A Model for Understanding the Relationship Between Transaction Costs and Acquisition Cost Breaches

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Cost Growth in DoD

- Controlling cost growth for major defense acquisition programs (MDAPs) has been problematic in the Department of Defense (DoD) for many years.
- A 2007 RAND study of 46 weapons system programs in DoD found an average of almost 50% cost growth from Milestone B (program initiation) (Obaid Younossi et. al 2007, xvi).
- According to the GAO, active MDAPs in FY 2011 collectively experienced a cost growth of $74.4B (GAO 2011, 2).

Transaction Costs

- Transaction costs are the costs associated with source selection, periodic competition and renegotiation, contract negotiation and management, performance measuring and monitoring and dispute resolutions.
- Although they are not often captured in the accounting records, the time and effort associated with these three types of transactions represent real costs to the organization.

Cost Breaches

- A cost breach is considered to occur when cost expenditures exceed the approved baseline cost estimate for an MDAP—also known as the acquisition program baseline (APB).
- If an MDAP has been officially rebaselined cost breaches are measured relative to the current baseline.

Types of Cost Breaches

	APB Breach (RDT&E, Procurement, MILCON, O&M)	Nunn-McCurdy "Significant" Breach (PACU & APUC)	Nunn-McCurdy "Critical" Breach
Current Baseline	+10%	+15%	+25%
Original Baseline	N/A	+30%	+50%

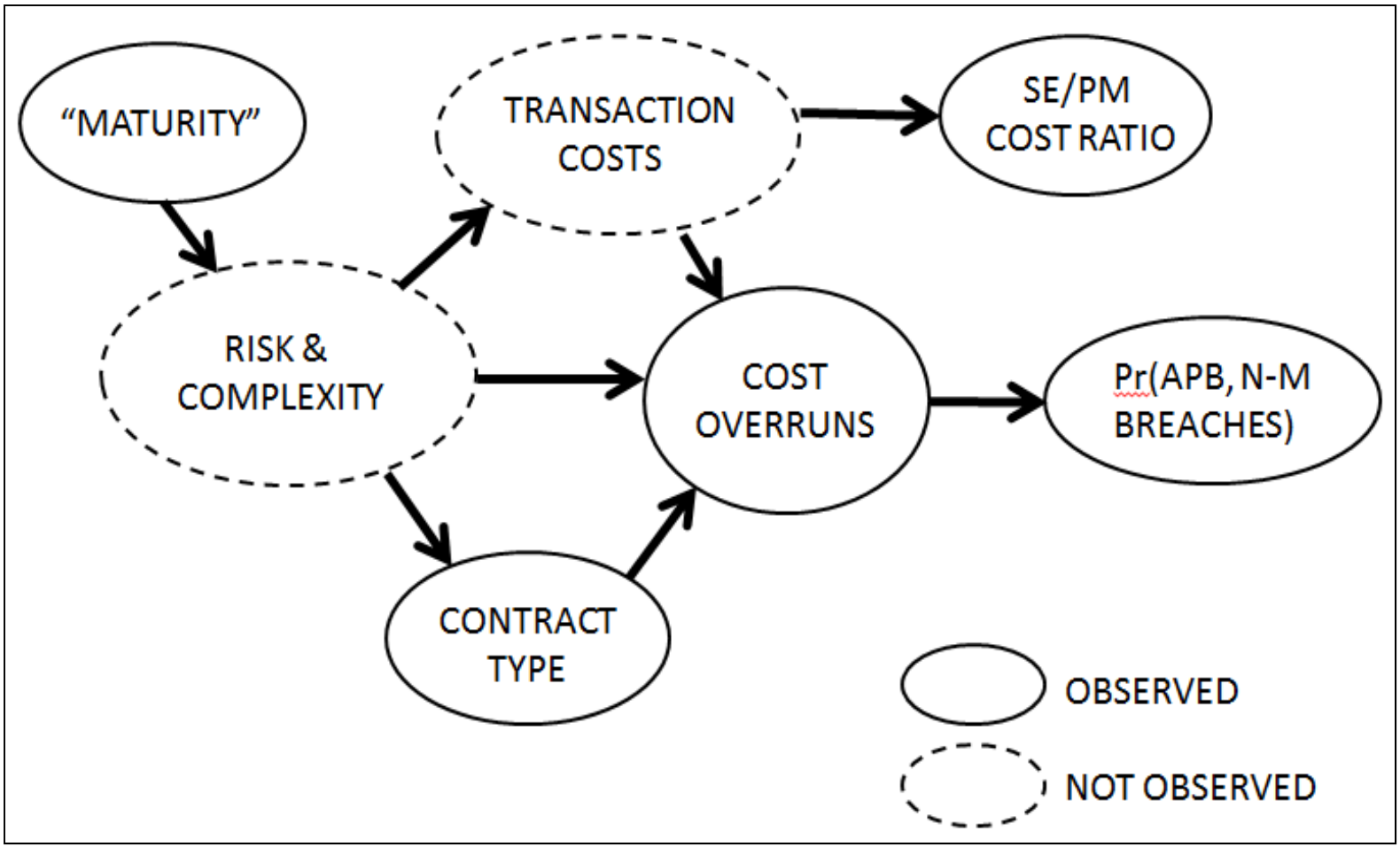
Relationships

- A 2006 RAND study established that MDAP SE/PM costs vary between programs depending on the program type (Stem, Boito, and Younossi, 2006)
- Angelis et al. (2008) suggested using the SE/PM cost as a proxy for transaction costs to examine the relationship between transaction costs and cost overruns.
- Biggs (2013) showed that as the EAC SE/PM cost ratio rises there is a statistically significant corresponding increase in the probability of a cost threshold breach occurring.

