

OFFICE OF THE DIRECTOR OF NATIONAL INTELLIGENCE



MARKETS ANALYSIS & TESTING of CONTEXTUAL HYPOTHESES ENHANCEMENT SYSTEM (MATCHES) PROPOSERS'S DAY



Office of Incisive Analysis

L E A D I N G I N T E L L I G E N C E I N T E G R A T I O N

Jason Lee
14 July 2011



Disclaimer

- This presentation is provided solely for information and planning purposes
- The Proposers' Day Conference does not constitute a formal solicitation for proposals or proposal abstracts
- Nothing said at Proposers' Day Conference changes the requirements set forth in a Broad Agency Announcement (BAA)
- The BAA supersedes anything presented or said at the Proposers' Day Conference by IARPA



Agenda

9:00 a.m. - 9:15 a.m.	Introductory Remarks and Security Briefing	Jason Lee, MATCHES Program Manager IARPA Security Team
9:15 a.m. - 9:30 a.m.	IARPA Overview	Peter Highnam, Director, Office of Incisive Analysis
9:30 a.m. - 10:30 a.m.	Program Overview	Jason Lee, MATCHES Program Manager
10:30 a.m. - 10:45 a.m.	Break	
10:45 a.m.- 11:00 a.m.	Q&A Session	All
11:00 a.m.- 11:30 a.m.	Contracting	Sarah Wiley, IARPA
11:30 a.m.- 1:00 p.m.	Lunch (Government Departs)	
1:00 p.m. - 3:00 p.m.	Proposer Presentations	Participating Attendees
3:00 p.m. - 4:30 p.m.	Teaming Discussions	Participating Attendees



Goals of Today's Conference

- Familiarize participants with MATCHES' interest in development of reliable indicators of market behaviors
 - identify time-dependent forensic and predictive indicators robust to multiple asset classes of investment transaction data
- Solicit feedback and questions
- Foster networking and discussion of synergistic opportunities and capabilities among potential program participants



Glossary

- **Indicator.** An observation or event of interest detected in the data set informing an analyst where to find more information
- **Inference.** A fact-based conjecture, stemming from the indicators, containing a degree of uncertainty
- **Situational Awareness.** Interpreting and building context around data



Schedule

- Full proposals will be due ~60 days after the BAA is published
- Once BAA is released, questions can only be answered in writing on the program website



MATCHES Program Goals

- Develop novel theory-based methods and tools to assist analysts in quickly and accurately assessing petabytes of complex anonymized financial data
- These tools will support
 - Navigation and exploration
 - Discovery of consistent occurrences inside the transaction data set that serve as indicators of events
 - Forensic and predictive indicator models
 - Develop new quantitative, science-based tools to evaluate massive amounts of data
 - Inferences
 - Generate inferences from indicators



Expectations for Performers

- Develop an automated indicator-based detection system
- Propose indicators of the following market behaviors or events to be tested against case studies provided by the Government
 - Transaction and/or instrument manipulation
 - Strategic competitive duress
 - Market tells
- Propose additional market behaviors of interest beyond the above three
- Characterize the relationships of influence, correlation and causation both from individual indicators and from amongst indicators
 - To support analyst understanding of worldviews and consensus in markets



Industry & IC Analysts Differing Missions



- Private sector investment analysts are faced daily with making portfolio allocation decisions subject to risk, uncertainty and incomplete information
- Intelligence community (IC) analysts also face risk, uncertainty and incomplete information, but address a wider variety of topics associated with world events and need to make qualitative inferences from quantitative data

Challenges of Market Scale

1 New York Stock Exchange Trading Volume



Source: LPL Financial, Bloomberg Data



- Investment transaction data differ in size, number of markets, geographical coverage, volume of trading, and availability in granular statistics
- Data are quite “messy” because different countries have varying regulatory and accounting practices and trading is done on different system platforms



