Revolution Capital Management

# Intra-day System Overview

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# Section 1

End-of-day/Intra-day Synergies

# Intra-Day Properties

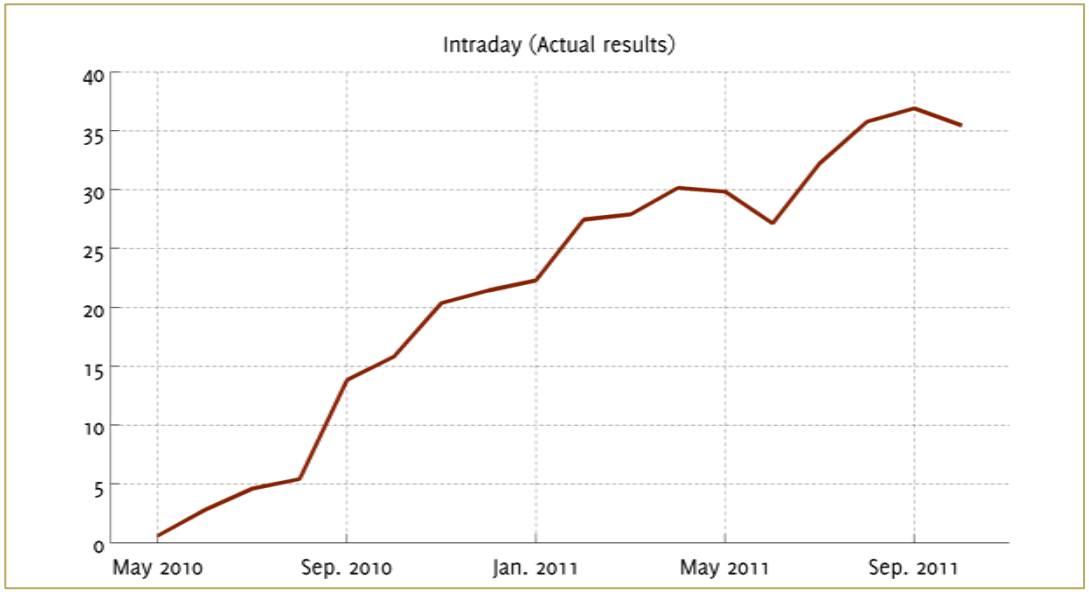
- Intra-day (ID) model architectures are similar to existing end-of-day (EOD) models.
- We have 33 different ID models that exploit a wide variety of dynamics.
- Sixteen (16) of these are complementary to the current Mosaic program.
- The system trades 24 hours a day via automated signaling and execution.
- Signals are generated 12-16 times per day depending on the market (this is not a "high-frequency" liquidity provision/market-making system).

# Summary of Real-Time Testing

- Started with e-mini S&P 500 in April 2010.
- Evolved to a 4-market ensemble (S&P 500, Crude Oil, Euro, 10-year US Note) in August 2010 with a trading level of roughly $1 million.
- Twelve (12) market ensemble began trading in March 2011. Trading level was roughly $10 million at 12% annualized volatility.
- Final 25-market ensemble began trading in October 2011.
  - Currencies (5): Australian $, British Pound, Euro, Japanese Yen, Swiss Franc
  - Grains (3): Corn, Soybeans, Wheat
  - Energies (3): Crude Oil, Heating Oil, Natural Gas
  - Metals (3): Gold, Copper, Silver
  - Stock Indices (5): Dax, Nasdaq, S&P 500, Euro Stoxx 50*, FTSE
  - Interest Rates (6): Bobl, Bund, Gilt, 10-yr. US Note, 5-yr. US Note, 30-yr. US Bond
- Prior to October 2011, ID model mix included models with EOD overlap. Final mix is complementary to EOD model suite.
- Trading was halted in November 2011 due to MF Global bankruptcy.
- Multiple infrastructure enhancements were made subsequent to this (see Section 3 for full discussion).
- Trading was restarted in late December 2011.

