Identify most attractive VIX future for a market neutral portfolio

Calculate risk-adjusted expected return:

- Estimate roll yield (return) for each VIX future
- Estimate volatility (risk) of each VIX future
- Identify VIX futures with highest and lowest risk adjusted expected return

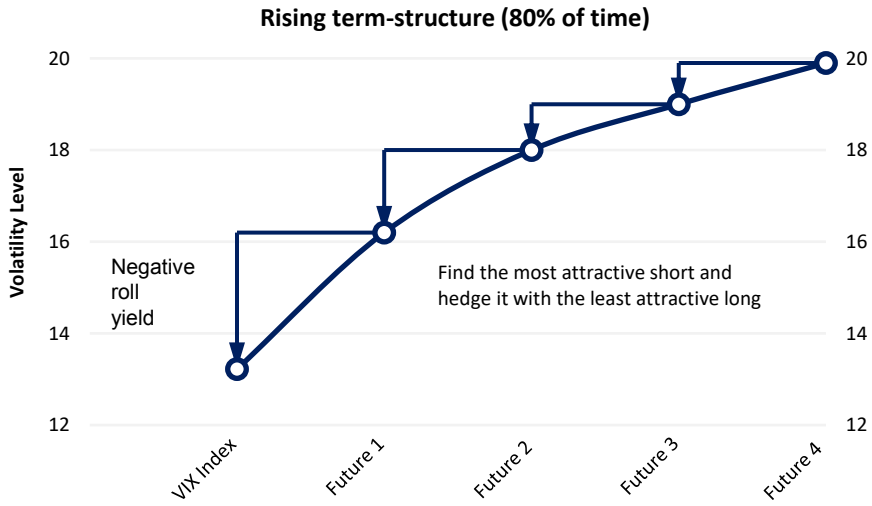
Construct a mostly market neutral portfolio of VIX futures (both long and short) plus at times S&P 500 futures as an additional hedge

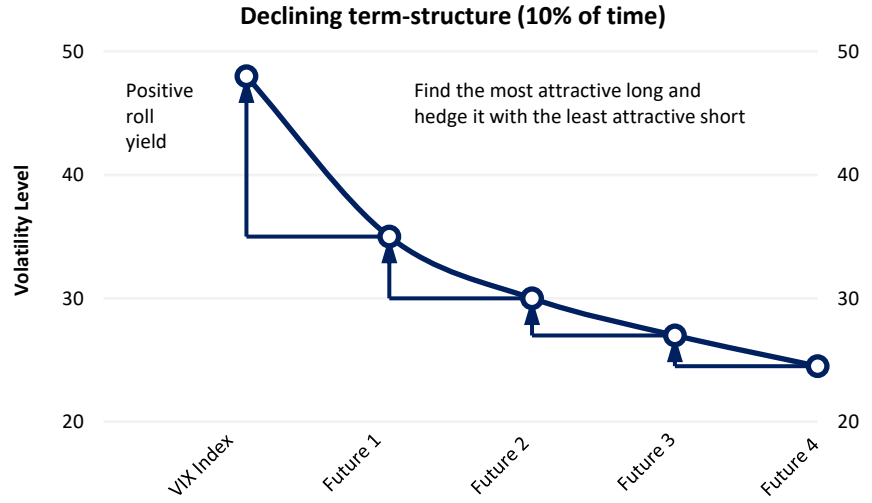
Select optimal position size by

- market attractiveness
- leverage criteria
- current drawdown
- probability of volatility spikes
- accuracy of historic volatility estimation

Always trade two expiries, one short, one long

- find best short in calm periods (rising term-structure)
- find best long during market stress (declining term-structure)





Constructing a Portfolio Covering Different Path Dependencies, Utilizing Desirable and Robust Cross-Correlations

Deep Field Capital

Correlations

All days

Correlation on All Days		Calendar Spread	Inter Market Spread	ICA Global	ICC USA	Average
Calendar Spread	I		0.31	-0.05	-0.04	0.08
Inter Market Spread	II	0.31		0.05	0.46	0.27
Equity Momentum (ICA)	III	-0.05	0.05		0.27	0.09
VIX Momentum (ICC)	IV	-0.04	0.46	0.27		0.23
Average		0.08	0.27	0.09	0.23	0.17

Up-Days

Correlation on Up Days →		When Calendar Spread is Up	When Inter Market Spread is Up	When ICA Global is Up	When ICC USA Up	Average
Calendar Spread	I		0.31	-0.04	-0.05	0.07
Inter Market Spread	II	0.17		0.06	0.49	0.24
Equity Momentum (ICA)	III	0.04	0.11		0.24	0.13
VIX Momentum (ICC)	IV	0.00	0.59	0.31		0.30
Average		0.07	0.34	0.11	0.23	0.19

Down-Days

Correlation on Down Days →		When Calendar Spread is Down	When Inter Market Spread is Down	When ICA Global is Down	When ICC USA Down	Average
Calendar Spread	I		0.19	-0.07	-0.01	0.04
Inter Market Spread	II	0.22		0.04	0.05	0.10
Equity Momentum (ICA)	III	-0.20	-0.09		-0.07	-0.12
VIX Momentum (ICC)	IV	-0.13	0.00	0.01		-0.04
Average		-0.04	0.03	-0.01	-0.01	0.00

