Getting MSOM Noticed

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Themes

• Researchers in operations are increasingly interested in interfaces with other functional areas (e.g., finance and marketing)
• The reverse trends are not evident
• Several factors may have contributed to the situation including our general outlook
• Potential to have impact and visibility beyond our field
Outline

• Limited visibility evidence
• Possible causes
• Interests other domains
• Potential for impact
• Example analyses
• A few big questions
• Conclusions
Our Limit Visibility

- Journal Impact Factor
  J. Marketing 4.83
  Academy of Management 3.35
  Journal of Finance 3.26
  J. Political Economy 3.19
  Econometrica 2.40
  Management Science 1.69
  Operations Research 1.23
More Evidence

- Most cited papers in finance (Keloharju 2007)

**Ranking**

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Possible Causes

• We’re too prescriptive
  – Our view of managers:
  – Their view of managers:
• We are too stylized
• We use too little data (i.e., not empirical)
• We choose the wrong problems
  or maybe … we just lack skill?
What’s Important in Other Fields?

- Why do people do what they do? (What is the basis for our choices?)
- Why do we observe events and conditions in society?
- Can we predict outcomes and events in society?
- What policy choices might improve overall social welfare?
Examples that Involve Operations

• What determines the value of a firm?
• Why are firms and industries organized as they are?
• What causes differences between countries and regions?
• What can we do about:
  – global warming
  – bubble markets
  – business implosions
  – health care costs
  – epidemics
  – terrorism ….
What Made MSOM Important?

• Focus on measurement and achieving the “best”
• Process descriptions and standardizations enabled productivity improvement
• Principles of waste, variability reduction, responsiveness, and system view
• Success of various movements (lean, 6 Sigma, TQM,...)
What are Challenges?

• Manufacturing success brings smaller impact on US economy
  – Productivity improvements will continue to reduce share of GDP (both US and worldwide)
• Increasing complexity makes impacts harder to measure, breakdowns more likely, and limited models/programs potentially harmful
• Globalization and market trends toward customization and time competitiveness have changed traditional measures and rankings
Results of Network Complexity

• Common failures
  – Energy – blackouts, California crisis
  – Financial - bubble, crashes, firm failures
  – Communications – regional losses
  – Health – epidemic spreads
  – Media – disinformation spreads

• Why?
  – Lack of central control
  – Lack of awareness, visibility
  – Interdependencies

• What to do? (Challenge AND Opportunity)
  – New form of modeling
  – New analyses and computation

But.. we are uniquely positioned to take advantage
Signals that Operations Really Matters

• ISM survey
  – Increase in the weighting on inventories in index
• Inventory reflects effects in the economy (including credit ease)
• Firms appear to follow consistent procedures with our theories
• Firms that experience supply chain disruptions pay the price (sometimes permanently)
• SmartOps success
Hypothesis

• Operations has a first-order effect on the value of a firm

• Marketing and product development might also have first-order effects but…

• Financing has a second-order effect on the value of a firm
Some Support

From economics:
- Inventories fall when credit is tight and have a large impact on economic growth (Kashyap, et al. (1994))

From industry:
- ISM increased weight on inventories in Report on Business
From MSOM Research

- Supply chain problems reduce firm value
  - Hendricks and Singhal (2005)
- Inventories have a relationship with market performance
  - Chen, et al. (2005); Gaur and Seshadri (2005)
- Firms actually seem to follow some basic operations principles
  - Roumiatsev/Netessine (2007)
- Operational characteristics (inventory) may implicate managerial manipulation
  - Lai (2006)
Some Issues in Finance

• How and why do firms choose between debt and equity in financing operations? (question of capital structure)

• Why is there a value premium (i.e., what do “value” stocks have greater abnormal returns than “growth” stocks)? (value premium puzzle)
Capital Structure Theories

• Tradeoff (Modigliani/Miller (1958/1963))
  – Without market imperfections, firms are indifferent among capital structures (debt vs. equity)
  – Firms trade off the tax advantage of debt and the costs of financial distress to obtain an optimal capital structure

• Implications
  – Firms with higher profitability can support more debt and, therefore, should have higher market leverage (ratio of debt to the value of the firm)
Pecking Order Theory

• Myers/Majluf (1984)
  – Firms have private information that is signaled to the market through capital structure
  – Firms prefer first to use internal funds, followed by debt and then equity to finance investments

• Results
  – As firm profitability increases, firms use less debt and should have lower market leverage
Tradeoff Revisited

• Missing elements
  – Debt capacity of the firm is determined by expectations of future repayment capability which depends on current decisions
  – Time lag exists between purchasing commitments and realization of revenues
Decision Structure