*Euro Stoxx 50 is on trading hiatus until shorting ban is lifted

# ID Proprietary Trading Overview




Performance Table

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | YTD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2012 | 5.49 | -0.51 | 0.91 | -1.64 | 3.20* | | | | | | | | 7.45 |
| 2011 | 0.84 | 5.16 | 0.45 | 2.25 | -0.32 | -2.70 | 5.12 | 3.53 | 1.14 | -1.45 | - | - | 14.01 |
| 2010 | - | - | - | - | 0.59 | 2.21 | 1.80 | 0.81 | 8.42 | 1.99 | 4.55 | 1.07 | 21.44 |
| | | | | | | | | | | | | | |

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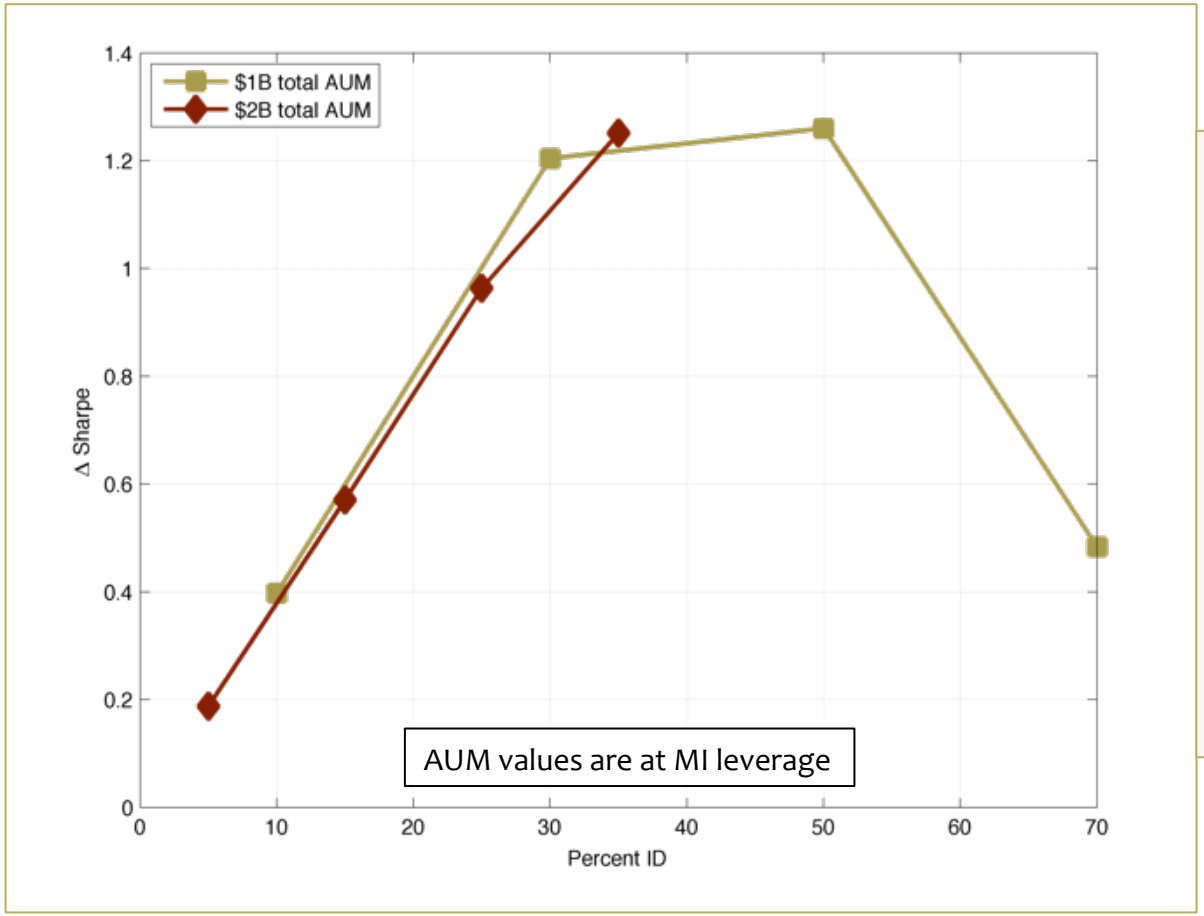
# Intra-day Strategies

- Just as with multi-day models, a variety of intra-day trading styles can be implemented.
- However, in many cases intra-day models exploit similar dynamics to those already targeted by end-of-day models.
  - Trend-following (TF) models have substantial correlation to existing TF systems.
  - High-frequency counter-trend (CT) systems overlap with end-of-day CT systems!
  - Thus, it's not desirable to simply implement the same strategy mix at higher frequencies.
- Extensive analysis has been done in order to:
  - Identify ID strategies that exploit new dynamics.
  - Select ID strategies that are maximally complementary to the existing end-of-day strategies from both correlation and risk viewpoints.

