



# EDUCATIONAL OVERVIEW: CRISIS RISK OFFSET™ CLASS MANAGEMENT & THE SYSTEMATIC TREND FOLLOWING STRATEGY

Rhode Island State Investment Commission

PCA

PENSION  
CONSULTING  
ALLIANCE

November 16, 2016

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# Background & Review Crisis Risk Offset<sup>SM</sup> (CRO<sup>SM</sup>) Class

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# Background

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- At its September 28, 2016 meeting, the RISIC approved a 8% allocation to a CRO<sup>SM</sup> class
- CRO<sup>SM</sup> rationale: produce appreciation during a growth crisis
- Key features of the CRO<sup>SM</sup> class:
  - In aggregate, high-confidence of negative conditional crisis correlation
  - Relatively high volatility: must be  $\geq$  to the volatility of the Total Portfolio
  - Responsive and complementary strategies:
    - Duration: first responder during a flight-to-quality a crisis
    - Systematic trend following (STF): performs well when crisis is confirmed
  - Because of low cross-correlations, individual components must exhibit higher isolated volatilities than the CRO portfolio volatility target

# CRO<sup>SM</sup> Implementation Considerations

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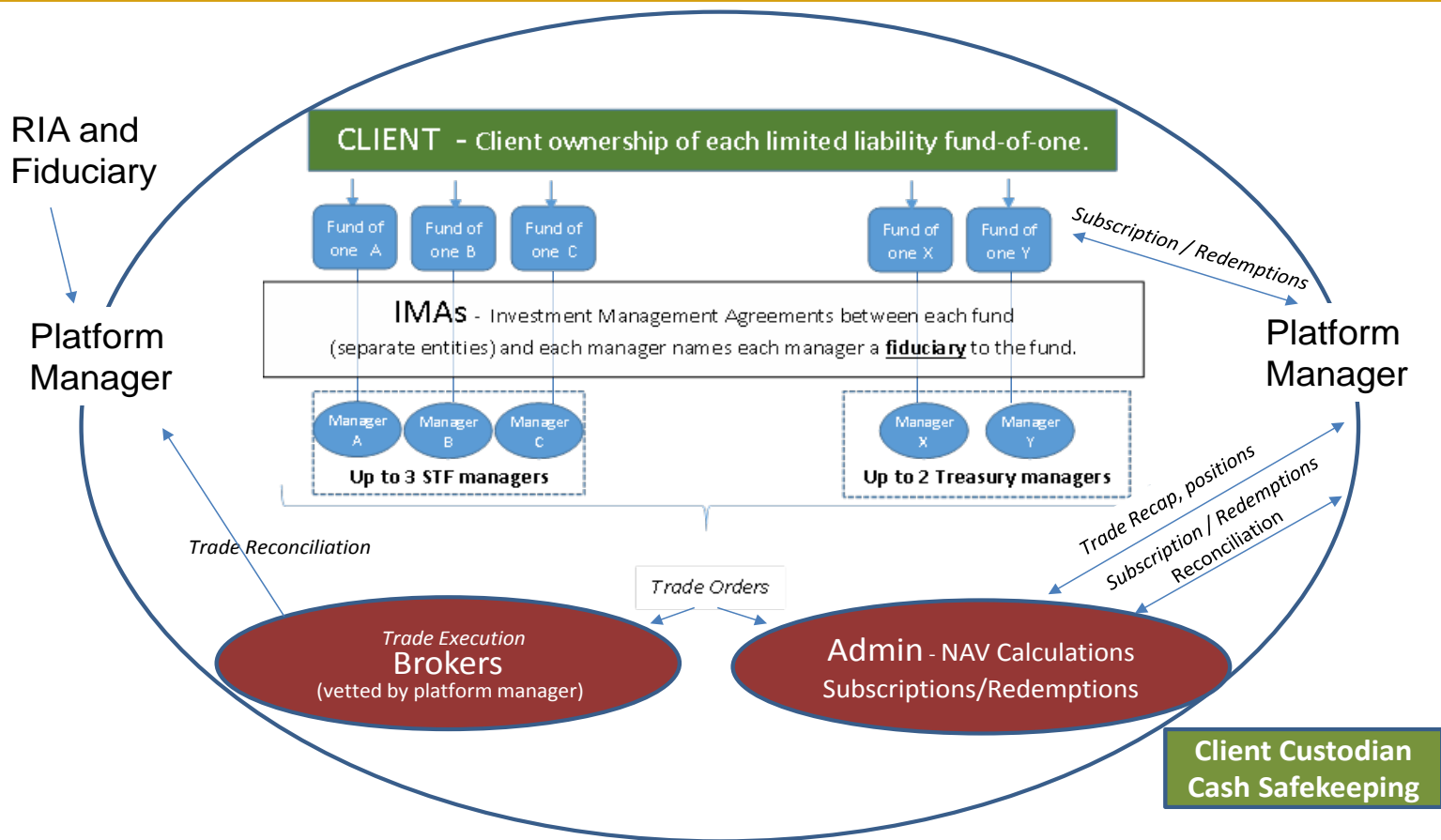
- All underlying strategies/component portfolios will have high liquidity/marketability
- All-in costs will be reasonable (likely in the 40bp – 100bp range)
- Given highly-volatile components, there should be continual oversight
- The systematic trend following strategy component will
  - employ long and short positions
  - will use derivatives leverage to establish volatility levels
- Managers are not seeking “alpha;” they are seeking risk capture
  - Duration managers capturing interest rate risk
  - STF managers capturing trend/momentum risks across dozens of markets

# CRO<sup>SM</sup> Implementation Considerations (Platform Manager)

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- Act as fiduciary to the plan
- Key role: gathering and accounting for all long-short positions across all component managers
- Reconciling manager position data with primary broker position data
- Provide account administrative functions, very similar to RISIC custodian function
- Netting all positions and providing risk analytics/characteristics of aggregate portfolio
- Monitoring and managing risk levels per client direction/guidelines
  - Re-setting manager account levels (i.e., rebalancing among managers)
  - Directing managers to adjust collateral levels
- Provide best-practices user-interfaces to asset-owners such as RISIC

# CRO<sup>SM</sup> Class Management Diagram



- Within this construct, the asset-owner (i.e., RISIC):
  - Searches for and selects platform manager
  - Searches for and selects component managers (funds)
  - Determines level of guideline authority to assign to platform manager

# Systematic Trend Following Benchmark Review

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# Description – What is Systematic Trend Following?