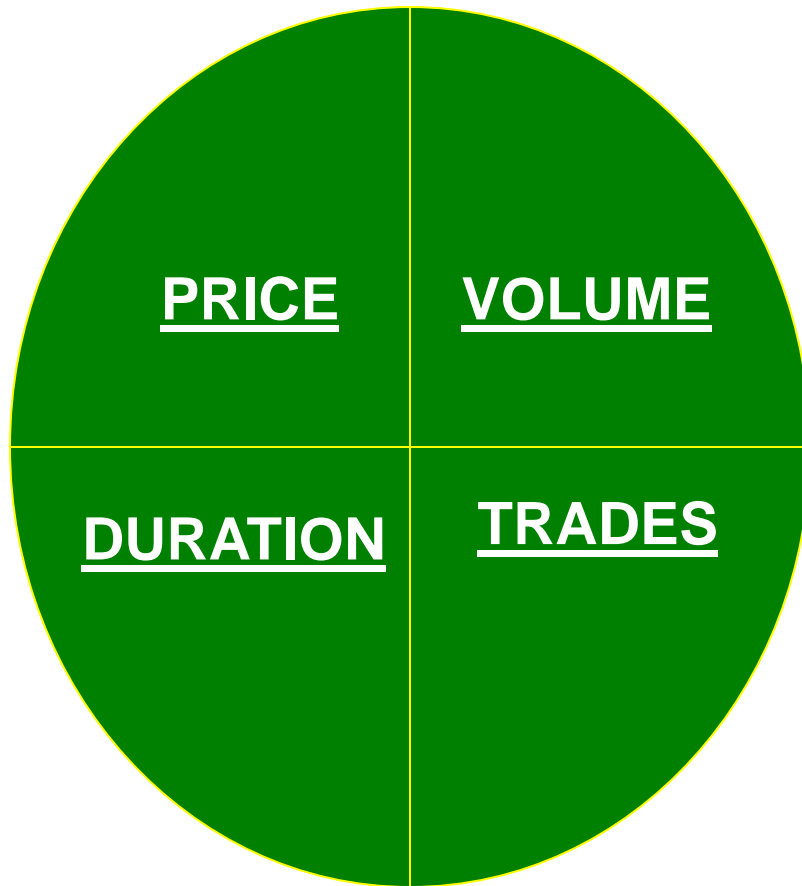
Scope and Size of Financial Markets

- Equities: 19 major global exchanges
 - ~60,000 individual stocks
 - ~5,000 exchange-traded US stocks and ~10,000 OTC US stocks
- Fixed Income:
 - ~\$30TT market in sovereign debt
 - ~\$25TT market in commercial debt
- Derivatives:
 - ~\$400TT notional value of instruments traded
 - ~\$2.5TT in average daily turnover
- Foreign Exchange: ~\$4TT in notional value of transactions
 - \$1.7TT in FX swaps and \$1.4TT in spot transactions



MATCHES Will Use Granular Information

BREADTH



BREADTH AND DEPTH





Current Approaches

- Traditional IC analytics
 - Massive and growing volume of coarse-grained data
 - Paucity of computational tools to address the volume of data
 - Analytical complexity in distilling insights from data
- State of the art forensic financial analytics (e.g., FinRA SONAR)
 - Are focused on few events, including inside trading, pump-and-dump schemes, and Ponzi schemes
 - Are not designed to support deductive analysis



MATCHES: A Novel Approach

- **Use fine-grained, in lieu of traditionally used coarse-grained, datasets**
 - Full depth-of-book data across hundreds of global markets
- **Develop theory-based mathematical and behavioral models based on rigorous methodologies**
- **Develop automated tools to**
 - Aid analysts to perform sophisticated mathematical analyses of complex transaction data
 - Discover indicators in the presence of significant amounts of noise
 - Justify and explain relationships between indicators and events



Examples of Market Events

- **Financial manipulation**
 - Informed trading
 - Private Investment in Public Equity Instruments (PIPEs)
 - Currency arbitrage
- **Strategic duress**
 - Hostile takeovers
 - Pump and dump schemes
 - Intentional devaluation of a security's price/value
- **Market tells**
 - Greek debt crisis
 - Anticipation of governmental policy on environmental action



