Retail Inventory Productivity and Financial Performance
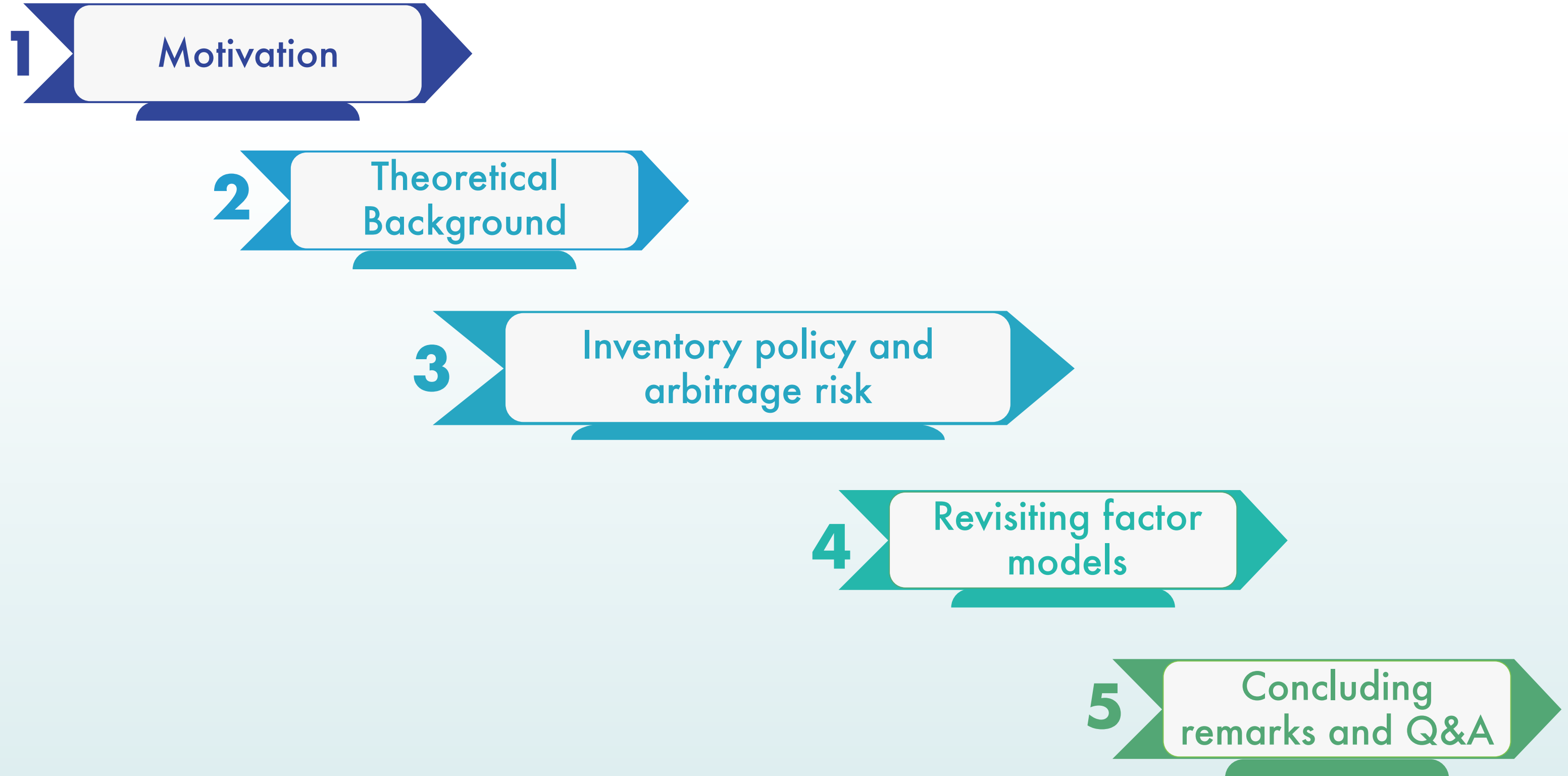
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Outline

