

Using Prediction Markets to Hedge Information Security Risks



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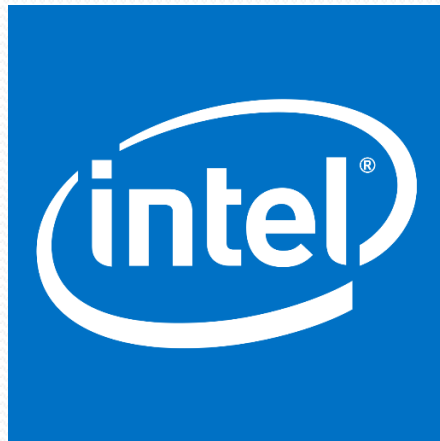
What is a Prediction Market?

- Decision Markets, Information Markets, Virtual Stock Markets, Speculative Markets
- Markets that are designed and operated with the primary purpose of mining and aggregation of information which is scattered among traders. Subsequently this information is used in the form of market values to predict the specific future events[1]

Public Prediction Markets



Private Prediction Markets



ArcelorMittal

Related Examples

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FutureMAP

A large teal arrow pointing to the left, containing the text 'Saddam Security' in white serif font.

Saddam
Security

FutureMAP Project

- Future Markets Applied to Prediction (FutureMAP) project started in 2001 by Defense Advanced Research Project Agency (DARPA), USA [2]
- To be used as a ‘Electronic Market based Decision Support’
- To improve the existing approaches of collecting intelligence information

