

DRAFT Proposal for SBIR Interim Funding
Preparing PAM for SBIR Phase II

In Phase I of SBIR effort DAAH01-02-C-R030, Net Exchange examined the use of futures markets as decision support tools for U.S. foreign, military, and intelligence policy analysis. Net Exchange set out to describe, design, and component test a Policy Analysis Market (PAM) that could realize the promise of applying market mechanisms to policy analysis. Before PAM can undergo the test bed implementation required in an SBIR Phase II, its components must be integrated and certain key real-world interfaces must become better defined than was possible during Phase I.

Interim Funding Proposal

Preparing PAM for test bed implementation will require \$100,000 and three months of concerted effort broken down as follows:

Activity	Month			Labor	Cost
	Aug.	Sept.	Oct.		
Integration of Market Mechanisms	████████████████████			NEX & GMU	\$ 35,000
User Interaction: Design & Process			████████	NEX & Human Factors Consultant	\$ 20,000
Data Series Process Development		████████		The Economist Intelligence Unit	\$ 25,000
Phase II Detailed Implementation Plan	██████		██████	NEX	\$ 20,000
				Total	\$100,000

Integration of Market Mechanisms: Three market mechanisms studied in Phase I need to be integrated: the underlying combinatorial call market, the automated over the counter (OTC) market maker that functions between call market runs, and the process of including specific event securities. The majority of this work will be done by Net Exchange staff with some OTC market maker assistance from George Mason University.

User Interaction: PAM relies on the ability to fashion and process conditional securities, such as options, out of building block securities. These conditional securities add value to PAM as their use is directly and intuitively tied to the analysis processes of the anticipated PAM participants. However, the process for fashioning these is neither intuitive nor easily learned; so, user interaction needs to be facilitated by a higher level ordering language. Applying human factors design principles can further enhance PAM.

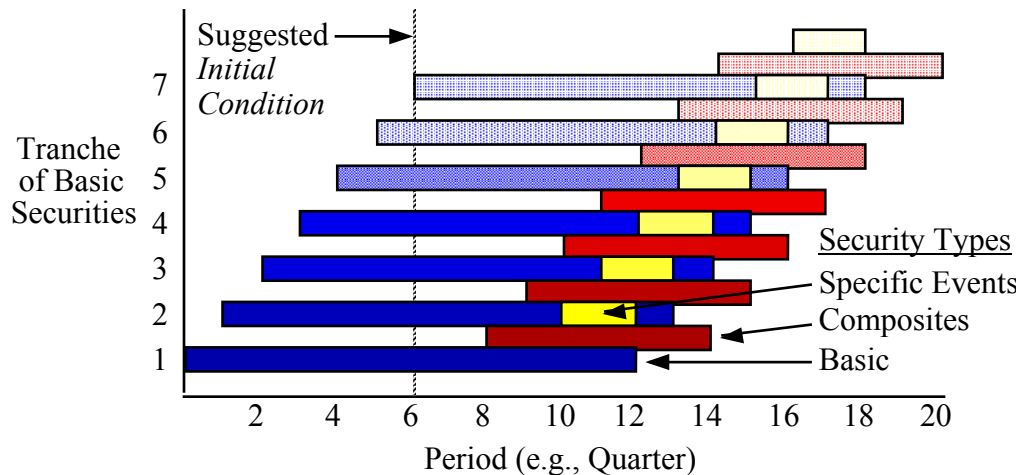
Data Series Process Development: The basic securities that underlie all PAM functions must be based from professionally defined and monitored data series, each of which bares on a significant concern of policy analysis itself. Establishing the limitations of and

collection processes for these series is critical prior to a test bed of PAM. The Economist Intelligence Unit (EIU) has agreed to design the data series process for PAM during this interim phase and, pending negotiation, will perform the data series gathering, monitoring, and reporting functions should a PAM test bed be funded.

Phase II Detailed Implementation Plan: A detailed implementation plan for Phase II will be produced in two pieces: The first piece will precede most of the interim effort and guide that effort. The second will compile the interim effort results and conclude with a presentation to DARPA and to representatives from prospective Phase II clients.

Review of SBIR Phase I

Policy analysis is built up from the observation of underlying fundamentals and the expert consideration of interrelationships among these fundamentals. Perceptions of specific relevant events evolve from the analysis of trends and interactions. During SBIR Phase I, Net Exchange designed and component tested a PAM capable of implementing a security structure that is in tune with the nature and intent of policy analysis. This security structure evolves from general fundamentals to specific event.



