How to identify an appropriate research method and increase the rigor of your analysis

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For Presentation at

2014 IAAER Paper Development Workshop

Florence, Italy

November 15, 2014

Agenda

1. Does Accounting Matter? Why?

2. Key Features of Capital Market Based (Empirical) Accounting Research?

3. Research Methods & Rigor (DiD & Variants):Identifying the cause-effect relation

4. New Research Paradigm (Third Moment Approach) and New Research Ideas

Puzzle

- What would be the two most significant inventions in the entire history of human civilization?

Two Most Significant Inventions?

- **Invention of Wheel**

- **Invention of DEBS (Double-Entry Bookkeeping System)**

Does Accounting Matter?
Two Distinct Ways of Knowledge Creation

- **Invention of Wheel:**
  - **Natural Science**
  - Scientific discovery & technological innovation.
  - Discovery of new knowledge via Laboratory **Experiment**
- **Invention of DEBS:**
  - **Social Science**
  - Institutional infrastructure of any socio-economy.
  - Discovery of new knowledge by studying **History**: Archival-based empirical research.
- **A fascinating research question:** How is accounting quality related to discovery/technological innovations?
- **Is a natural experiment possible in archival-based accounting research???**

Key Features of Capital Market- Based Empirical Research

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┌─────────────────────────┐                    ┌─────────────────────────┐
│  Real Economic Sector   │ ─────────────────> │  Capital Market Sector  │
└─────────────────────────┘                    └─────────────────────────┘
            ↕                                               ↕
┌─────────────────────────┐                    ┌─────────────────────────┐
│ (E & BV) Summary of     │                    │ Mean/Variance/Tail Risk │
│ Value Creating Activities│ ─────────────────>│ of Stock Return         │
│ via                     │                    │ Distribution            │
│ Prod/Sales/Investment/  │                    │                         │
│ Financing               │                    │                         │
└─────────────────────────┘                    └─────────────────────────┘
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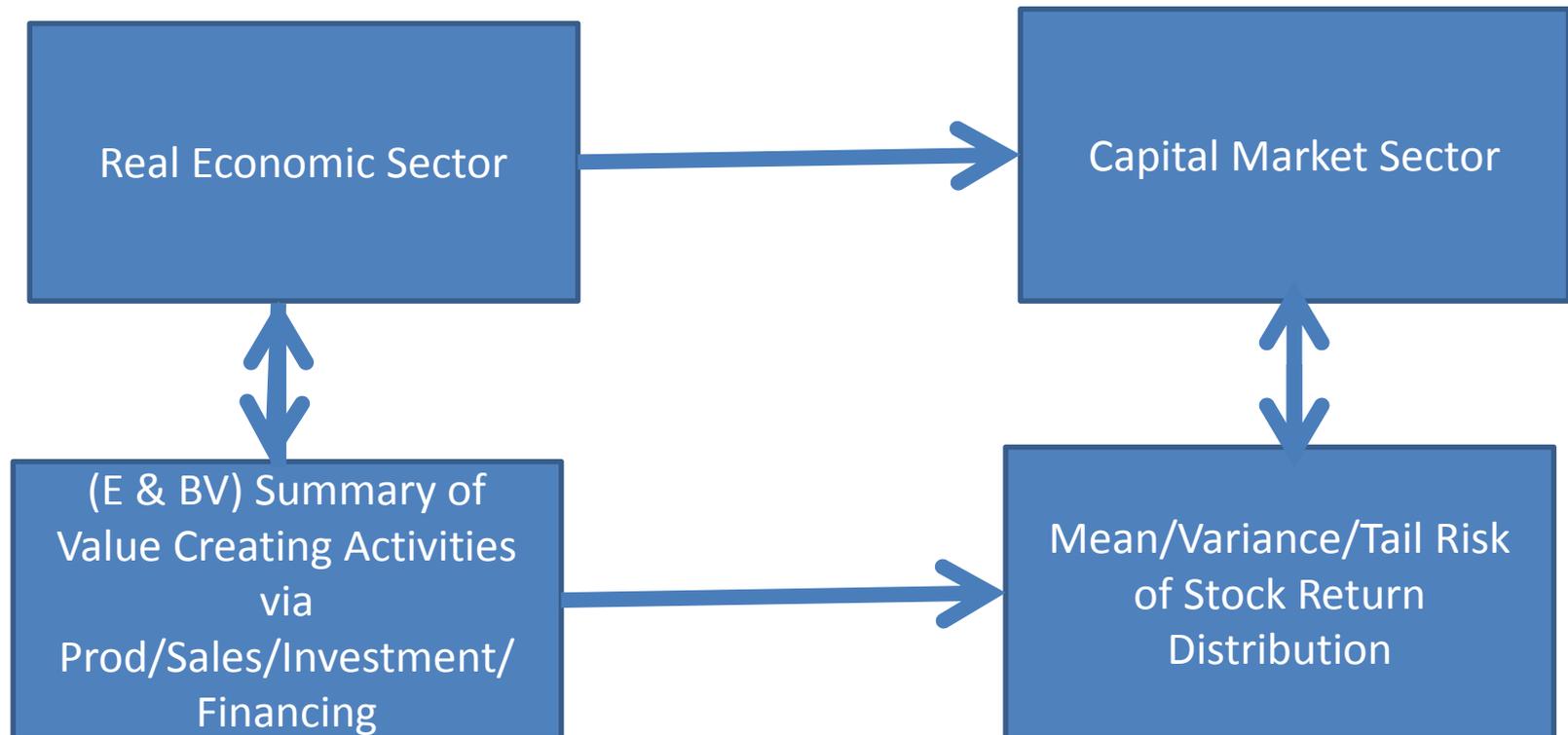
How to identify relevant research questions?
What are your research interests?