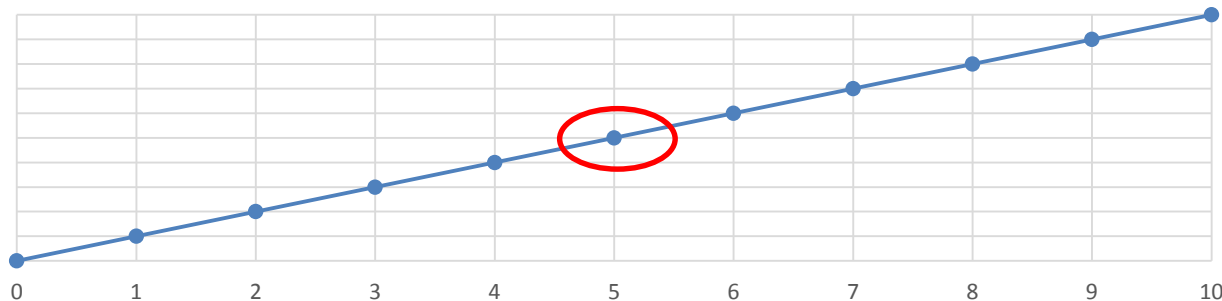
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- *Momentum* and *Trend Following* are somewhat interchangeable terms
- That which has done well recently will continue to do well
- That which has done poorly recently will continue to do poorly
- Buy what is going up; sell what is going down
  - Ex: if S&P 500 has a positive 1-year return, buy/go long
  - Ex: if oil has a negative 1-year return, sell/short
- This results in a volatile, yet low correlation return vs. risky assets (e.g., equities) over a full market cycle
  - Often a positive correlation during strong (extended) bull markets and a negative correlation during major bear markets

# Trend Following Terminology

- Trend horizon or lookback period = the length of time that the signal is “looking back” to see if the total return index is higher (lower) today, than 30 days, 3 months, 1 year ago, etc.
- Moving average (MA) crossover is a methodology to identify a trend:
  - if short term MA is above longer term MA = Uptrend (buy market)
  - if short term MA is below longer term MA = Downtrend (sell market)
- The trend horizon of a moving average is half of its moving average – this makes sense

Example: The average lookback of an equally weighted moving average is total days in the moving average divided by two



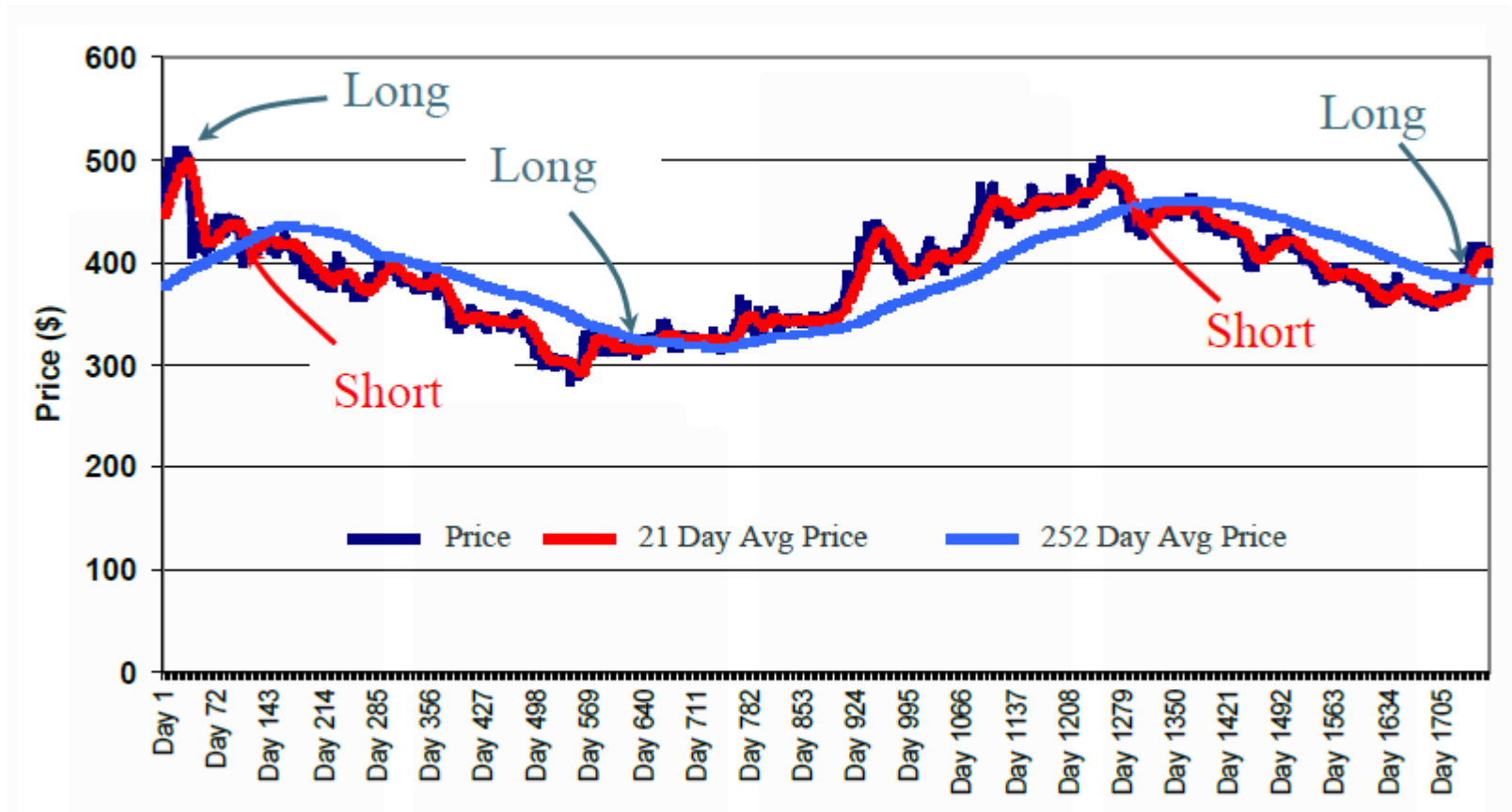
# How do systematic trend following managers invest?