# Mosaic ID/EOD Mix Analysis




- Maximum benefit of ID requires 30% to 50% participation (portfolio performance is maximized at a 50/50 balance)
- We believe that $700 million is achievable for the ID strategy if we accept some size-induced performance degradation
- At $2B total MI AUM, we can still derive near-optimal benefit of ID (since this would be 35% ID, 65% EOD)

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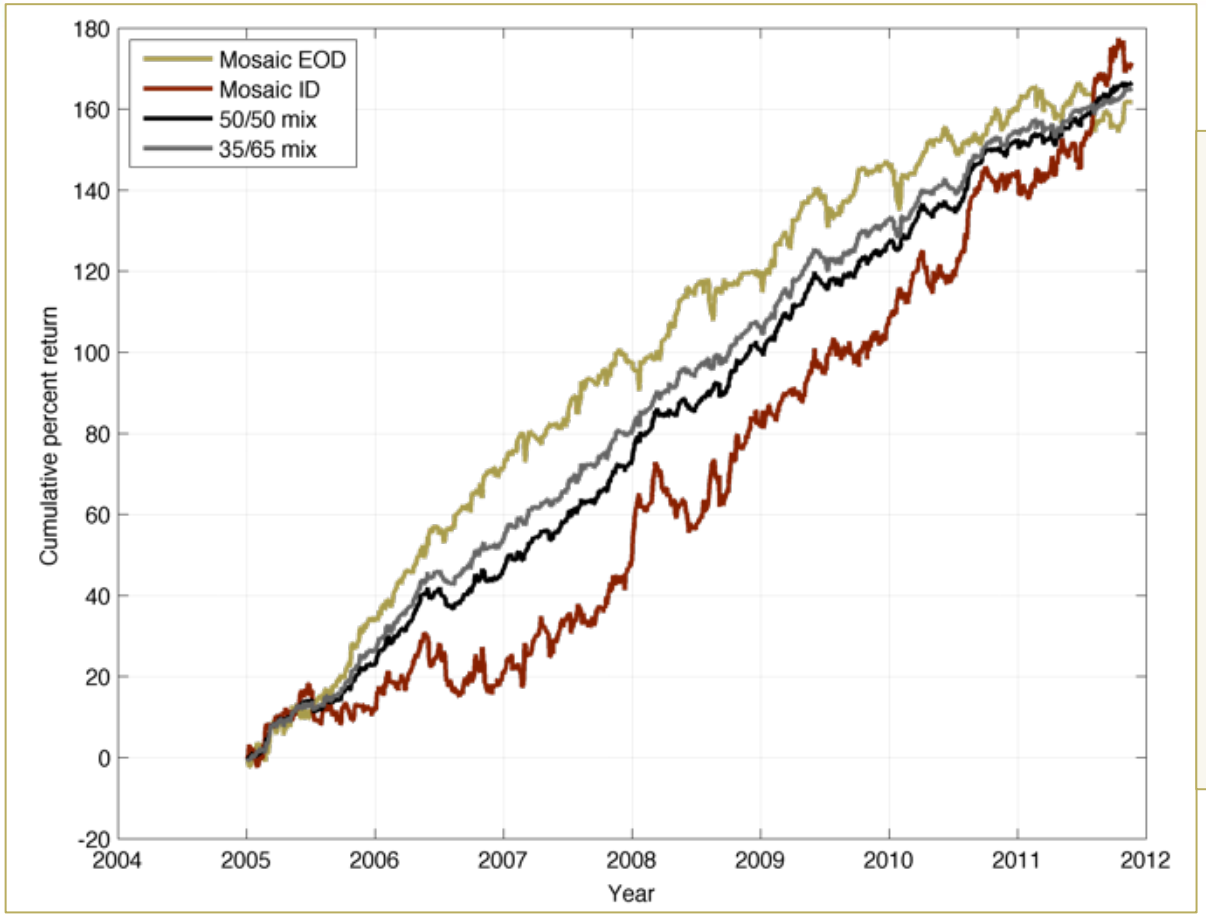
# Mosaic ID/EOD Performance vs. Time




- 2005-2007 results were above-average for EOD.
- Since the financial crisis of 2008, market shocks have increased EOD drawdown frequency and in 2010-2011 have decreased EOD returns
- Conversely, ID under-performed in 2005-2006. However, it has profitably exploited market-shock propensity in 2009-2011.
- Correlation for ID/EOD is **-0.40**.