Return Capture

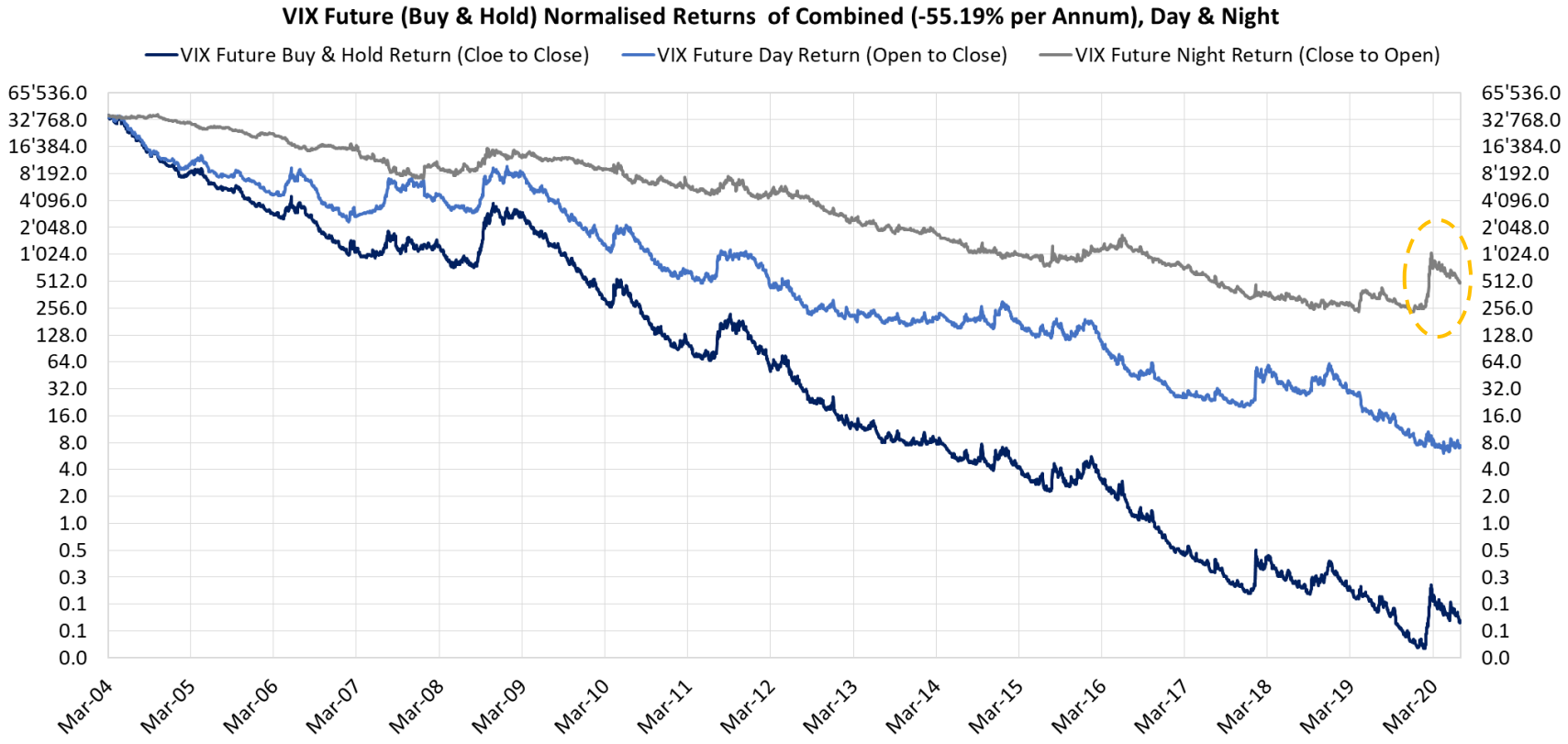
Average Gross returns on All Days	Calendar Spread	Inter Market Spread	ICA Global	ICC USA	Average
Average	0.14%	0.10%	0.14%	0.06%	0.11%

Gross Returns on Up Days →	When Calendar Spread is Up	When Inter Market Spread is Up	When ICA Global is Up	When ICC USA Up	Average
Calendar Spread		0.21%	0.13%	0.16%	0.17%
Inter Market Spread	0.30%		0.10%	0.14%	0.18%
Equity Momentum (ICA)	0.15%	0.11%		0.17%	0.14%
VIX Momentum (ICC)	0.04%	0.07%	0.09%		0.07%
Average	0.16%	0.13%	0.11%	0.16%	0.14%

Gross Returns on Down Days →	When Calendar Spread is Down	When Inter Market Spread is Down	When ICA Global is Down	When ICC USA Down	Average
Calendar Spread		-0.04%	0.15%	0.13%	0.08%
Inter Market Spread	-0.18%		0.10%	-0.07%	-0.05%
Equity Momentum (ICA)	0.18%	0.19%		0.01%	0.13%
VIX Momentum (ICC)	0.06%	0.02%	0.01%		0.03%
Average	0.02%	0.06%	0.09%	0.03%	0.05%

- To achieve a high degree of portfolio diversification, any sub-strategy addition to a portfolio should ideally be positively correlated when portfolio returns are up and negatively correlated when they are down
- E.g. both intraday approaches (III + IV) show a desirable negative (respectively no) correlation on down days of sub-strategies (I + II) and an average positive return capture confirming their role as providers of hedging capabilities and uncorrelated alphas to the VolArb Program

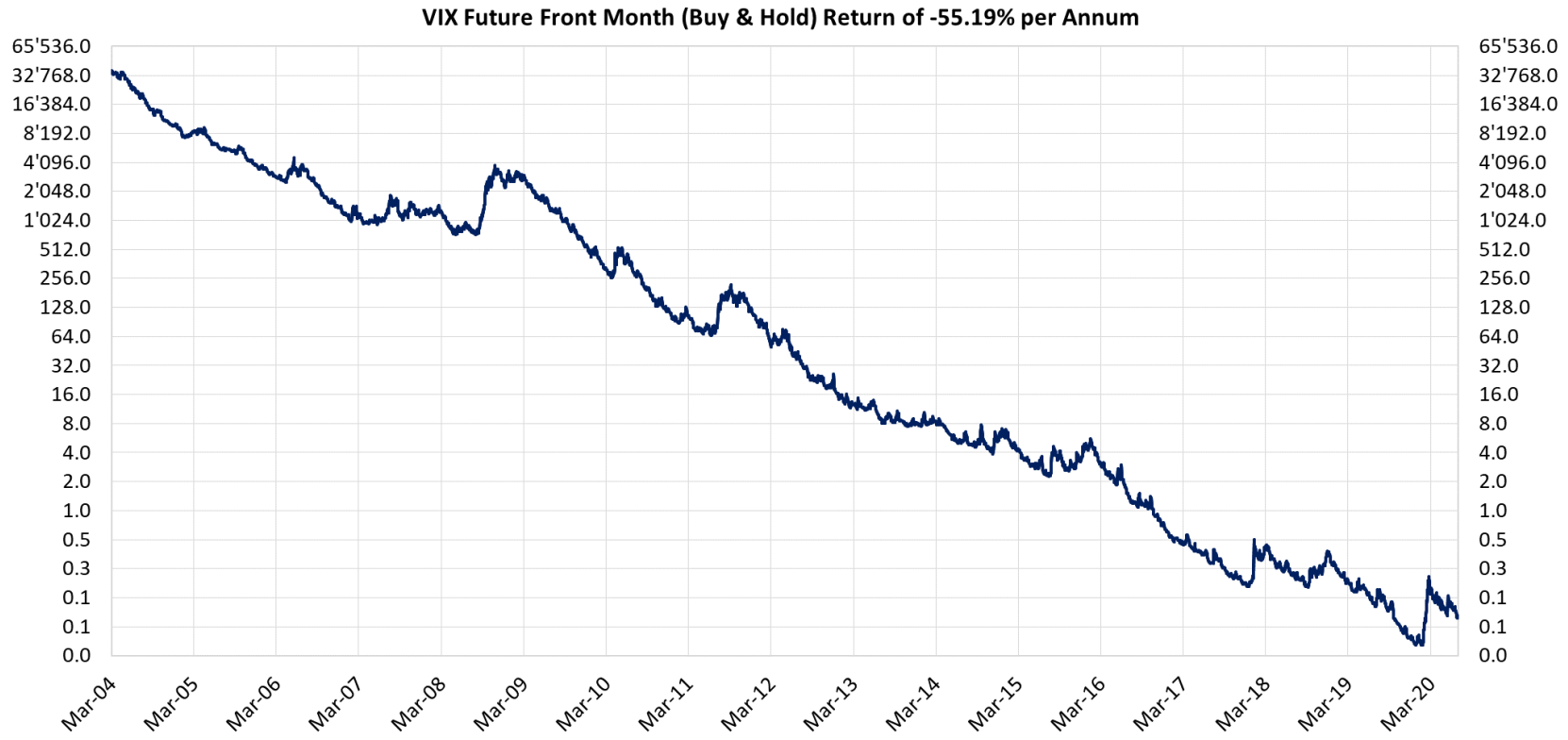
The Recent Increase of the Overnight Action in VIX Futures Stands in Contrast to the Historically, Dominant Pattern of Intraday Action