A tranche of basic securities is made available at the start of each period, where a period represents the time granularity of PAM. Each tranche is made up of securities that are tied to data series representing economic, civil, and military fundamentals in the countries covered by PAM. Each basic security matures, or pays off, at a time certain in the future – the time horizon of PAM is the lifetime of a basic security. Each basic security has three discrete and independent states, one of which will pay at the face value of the security and the other two of which will pay nothing.¹ The face value of a basic security is the amount of money a trader can pay the market operator for one of each state of the basic security at any time prior to maturity.²

¹ For example, an Egyptian GDP security issued in period 2 will mature in period 14. The security actually tracks the change in GDP between periods 13 and 14. Its three states are neutral (within a band), up (above the band), and down (below the band).

² The face value for all basic securities in PAM is the same; e.g., \$1.00.

Composite securities are derived from basic securities. Future events involve actions that underlie more than one basic security. The purpose of the composite type of security is to provide a PAM participant, who has insight into interrelations among basic securities, with a means of expressing this insight and benefiting from the expression if correct. A simple composite is an intersection between two basic securities; e.g., the probability that a decrease in Country X GDP will coincide with an increase in Country X civil unrest. Given an intersection composite, beliefs about conditional probability can be expressed in PAM, which allows for various types of options as composite securities.³

To focus the attention of PAM participants, composite securities would not become available for trade until deep into the life of a basic security. Prior to the allowed use of composites associated with a tranche of basic securities, the basic securities are traded among the participants for the purpose of coalescing trend estimations among the securities. Note also that a composite may mature after a basic security from which it is derived has matured. This is the case for a composite that is also derived from a basic security that matures later; for example, an intersection of one security that matures in period 15 and another that matures in period 16.

As trading activity becomes focused approaching the maturity of a basic security tranche, and focused further by trading in composites derived from these basic securities, specific event securities can be directly included in PAM. These take the form: Event C will or will not happen during period T. Trading throughout the tranche's life has supported the policy analysis that goes into nominating specific event securities. By introducing event securities later, rather than at the earliest point in the time horizon of a PAM, it is much more likely that the events available for trade will be relevant.

The proposed security structure does have a serious initial condition problem – if PAM begins at the inception of its first tranche of basic securities, then it will be a long while before PAM's participating traders have a lot of interesting things to trade. Since this could undermine the buildup and maintenance of liquidity that would be critical to the worthwhileness of PAM, we suggest that PAM be started midway into the life of tranche #1, as illustrated.

Envisioned SBIR Phase II

PAM is designed to operate at the country scale. We envision a field test of PAM that covers 20 countries comprising the most significant concerns in the Middle East, Central Asia, and the Subcontinent. Data series will be designed that will underpin basic securities reflecting economic, civil, and military fundamentals in each of these countries.

³ An example of a classic option supportable as a PAM composite security: A Country X analyst knows that civil stability in X is affected by the difference in economic performance between X and Country Y. However, this analyst does not have any special insight into the economic fundamentals of Y. PAM allows this analyst to buy an option that pays off if Y's economy performs at or above a certain level and X experiences an increase in civil unrest while insuring the analyst against lower Y economic performance.

The United States will be similarly covered; further, data series reflecting U.S. military and economic relations with these countries will be included.⁴

To accommodate concerns over the transfer of funds between U.S. Government agencies and non-government entities, two instantiations of PAM will be operated. The inclusion of non-U.S. Government centers of expertise is considered important, both as a check on the PAM process and as a means of including a broad and varied pool of knowledge in support of policy analysis. Examples of non-U.S. government participants are: academics, think tank professionals, international insurance firms (e.g., Lloyds), private firms involved in the countries covered by PAM, members of the press, and retired members of the government.

For the two-year field test of an SBIR Phase II, PAM technical operation will require a system operator, clearance and settlement functions, technical maintenance, training, a user help function, and data series production & maintenance. All of these items will be addressed in the Detailed Implementation Plan that will be produced as part of the proposed interim effort, should it be funded.

At this time, three months of concerted final production, followed by three months of system tests and user training are envisioned at the start of Phase II. These would lead directly into the two-year field test. Thus, Phase II of this SBIR is expected to require two and a half years to complete.

Summary

In Phase I of SBIR effort DAAH01-02-C-R030, Net Exchange established the design and basic components required for a Policy Analysis Market (PAM) that would provide long-term decision support regarding U.S. foreign, military, and intelligence policy concerns. Though promising, the results of Phase I are insufficiently advanced to move directly into the field test required by Phase II of an SBIR. Net Exchange has proposed herein that DARPA approve an interim effort to prepare the Net Exchange PAM design and components for Phase II. The proposed interim effort will require three months to complete and \$100,000 to fund.

⁴ At a minimum, this will require 103 basic securities to be issued each period: 21x3 (econ, civil, mil.) + 20x2 (U.S. econ. & mil. relations).