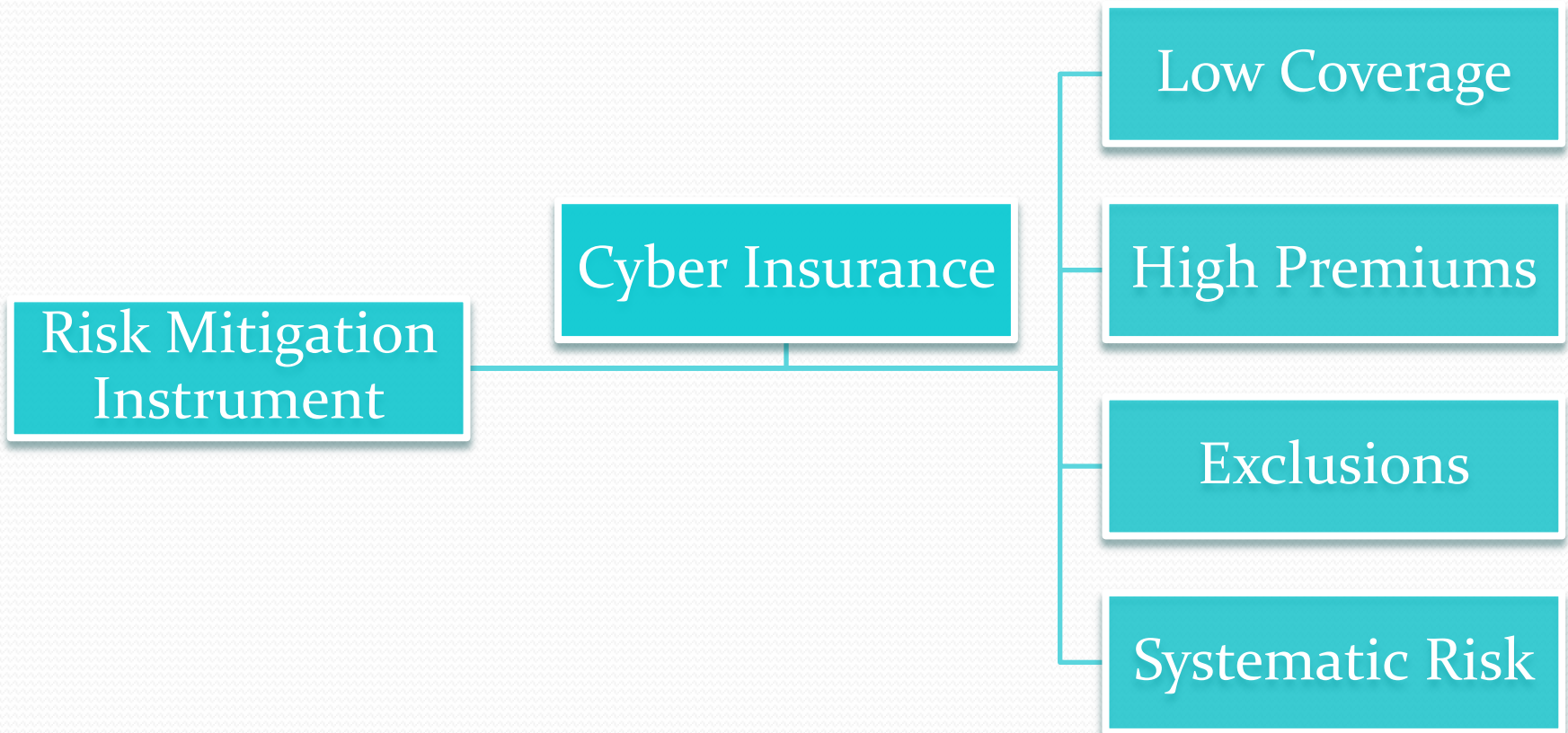
Saddam Security Study

- To study if decision makers can be informed in real time by means of existing financial, energy and prediction markets [3]
- ‘Saddam Security Contract’ @ Tradesports.com paid if and only if Saddam Hussein was out of office by 30/Jun/2003
- Relationship between Equity, Spot and Future Prices of Oil and ‘Saddam Security’

Saddam Security Study

- High Price for Saddam Security => High Chance of War
- High Price of Oil => Medium Impact on Supply
- Negative correlation between S&P 500 future price for one year ahead => Negative Impact on global economy

