

Online Appendix

Optimal Option Portfolio Strategies:
Deepening the Puzzle of Index Option Mispricing

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Abstract

Additional Results.

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Figure A.1

Choice of window sample width, d , in the volatility estimator

This figure presents the choice of window sample width, d , in the volatility estimator.

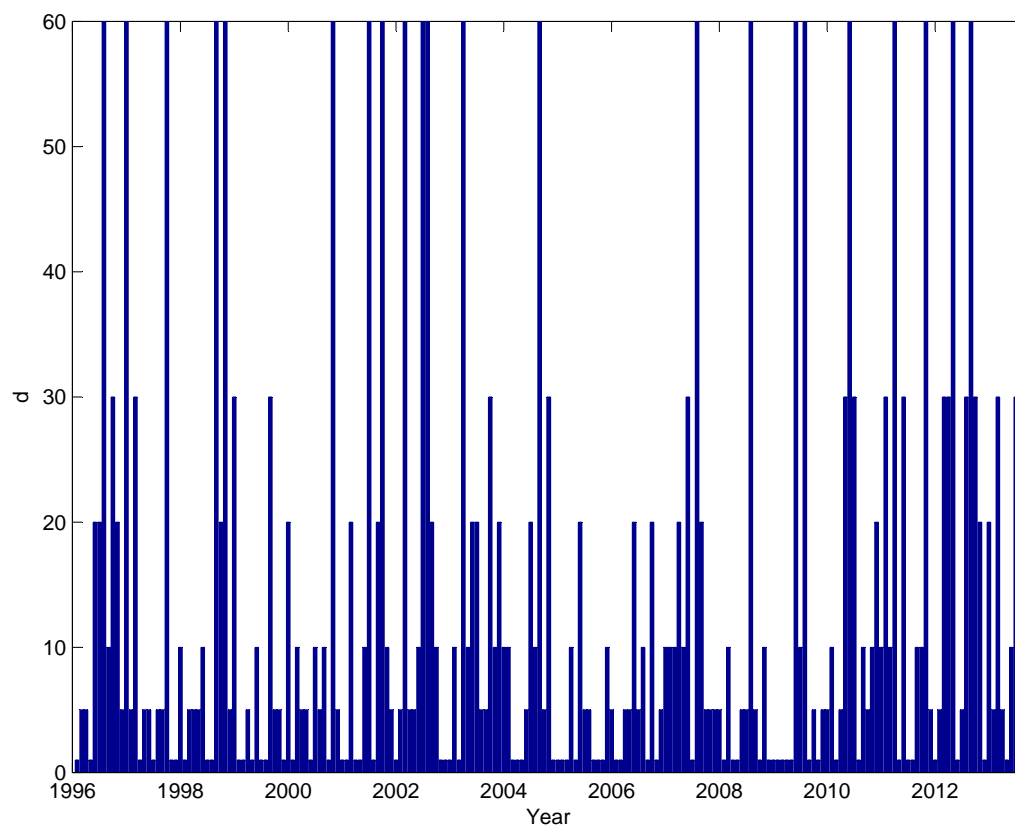


Figure A.2
Short OTM put time-series risk measures

This figure presents risk measures calculated according to the Black-Scholes model of a short position on a OTM put. *Beta* is the percentage change in the portfolio to a one percent change in the underlying price. *Percent Vega* is the percentage change in the portfolio due to a one percentage point change in the volatility. *Market Jump of -5%* is the percentage change in the portfolio if the stock market drops 5%. Period: January 1996 to August 2013.