- The most recent substantial increase in overnight action in the US VIX Future clearly differs from the long-term dominance of intraday action
- The majority of the large VIX events usually takes place during the intraday sessions
- The Price decay also predominantly takes place during intraday sessions
- Historically the intraday sessions are substantially more volatile and hence provide more trading opportunities and higher profit potential

Deep Field Capital

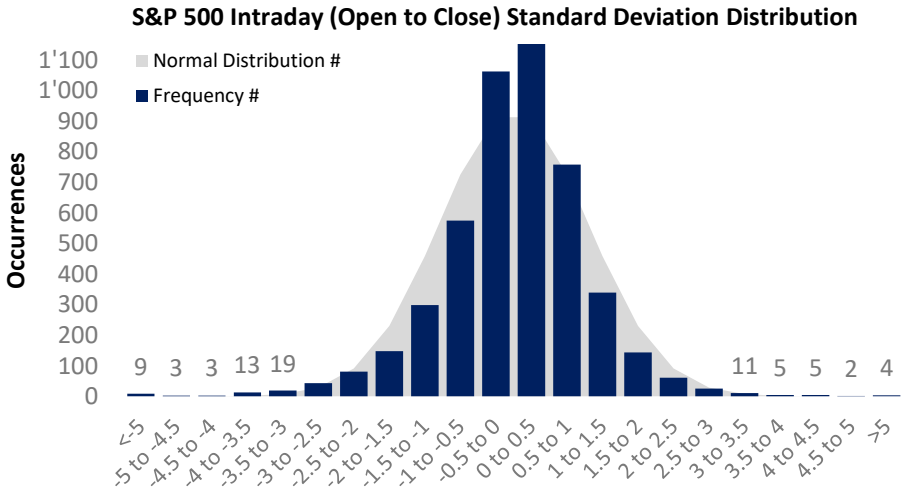
Simple “Buy & Hold” in VIX Futures Faces Devastating Returns Over Time, Underlining the Difficulties of Easily Capturing Long Volatility

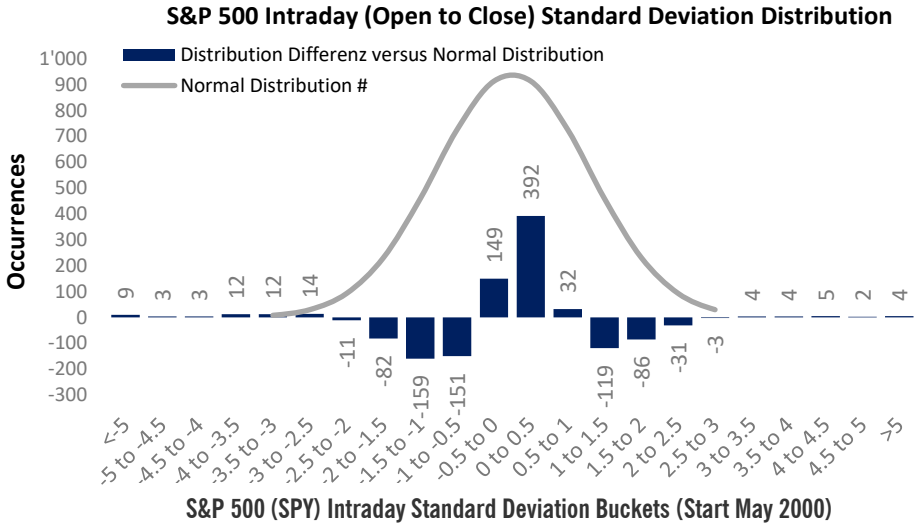


- VIX futures are falling when S&P 500 is moving only gradually upwards or sideward
- VIX futures are also falling after large upwards jumps if equity markets hold on to their status quo without additional downwards pressure (to remain on high levels or increasing further VIX futures would require a further escalation in the moves of the S&P 500)
- Hence simple buy & hold approaches result in devastating returns due to almost constant downward pressure of the VIX futures
- Reflects challenges of successfully managing a “long volatility approach” over time against this constant “short pressure”

Deep Field Capital

Fat Tail Events Happen Significantly More Frequent Than Expected When Assuming a "Normal Distributed World"





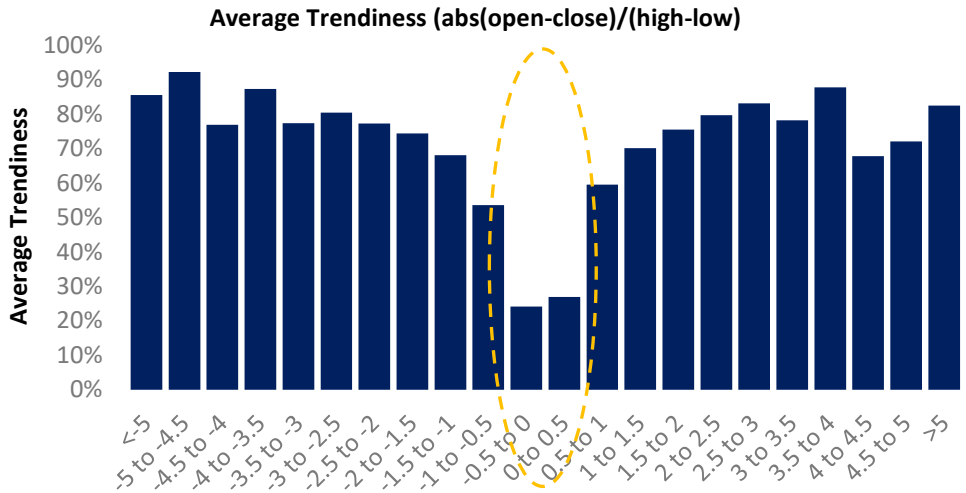
- The S&P 500 Index intraday (open to close) returns show significant outlier moves to the upside (best +7.3 standard deviations) as well as the downside (worst -8.1 standard deviations)
- Those moves on the tails of the distribution happen significantly more often than expected when assuming a normal distribution

