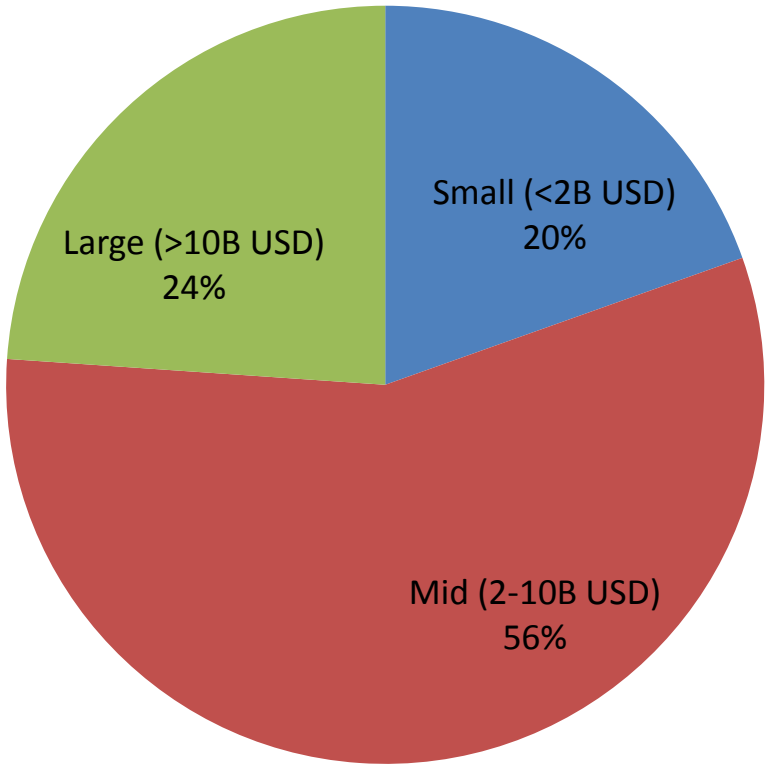
- Collect daily total return data for entire universe
- Regress each security's return against S&P over a one-month period as shown below
  - Regressions run in both MatLab and Python for confirmation
- Sum of Squared Residuals from each regression collected and used to rank securities
  - Highest SSR ranked = highest IVOL

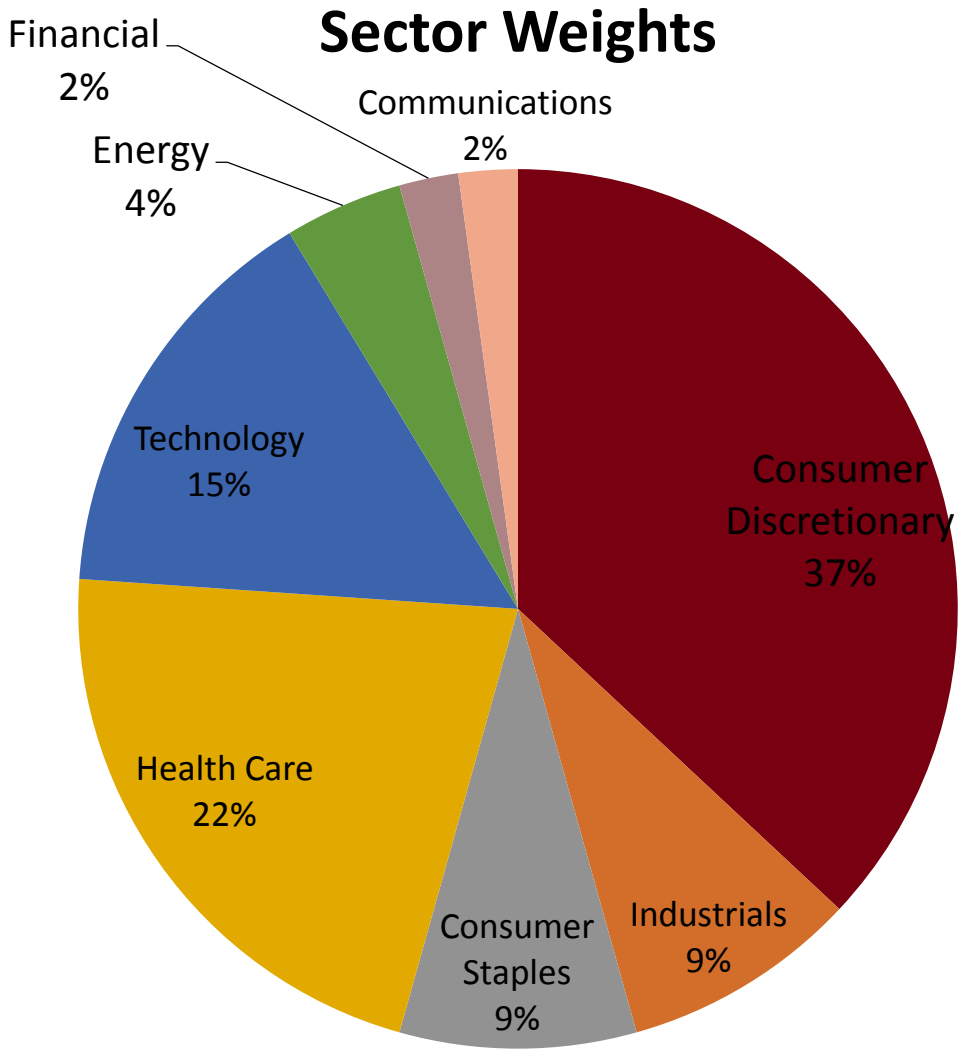
$$Return_i = \alpha + \beta_i (Return_{S\&P500}) + \varepsilon_i$$