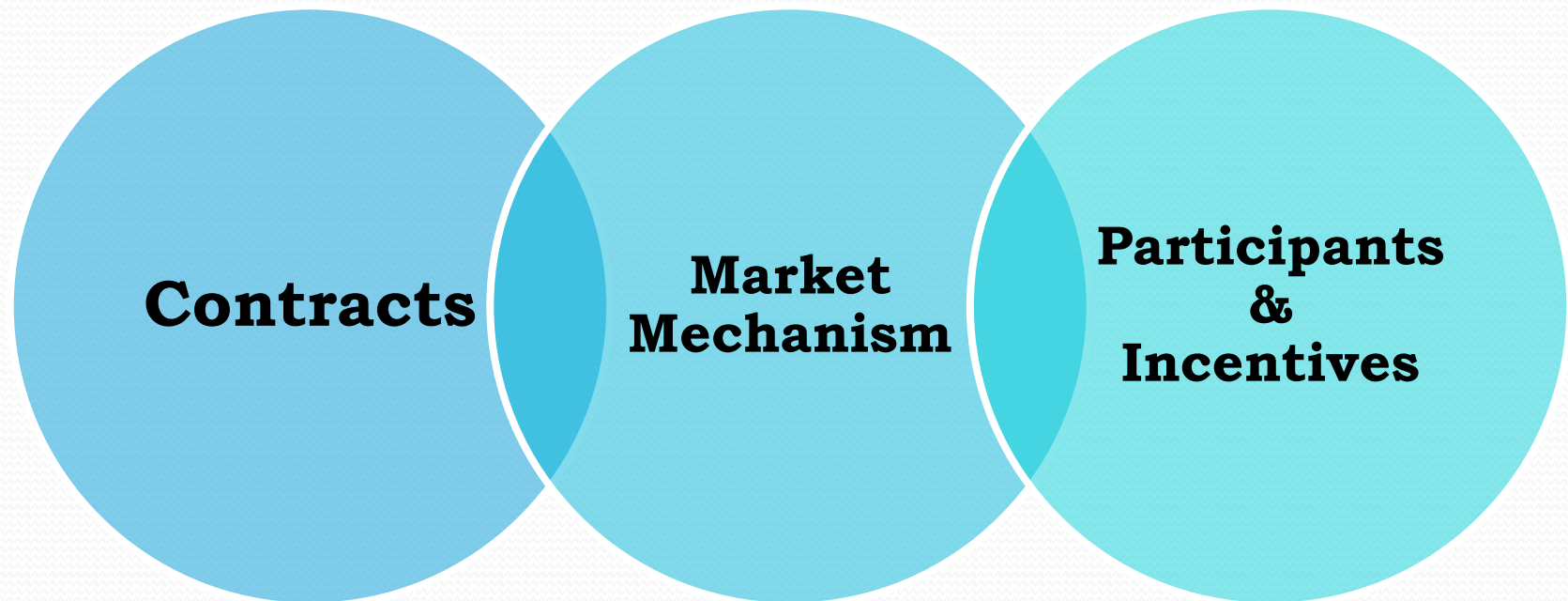
Case for ISPM



Expected benefits of ISPM

- Capital Markets have less or no moral hazard
- Participants do not need to prove their claim
- No risk of 'adverse selection'
- Transparent and fair prices
- Lower transaction cost due to economics of volume