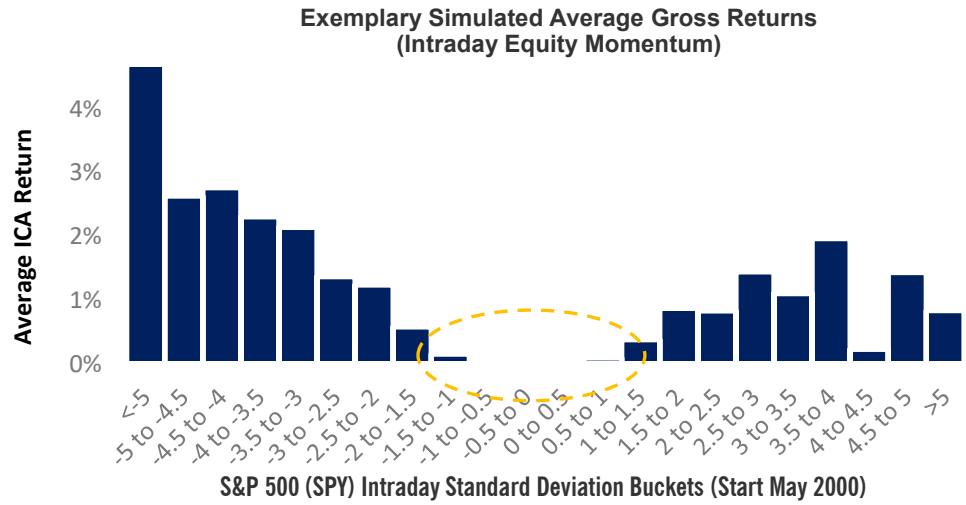
- The chart to the left shows how more or less frequently a standard deviation move in the S&P 500 Index day session occurred

→These extreme moves (fat-tails) can severely hurt investors' portfolios and protection is needed

Deep Field Capital

Signal Clearness and Strength of Intraday Fat Tail Movements Provide Great Trading Opportunities Specifically on Down-Days



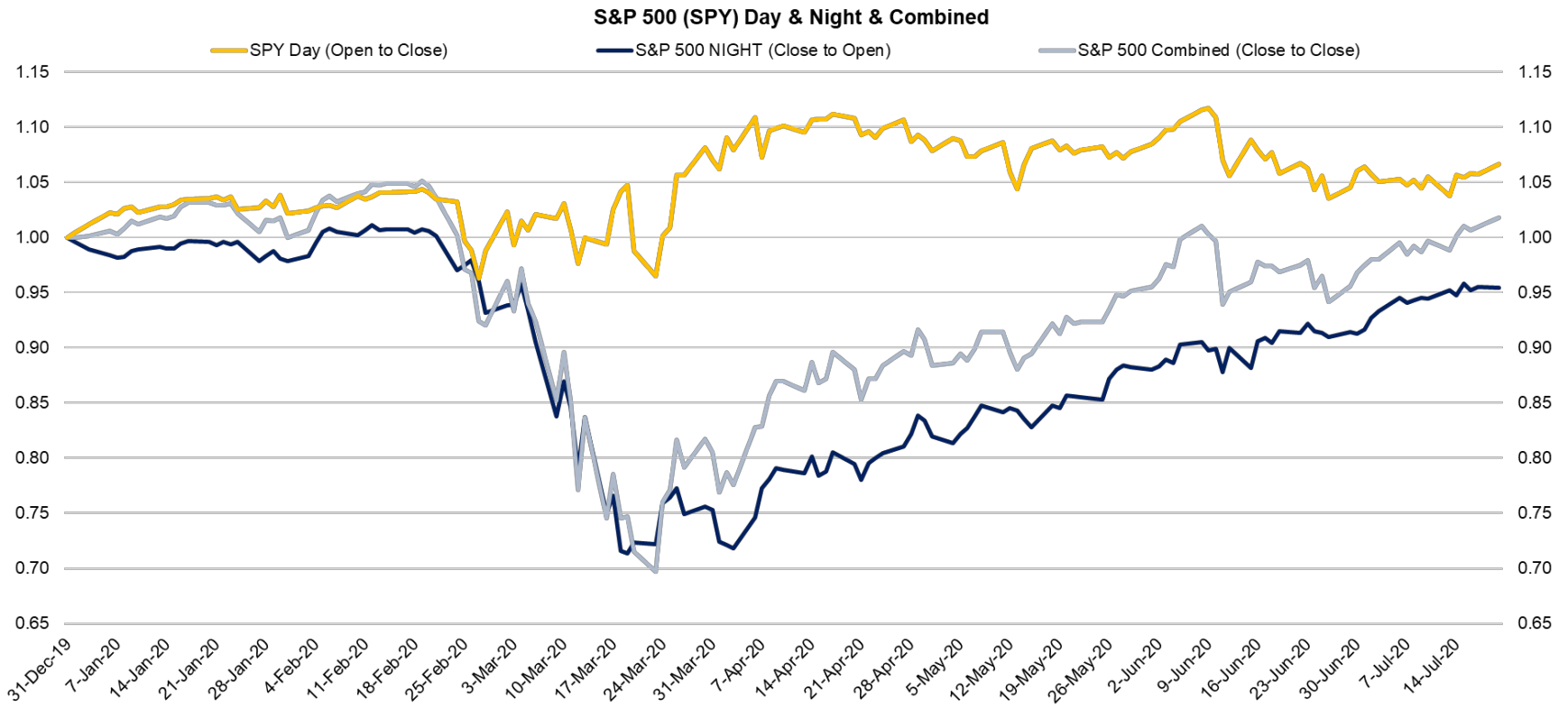


- Fat tail moves come with a significantly higher intraday "trendiness" - when compared to more normal intraday moves
- Equity markets are usually mean reverting
- The little daily up- and downs (yellow dotted circle) are the highly mean reverting territory
- Targeting larger (tail) intraday moves offers higher signal strength

- An intraday equity momentum program can be designed to systematically identify these bigger, generally more trendy moves and to profit from positive as well as negative fat-tails, while aiming to patiently observe markets from the side lines on average "noisy" days (dotted circle)
- The left side reflects trading opportunities in times of crisis (fear/ panic)
- The returns on the right side are often associated with previous sell-offs (recovery moves)
- Successfully staying away from the mean reverting territory should result in only little P&L in the middle part