Portfolio Construction

- Initial portfolio formed on intersection of top 30% in underpricing and IVOL rankings
- Independently excluded firms in M&A situations or with high-impact recent news
- Market cap-weighted, but with a 50bp floor and 5% ceiling
- First month: 46 securities purchased

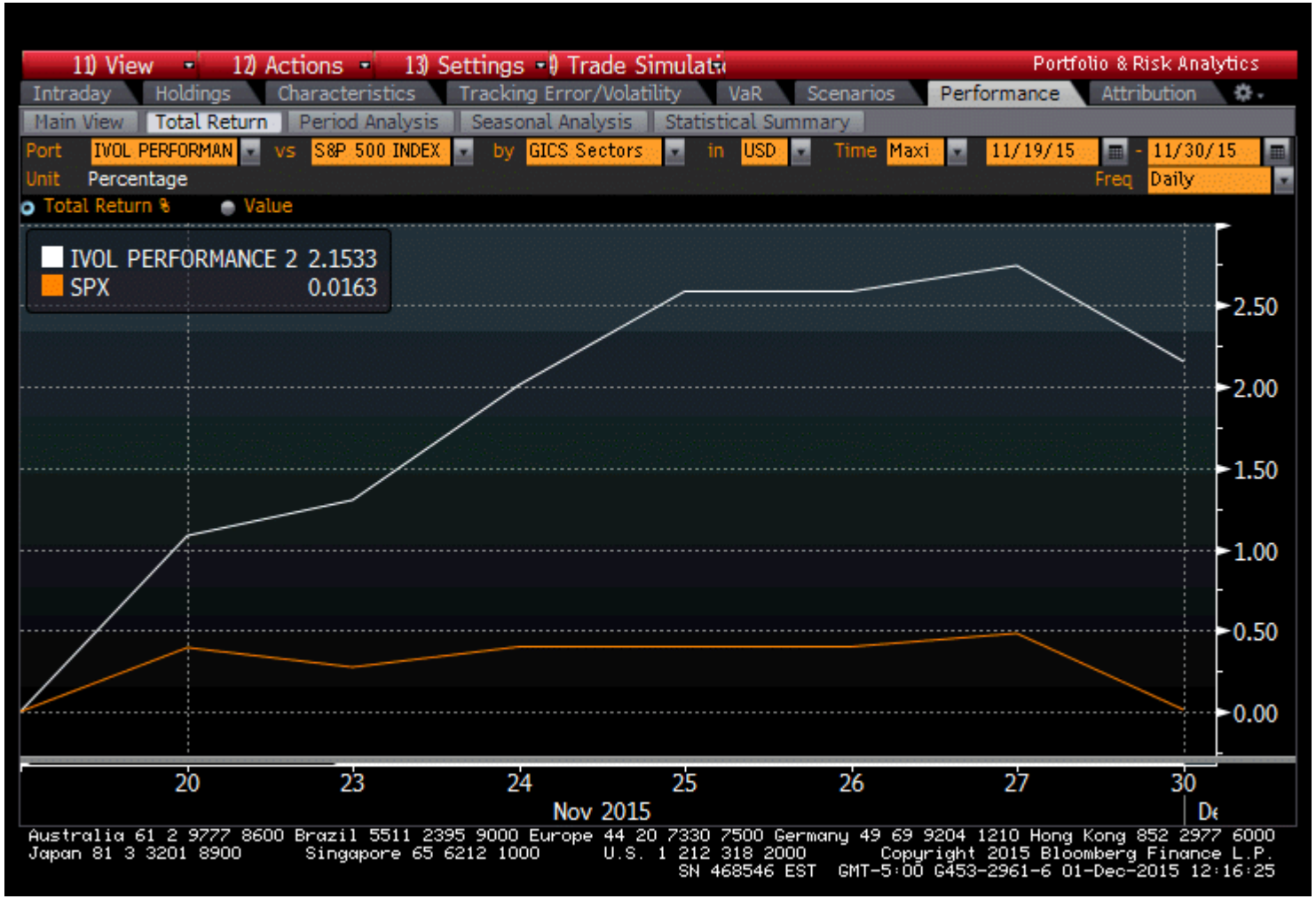
Portfolio Mkt Cap Breakout




Sector Weights
Financial 2%
Communications 2%
Energy 4%
Technology 15%
Consumer Discretionary 37%
Health Care 22%
Consumer Staples 9%
Industrials 9%

Returns

	IVOL	S&P 500
Return To Date:	2.15%	0.02%
Annualized Standard Dev:	8.69	4.21



Looking Forward

- Fully implement SQL Server
  - Store portfolio data and returns
  - Use for portfolio analytics
- Begin using XBRL data
- Analyze different ranking techniques (non-simple average)
- Fundamental Analysis
- Knowledge Transfer

At this time we would be happy to take your questions

Appendix

Anomaly Correlations

Anomaly		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Panel A. Correlations: long minus short													
(1)	Failure probability	1.00											
(2)	Ohlson's O (distress)	0.47	1.00										
(3)	Net stock issues	0.27	0.20	1.00									
(4)	Composite equity issues	0.20	0.11	0.43	1.00								
(5)	Total accruals	0.15	0.08	0.15	0.11	1.00							
(6)	Net operating assets	0.09	0.16	0.22	0.10	0.26	1.00						
(7)	Momentum	0.62	0.18	0.22	0.25	0.15	0.14	1.00					
(8)	Gross profitability	0.36	0.34	0.21	0.01	−0.12	0.13	0.19	1.00				