1 Motivation

2 Theoretical Background

3 Inventory policy and arbitrage risk

4 Revisiting factor models

5 Concluding remarks and Q&A

Retailers' addiction to growth

- High growth objectives
- More stores
- More inventory
- Poor inventory management

Curing the Addiction to Growth

by Marshall Fisher, Vishal Gaur, Herb Kleinberger

Publication Date: January 01, 2017

In pursuit of double-digit top-line growth, many retailers relentlessly open new stores, even when doing so destroys the profitability of their businesses. This addiction is fueled by Wall Street and a capitalist culture that's obsessed with growth. It's hard to

Observation #1: Retailers would be prone to growth anomalies, which would lead to serious operational problems and deteriorating inventory productivity.

Some hedge funds make arbitrage investments

- David Berman Case
- Benchmark comparison
- High inventory turnover AND high operating profits
- Two apparel retailers
  - Joseph A Bank (high margin, low inventory turnover)
  - Men's Wearhouse (moderate margin, high inventory turnover)

Raman, Ananth, Vishal Gaur, and Saravanan Kesavan. "David Berman." Harvard Business School Case 605-081, April 2005. (Revised October 2006.)

Joseph A Bank vs Men's Wearhouse
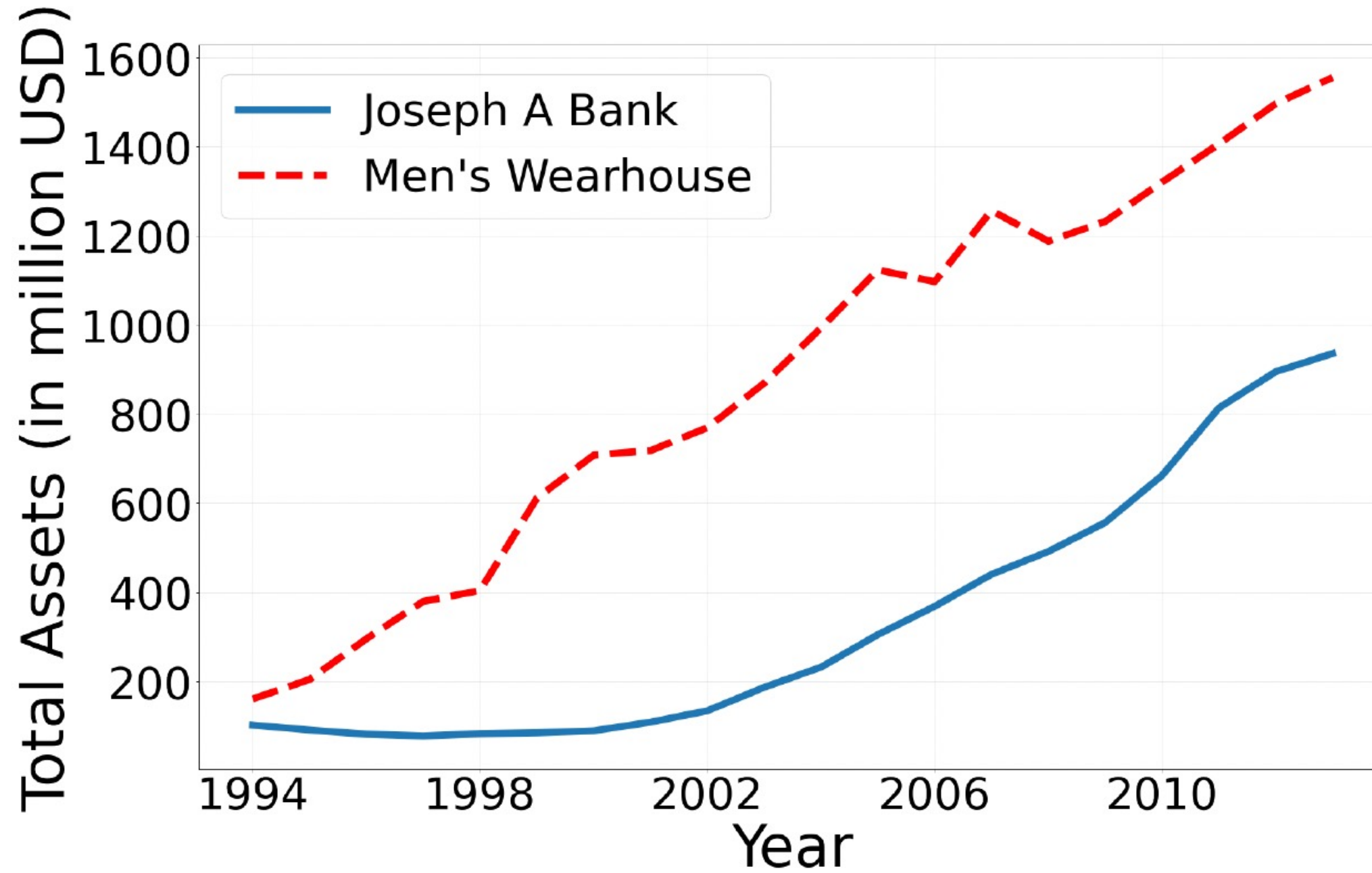
Theoretical Background