Deep Field Capital

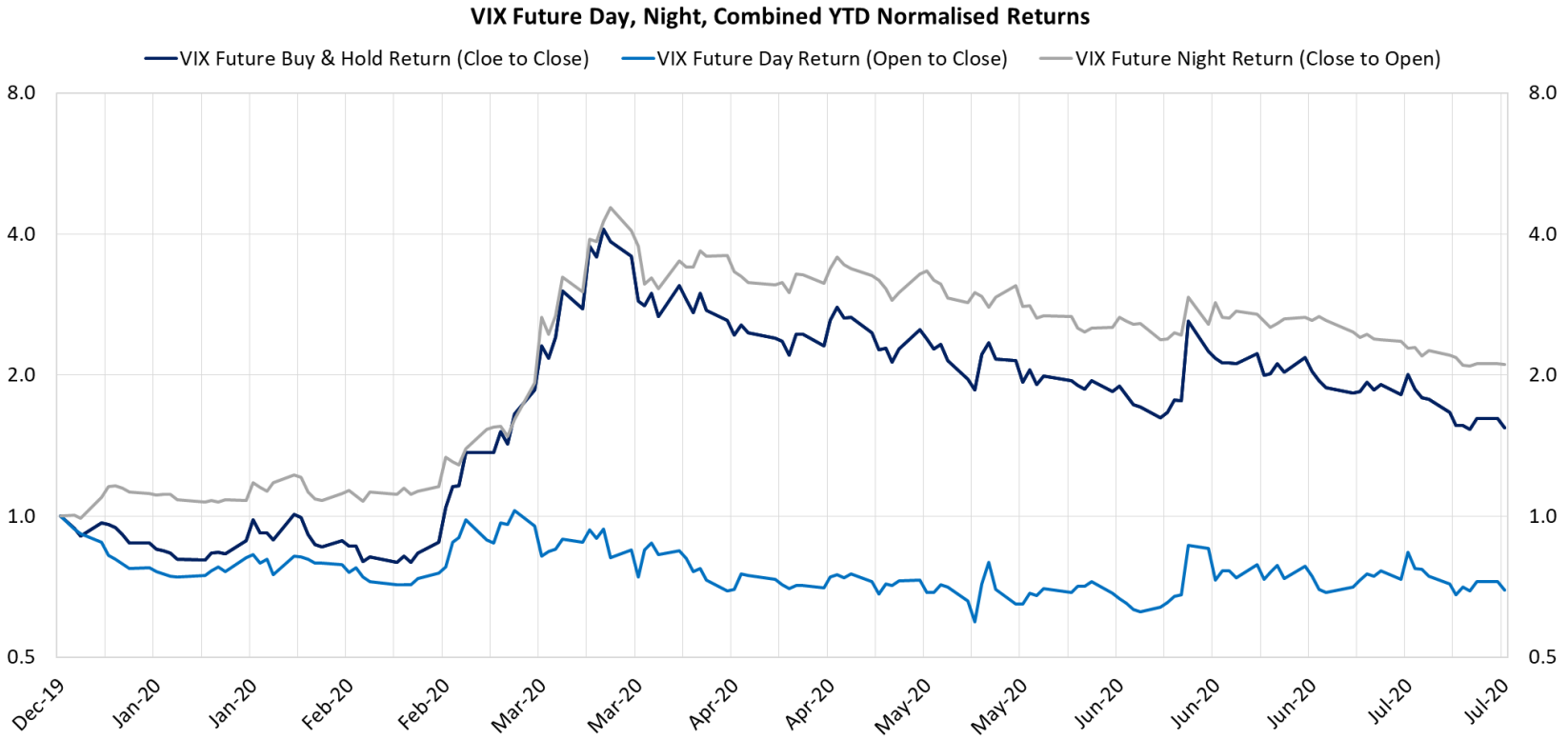
Both, the Sell-Off and the Breath-Taking Recovery in US Equity Markets Almost Exclusively Played out in the Overnight Session



- The activity in the S&P 500 during the overnight session (dark blue) has almost entirely driven the sell-off in March, as well as the following recovery
- In fact the S&P 500 intraday session (yellow) was even positive during the largest turmoil in March and rather travelled sideward during the subsequent recovery
- In this regards the sell-off in March clearly differs from all other large sell-offs in the S&P 500 since the Dot.com crisis, which were predominantly driven by the action in the intraday session. This further stresses the advantages of a global intraday approach beyond a US only program

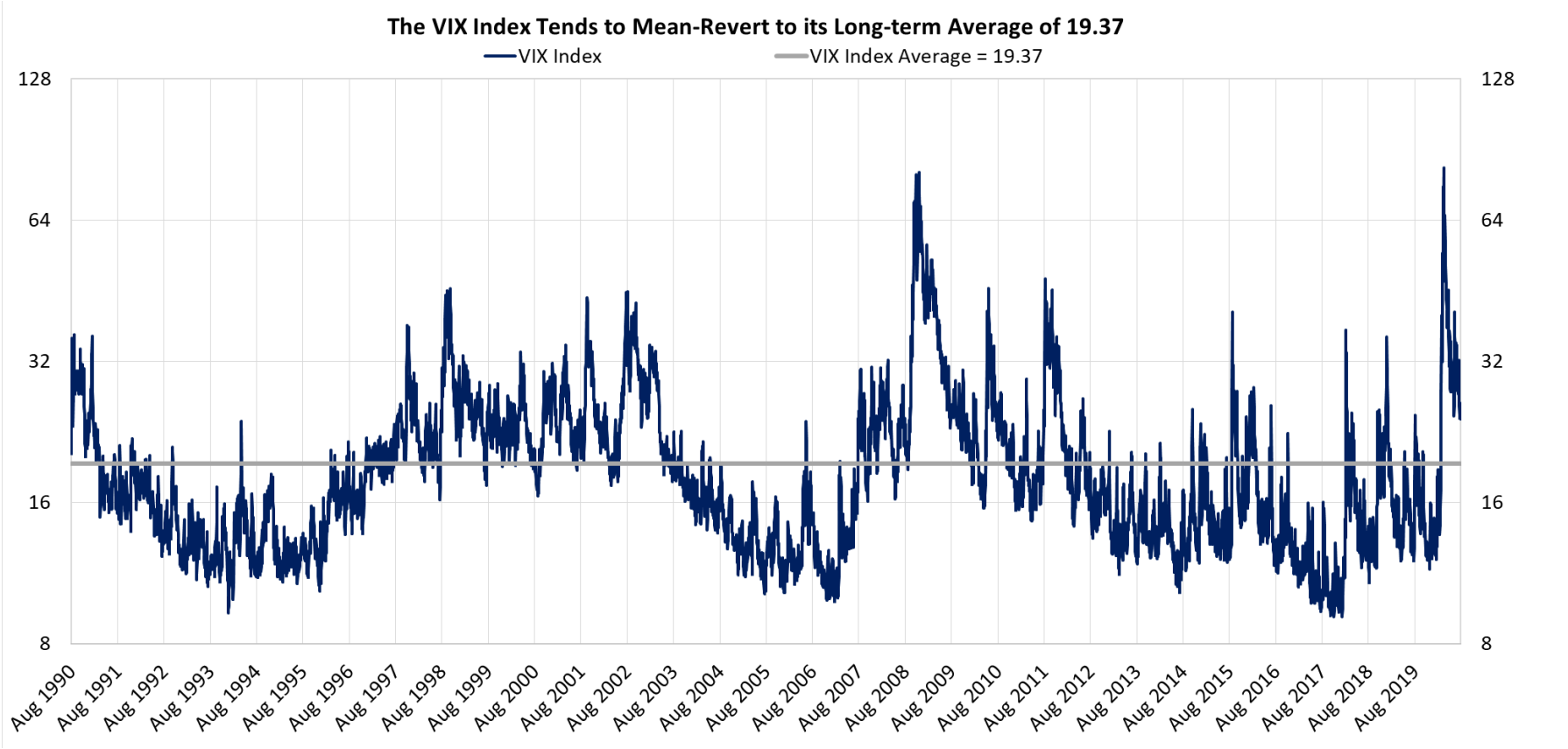
Deep Field Capital

Both, the Vol-Expansion and the Subsequent Contraction in the VIX Future Almost Exclusively Played out in the Overnight Session