(9)	Asset growth	0.09	0.03	0.36	0.22	0.22	0.36	0.17	−0.01	1.00			
(10)	Return on assets	0.58	0.41	0.16	0.01	0.03	0.02	0.31	0.38	−0.03	1.00		
(11)	Investment-to-assets	−0.02	−0.01	0.19	0.12	0.34	0.32	0.08	−0.08	0.51	−0.08	1.00	
(12)	Combination	0.77	0.52	0.52	0.39	0.42	0.42	0.68	0.43	0.44	0.56	0.35	1.00
Panel B. Excess returns													
Long leg (mean)		0.94	0.51	0.70	0.62	0.72	0.71	1.11	0.69	1.00	0.64	0.91	0.76
Short leg (mean)		−0.01	−0.19	0.07	0.20	0.13	0.06	−0.45	0.29	0.04	−0.34	0.15	−0.01
Long minus short (mean)		0.95	0.70	0.63	0.42	0.58	0.65	1.56	0.40	0.96	0.98	0.75	0.77
Long leg (*t*-statistic)		3.97	2.18	3.66	3.47	2.54	2.98	3.81	3.20	3.82	2.56	3.65	3.57
Short leg (*t*-statistic)		−0.01	−0.51	0.27	0.79	0.40	0.22	−1.23	1.33	0.14	−0.88	0.57	−0.05
Long minus short (*t*-statistic)		2.55	2.83	5.11	2.59	3.11	4.41	5.45	2.45	5.34	3.53	5.22	6.91
Panel C. Benchmark-adjusted returns													
Long leg (mean)		0.39	0.21	0.20	0.02	0.26	0.25	0.63	0.43	0.22	0.38	0.17	0.28
Short leg (mean)		−1.16	−0.93	−0.46	−0.41	−0.34	−0.51	−1.14	−0.23	−0.44	−0.90	−0.37	−0.60
Long minus short (mean)		1.55	1.13	0.66	0.43	0.61	0.76	1.77	0.66	0.66	1.28	0.54	0.87
Long leg (*t*-statistic)		3.39	3.37	3.87	0.29	1.85	2.27	4.95	4.42	1.76	4.40	1.59	7.66
Short leg (*t*-statistic)		−4.53	−6.17	−4.62	−3.85	−2.24	−4.75	−5.11	−2.19	−3.93	−4.29	−3.30	−7.07
Long minus short (*t*-statistic)		5.00	7.13	5.96	3.18	3.09	4.98	5.82	4.30	3.94	5.48	3.78	9.38