- Are you interested in how accounting values/amounts are related to mean, volatility or tail risk of return distributions? (**Long-window**, **association studies**)

- Are you interested in the impact of certain disclosures/announcements on return distributions? (**Short-window**, **event studies**)

- Are you interested in how new accounting standards and/or financial market regulations (e.g., Mandatory IFRS Adoption, SEC's XBRL Mandate) change the above relations?

  – New regulations often provide researchers with an opportunity for **Natural Experiments**.

Research Methods

- **Association Tests:**
  - Which Association?
  - The third moment approach

- **Natural Experiments** to examine the Impact of Accounting regulations
  - Difference in differences design and its variants

Which Association do you have in mind?

❑ **The first moment approach**, focusing mean of return distribution (Traditional ERC research)

- P = a. + b.E + b.BV

- $\Delta P(t)/P(t-1) = a + b.\Delta E/P(t-1) + c.\Delta BV(=E)/P(t-1)$

- $RET = \Delta P(t)/P(t-1) = a + b.\Delta E/P(t-1) + c.E/P(t-1)$

❑ **The second moment approach**, focusing on **symmetric volatility**: σ(RET) or Synchronicity, σ(E), σ(ΔE)

❑ **The third moment approach**, focusing on **asymmetric volatility**, downside risk, and/or extreme negative tail risk.

❑ **Direction for Future Research**

Under-researched, but Important, Question:

- How is accounting related to extreme **negative tail risk (stock price crash risk)** or extreme positive tail risk (jump risk)?

How is Accounting related to the third moment of return distribution, i.e., stock price crash? Information Hoarding Story

Managerial Incentives (One side?) → Bad News Hoarding → Stock Market Uninformed of Bad News (no price adjustments) → Bad News Accumulated within the Firm → Crash

•Stock/Options
•Termination
•Promotion
•Reputation
…

-Jin&Myers (JFE2006);
-Kothari, Shu & Wysocki (JAR2009)