- ## Operations Management
  - Alan, Y., G. P. Gao, V. Gaur. 2014. Does inventory productivity predict future stock returns? A retailing industry perspective. Management Science 60(10) 2416-2434.
  - Ullrich, Kristoph KR, Sandra Transchel. 2017. Demand-supply mismatches and stock market performance: A retailing perspective. Production and Operations Management 26(8) 1444-1462.
  - Gaur, V., M. L. Fisher, A. Raman. 2005. An econometric analysis of inventory turnover performance in retail services. Management Science 51(2) 181-194.
  - Chen, Hong, Murray Z Frank, Owen Q Wu. 2007. US retail and wholesale inventory performance from 1981 to 2004. Manufacturing & Service Operations Management 9(4) 430-456.

- ## Finance
  - Frank, Murray Z, Tao Shen. 2016. Investment and the weighted average cost of capital. Journal of Financial Economics 119(2) 300-315.
  - Sharpe, William F. 1964. Capital asset prices: A theory of market equilibrium under conditions of risk. The Journal of Finance 19(3) 425-442.
  - Lintner, John. 1965. The valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets. The Review of Economics and Statistics 47(1) 13-37.
  - Fama, Eugene F, Kenneth R French. 1993. Common risk factors in the returns on stocks and bonds. Journal of Financial Economics 33 3-56.
  - Fama, Eugene F, Kenneth R French. 2015. A five-factor asset pricing model. Journal of Financial economics116(1) 1-22.

Arbitrage Risk: Existence

- Fama-French Five-factor model

$$R_{it} - R_{Ft} = a_i + b_i(R_{Mt} - R_{Ft}) + s_iSMB_t + h_iHML_t + r_iRMW_t + c_iCMA_t + e_{it}$$

- DuPont model

$$\text{ROA} = \frac{\text{Net Profit}}{\text{Cost of Goods Sold}} \times \frac{\text{Cost of Goods Sold}}{\text{Inventory}} \times \frac{\text{Inventory}}{\text{Total Assets}}$$

Observation #2: Although Inventory Turnover is part of ROA calculation, it is not included in the asset pricing models. Weighted Average Cost of Capital doesn't reflect the inventory risk.

Research Questions

1. Why do some retailers intentionally choose to assume higher levels of inventory risk?

    – Is this strategy justified given high growth targets?