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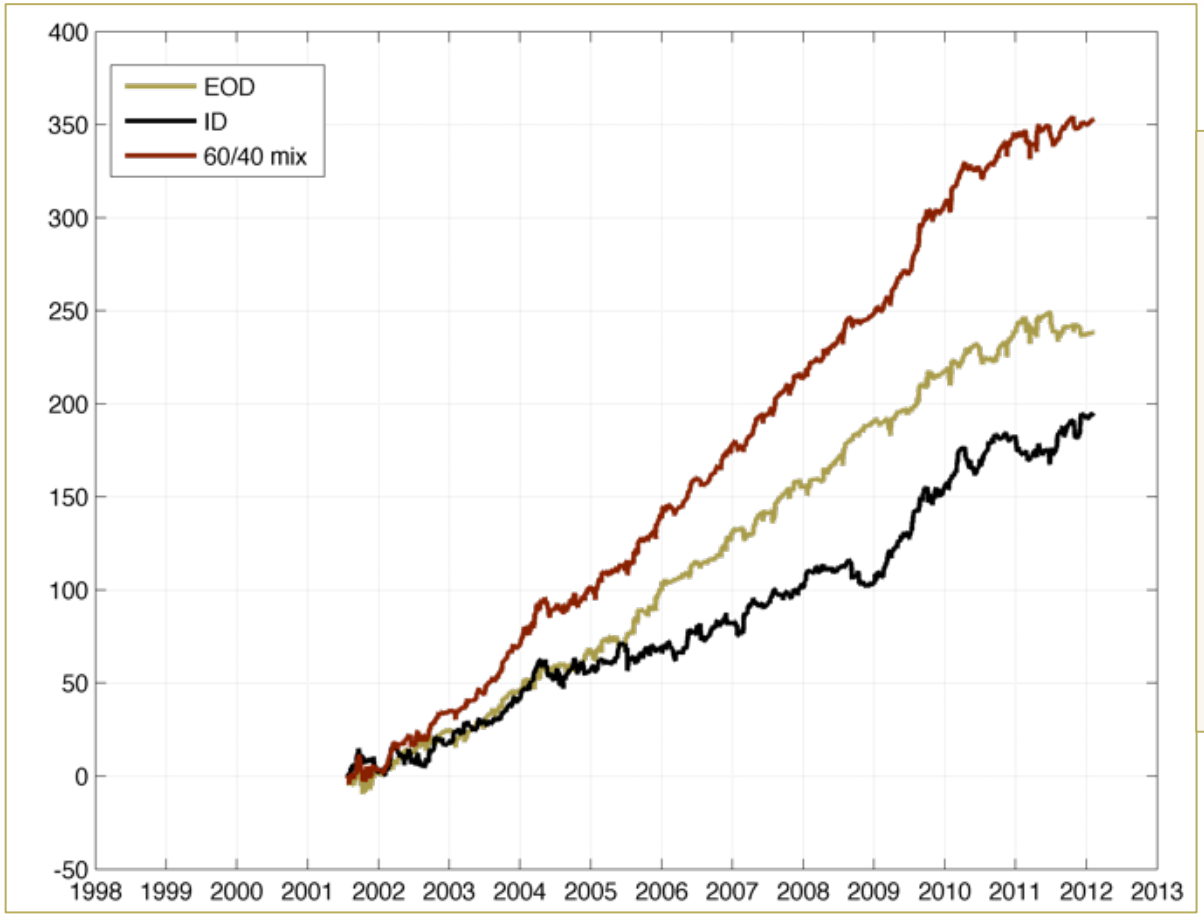
# GSI ID/EOD Performance vs. Time




- Since the financial crisis of 2008, market shocks have increased EOD drawdown frequency and in 2010-2011 have decreased EOD returns.
- Conversely, ID under-performed in 2004-2006. However, it has profitably exploited market-shock propensity in 2009-2011.
- Correlation for ID/EOD is **-0.25**.

