

The Policy Analysis Market: An Electronic Commerce Application of a Combinatorial Information Market

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OVERVIEW

In September 2003, the Policy Analysis Market (PAM) will open for live trading. Net Exchange has designed and will operate PAM under contract with the Defense Advanced Research Projects Agency (DARPA). PAM is a combinatorial information market: a market in futures, options, and derivatives that are based on eventualities rather than specific commerce. PAM will trade contracts of one year maturity, issued quarterly, that span economic, civil, and military conditions in the countries of the Middle East. A trader will be able to trade the pure contracts and to construct and trade composites of pure contracts that reflect his or her insights.

DARPA is interested in improving the formulation and analysis of security policy by augmenting how information regarding eventualities is aggregated and assessed. In support of DARPA's interest, PAM is an experimental decision support tool for aggregating and focusing information. The principles of applied mechanism design have guided PAM design and development: Net Exchange began with a model of trader nature, posited several mechanisms to coordinate this nature toward DARPA's goal, tested these using the techniques of experimental economics to determine what mechanism to employ in PAM, and is now proceeding to deploy a commercial product.

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The individual trader in PAM is assumed to have insight into a small subset of the issues spanned. This insight is assumed to include conditional beliefs. For example, an expert in Jordanian political matters may have special insight into the likelihood of the stability of the Monarchy given the duration of Iraqi resistance to U.S. military policy. This expert can hold this insight without any special knowledge about the conduct of U.S. military policy. This amounts to a belief of a conditional probability, which in trading parlance is a hedge; "Given that B happens, I believe that there is an X% chance of A happening."

Given the huge number of conditional beliefs and the concentrated expertise of the best envisioned PAM traders, PAM will be a thin market even at its designed load of 10,000 traders. Two-sided combinatorial markets are an established approach for the exchange of multiple items among a *thin* trading population. Using the experimental economics labs at Caltech, Net Exchange tested two such combinatorial mechanisms against a serial mechanism representing the status quo in information markets. Both combinatorial mechanisms allowed traders to express composite events, including contingent events (AB, A|B, AB|C, ...). The serial mechanism supported only pure events (A, B, C, ...). An information environment, modeled after that assumed for PAM, was established and runs of all three mechanisms were carried out with groups of students. Both combinatorial mechanisms outperformed the serial mechanism.

The two combinatorial mechanisms tested were a combinatorial call market (CCM) and a combinatorial market maker (CMM). The CCM was a modification to a long-established Net Exchange commercial product. The CMM was the first implementation of a concept invented by Robin Hanson of George Mason University and designed specifically for a PAM-type information market. The CMM can function with any number of traders – a very attractive trait for a commercial product that must plan for small numbers of traders initially. However, prior to Net Exchange's comparative tests, the effectiveness of the CMM was difficult to assess. Due to its performance in the comparative tests, PAM will open with the CMM as its sole trading mechanism. The use of both mechanisms in information markets warrants substantial additional research and Net Exchange may incorporate improvements to each as PAM operations progress.

Turning dispersed experts into PAM traders requires much more than an assumed information environment and a well-justified

mechanism for coordinating that information. The following are also needed: securities that represent the issues of interest, a trading interface that facilitates the expression of trader insights into this market framework, a process of attracting and assuring traders that PAM is something in which they want to involve themselves, and a system architecture that supports a worthwhile scale of operation.

PAM will trade three types of securities: Regional, Global, and Special Event. The regional securities are defined for each major country in the Middle East and there are five of these per country; economic health, civil stability, military disposition, economic involvement with the U.S., and military involvement with the U.S. There are five global securities; U.S. equities, U.S. GDP, global trade, deaths from terrorism, and U.S. military deaths. Special event securities will be near-term issues that focus on clear Yes/No observables – these are nominated from the market and approved or disapproved by PAM Operations. The Economist Intelligence Unit will conduct all data collection for these securities and will judge the value of each security at maturity.

The PAM trader interface is a Java applet that is, predominantly, map based. Separate, but interlinked sections exist for general market information, trader specific information, and order formation and execution. In addition, there are links to on-line help and a PAM message board that is available only to registered

PAM traders. The PAM trader interface exists in two versions: a full version and a stripped down version for displaying a subset of the general market information to the general public.

PAM marketing will begin in earnest by mid-May 2003. Open registration will begin in July 2003 as will on-line training. Trader registration requires the deposit of funds by the trader. Net Exchange and DARPA recognize that anonymity may be very important to many prospective and highly desired PAM traders. For this reason, a trusted bank will hold all PAM trader funds and will be the only entity involved in PAM operations that knows any information about the identity of a PAM trader.

To control system load, various PAM functions will be hosted at different sites, all accessible through a single PAM home page (www.PolicyAnalysisMarket.org). PAM is funded to operate through March 31, 2005.

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