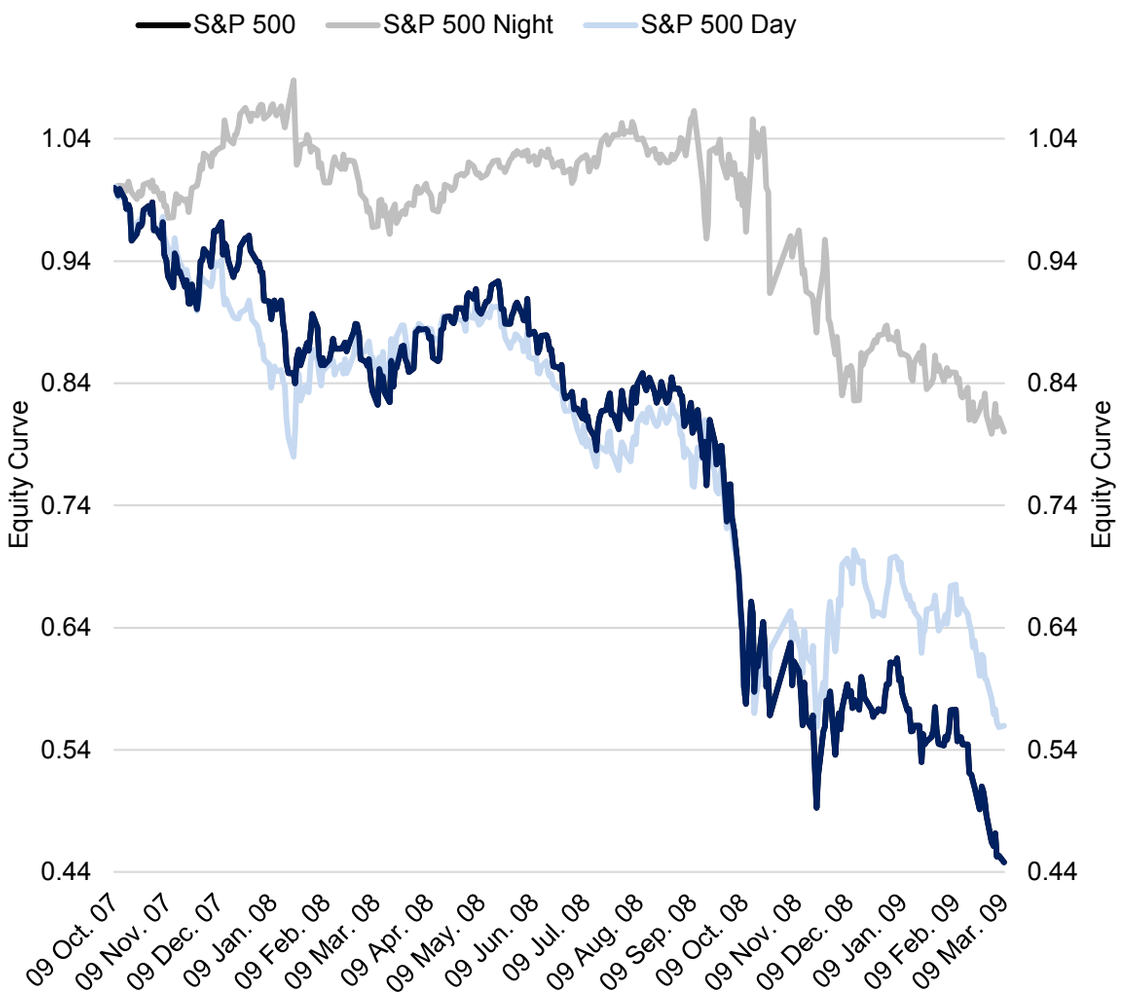


- The massive volatility expansion, reflected in the sharp upwards move in the US VIX Future since late February, is almost entirely explained by the VIX Futures move in the overnight session (dark blue)
- This unusual pattern could also be observed in the overnight action of the S&P 500 (see other slide), explaining the muted activity of the US focused intraday programs (VIX futures as well as US equity index futures)

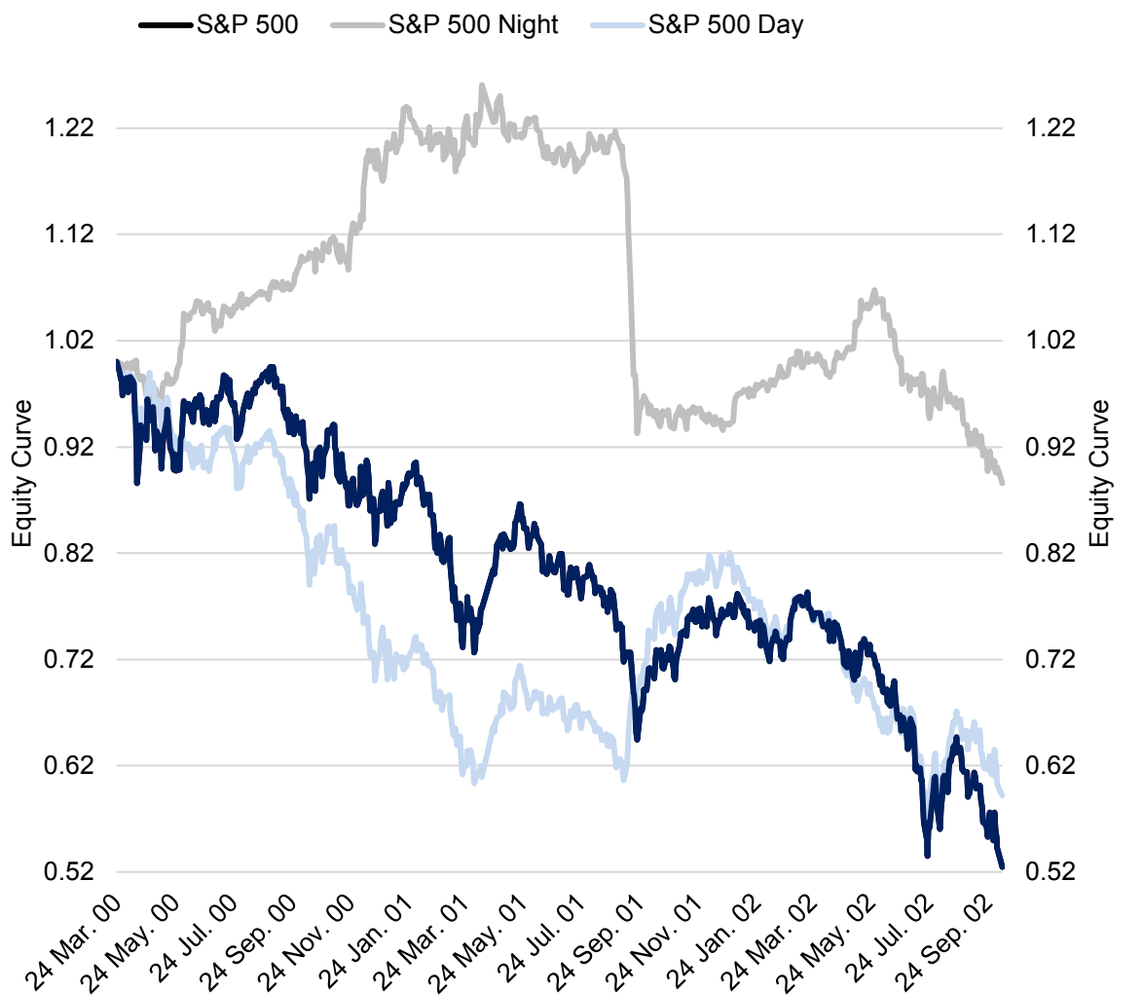
In the Long-term the VIX Index is Clearly Mean Reverting