SE/PM ratio

$$\text{SE / PM Cost Ratio} = \frac{\text{SE / PM Costs}}{\text{Total Cost}}$$

Interactions



Data Sources

- Selected acquisition reports (SAR)
  - Cost threshold breaches
  - Program maturity (time since program initiation at Milestone B
- Cost and software data reporting system (CSDR)
  - SE and PM costs
  - Type of contract
- A total of 32 MDAPs representing Air Force, Army, Navy, and Joint programs since 1988.

Possible Relationships

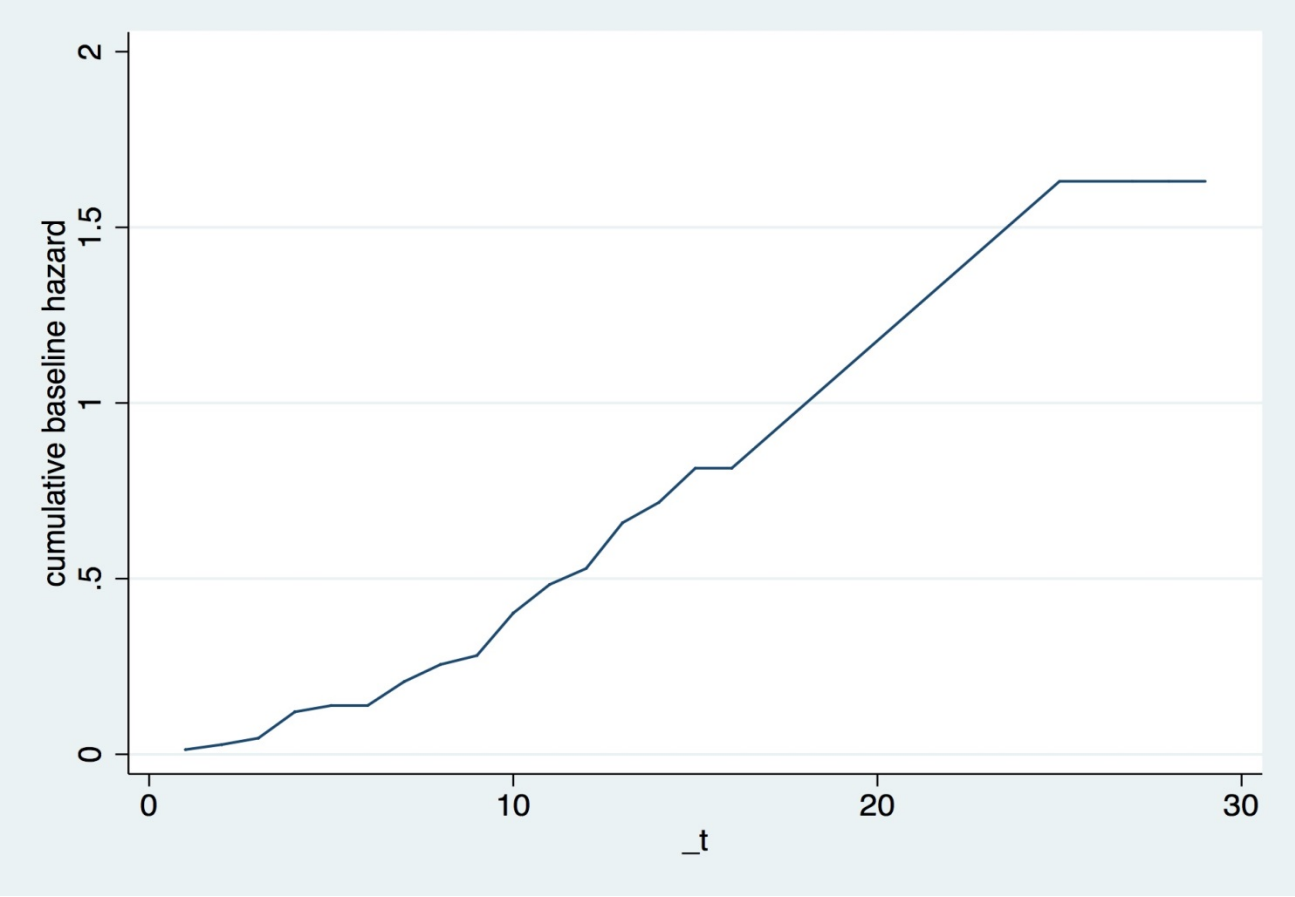
- Relationship between transaction costs (using the SE/PM cost ratio as a proxy) and the likelihood of cost breaches experienced by a program
  - Survival model looks a the hazard of cost breaches over program maturity time
  - Focus on Nunn-McCurdy breaches