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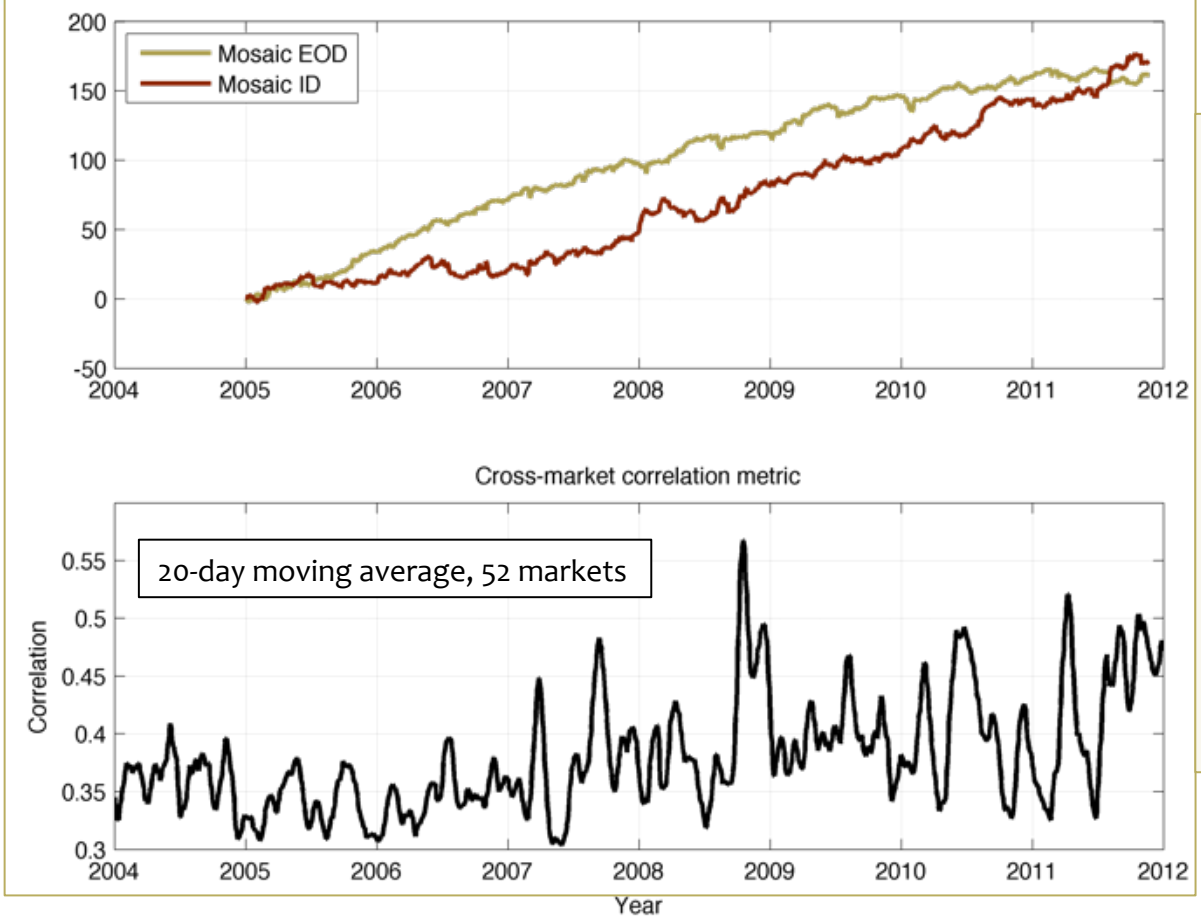
# The Effect of Correlation




- EOD prefers low, constant correlation (e.g. 2004-2006).
- EOD underperforms when correlations are high or when correlation changes rapidly.
- ID, conversely, prefers regimes where correlation is high and/or volatile.
- Note persistence of high correlation in second half of 2011.
- Higher correlation is associated with punctuated drawdowns in EOD strategies.