2. How can inventory risk be better reflected in the valuation of a retailer's assets?

Analytical Results

- Postponement policy: Keeping excess inventory in stock at the book value, rather than selling it immediately at a discount

- Timely markdown policy: Sell excess inventory immediately, even at a salvage value that is less than purchasing cost

PROPOSITION 1. *The postponement policy leads to the announcement of a higher "Net Profit" and "Inventory" but a lower "Cost of Goods Sold" in expected value terms than the timely markdown policy.*

PROPOSITION 2. *There exists a threshold value for the total assets such that the postponement policy results in higher ROA than the timely markdown policy if the value of total assets exceeds the threshold value.*

Hypothesis development

- Postponement policy is not viable for small retailers (Proposition 2).
  - Small retailers that achieve high margins and inventory turnover outperform those inflating margins to _ultra_ high values while suffering from low inventory turnover
  - Not the case for big retailers. They may tend to inflate their margins to _ultra_ high values by following the postponement policy, rather than keeping both margins and inventory turnover high.
- There is a positive interaction effect of operating profits and inventory turnover on the ROA. Is the interaction effect persistent in the long term?

HYPOTHESIS 1. *There is a positive interaction effect of inventory turnover and operating profits on the next year's stock returns only for small retailers.*

Data description

- Time period: July 1983 to November 2018 (449 months)
- Financial data from Compustat; stock prices from CRSP databases
- NYSE median market cap used as a breakpoint to group retailers as small and big

Empirical Model

- Generalized method of moments with (potentially) invalid instruments

$$f(r_{it}) = r_{it} - \Big(b_0 + F_i + L_{t-1} + b_1 InventoryTurnover_{i(t-1)} + b_2 OperatingProfit_{i(t-1)}$$

$$+ b_3 OperatingProfit_{i(t-1)} \times InventoryTurnover_{i(t-1)}\Big),$$

$$m_0 = \frac{\sum_i \sum_t f(r_{it})}{n},$$

$$m_{1j} = \frac{\sum_i \sum_t f(r_{it})xj}{n}, \qquad \forall j \in \mathcal{J}_{exog},$$

$$m_{2j} = \frac{\sum_i \sum_t f(r_{it})zj}{n} - \frac{b_4}{\sqrt{n}\mathbb{E}[zj]}, \qquad \forall j \in \mathcal{J}_{inst},$$

Number of observations: 1696

Hansen J: 0.6262

Prob (Hansen J): 0.429

R-square: 0.282

	Estimate	Standard Error	z-value	$\Pr(>|z|)$
b_0	-0.0203	0.021	-0.964	0.335
b_1	0.0011*	0.001	1.810	0.070
b_2	-0.1068***	0.032	-3.334	0.001
b_3	0.0011**	0.000	2.713	0.007
b_4 (bias term)	-0.0013	0.017	-0.074	0.941

Significance levels: *** ≤ 0.001; ** ≤ 0.05; * ≤ 0.1

Results-Big Retailers

Number of observations: 867				
Hansen J: 0.06408				
Prob (Hansen J): 0.800				
R-square: 0.347				
	Estimate	Standard Error	z-value	$Pr(>|z|)$
b_0	0.0088	0.017	0.516	0.606
b_1	0.0016**	0.001	3.148	0.002
b_2	0.0274	0.025	1.094	0.274
b_3	-7.559e-05	0.000	-0.295	0.768
b_4 (bias term)	0.0085	0.015	0.582	0.561
Significance levels: *** ≤ 0.001; ** ≤ 0.05; * ≤ 0.1				

An additional factor

- Fast-minus-Slow (FMS): Inventory turnover median used to group retailers

$$R_{it} - R_{Ft} = \alpha_i + \beta_i(R_{Mt} - R_{Ft}) + \theta_i SMB_t + \omega_i HML_t + \phi_i RMW_t + \gamma_i CMA_t + \xi FMS_t + \epsilon_{it}$$

FMS (IT) Dependent variable: all Size-IT portfolios	S	F	S	F
	α_i		$t(\alpha_i)$	
S	0.009	0.007	5.347***	4.472***
B	0.007	0.009	4.301***	5.469***
	β_i		$t(\beta_i)$	
S	0.875	0.904	21.042***	23.212***
B	0.896	0.867	22.615***	21.697***
	θ_i		$t(\theta_i)$	
S	0.732	0.804	16.614***	19.485***
B	-0.189	-0.261	-4.495***	-6.165***
	ω_i		$t(\omega_i)$	
S	0.122	-0.085	2.421**	-1.804*
B	-0.161	0.047	-3.345***	0.960
	ϕ_i		$t(\phi_i)$	
S	0.122	-0.023	2.490**	-0.510
B	0.060	0.206	1.293	4.370***
	γ_i		$t(\gamma_i)$	
S	0.014	0.030	0.297	0.680
B	-0.037	-0.053	-0.816	-1.163
	ξ_i		$t(\xi_i)$	
S	-0.862	0.426	-18.416***	9.720***
B	-0.586	0.126	-13.125***	2.802***