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- Manage long and short positions according to systematic signals
- Implemented in futures and forwards (currency) markets (see Appendix)
- Investable universe includes liquid markets across the globe:
  - Equities = typically broad indices such as S&P 500, Nikkei 225, etc.
  - Fixed Income = typically sovereign bonds/rates such as U.S. 10-year Treasury
  - Currencies = typically major currencies such as JPY, GBP, EUR, AUD, CAD, CHF
  - Commodities = energy, metals, and agriculture components
- Strategy implementation volatility is customizable (range anywhere from roughly 5%-30% (capable of offsetting equity  $\approx$  18%-20%))
- Systematic = rules-based implementation
- Related terms = managed futures, CTAs (commodity trading advisors)

# Basic Trend Following Example

- Single Asset Example:
  - 21 day average price > 252 day average price = long position
  - 21 day average price < 252 day average price = short position



# RISIC Mandate – Trend Following Allocation

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- The RISIC's *Trend Following* allocation and corresponding managers should be compiled based on assessing the following criteria:
  - Trend Horizons:
    - Short  $\approx <1$  month
    - Medium  $\approx 1-11$  months
    - Long  $\approx 12+$  months
  - Systematic implementation = quantitatively-oriented firms
    - Graduate (PhD, Masters) backgrounds in mathematics, physics, computer science
    - Straight forward strategy design (i.e., humility)
  - Focus on global futures markets (i.e., utilize forwards on limited basis)
  - Strong focus on risk management and diversification
  - Target  $>15\%$  annual standard deviation
    - Required in order to meaningfully impact portfolio

# What length of trend is best? How many?

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## Why medium-term trends?

- Trend Horizons: Short  $\approx <1$  month | Medium  $\approx 1-11$  months | Long  $\approx 12+$  months
- Medium to long-term trends provide most robust return patterns - why?
  - Short term trends are too short (risk getting whipsawed in choppy markets)
  - Long term trends are too long (longer time to turn, lower hit ratios)
- The average of all trend horizons traded is the horizon of the strategy

Using a larger number of moving average signals reduces the dependency on individual data points and leads to an increased robustness of the strategy vs. more concentrated strategies, shorter drawdown periods.

# Trend Following Benchmarks

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- Benchmarking *Trend Following* strategies is imperfect
  - Primarily due to different volatility targets, markets traded, and trend horizons (lookback)
- Benchmark characteristics
  - Construction based on consistently applied trading/risk-management rules
  - Inclusive of markets traded by managers (rates, currency, commodities, equities)
  - Broad, scalable, investible, published, available at low cost as a simple option
  - Comparable to the strategies run by managers that will be sourced
- Institutional investors track several major benchmarks
  - MLM 3X Index™ (Investable, rules-based)
  - Credit Suisse Managed Futures Liquid Index™ 15% Target Volatility (Investable, rules-based)
  - Societe Generale Trend Index™ (Uninvestable, 10 largest trend managers)

# Investable Trend Following Benchmark Comparisons

## Selected Investable STF Benchmark Characteristics

	MLM Index 3X™ (with interest on cash)	Credit Suisse Managed Futures Liquid Index™ 15% Target Vol	
<b>Basic trend signal</b>	Time-series momentum	Moving Average Crossover	
# of look-back periods utilized	<b>1</b>	<b>16</b>	
Range of look-back periods	only 12-months	1-month to 9-months	
Average look-back period	12-months	5 months	
<b>Markets traded</b>			
Number of markets	<b>22</b>	<b>31</b>	
Major market segments	Fixed Income (5) Currencies (6) Commodities (11)	Fixed Income (4) Currencies (5) Commodities (17) (in 4 aggregated contracts) Equities (5)	
<b>Contracts traded</b>	<b>22</b>	<b>18</b>	
<b>Trading Frequency</b>	Monthly	Daily	
<b>Volatility Framework</b>	Leveraged to set volatility at 3-times non-levered index volatility. Volatility is not bounded, but results from construction.	Leveraged to target volatility at an expected forward-looking standard deviation of 15% (within a range of variation).	S&P 500 1995-2016 Volatility
<b>Index Volatility 1995-2016</b>	14.1	14.7	14.9
<b>Inclusion of return on cash</b>	Yes	Yes	
<b>Year of Inception Index</b>	1970	1995	