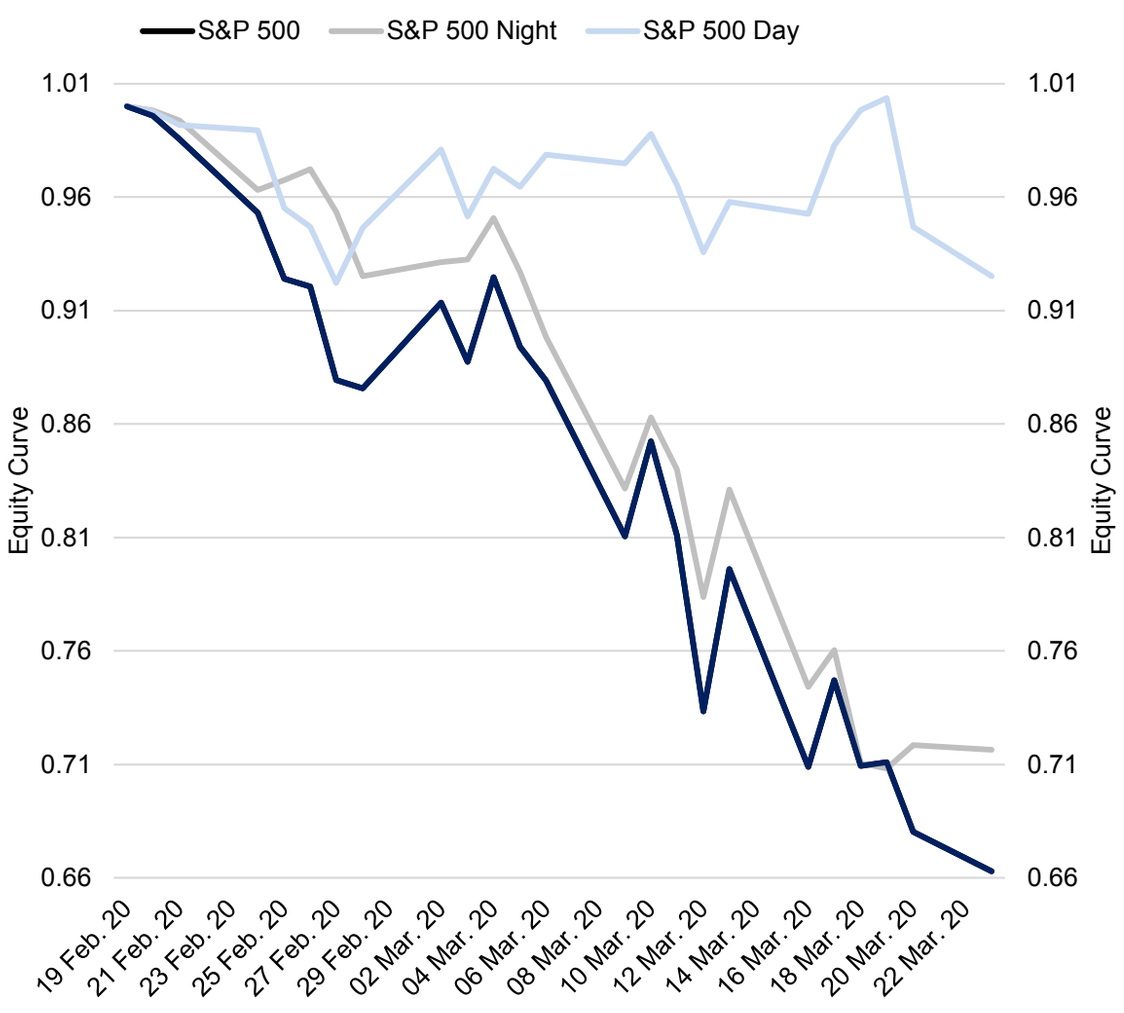
2007 - 2009: S&P 500 Drawdown (-55.19%)