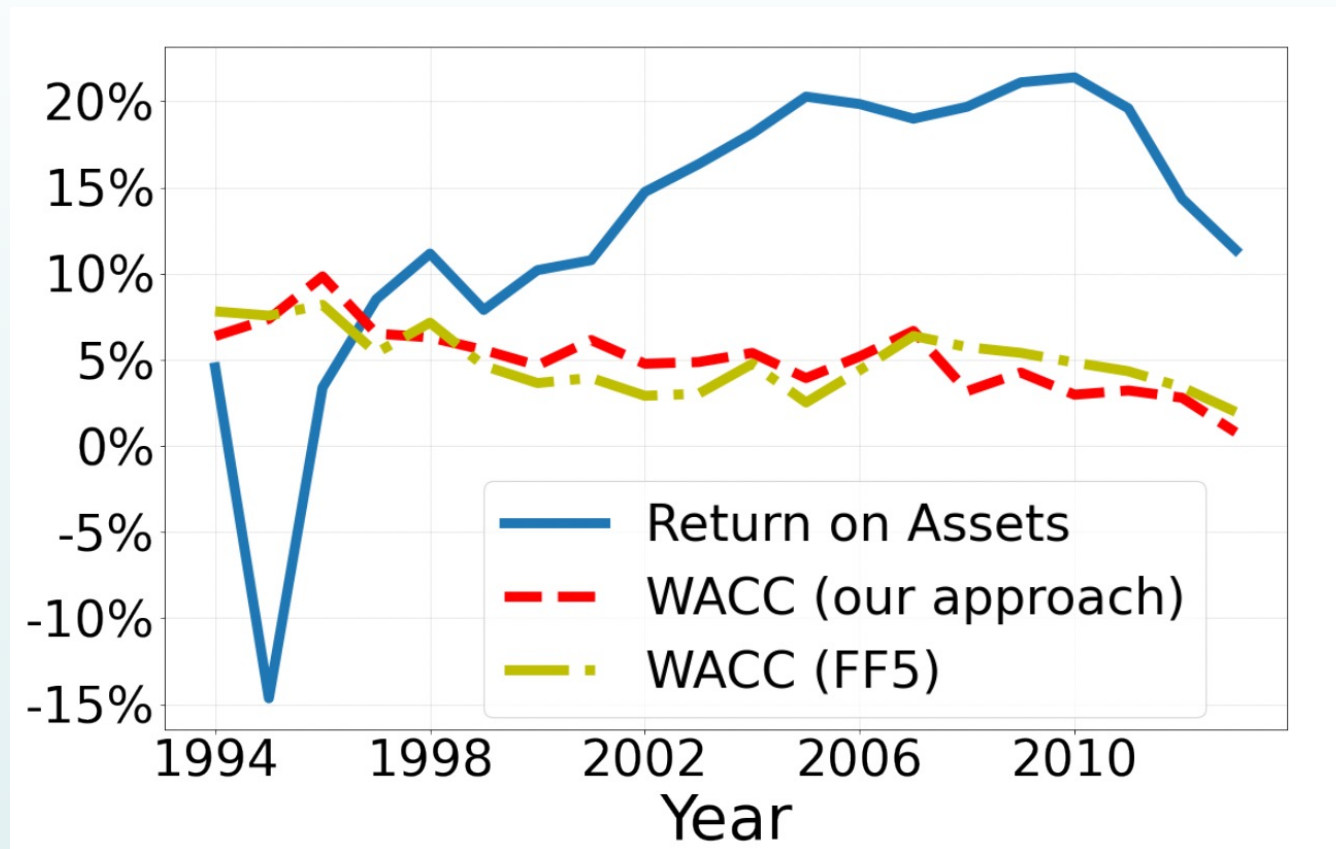Note: *p<0.1; **p<0.05; ***p<0.01