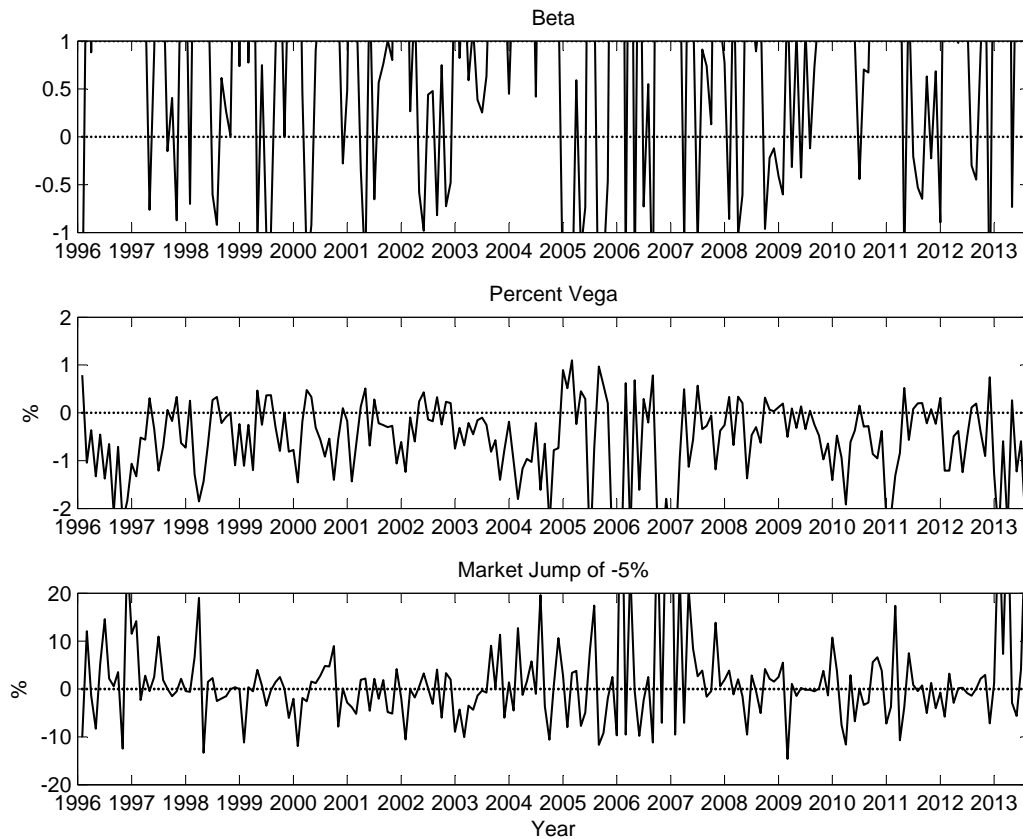


Figure A.3
Short ATM straddle time-series risk measures

This figure presents risk measures calculated according to the Black-Scholes model of a short position on a ATM straddle. *Beta* is the percentage change in the portfolio to a one percent change in the underlying price. *Percent Vega* is the percentage change in the portfolio due to a one percentage point change in the volatility. *Market Jump of -5%* is the percentage change in the portfolio if the stock market drops 5%. Period: January 1996 to August 2013.