- Greater coverage and easily accessible

Design Issues



Design Issues



Contracts

Derivatives

Insurance Linked
Derivatives

Design Issues



Market Mechanism



Continuous Double Auction Model

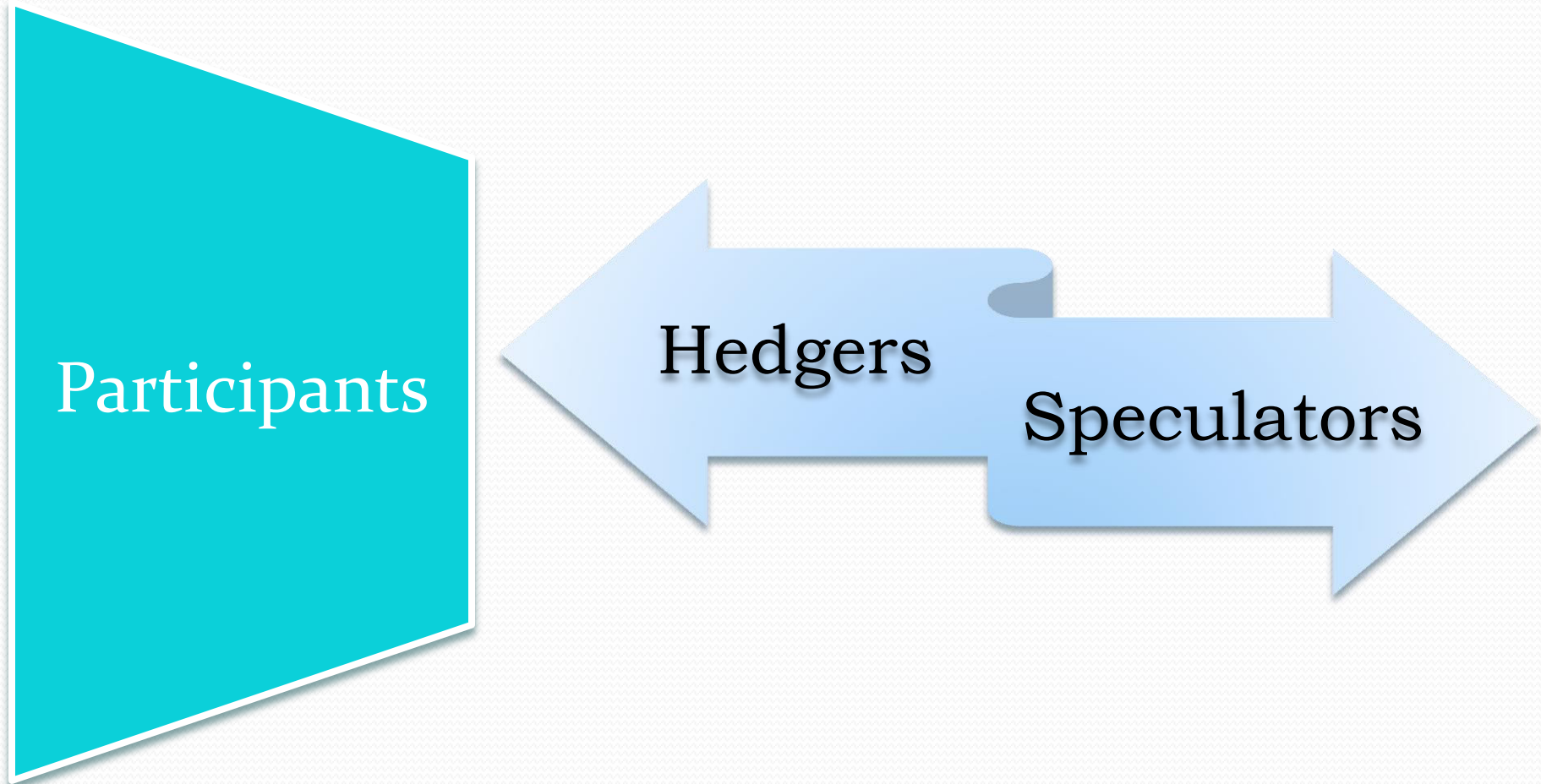
Continuous Double Auction with Market Maker