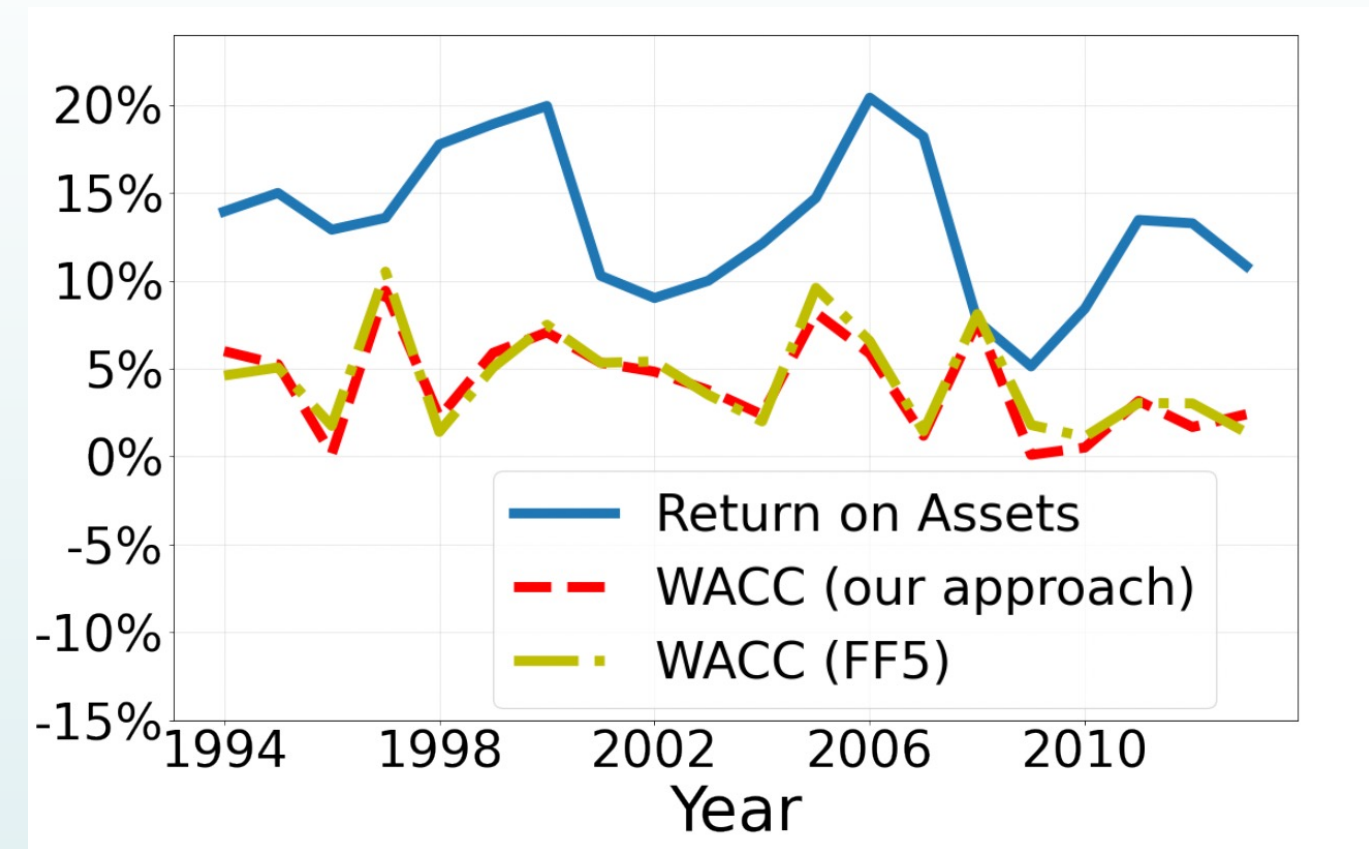
Case Analysis (Jos