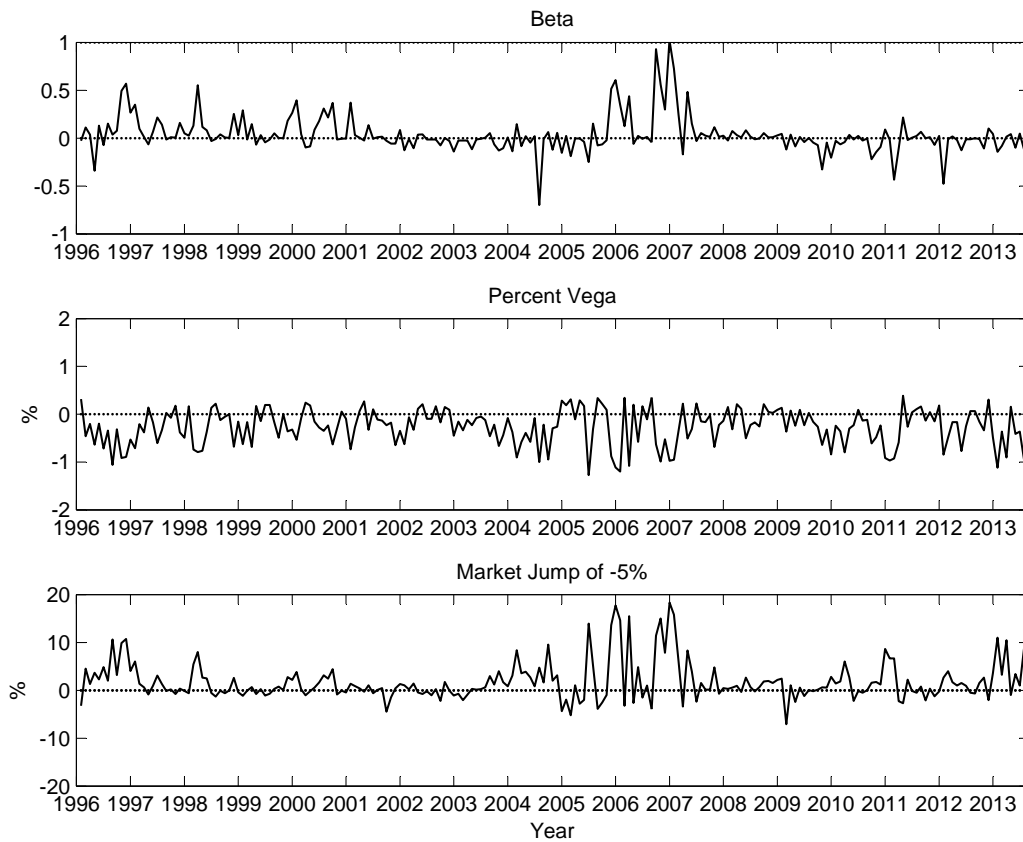


Figure A.4

Short zero-beta straddle time-series risk measures

This figure presents risk measures calculated according to the Black-Scholes model of a short position on a zero-beta straddle. *Beta* is the percentage change in the portfolio to a one percent change in the underlying price. *Percent Vega* is the percentage change in the portfolio due to a one percentage point change in the volatility. *Market Jump of -5%* is the percentage change in the portfolio if the stock market drops 5%. Period: January 1996 to August 2013.