Crash probability as a function of *CSCORE deciles*
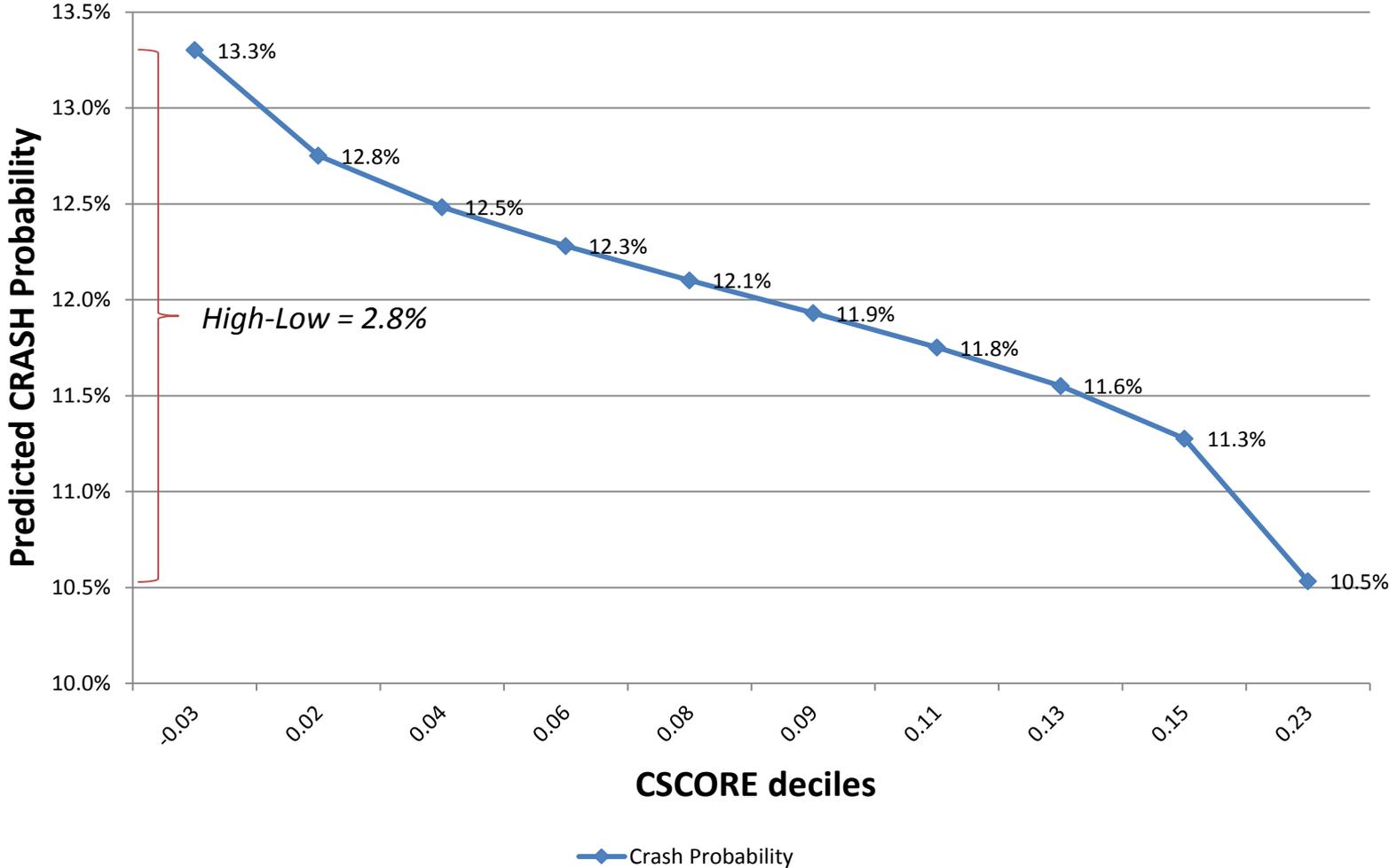
In many cases, Cross-sectional Association Tests are not sufficient.
Use Exogenous Shocks to strengthen cross-sectional associations!

- In many cases, a new regulation can be viewed as **an exogenous shock to the existing system**, thereby giving researchers an ideal setting of pre- vs. post-event comparison setting.

– Mandatory disclosure of ICW under SOX

– IFRS adoption by EU member countries

– The SEC's XBRL mandate

– Salary claw-back clause under Frank-Dodd Act

– Mandatory auditor rotation

– Privatization of SOEs in developing countries like China

Natural Experiment and Difference-in-Differences (DiD) Design

- **DiD, if applicable, is the best way of identifying the cause-effect relation.**
- **Y = A + b.Treat + c.Post + d.Treat*Post + Controls**
- Treat = 1 (0) for the treatment (control) sample
- Post = 1(0) for the post-event (pre-event) period
- Ideally, we want to show NO difference in effect between treatment and control during the pre-event period (**b insig**), and NO difference in effect between the pre- and post-event period for the control sample (**c insig**).
- We want to show that the **d-coeff** is significant.