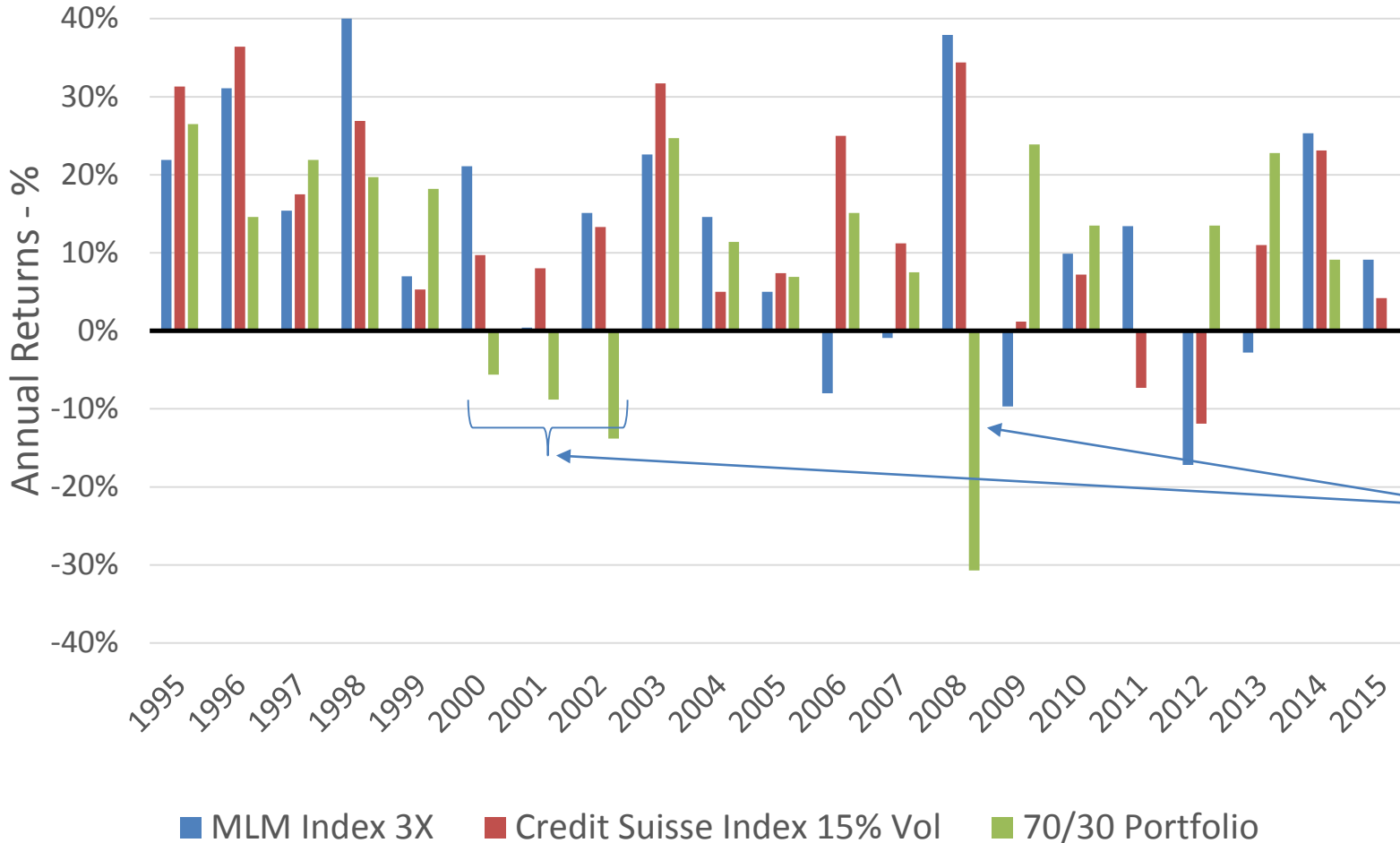
- Several distinctions between indices can produce different performance behaviors