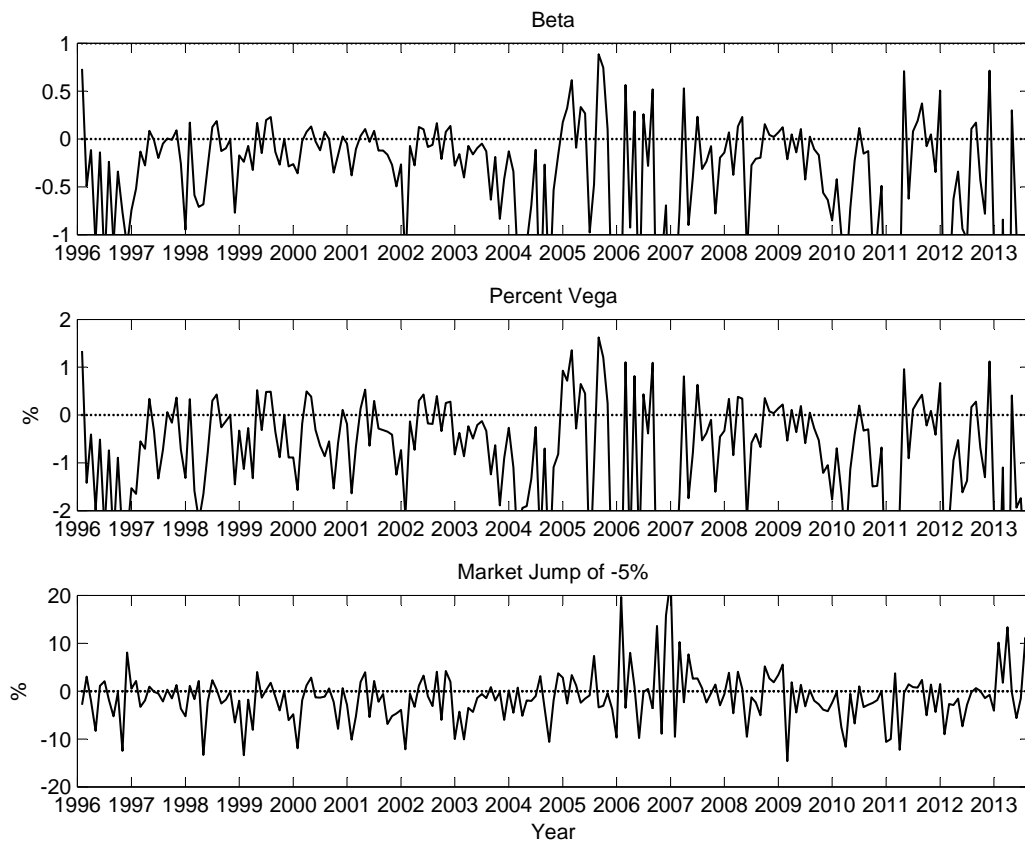


Figure A.5

Short crash straddle time-series risk measures

This figure presents risk measures calculated according to the Black-Scholes model of a short position on a crash straddle. *Beta* is the percentage change in the portfolio to a one percent change in the underlying price. *Percent Vega* is the percentage change in the portfolio due to a one percentage point change in the volatility. *Market Jump of -5%* is the percentage change in the portfolio if the stock market drops 5%. Period: January 1996 to August 2013.

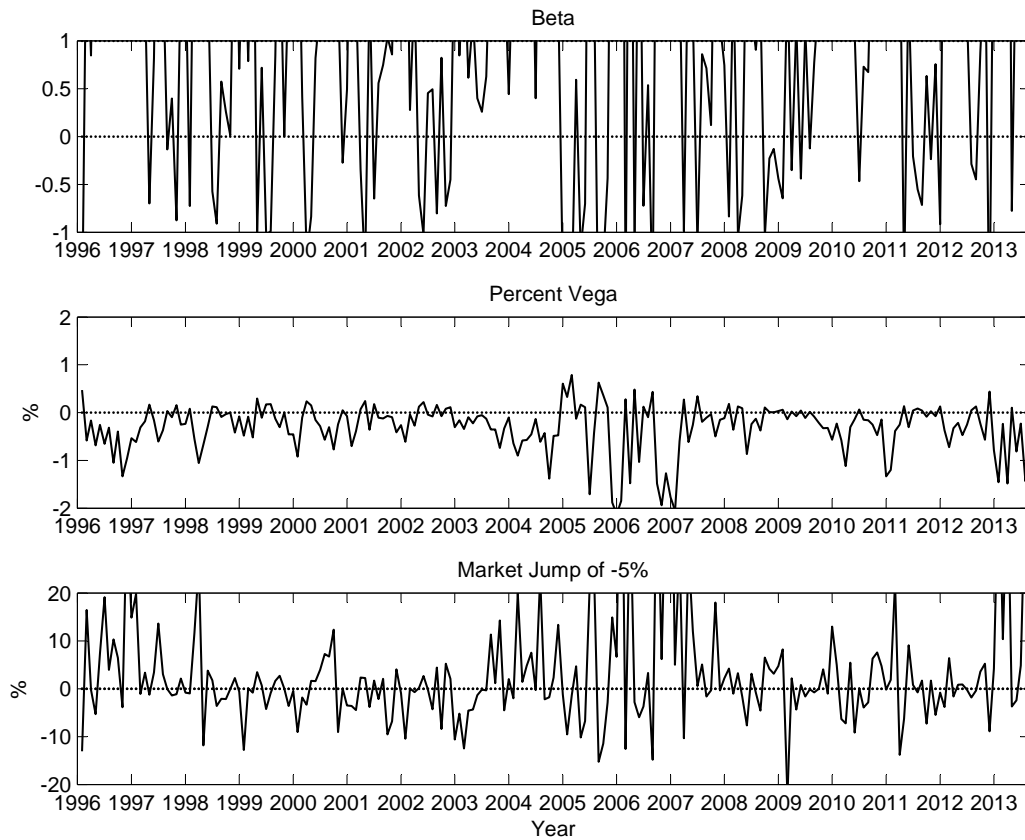


Figure A.6

Checking linearity specification of explanatory regressions

This figure presents scatter plots of OOPS out of sample returns against each risk factor of explanatory regressions in Table 7.