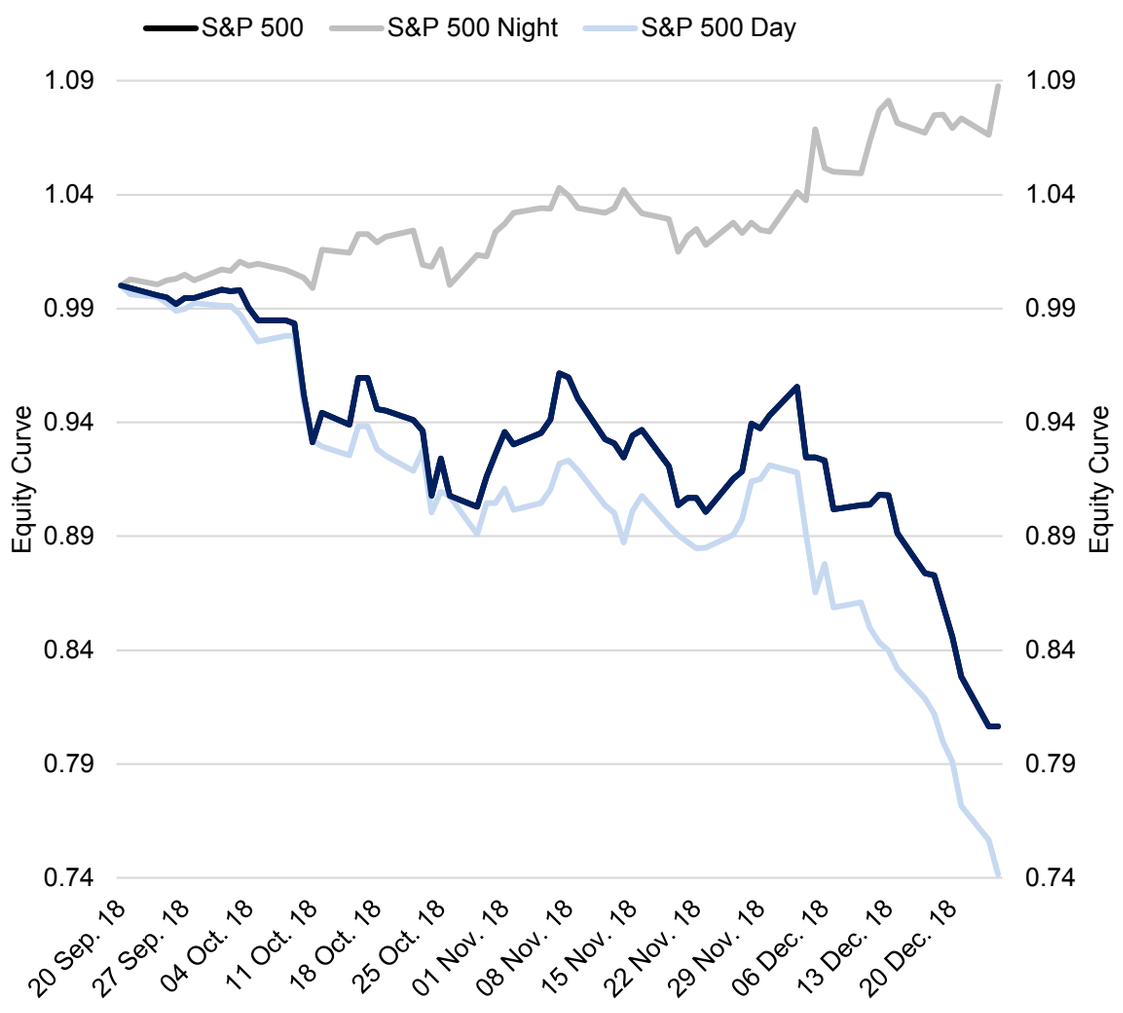
2000 - 2002: Worst S&P 500 Drawdown (-47.51%)



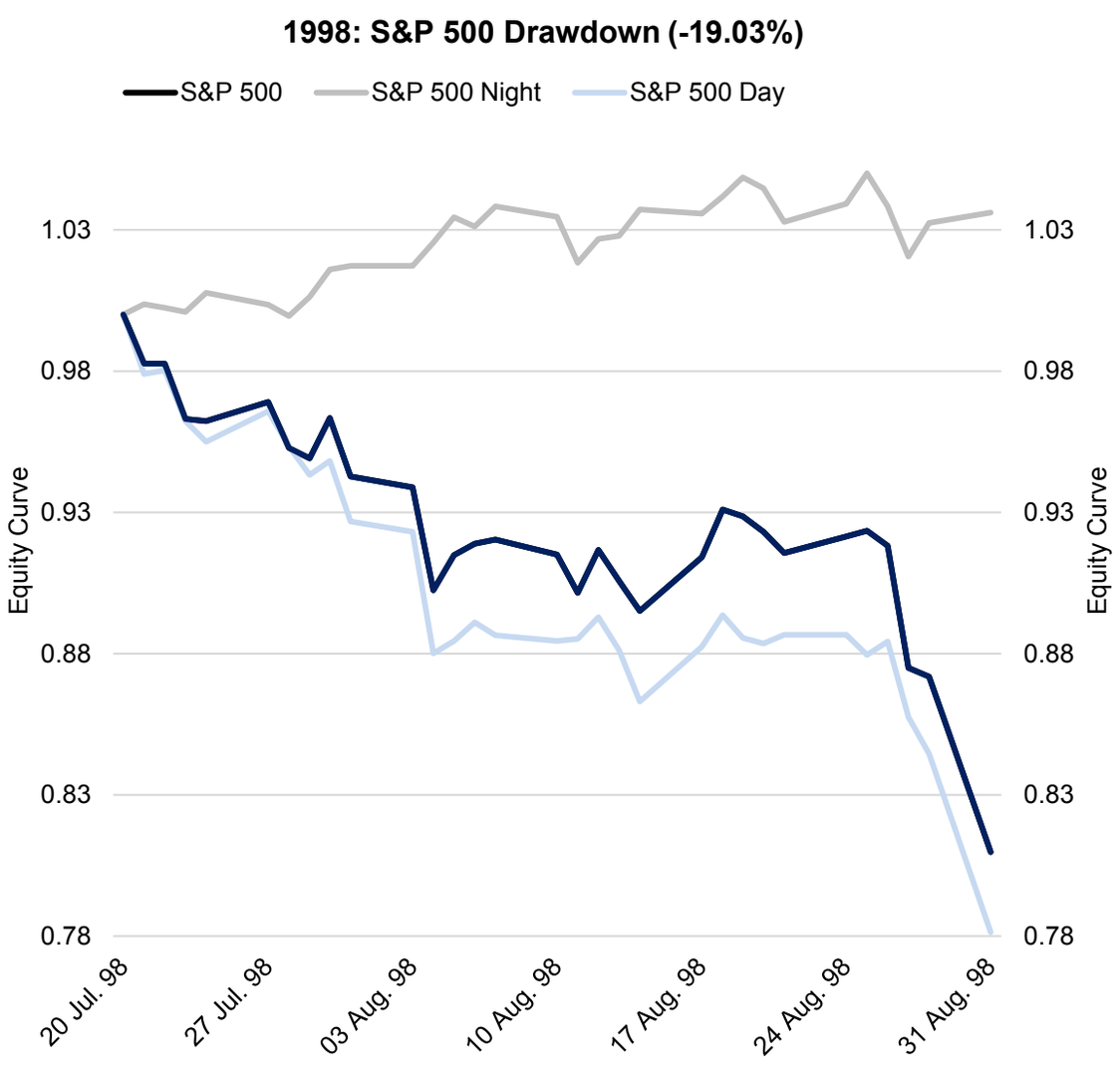
2020: S&P 500 Drawdown (-33.72%)



2018: S&P 500 Drawdown (-19.35%)



1998: S&P 500 Drawdown (-19.03%)



2015: S&P 500 Drawdown (-13.02%)