Pari-Mutuel Market Model

Market Scoring Rule

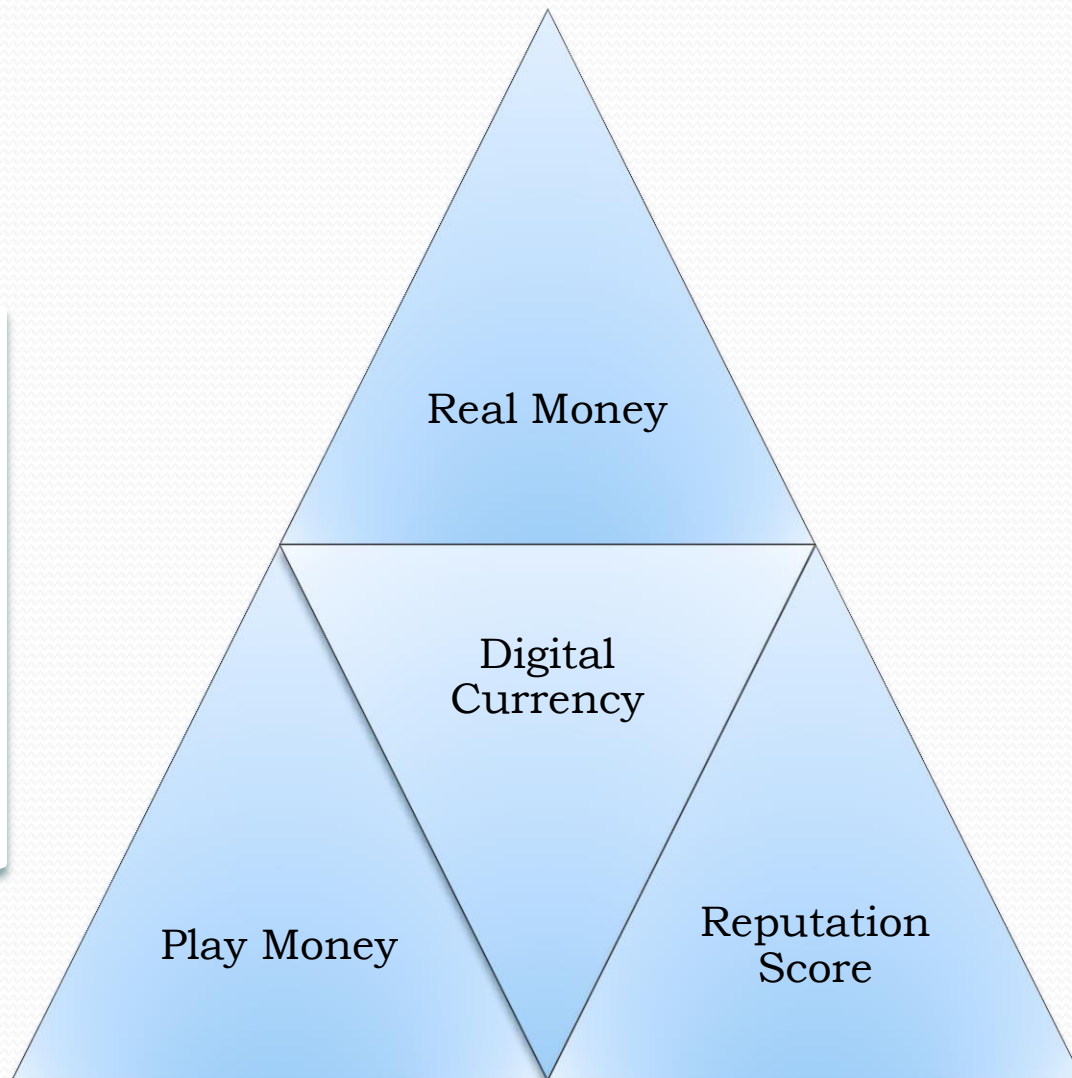
Dynamic Pari-Mutuel Market Model

Design Issues



Design Issues

Incentives



Risk Assessment of ISPM

Issue of
Acceptance

Risk of
Failure

Standards on
Decision
Criteria

Market
Bubbles

Market
Manipulation

Risk Assessment of ISPM

Issue of Acceptance

- People may have reservations regarding idea, financial instruments and trading
- Foreign currency swaps were not developed until 1980s
- Futures market on stock price indices did not exist until 1982
- Weather derivative traded for the first time in 1997, now accounts for billions of dollars
- Carbon emissions trading market had a slow start
- Macro markets were never developed to allow actual trading

Risk Assessment of ISPM

Fear of Failure

- Long time to acceptance
- Prone to high risk of failure
- Consumer Price Index (CPI) Futures Market estd. In 1985 in USA and failed in 1986
- CPI Market succeed in Brazil
- Point is not that such markets cannot succeed but they take time to get accepted by others