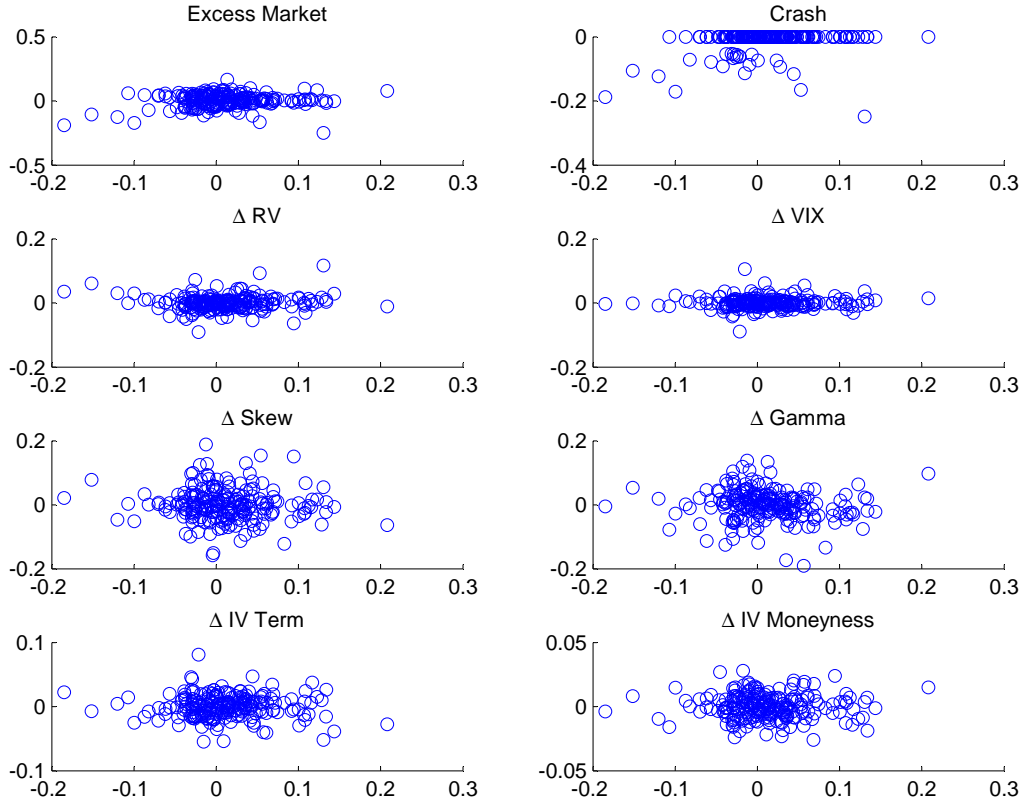


Figure A.7

Checking linearity specification of predictive regressions

This figure presents scatter plots of OOPS out of sample returns against each risk factor of predictive regressions in Table 8.

