The Policy Analysis Market:
“Market in Death”
Or Your Next Decision Support Tool?

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Redmond, WA, 9 September 2003
Immediate Background

On July 28, the Policy Analysis Market (PAM) became the D.C. story of the week. Derided on the floor of the Senate as a “Market in Death,” PAM was terminated on July 29.

PAM is best seen as an application of an established information-processing tool -- markets. Markets aggregate pieces of information held by many and resolve signals of the underlying information state.

Within a firm, valuable information may be obtained through an internal market. PAM’s technology offers firms a means to enhance their decision processes.
An Infamous Example -- The Policy Analysis Market

Write contracts off data indices that track policy interests

- Indices for each country in the Middle East: economic health, civil stability, military preparedness, and U.S. involvement (econ. & mil.)

- Global Indices: economic and conflict indicators

Issuance 01.10.03 31.12.03 31.03.04 30.06.04 30.09.04 31.12.04 31.03.05

Maturity

Payoff: EIU assesses data indices on which securities are defined

Group of all Regional and Global PAM Securities defined over a four-quarter Span
Focusing on Specific Events, *When Warranted*

Issue specific event securities (yes/no) into PAM if index-based trading suggests that focus is warranted:

- Imagine a surge of trading activity in Q3 2004 Jordanian Econ. Health
- Try to illuminate by issuing event securities correlated to Road Map

<table>
<thead>
<tr>
<th>Jordanian Economic Health Increases in Q3’04 (~ means NOT)</th>
<th>Trader Views &amp; Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hamas Joins PA in Q2’04</td>
<td>Mossad agent thinks Hamas mil. wing will not disband -- Buys ~B @ $0.50.</td>
</tr>
<tr>
<td>~B</td>
<td>Jordanian banker believes gov. processes add 6-month lag to foreign investment effect -- Sells AB @ $0.45.</td>
</tr>
<tr>
<td>Price of $1 face value security A (&amp; probability)</td>
<td>Swedish firm preparing to invest in Jordan wants to hedge preparation costs -- Buys ~A</td>
</tr>
<tr>
<td>0.70</td>
<td>0.30</td>
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<table>
<thead>
<tr>
<th>A</th>
<th>~A</th>
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<tbody>
<tr>
<td>0.45</td>
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<tr>
<td>0.25</td>
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</table>
A Brief History of Information Markets

1. Village market: prices indicate current distribution of values among villagers and impact future production.

2. Futures markets: separate current pricing from forward pricing (thus, more effectively plan future production & investment)

3. Derivative markets: allow futures to be combined so that specific risks can be hedged (focus on the risks you can affect)

4. Iowa Electronic Market for elections: pure info. market

5. Economic Derivatives futures contracts written off trusted data indices that track something of interest to traders; e.g., CPI

Overview of the Classic Information Market -- Iowa

Specific event securities associated with elections

- Security sets that *span* all possible states (Bush, Gore, Nader, Other)
- Each security has a $1.00 face value and traders buy a set for $1.00
- Trading through a bid/ask bulletin board (double auction)
- Evolution of prices (all $ \leq 1.00$) interpreted as % predictions of victory
- Securities must have clear, objective definitions (% of popular vote)

Summary of performance to date

- Election markets give superior predictions to polls (451/596)
- Limitations: fixed horizon, no endogenous definition, limited to pre-structured derivatives.

Debuted in 1988 & remains the deployed state of the art
Combinatorial Information Market (highly efficient derivatives)

Combinatorial Market -- a market in which traders can structure multi-item orders by themselves.