	Pre-event (Post=0)	Post-event (Post =1)
Treatment sample (Treat =1)	A + **b**	A + **b** + **c** + **d**
Control sample (Treat =0)	A	A + **c**

When Natural Experiments are unavailable, How to increase the rigor of your analysis? (Part 1): Change Analysis and Firm Fixed Effect

- Try to apply **difference/change analyses** whenever possible, using:

  – Deviation from industry or other cross-sectional mean

  – Change relative to last year ($\Delta X = X_t - X_{t-1}$)

  – Help mitigate problems of **omitted correlated variables** and **reverse causality**

- **Firm fixed effect** regressions allow researchers to effectively control for time-invariant firm-specific factors (which omitted from the empirical model).

Firm Fixed Effect and Endogeneity

- Firm Fixed effect regressions also allow research to control for **time-invariant firm-specific factors**, and help address concerns about problems of omitted correlated vaiables and the associated endogeneity.

- For example, when examining the conservatism-crash relation, **endogeneity problems** arise in case that both crash risk and conservatism are correlated with:
  - Corporate governance mechanism
  - Manager quality
  - Other unknown factors

- To the extent that these governance or manager quality factors **remain relatively stable over time**, we can then alleviate this problem by using firm fixed effect regression for the panel data set.

When Natural Experiments are unavailable, How to increase the rigor of your analysis? (Part 2): Dynamic Effect Analysis

- Try to analyze inter-temporal dynamic effect, as suggested by Bertrand & Mullainathan (2003: JPE): **Y(t) refers to the event year**

- $Z = a0 + a1.Y(t-2) + a2.Y(t-1) + a3.Y(t) + a4.Y(t+1) + a5.Y(t+2) + CTLs$

    – If **a1, a2 = 0** & **a3, a4 ,a5 > (or <) 0**, then **the direction of causality** is strengthened.

    – |a1| =|a2|< |a3| < |a4| < or = |a5| suggests a **learning effect**.

    – Useful to address the potential **reverse causality**.

Table 8 Dynamic Effects of XBRL Adoption

Var.	(1) Ln (#All Investors)	(2) Ln (#Individual Investors)	(3) Ln (#Institutional Investors (Foreign))	(4) Ln (#Institutional Investors (Domestic))	(5) %Individual Investor Holdings	(6) %Institutional Investor Holdings (Foreign)	(7) %Institutional Investor Holdings (Domestic)
$Year_{t-1}$	0.013	0.026	0.003	-0.041	0.004	0.000	-0.004
	(0.456)	(0.168)	(0.751)	(0.182)	(0.299)	(0.582)	(0.161)
$Year_t$	0.026**	0.053**	0.034***	-0.074***	0.007**	0.003***	-0.010***
	(0.043)	(0.023)	(0.006)	(0.000)	(0.013)	(0.005)	(0.001)
$Year_{t+1}$	0.057**	0.084**	0.056	-0.091***	0.019***	0.007***	-0.026***
	(0.034)	(0.015)	(0.128)	(0.000)	(0.000)	(0.000)	(0.000)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm & Yr Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	18,032	18,032	18,032	18,032	18,032	18,032	18,032
Adj. R^2	0.018	0.012	0.215	0.127	0.120	0.065	0.109
$Year_t$ vs. $Year_{t+1}$ Diff: p-value	0.028	0.063	0.075	0.184	0.000	0.001	0.000

When Natural Experiments are unavailable, How to increase the rigor of your analysis? (Part 3): Self-selection Bias & Two-way Causation

Regulatory Mandate (Exogenous Event):

- Y = A + b.Treat + c.Post + d.Treat*Post + Controls

Voluntary Adoption (Endogenous Choice):

- Y = A + b.Treat + Controls

- **For voluntary choice, Need to check for self selection bias and related endogeneity**

  – **Heckman two-stage treatment effect model**

    Prob (Treat = 1) = a0 + a1.X1 + a2.X2 + a3.X3 + …

  – **2SLS Regressions**

  – **The Propensity Score Matching (PSM) is also useful for addressing self selection bias.**

Checks for Potential Endogeneity

1. **(Pre- v. Post-Adoption Comparison):** Using the sample of adopters only, check whether *SYNCH* decreases from the pre- to the post-adoption period.

2. **(Pre-Adoption Inherent Difference in *SYNCH*)** After dropping the post-adoption sample, check whether *SYNCH* differs between Never-Adopters and 'To-Be' Adopters in the pre-adoption period.