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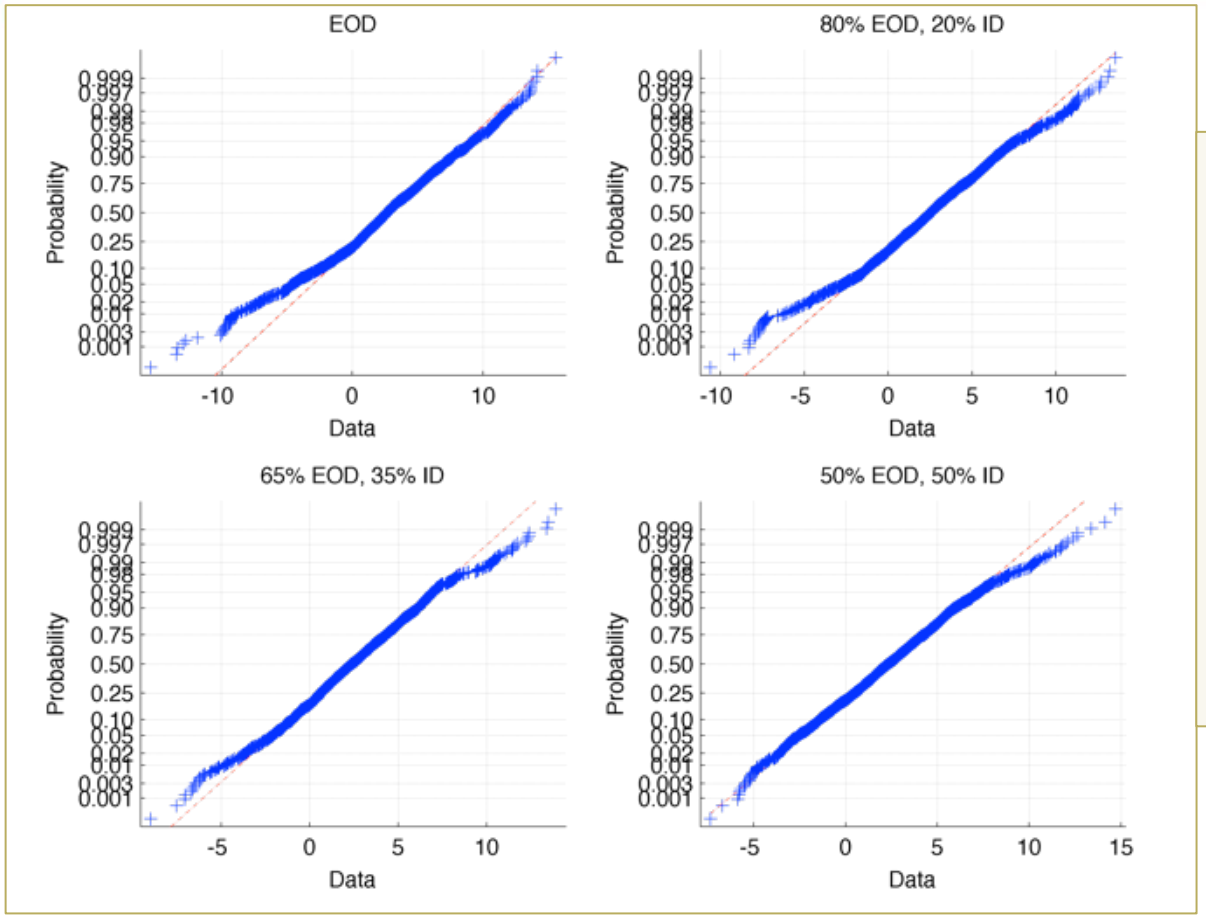
# Fat Tail Reduction (GSI)




- Figures show 30-day returns.
- Red dashed lines indicate Gaussian (aka "normal") distribution
- As ID percentage is increased, downside kurtosis decreases and upside kurtosis increases.
- However, overall trend-following correlation does not increase (in fact, downside TF correlation decreases)

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# Section 2

Integration Strategy

# Integration Plan

- Intra-day proprietary testing has traded at $10 million AUM at MI leverage.
- Planned starting level for ID is 1% of AUM at MI leverage, or $10 million (i.e. equal swap of AUM from prop accounts to customer accounts).
- Final goal is ~50% of current MI AUM.
- Algo trading should enable faster ramping of ID.
- Exact timeline depends on any issues identified during milestone validations, but goal is to complete ramping within 2012.