MATCHES is NOT Interested In

- Data containing personal identifying information
- Work products that attribute or produce personal identifying information
- Investments not publicly traded on markets
- Geographical exchanges with an immature infrastructure or poor/inconsistent regulatory environment
- Esoteric asset classes



Program Structure

Phase I: Indicator detection (18 Months)

- Demonstrate that full depth of the trading book transaction data can support the identification of theory-based indicators robust to multiple asset classes
- Address “Transaction and Instrument Manipulation” in one asset class, plus those of the performer
 - Required number of detections and false positive rate to be specified in BAA
 - Exchange in one country

Phase 2: Inferencing (12 Months)

- Identify influence, correlation, and causation relationships from and between indicators
- Two or more exchanges
- Address “Transaction and Instrument Manipulation” plus “Strategic Competitive Duress” in two or more asset classes, plus those of the performer
 - Required number of detections will be increased and false positive rate will be decreased (to be specified in BAA)

Phase 3: Fusion (12 Months)

- Address “Transaction and Instrument Manipulation, Strategic Competitive Duress,” plus “Market Tells,” plus those of the performer
- Increase complexity across multiple asset classes and exchanges (to be specified in BAA)



Government Testing

- **The Government will conduct testing, and:**
 - Provide anonymized data (trade attributes only) and developmental test cases to performers (details to follow in BAA)
 - Utilize surprise asset classes and/or geographic markets
 - Utilize surprise test cases
 - Provide a control group
- **IC analysts will evaluate the utility of the tools delivered**
- **Ground truth will be established via real-life historical case studies from US federal law enforcement and regulatory agencies**
- **Mixed methods** – qualitative and quantitative



Teaming is Encouraged

- Due to the many challenges presented by the program, depth and diversity will be beneficial
 - Make sure you have enough people and expertise
 - Make sure you have sufficient resources to follow a critical path of alternatives for risk mitigation
 - Make sure you have any capability necessary for success
 - Make sure you provide an environment for clear/strong management with each team member contributing significantly to the program goals
- Remember, you may be very accomplished but can you do it all?



Submitting Responses to the BAA

- After BAA release, questions may only be submitted on the program's website and will be responded to in writing
- Networking and discussion of synergistic opportunities and capabilities among potential program participants in collaborative teaming
- Your proposal should include a full discussion of the technical approach that will be used to meet the program goals. Also include:
 - Your team's current technical capabilities
 - Key resources needed (not currently available to your team)
 - A teaming plan along with the roles and responsibilities of each member of the research team
 - End of phase and some intermediate milestones
 - A schedule of all milestones including a clearly charted description of the various risk mitigation strategies



Proposal Guidance and Tips

- Download ALL materials posted to the FedBizOps.gov announcement (BAA, instructions, templates, etc.)
- Check periodically for any amendments and/or changes posted prior to the proposal deadline
- Read FAQs posted to the website
- Ensure that your submission
 - Meets the stated deadline
 - Does not exceed maximum page limits
 - Follows templates included in the appendix section of the BAA
 - Does not include unnecessary marketing materials or brochures
 - Fails to follow protocols and procedures outlined in the BAA which may result in the proposal not being evaluated



Eligibility Information

- **Not Eligible:** Other Government Agencies, Federally Funded Research and Development Centers (FFRDCs), University Affiliated Research Centers (UARCs), and any other similar type of organization that has a special relationship with the Government, that gives them access to privileged and/or proprietary information or access to Government equipment or real property
- Non-US organizations and individuals may be able to participate but...
 - Must comply with Non-Disclosure Agreements, Security Regulations, Export Control Laws, and other requirements as appropriate
 - Adhere to specific guidance for non-US participation as outlined in in the BAA



Proposal Evaluation Criteria

- Overall scientific and technical merit
- Effectiveness and feasibility of proposed work plan
- Relevance to the MATCHES program goals and overall IARPA mission
- Relevant experience and expertise of performer execution team
- Cost realism



Additional Program Information

- Website: http://www.iarpa.gov/solicitations_matches.html
- Email: DNI-IARPA-BAA-11-08@ugov.gov