Source: Mount Lucas Management, Credit Suisse



# The Credit Suisse MF Liquid Index™ 15% Vol vs MLM™ 3x Index

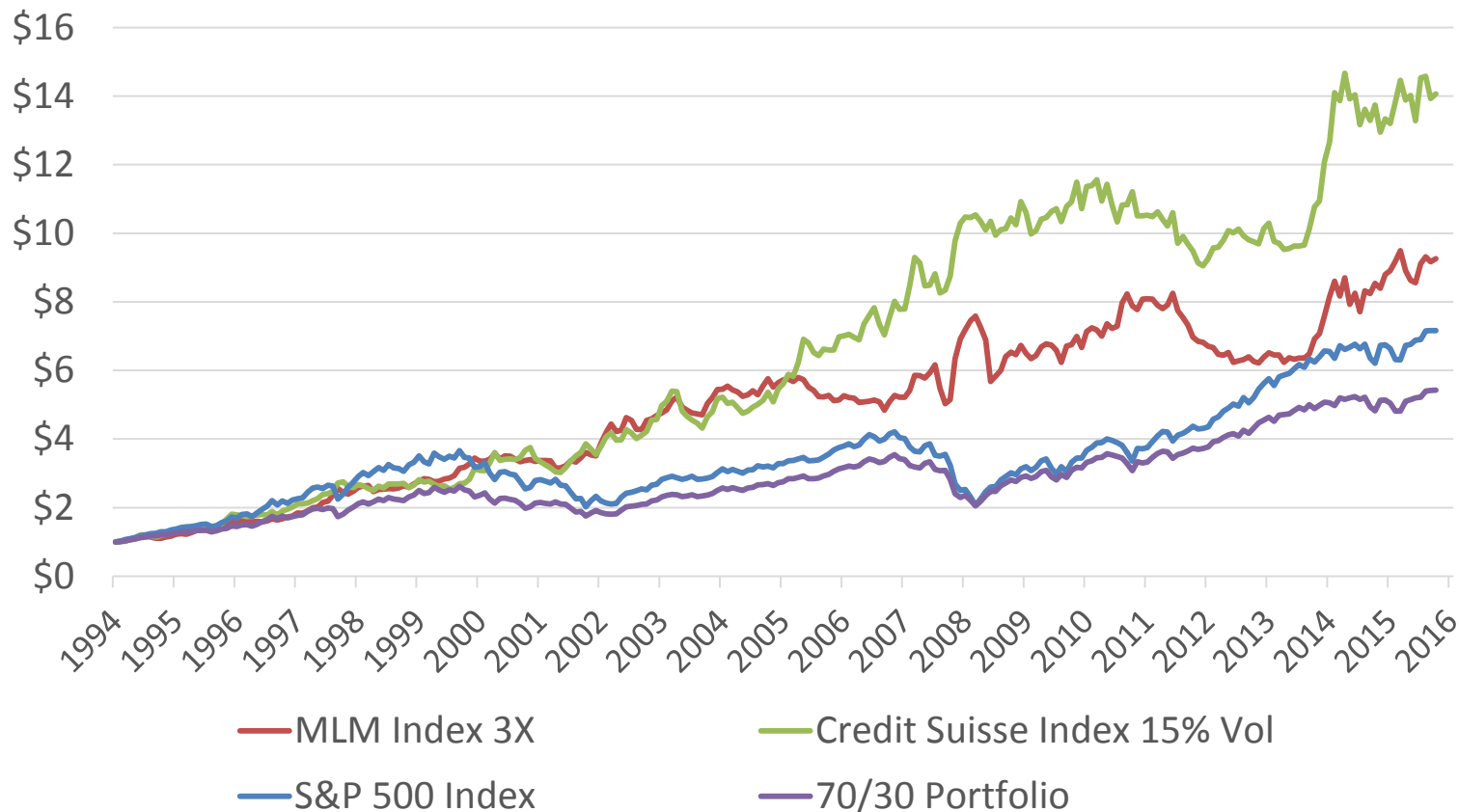
## Calendar Year Returns



Several years where indices diverge; particularly in more recent calendar years, but both provided major offset in severe down markets.

# The Credit Suisse MF Index™ 15% Vol vs MLM 3x Index

## Growth of \$1 – Index Comparisons



**CSMF Index™ 15% vol has produced a similar but more consistent return pattern versus MLM 3X Index™**

- Returns to systematic trend following are episodic, with long periods of little going on

# The Credit Suisse MF Index™ 15% Vol vs MLM 3x Index

## Comparative Performance Statistics

	MLM 3x			Credit Suisse 15% Vol			70/30			S&P 500		
	Annld. Ret.	Annld. Risk	Sharpe Ratio	Annld. Ret.	Annld. Risk	Sharpe Ratio	Annld. Ret.	Annld. Risk	Sharpe Ratio	Annld. Ret.	Annld. Risk	Sharpe Ratio
<b>Periods Ending 9/30/2016</b>												
1 Year	8.5%	12.4%	0.7	2.4%	16.2%	0.1	12.5%	10.5%	1.2	15.4	12.5	1.2
3 Years	13.9%	14.5%	1.0	13.0%	15.6%	0.8	7.9%	9.0%	0.9	11.2	10.8	1.0
5 Years	3.3%	12.9%	0.3	4.6%	13.8%	0.3	12.0%	9.2%	1.3	16.4	11.1	1.5
10 Years	5.8%	16.3%	0.3	7.9%	14.4%	0.5	6.2%	12.4%	0.4	7.2	15.3	0.4
20 Years	9.8%	14.1%	0.5	11.7%	14.7%	0.6	7.1%	12.1%	0.4	7.9	15.4	0.4

<b>Statistical Measures</b>				
Largest Drawdown - period	Mar-09 - May-09	Mar-11 - Nov-12	Nov-07 - Feb-09	Nov-07 - Feb-09
Largest Drawdown - %	-25.09	-27.7	-42.16	-50.95
Largest Drawdown - # of months	3	21	16	16
Recovery Period	Jun-09 - Jul-11	Dec-12 - Nov-14	Mar-09 - Apr-11	Mar-09 - Mar-12
Recovery Duration	26	24	26	37

<b>Crisis Period Returns</b>				
LTCM/Russian Debt (July 98' - Sept. 98')	12.1%	14.3%	-8.8%	-10.0%
Tech Bubble (April 00' - Sept. 02')	11.3%	12.7%	-14.5%	-20.6%
Financial Crisis (Oct. 07' - Feb. 09')	32.6%	27.7%	-30.9%	-38.8%

- MLM 3x and Credit Suisse 15% Vol exhibit similar statistical characteristics

# The Credit Suisse MF Index™ 15% Vol vs MLM 3x Index Correlations

## Correlations – various periods ending 9/30/16

1 Year Correlation				3 Year Correlation			
	S&P 500	70/30	MLM		S&P 500	70/30	MLM
70/30 Portfolio	0.99			70/30 Portfolio	0.99		
MLM Index 3X	-0.54	-0.56		MLM Index 3X	-0.23	-0.26	
Credit Suisse Index	-0.59	-0.55	0.80	Credit Suisse Index	-0.21	-0.20	0.82

5 Year Correlation				10 Year Correlation			
	S&P 500	70/30	MLM		S&P 500	70/30	MLM
70/30 Portfolio	0.99			70/30 Portfolio	0.99		
MLM Index 3X	-0.31	-0.33		MLM Index 3X	-0.36	-0.36	
Credit Suisse Index	-0.27	-0.27	0.76	Credit Suisse Index	-0.21	-0.21	0.66

20 Year Correlation			
	S&P 500	70/30	MLM
70/30 Portfolio	0.98		
MLM Index 3X	-0.27	-0.26	
Credit Suisse Index	-0.18	-0.16	0.66

- Both MLM and Credit Suisse exhibit similar negative correlations with U.S. equities.
- MLM and Credit Suisse indices are highly correlated with one another.