- *End-of-day strategies will trade separately from intra-day strategies due to vastly different (and asynchronous) trading frequencies.*

# Milestone Validation Plan

- At each discrete AUM level, a rigorous validation will be performed to ensure that system is behaving as expected.
- Validation checklist highlights:
  - Compare actual performance to modeled performance.
  - Measure slippage for every trade and compare to expectations.
  - Measure price drift within time window and compare to historical values.
  - Measure time window for every trade set and compare to expectations.
  - Assess correlation to Mosaic end-of-day system.

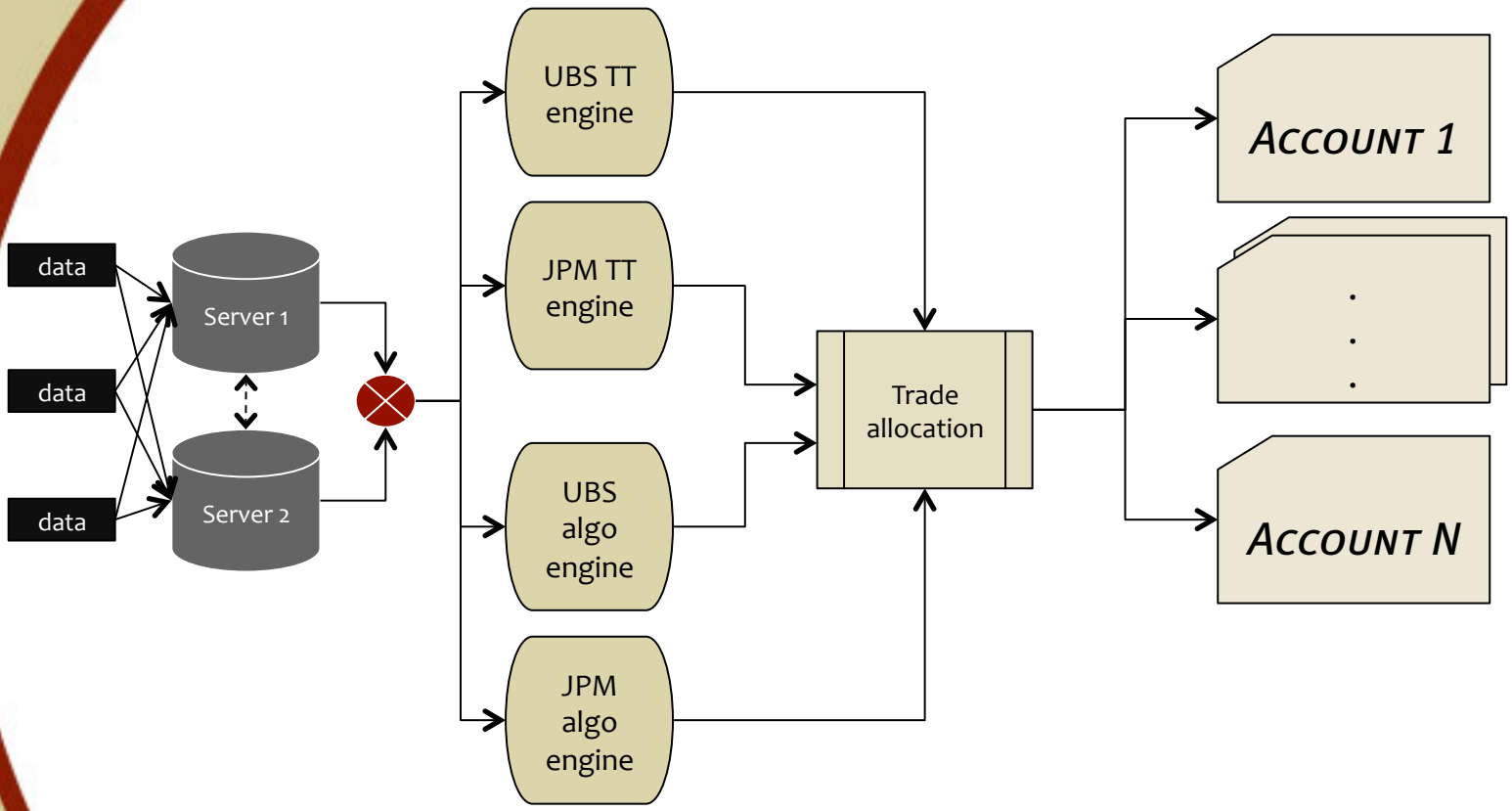
# TIMELINES

- Mosaic
  - February 2012: $11 million (1%)
  - March 2012: $22 million (2%)
  - April 2012: $55 million (5%)
  - May 2012: $140 million (12%)
  - June 2012: $220 million (20%)
  - July/August 2012: final ramp to 30%
- GSI
  - Ramping can be faster because operational issues have been tested with Mosaic
  - June 2012: 20%
  - July 2012: 35%
  - August 2012: final ramp to 40%-50%