Risk Assessment of ISPM

Decision Criteria

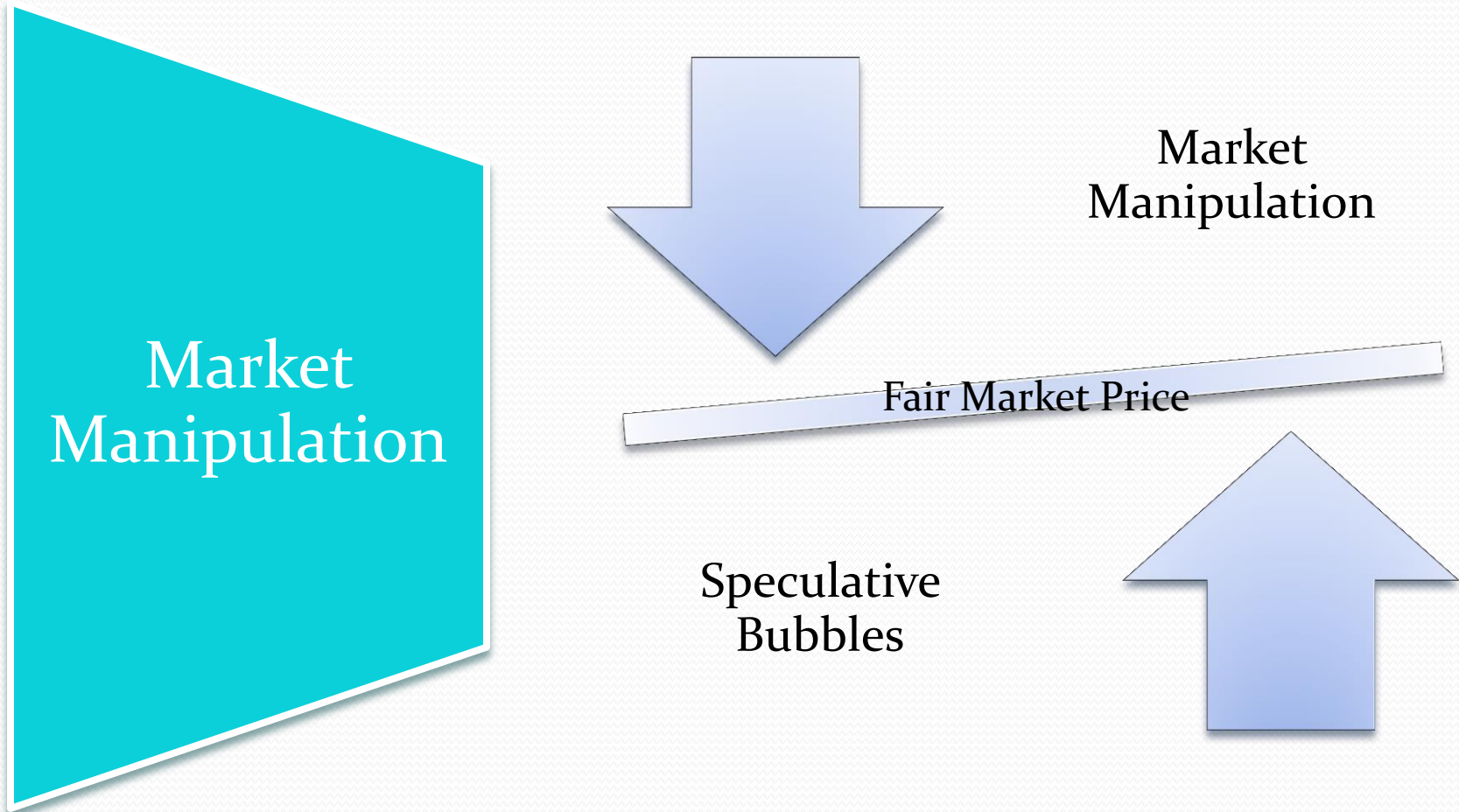
- Lack of standards on what constitutes an information security attack
- Index linked triggers can be developed but we do not have an index linked to information security
- Homogeneity in decision criteria on settlement of contracts

Risk Assessment of ISPM

Market Bubbles

- Bubbles in Information security market cannot be ruled out
- Eventual burst of the bubble will lead to sudden market crash
- Market prices will not reflect the 'true' prices
- Difficult to differentiate between a bubble price and a true price
- Bubbles will inhibit the whole purpose of risk hedging

Risk Assessment of ISPM



Conclusion

- Outlined the use of prediction market to hedge information security risks
- Benefits of prediction market for trading of financial and insurance-linked instruments are larger than the challenges
- Substantial proportion (if not, all) of the information security risk can be hedged

Future Work

- Architecture (Design issues) of information security prediction market
- Designing different types of trading contracts
- Implementation of information security prediction market



References

- 1) J. E. Berg and T. A. Rietz, “Prediction markets as decision support systems,” *Information Systems Frontiers*, vol. 5, no. 1, pp. 79–93, Jan. 2003.
- 2) R. Hanson, “Designing real terrorism futures,” *Public Choice*, vol. 128, no. 1, pp. 257–274, 2006.
- 3) J. Wolfers and E. Zitzewitz, “Using markets to inform policy: The case of the iraq war,” NBER Working Paper, 2006.
- 4) <http://www.bloomberg.com/news/2014-08-29/next-u-s-bank-bailout-could-come-after-a-cyber-terror-attack.html>