# Recommended RISIC Mandate Benchmark

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## Systematic Trend Following modeled with the MLM 3X Index<sup>TM</sup> in the AL study

- Long history calculated back to pre-1970, PCA used data going back to 1970
- Simple, captures the beta, captures big down markets, reasonable for modeling
- However, has only one lookback period (12 months), slow to respond to trends
- Investible, but not inclusive of the full opportunity set (no equities)

## Benchmark recommendation: Credit Suisse Managed Futures Liquid Index<sup>TM</sup> 15% vol

- Diversified across 18 deep and liquid futures contracts in major markets
- Diversified across 16 lookback horizons from trading 30 days to 12 months
- Utilizes a moving average crossover method to determine the signal
- Equally risk weighted over 288 potentially different signals (long or short)
- Most comparable to the strategies that will be sourced

# Due Diligence Plan Update Relating To STF and Platform Manager

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# Due Diligence Process Outline: Platform Manager

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- Provide a short list of platform implementation / platform managers
  - Draft DDQ prepared to be issued
- Send DDQ to short list platform managers
- Conduct a review of platform managers DDQ responses - rate proposals
  - PCA and Rhode Island investment staff
- Conduct onsite due diligence at platform managers offices in NYC
  - PCA and Rhode Island investment staff
- Platform manager recommendation
  - PCA memo to SIC
  - SIC interview recommended platform manager

# Due Diligence Process Outline: STF Managers

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- Provide a short list of systematic trend following managers
  - Draft DDQ prepared to be issued
- Send a DDQ to short list systematic trend following managers
- Conduct a review of STF managers DDQ responses - rate proposals
  - PCA and Rhode Island investment staff
- Systematic trend following managers recommendation
  - PCA memo to SIC
  - SIC interview recommended systematic trend following managers



# Other Implementation: Crisis Risk Offset<sup>SM</sup> Class Managers

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## Other:

- Platform manager to conduct operational due diligence at recommended STF Manager's office
- STF Managers hired / contracting / other administration 1Q 2017
- Fund long-duration Fixed Income and systematic trend following accounts pari passu
  - Primary source of funds – Equity HF portfolio redemptions

# Appendix

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# Model Output: Focus Portfolio Comparison of Trend Indices

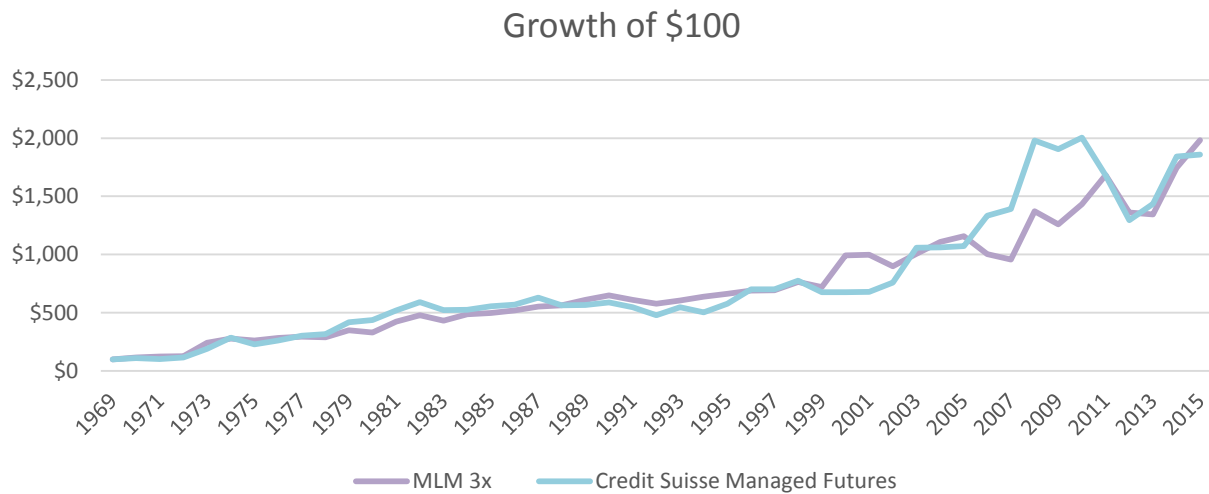
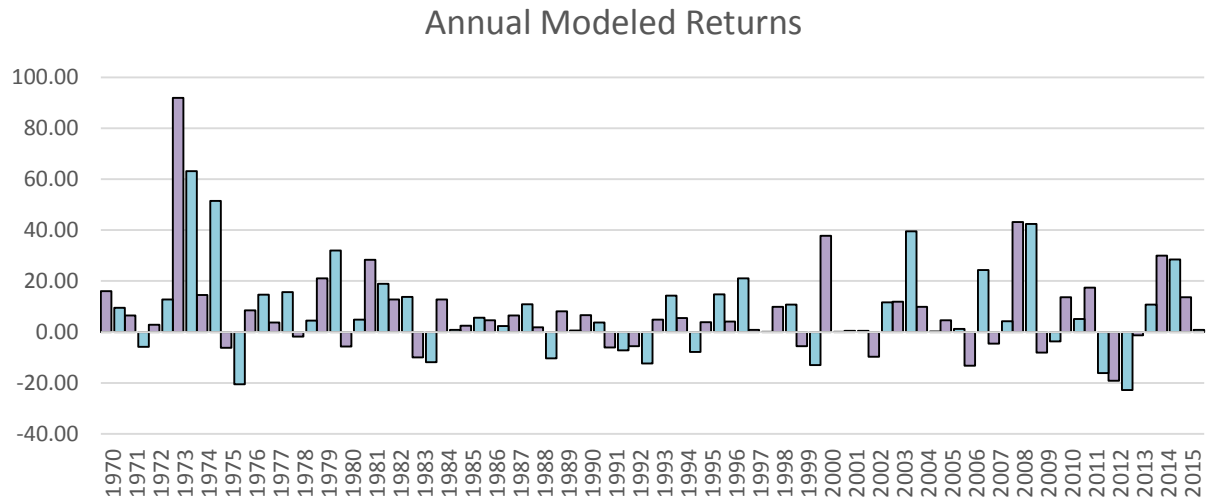
Line	Strategic Class %	Focus Portfolio	
		Trend: MLM 3x Index	Trend: CS MF Index
1	US Equity	20.0	20.0
2	Non-US Equity	20.0	20.0
3	Private Growth	15.0	15.0
4	Income Class	6.0	6.0
5	Crisis Risk Offset	8.0	8.0
6	Inflation Protection	10.0	10.0
7	IG Fixed Income	11.5	11.5
8	Absolute Return	6.5	6.5
9	Cash	3.0	3.0
10	Total	100.0	100.0