3. **2SLS**

4. **(PSM Sample):** We match IFRS Adopters to Never Adopters using the predicted likelihood (propensity score) estimated from Eq. (3) with a max. allowable of PS of 0.1% and with Never Adopters being in the same industry, country and year.

5. **(*GDiff* Effect):** If IFRS reporting is a driving force that causes a decrease in *SYNCH*, we expect that *SYNCH*-reducing effect of IFRS reporting should be greater for firms in countries with large *GDiff.*

Table 5: Results for addressing potential endogeneity checks

	(1) Pre- v. Post-Adoption (adopter sample)	(2) Never adopters v. 'To-Be' adopters	(3) 2SLS	(4) PSM sample	(5a) PSM sample, GDiff< Q1	(5b) PSM sample, Q1≤GDiff <Q2	(5c) PSM sample, Q2≤GDiff <Q3	(5d) PSM sample, Q3≤GDiff <Q4
DIFRS	-0.279** (-2.20)	-0.007 (-0.11)	-0.545*** (-6.96)	-0.251*** (-4.60)	-0.073 (-0.50)	-0.081 (-0.99)	-0.392*** (-4.22)	-0.508*** (-2.74)
Foll	0.009 (0.28)	0.024*** (2.93)	0.008 (1.02)	0.056*** (3.14)	0.014 (0.36)	0.040 (1.35)	0.139*** (4.05)	0.070 (0.98)
DIFRS *Foll	0.136*** (3.46)	-0.033 (-1.14)	0.205*** (5.92)	0.106*** (3.99)	-0.020 (-0.32)	0.004 (0.11)	0.170*** (3.94)	0.245*** (3.50)
N	1,160	14,318	15,382	3,327	640	981	1,435	271
R-Sq	43.02%	34.02%	34.51%	36.02%	39.70%	37.59%	38.77%	61.59%

New Direction & New Paradigm for Future Accounting Research: Third Moment Approach

- First moment approach in 1970-90:
  - Return-Earnings Association or **ERC**
  - **Typically contemporaneous mean relation**
- Second moment approach in 1990-2000
  - The impact of accounting choice or regulation on **return volatility** and **stock price synchronicity.**
  - The second moment approach inherently assumes **Symmetric Relation.**
- **Third moment approach in 2010 and onward: Focus on**
  - **Accumulated effect, rather than periodic or contemporaneous effect.**
  - **Extreme negative outliers or tail risk.**
  - **Bad news or poor performance**
  - **Asymmetric Relation, asymmetric payoff function, convex compensation function**

Suggestions on FUTURE Research Questions Consequences of Crash Risk

- Extant crash research focuses mainly on
  - Cross-firm determinants of crash risk, not the consequences.
- Crash risk is negative tail risk, and inherently related to **downside risk**, and thus, may be crucially important to debtholders.
- Crash risk reflects **accumulated effects**, and thus, **cannot be diversified away** unlike second-moment risk.
  - What about economic consequences of crash risk (using crash risk as the independent variable)?
  - Do debt market participants (e.g., bondholders, banks) anticipate crash risk in the equity market, and factor it into debt contracting, given that downside risk, not upside potential, is their primary concern?
  - Do short sellers (who trade on bad news) anticipate crash risk?
  - What would be the impact of crash risk on CDS premiums or spreads, given that CDS is an insurance vehicle for downside risk protection?

Ex Ante Expected Crash Risk vs. Ex Post Realized Crash Risk

- **Ex Post Actual CoC:**
  - **Realized**, actually observed stock return.
- **Ex Ante, Expected CoC:**
  - **Implied CoC**, i.e., IRR implied by a valuation model
  - Need (unobservable) earnings forecasts data and thus suffer from measurement errors.
- **Ex Post Actual (Realized) Crash risk:**
  - **Realized, actually observed crash risk** such as **CRASH, NCSKEW, DUVOL**, etc.
- **Ex Ante Expected Crash Risk: New Research Paradigm**:
  - **Implied Volatility Smirk** = **OTM Put Opt. IV − ATM Call Opt. IV**
  - **Less measurement errors involved.**

Concluding Remarks

- In archival-based research, it is difficult, if not impossible, to completely rule out alternative explanations.

- DiD design is the most powerful, but is applicable to only special circumstances where natural experiments are possible.

- Ask yourself whether your research question allows you to apply the DiD design.

- If not, it is necessary to conduct a variety of sensitivity checks.

THANK YOU!