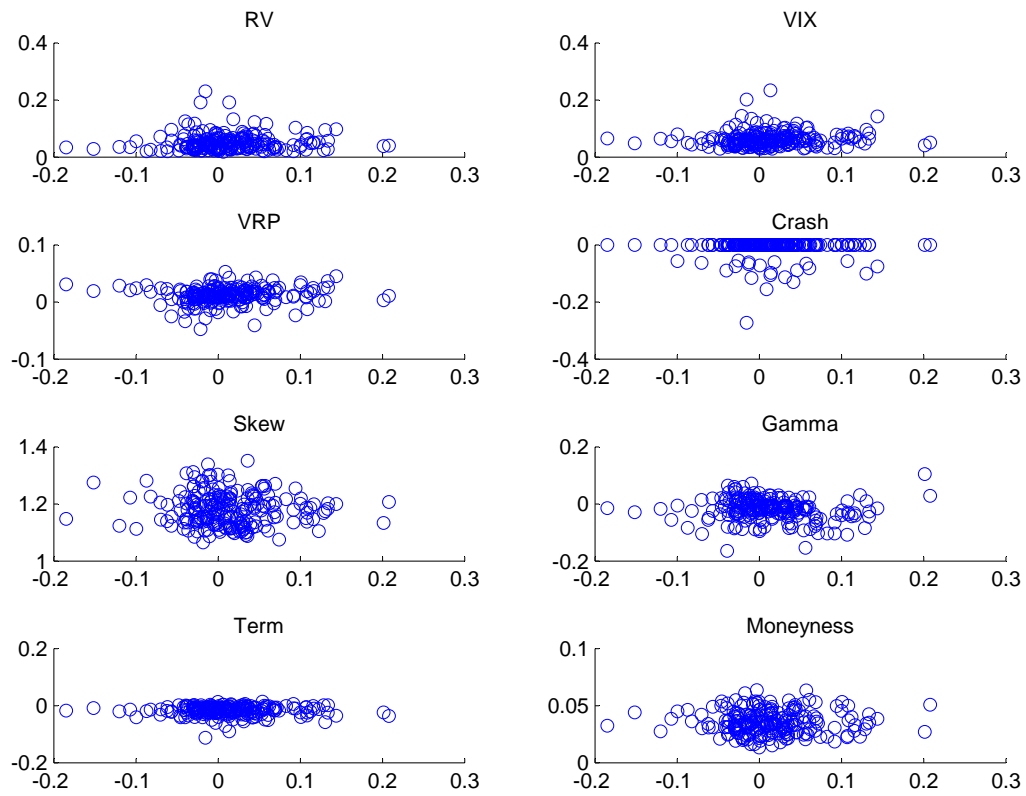


Figure A.8
Drawdowns

This figure presents the drawdowns of OOPS and S&P 500 index stock returns.

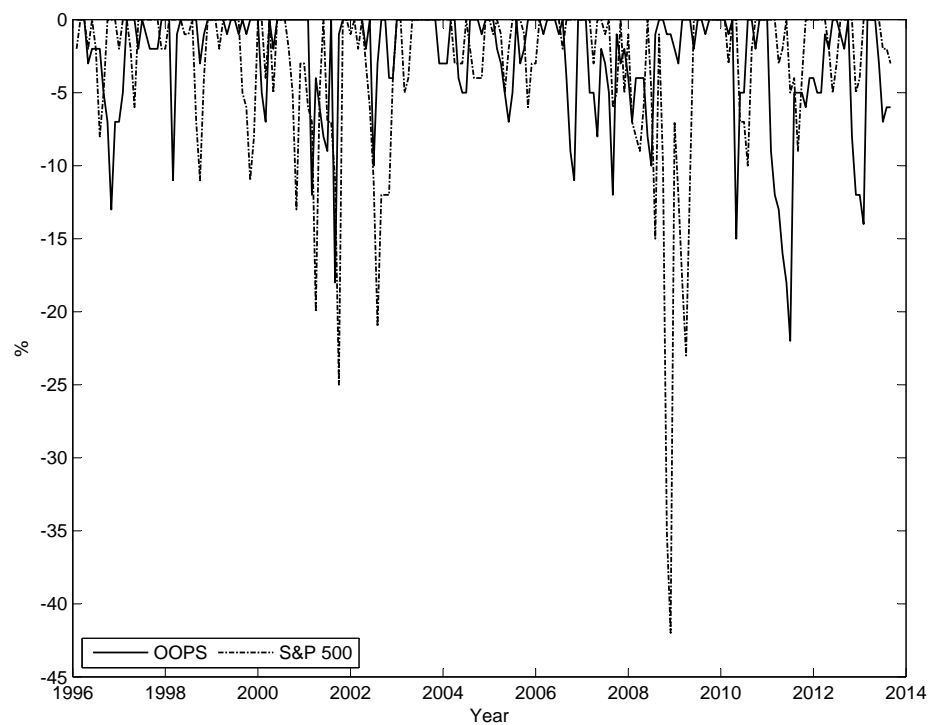


Table A.1
Benchmark returns

This table reports time-series summary statistics (annualized mean, annualized standard deviation, minimum, maximum, skewness, excess kurtosis, annualized certainty equivalent, and annualized Sharpe ratio) for the S&P 500 total return index and a portfolio consisting of the stock market and the bond optimized each month using the OOPS methodology. Period: January 1996 to August 2013.