Asset Only Statistics			
11	Median Scenario Comp Return (22-year period)	7.3	7.3
12	Average Scenario Standard Deviation (22-year period)	11.8	12.1
13	Sharpe Ratio (22-year period)	0.41	0.40
14	Sortino Ratio (22-year period)	0.74	0.74
15	Best Year / Worst Year	29.8 / -20.8	30.6 / -21.0
16	Average 2-year Loss of Worst 10%	-16.0	-16.4
Asset/Liability Statistics			
17	Percent of Scenarios <50% [during first 5-years]	7.5	7.9
18	Median Funded Ratio [end of 5-years]	60.0	59.9
19	Average Funded Ratio of Worst 10% [end of 5-years]	47.7	47.6
20	Median Funded Ratio [end of 22-years]	99.4	99.1
21	Average Funded Ratio of Worst 10% [end of 22-years]	67.1	66.5
22	Median Avg. Ann. Employer Cntrbs. Rate % [during 22-yrs]	20.6	20.6
23	Average % of Yrs. w/ Employer Cntrbs. Rate >30% [during 22-yrs]	4.4	4.7

- For modeling purposes both indices have same volatility assumptions
- Modeling the Focus Portfolio with the CS MF Index results in the same long-term return (line 11) and slightly higher risk (line 12)
- Portfolio results are similar regardless of the trend following index used in modeling the total portfolio

# Comparing Modeling of MLM 3x and CS MF Index

	MLM 3x Index	Credits Suisse MF Index
1970	16.07	9.49
1971	6.48	-5.80
1972	2.78	12.79
1973	91.90	63.23
1974	14.58	51.50
1975	-6.20	-20.55
1976	8.51	14.65
1977	3.74	15.59
1978	-1.78	4.53
1979	21.07	31.97
1980	-5.68	4.86
1981	28.39	18.89
1982	12.78	13.80
1983	-10.05	-11.94
1984	12.81	0.88
1985	2.39	5.56
1986	4.56	2.28
1987	6.43	10.85
1988	1.88	-10.38
1989	8.09	0.55
1990	6.57	3.77
1991	-6.04	-7.28
1992	-5.57	-12.35
1993	4.81	14.30
1994	5.49	-7.85
1995	3.84	14.78
1996	4.09	21.07
1997	0.77	0.06
1998	9.92	10.74
1999	-5.64	-12.98
2000	37.82	0.12
2001	0.43	0.49
2002	-9.72	11.65
2003	11.91	39.57
2004	9.92	0.17
2005	4.56	1.15
2006	-13.29	24.29
2007	-4.61	4.19
2008	43.24	42.42
2009	-8.11	-3.75
2010	13.70	5.09
2011	17.40	-16.16
2012	-19.10	-22.87
2013	-1.27	10.76
2014	29.95	28.43
2015	13.59	0.86



# Recommended Benchmark Index

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**The Credit Suisse Managed Futures Index™** is a systematic trend following strategy that trades a total of 18 futures contracts, providing liquid and diversified exposure to market trends across asset classes, geographies and time horizons. The strategy tracks 16 time horizon signals to identify trends across various horizons, ranging from shorter-term moving average (60 trading days) to longer-term moving average (360 trading days). The average length of moving average signal utilized is a 210 trading days moving average.

- Shortest signal compares the 60 (trading) day MA (moving average) versus 5 day MA
- Longest signal compares the 360 (trading) day MA (moving average) versus 5 day MA
- For each of the 18 different futures contracts (markets) total return index:
  - If average price in most recent 5 days is  $>$  average price over 60 days  
=> Buy the market (go long)
  - If average price in most recent 5 days is  $<$  average price over 60 days  
=> Sell the market (go short)
- Signals are equally weighted, resulting in a portfolio of long and short exposures. When signals align (strong trends), the index is more long or more short.

# The Credit Suisse Managed Futures Index™ Markets Traded

## Global Investment Universe

### Equities

- ✓ S&P 500
- ✓ Hang Seng
- ✓ Nikkei 225
- ✓ Euro Stoxx 50
- ✓ FTSE 100

### Currencies

- ✓ Australian Dollar
- ✓ British Pound
- ✓ Canadian Dollar
- ✓ Euro
- ✓ Japanese Yen