Derivatives are based off of several futures contracts

- Only the most liquid are exchange traded (interest swaps)
- Most are structured contracts traded Over the Counter, and the Counter balances its book by trading in the underlyings

In a PAM-like market, traders structure derivatives from the underlyings (e.g., Kerry drops out if Dean wins New Hampshire)

Contention: If items of interest are interconnected and knowledge about the items is fragmented, then a combinatorial information market yields superior information performance to traditional, serial markets.
Candidate Commercial Combo. Info. Markets

Industrial Decision Support Tool
- Pharmaceuticals R&D Funnel (and similar)
- Complex product development

Market Research
- Movies (Box Office, advertising, and inputs)
- Product Design and Marketing (e.g., HP case)

Risk Hedging Exchanges
- Area Risk Analysis (e.g., PAM)
- Financial markets (pure and physical-derived)
Something real, not just hype: Cassini Payload Mgt.

Cassini mission to Saturn faced a fixed budget (*really*)

- Payload instrument R&D greatest historical cause of overruns
- JPL asks Caltech Economics Division for advice

Problem: *Tragedy of the Commons*

- Motives + asymmetric info. = moral hazard
- Classic management is counterproductive
  - Scientists reveal bad luck & hide good
  - Management reserves expended early

Solution: Property Rights + Trading

- All resources given to Scientists at start
- Trading to smooth out good and bad luck

Outcomes: Launched on budget, $100 m saved, Net Exchange founded
Some Economics -- Building a New Market

Characterize Information Environment

Securitize Information (definition & private value)

Determine Market Mechanism

Domain-Specific S/W Application

Interface w/ Established Processes (e.g. Settlement)

Operate with respect to Clear Rules

Business Analysis

Domain Experts, Market Structure

Mechanism Design

Information Technology

Business Process

Product Maintenance

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Two combo. mechanisms tested with same order format

- Combinatorial Call Market (CCM, established product)
  - Orders accumulate during an order submission period
  - Trades are identified through a batch solution process

- Combinatorial Automated Market Maker (CCAM, new)
  - Continuous trading through an automated intermediary
  - CAMM balances its risk across all its holdings

Environment for both (and a double auction)

- Binary Variables X, Y, Z; $2^3 = 8$ combinations
  - $P(X=0) = .3$, $P(X=Y) = .2$, $P(Z=1) = .5$

- 3 people, see 10 cases of: AB, BC, or AC

- Goal is to trade information to figure out mapping

<table>
<thead>
<tr>
<th>Case</th>
<th>A</th>
<th>B</th>
<th>C</th>
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<td>-1</td>
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<td>-0</td>
<td></td>
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</tbody>
</table>

Sum: 9 - 3

Same A B C
A --- 4
B ---
C ---
Some Economics -- Performance Comparison

Both combinatorial processes superior to double auction

- CAMM’s immediate liquidity makes it a better single choice than CCM

Complete Sharing

Best Market

CAMM

CCM

Random

Double Auction

Opinion Poll
Some Economics -- A Quick Look at CAMM

A market maker handles trades in $N$ two-state securities

- $2^N$ States of the World -- combinations of individual futures contracts
- A derivative is some subset of these $2^N$ states; call it $A$
- When the market maker buys $A$ from you, it sells $A^c$ to you, adjusting the prices of all the states and thus keeping its book in balance.

Scaled via an overlapping market maker approach

Figure 2. Market maker swaps $A$ and $A^c$
Summary

All markets perform an information refining role

- Traditionally, this role is based on an underlying real commerce and is performed between separate entities.
- Futures market techniques are broadening real to relevant.
- If the information environment relevant to a firm distinguishes entities within the firm, then a market may be a good decision support tool.

Combinatorial mechanisms make a better information market if the items of interest are interconnected and knowledge about the items is fragmented.

The Policy Analysis Market is an appropriate application of a combinatorial mechanism (CAMM) to an information environment of critical importance.
All Bets are off at the Pentagon; Tim Hartford; Financial Times, September 2, 2003, page 8

Information Aggregation Mechanisms: Concept, Design and Implementation for a Sales Forecasting Problem; Charles Plott, Kay-Yut Chen, Caltech HSS Working Paper 1131, March 2002


A Management Approach for Allocating Instrument Development Resources; Randii Wessen, David Porter; Space Policy 1997 13(3) 191-201