Cox-Relative Hazard

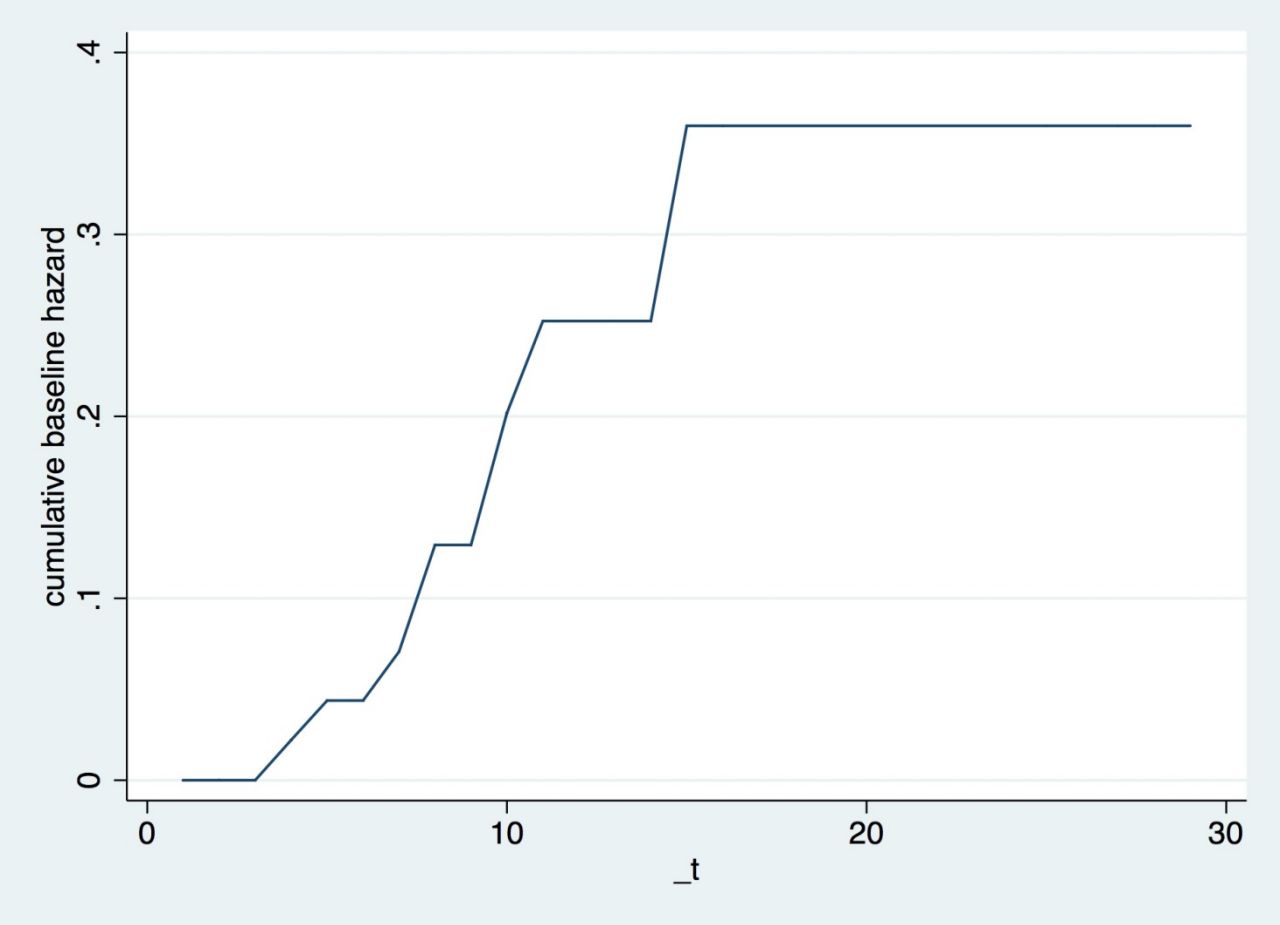
$$h_j(t) = h_0(t)\exp(x_j\beta_x)$$

The hazard a particular subject j faces at time t is a function of the baseline hazard modified proportionally by the vector of regression coefficients β_x

Cumulative Risk of APB Breach



Cumulative Risk of Nunn-McCurdy Breach



Significant Results

- APB breaches
  - A one percentage point increase in estimated SEPM at completion increases the risk of breach by 3-5%
  - The estimated impact is reduced in the model with to date SEPM, where it is about 2% when we do not control for contract type
  - Cost-plus programs are two to three times more likely to experience a cost breach

Significant Results

- Nunn-McCurdy breaches
  - In the model where we do not control for contract type, breaches are about 4% more likely per one percentage point increase in SEPM estimate at completion

Conclusion

- It seems reasonable to assume that higher SEPM ratios can be associated with more complex and risky programs.
- Our results suggest that the SEPM ratio is a promising measure of the likelihood that such programs will experience a cost breach.
- Program managers and others interested in controlling cost growth in DoD programs should consider using the SEPM ratio as an early indicator of the risk of a cost breach.