### Fixed Income

- ✓ US Treasuries
- ✓ UK Gilt
- ✓ Euro Bund
- ✓ Japanese Govt. Bond

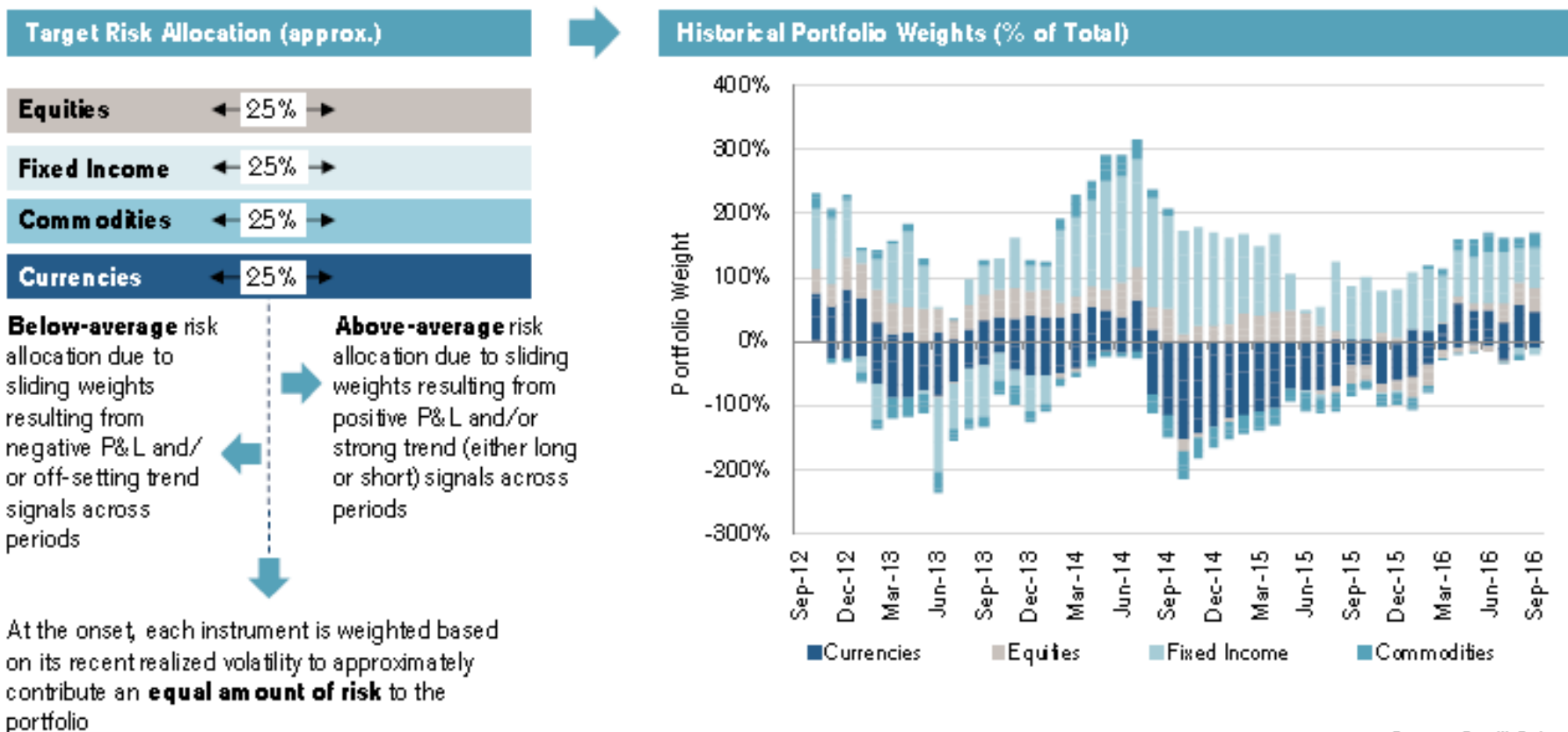
### Commodities

- ✓ Agriculture
- ✓ Precious Metals
- ✓ Industrial Metals
- ✓ Energy



# The Credit Suisse Managed Futures Index™ Risk Allocation

- Diversifies and balances risk across the four major futures market types
- Rebalancing incorporates recent trailing volatility of each instrument traded



Source: Credit Suisse

# Instruments: Forwards

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- Agreement to buy/sell an asset at a future time for a specified price
  - Long position = agree to buy at the future date
  - Short position = agree to sell at the future date
- Over-the-counter instrument (i.e., customized; have counterparty risk)
- Different than an option in that both buyer and seller have obligations
- Essentially a contract that states:
  - Asset type and amount
  - Future date of trade
  - Future price of trade
  - Settlement options (i.e., cash payment or delivery of asset)
- Currency forwards can be more liquid than currency futures



# Instruments: Futures

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- Futures = analogous to forwards but exchange traded/standardized
  - Exchanges (e.g., CME Group) provide numerous services:
    - Guarantee contracts will be honored, backed by exchange with is backed by all of the exchange members (de minimis counterparty risk)
    - Facilitate transactions
    - Set margin requirements
    - Organize daily settlement/marketing to market
    - Arrange settlement/delivery procedures
- Extremely liquid instruments
- Vast majority of futures contracts do not lead to delivery
- Regulated by the U.S. Government
  - Commodity Futures Trading Commission (CFTC)

# Futures: Transaction Example

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- November crude oil contract (one contract = 1,000 barrels of oil)
- “Price” of contract = delivery price (i.e., futures are free)
  - 1,000 barrels @ \$43 = \$43,000 of exposure (i.e., notional value)
    - Long/buy position = agree to buy 1,000 barrels in November @ \$43/barrel
    - Short/sell position = agree to sell 1,000 barrels in November @ \$43/barrel
  - Initial margin = \$3,190 (i.e., money that must be deposited to trade)
    - Typically equal to roughly one-day maximum price fluctuation
    - Margin = embedded leverage
    - Exchanges require daily settlement/mark to market
- At contract expiration (or anytime while contract is traded) | long/buy:
  - “Spot” price = \$50
    - Gain =  $(\$50 - \$43) \times 1,000 = \$7,000$
  - “Spot” price = \$40
    - Loss =  $(\$40 - \$43) \times 1,000 = (\$3,000)$

Gains/losses for short/sell position are the opposite

# Leverage in Trend Following Strategies

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- Futures contain embedded leverage
- *Trend Following* strategies leverage  $\approx 0x-7x$ 
  - Average/full-cycle leverage  $\approx 3x$
- Without leverage (i.e.,  $1x$ ), strategy volatility may be  $\approx 6\%$  (i.e., bond-like)
- Leverage/risk oversight is key component of strategy selection
- Leverage protections:
  - Futures have daily price limits and daily settlement
    - Price limit = maximum change in contract price
    - Exchanges will close out positions if failed settlement
  - Long and short positions partially offset leverage risks

# CRO<sup>SM</sup> Implementation Considerations (Long/Short aspects)

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- Long position – give up cash to buy a security (traditional)
- Short position – sell an un-owned security, receive cash; liable for security's position
- Because of the liability, short positions require collateral as security; collateral levels based on potential security *movements*, not total value of positions
- Minimum collateral requirements allow managers to apply leverage
- Unlike typical leveraged situations, collateral requirements re-set *every day*
- Long/short portfolios contain many offsetting long and short positions; it's the net position that matters
- Long/short portfolios utilize “primary brokers” to effect these types of trades
- In total, across entire CRO<sup>SM</sup> class, hundreds of netted l/s positions

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