# Section 3

Trading Infrastructure

# Intraday Process Flow



# Computer Hardware

- Security
  - Servers are co-located at 7 Ticks in the Equinix building.
  - See Data Center summary on next page.
- Redundancies
  - Two separate servers at 7 Ticks.
  - RAID 1 and RAID 6 protocols for hard drives/filesystems.
  - Two network interface sockets per network destination.
  - Dual power supplies for each server.
  - See Data Center summary on next page.
- Failover
  - Primary: Server 1 at 7 Ticks in Chicago.
  - Secondary: Server 2 at 7 Ticks in Chicago.
  - *<non-local machines are undesirable due to latency>*

# Data Center (7 Ticks)

- Security
  - All data centers are within "Top Tier Data Centers" (where the exchange servers are located).
  - 24/7 Security officers, biometric access, video monitoring.
  - Servers are locked in secure cabinets.
  - All clients are escorted to their servers within approved time windows.
  - Each client has its own secure virtual network.
  - All inbound traffic must be routed through VPN tunnels.
- Redundancies
  - Fully redundant power circuits.
  - Power backup via UPS systems and generators.
  - Fully redundant network hardware
  - Redundant Telco paths.

# Computer Software

- Protocols
  - Java, JBoss, FIX, Linux
- Security
  - VPN tunnels between Chicago/Denver (orders, monitoring) and Chicago/Florida (orders, monitoring).
  - Signal generation performed within an encrypted virtual machine.
  - Firewalls and port access restrictions used even within the VPN.
- Redundancies
  - Identical setups on all hardware instances to allow seamless failover.
  - MySQL database slaving keeps backup databases synchronized to "master".
- Failovers
  - Follows hardware failover on previous page.

# Data Feed

- Redundancies
  - Three separate feeds (CQG, TT via JP Morgan, and TT via UBS).
  - TT has internal redundant failover; transparent to user.
  - Auto-failover by RCM if selected primary fails.
- Failover
  - Primary: TT feed via JPM or UBS.
  - Secondary: CQG feed cross-connect.

# Order Interface

- Security
  - Direct cross-connects within 7 Ticks, i.e. private networks.
- Redundancies
  - Each TT FIX API has failover to a secondary server.
  - 2 TT sessions x 2 interfaces/session = 4 options.
  - Trade limits in place at both software and FIX levels to avoid over-trade errors.
- Failover
  - Dual primaries: TT via UBS and JPM.
  - Random switching of orders between brokers to obscure flow.
  - If one broker fails, all traffic can be routed to other broker.
  - Dual backups: Algo interfaces are broker-specific and independent of TT.
  - Algo interfaces will become dual primaries as AUM increases.

# MONITORING

- RCM has implemented multiple notification modes (email, text, audible alarms) in case of any procedural issues.
- GUI is simultaneously viewable from Colorado and Florida; this provides information on positions, orders, and feeds.
- DUNN provides 24/6 monitoring and back-office reconciliation.

# Special Situations and Corrective Actions

- Missing market data
  - Failover to alternate feed(s)
  - If missing period is brief, no action need be taken. Otherwise, liquidate.
- Signal generation fails for a particular run time and market set combination
  - Independent shutdown of market until corrective action is implemented.
- Execution not complete
  - Orders are amended so that remainder is executed in next period.

# Special Situations and Corrective Actions (continued)

- Loss of order interface to market(s)
  - Trades can be entered directly via broker algo through interactive front ends.
  - If situation persists, affected markets are liquidated until corrective action is applied.
  - As a last resort, liquidation trades can be called in manually.
- Complete loss of trading functionality
  - Trades can be liquidated manually via interactive front end or phone.