• Period t Value, $V_t(k_t, z_t, D_{t-1}) =$

Max \{0, d_t + \beta_t \left[ \int_0^{b_t} (\alpha p_t s) dF_t(s) + \int_{b_t}^{e_t} (V_{t+1}(p_t s - D_t(1+r_t), x_t + z_t - s)) dF_t(s) + (\int_{e_t}^{x_t+z_t} (V_{t+1}((1-\tau) p_t s + \tau(K_t+c_t x_t + h_t z_t + r_t D_t) - D_t(1+r_t), x_t + z_t - s)) dF_t(s) + \int_{x_t+z_t}^{\infty} (V_{t+1}((1-\tau) p_t(x_t + z) + \tau(K_t+c_t x_t + h_t z_t + r_t D_t) - D_t(1+r_t), 0)) dF_t(s) \right] \} \}

subject to:

\[ K_t + c_t x_t + h_t z + d_t \leq k_t + D_t - (1+r_{t-1})D_{t-1} \]

\[ D_t = \beta_t \left( \int_0^{b_t} (\alpha p_t s) dF_t(s) + D_t(1+r_t) \int_{b_t}^{\infty} dF_t(s) \right) \]

\[ x_t \geq 0 \]

Note: Debt paid at end of period (if not in default)
Observations: Variable Costs

• Results in single period and multi-period with no fixed costs (Xu/JRB):
  – As margin increases, market leverage ($D_t/V_t$) is convex function of profit margin ($(p_t-c_t)/p_t$)
  – Initially, leverage decreases with increasing profit margin, but may eventually increase with high margins

• Explanation: at low margins, order point is low quantile of distribution; small increases lead to large increases in risk; hence, more costly debt
Fixed Cost Effects

- As fixed cost increases, the order quantile only changes through changes in bankruptcy point
- Overall effect is that increasing fixed cost, should raise breakeven point and lower the advantage of debt
- Net effect is that debt is decreasing as fixed costs increase
Net Income Predictions

• High Fixed Cost Firms:
  – Possible net losses
  – Higher net losses should have low leverage

• Low Fixed Cost Firms:
  – Should have positive net income
  – Higher net income should have convex relation to leverage as in variable-cost case
Predictions on Net Operating Margin

Leverage

High
Fixed

Low
Fixed

Total

Profit Margin

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MSOM, UMD, 6 June 2008
Other Predictions

- Inventory variation should be increasing in net income for firms with low fixed costs.
- Variable effects should be larger in industries with lower capital costs.
- For firms with high fixed costs and significant losses, inventory variation may also be high due to high volatility in potential revenues.
Hypotheses

**H1:** Firms with operating losses exhibit an increasing relationship between debt-to-market-value ratio and pre-tax operating margin.

**H2:** Firms with low positive operating margins exhibit a decreasing relationship between debt-to-market-value ratio and pre-tax operating margin.

**H3:** Firms with high positive operating margins may exhibit a increasing relationship between debt-to-market-value ratio and pre-tax operating margin, depending on the distribution of demand for the firm's products or services.

**H4:** The volatility of inventories is initially decreasing in operating margin as firm losses decrease to zero and then increases as operating margin becomes significantly positive.
Empirical Results

• Datasets:
  – Value line (Damodoran)
  – Compustat (CRSP)

• Approach
  – Cross-section of firms in years 1997-2006
  – Sort net operating margin by decile
  – Compare test statistics on neighboring deciles for market leverage and inventory
  – Group by industry
## US 2006 Valueline Data

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Valueline 2006 Chart

• Market leverage of pre-tax operating margin deciles
## US 2005 data

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Overall Results

• H1: Very strong support for increasing leverage with lower losses
• H2: Strong support for decreasing leverage as margins rise from zero
• H3: Some support for inter-industry comparison of increasing leverage at high margins
• H4: Strong support for U-shaped inventory volatility relationship to margins
Other Operational Question
Examples

- Operational issues may be keys to:
  - Global warming
  - Oil price (bubble?)
  - Sub-prime loan crisis
  - Bear Stearns collapse
  - Efficient health care allocation
  - Reasons for mergers (e.g., airlines/PG-Gillette)
What do we need to do?

• Look at the research around us
• Focus more on explaining and understanding why people do what they do
• Use data more (i.e., more empirical work)
• Focus on big issues
• Generate success stories
Conclusions

- MSOM does not get the respect it deserves
- We are partly to blame in not connecting with core drivers in other business disciplines and not validating with data
- Many opportunities to make operations the focus in addressing multiple large issues of interest to all
• Thank you and questions?