	Ann Mean	Ann Std Dev	Min	Max	Skew	Exc Kurt	Ann CE	Ann SR
S&P 500	6.4%	18.2%	-29.5%	18.6%	-1.24	5.57	-1.31%	0.29
S&P 500 and rf	2.7%	5.7%	-9.4%	5.7%	-1.33	6.28	2.08%	0.29

Table A.2
OOPS returns - Constraints in OTM Put

This table reports time-series summary statistics (annualized mean, annualized standard deviation, minimum, maximum, skewness, excess kurtosis, annualized certainty equivalent, and annualized Sharpe ratio) for the OOPS. The first row presents the results when we remove the possibility of selling OTM puts while allowing them to be bought. The second row presents the results when the bid-ask spread for OTM puts is doubled. Period: January 1996 to August 2013.

	Ann Mean	Ann Std Dev	Min	Max	Skew	Exc Kurt	Ann CE	Ann SR
No shorting	15.7%	18.8%	-17.2%	20.9%	0.42	1.68	9.25%	0.78
Doub b-a spread	17.1%	18.8%	-17.4%	21.0%	0.42	1.73	10.82%	0.86

Table A.3**Explanatory regressions for OOPS returns**

This table presents estimated coefficients (*p-values* in squared brackets) and the adjusted R^2 for explanatory regressions in which the dependent variable is the out-of-sample OOPS excess returns and the independent variable is the variable stated in the left column. Δ Rel Bid-Ask Spread ATM Call is the relative bid-ask spread of the ATM call subtracted by its past month value. Δ Rel Bid-Ask Spread OTM Put is the relative bid-ask spread of the OTM put subtracted by its past month value. Δ Open Interest ATM Call is the open interest of the ATM Call subtracted by its past month value. Δ Open Interest OTM Put is the open interest of the OTM Put subtracted by its past month value. ***, **, * denotes significant estimated parameters at 1%, 5%, and 10% levels, respectively. Period: January 1996 to August 2013 corresponding to 212 monthly observations.

Variable	OOPS excess returns			
Δ Rel Bid-Ask Spread ATM Call	0.07			
	[0.89]			
Δ Rel Bid-Ask Spread OTM Put	0.13			
	[0.83]			
Δ Open Interest ATM Call			-0.05	
			[0.35]	
Δ Open Interest OTM Put				-0.01
				[0.91]
$\overline{R}^2(\%)$	-0.47	-0.46	-0.06	-0.47

Table A.4
Predictive regressions for OOPS returns

This table presents estimated coefficients (*p-values* in squared brackets) and the adjusted R^2 for predictive regressions in which the dependent variable is the out-of-sample OOPS excess returns and the independent variable is the variable stated in the left column. Rel Bid-Ask Spread ATM Call is the relative bid-ask spread of the ATM call. Rel Bid-Ask Spread OTM Put is the relative bid-ask spread of the OTM put. Open Interest ATM Call is the level of open interest of the ATM Call. Open Interest OTM Put is the level of open interest of the OTM Put. ***, **, * denotes significant estimated parameters at 1%, 5%, and 10% levels, respectively. Period: January 1996 to August 2013 corresponding to 212 mothly observations.

Variable	OOPS excess returns			
Rel Bid-Ask Spread ATM Call	−0.07 [0.61]			
Rel Bid-Ask Spread OTM Put		−0.07 [0.59]		
Open Interest ATM Call			−0.11 [0.14]	
Open Interest OTM Put				−0.07 [0.22]
\overline{R}^2 (%)	−0.35	−0.34	0.58	0.25