A Bank vs Men's Wearhouse)
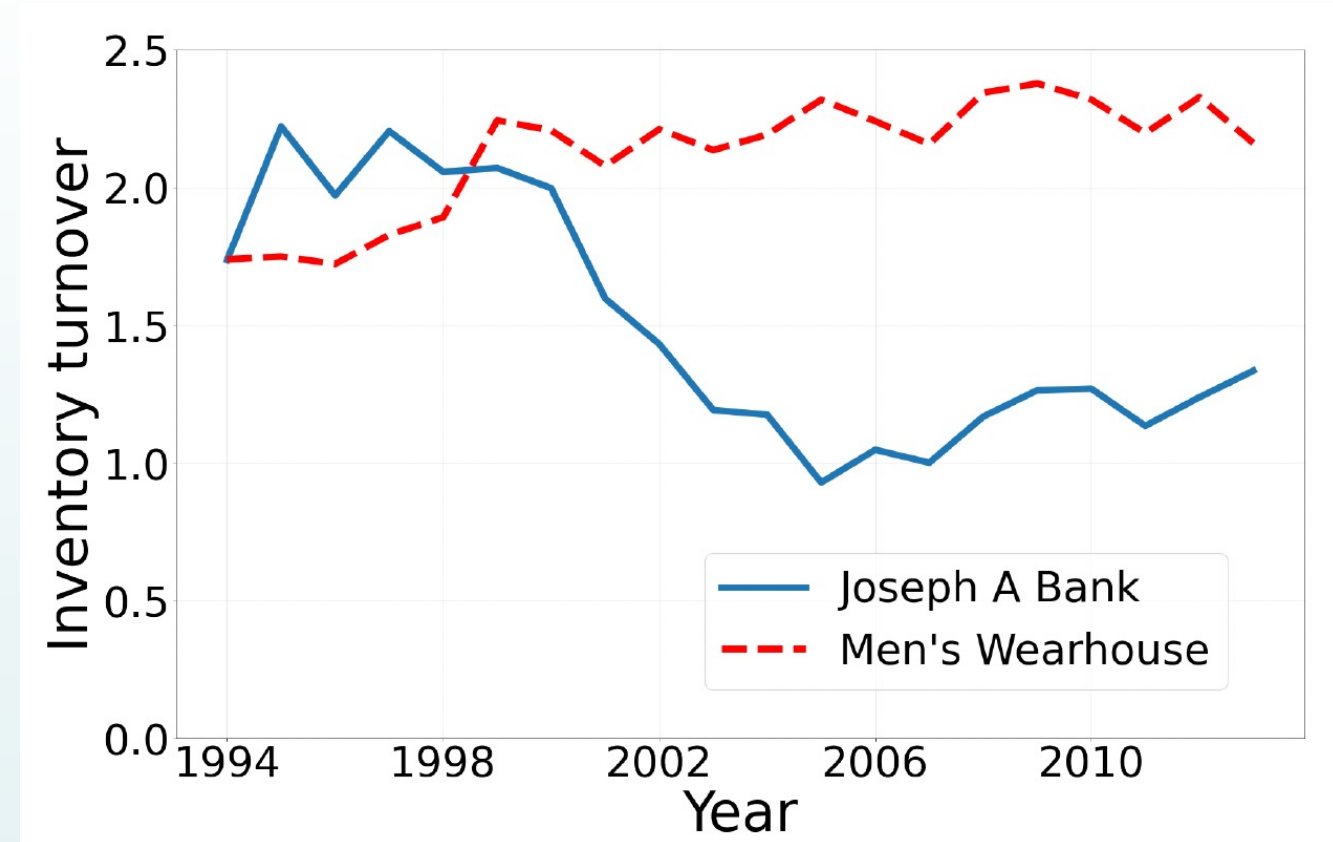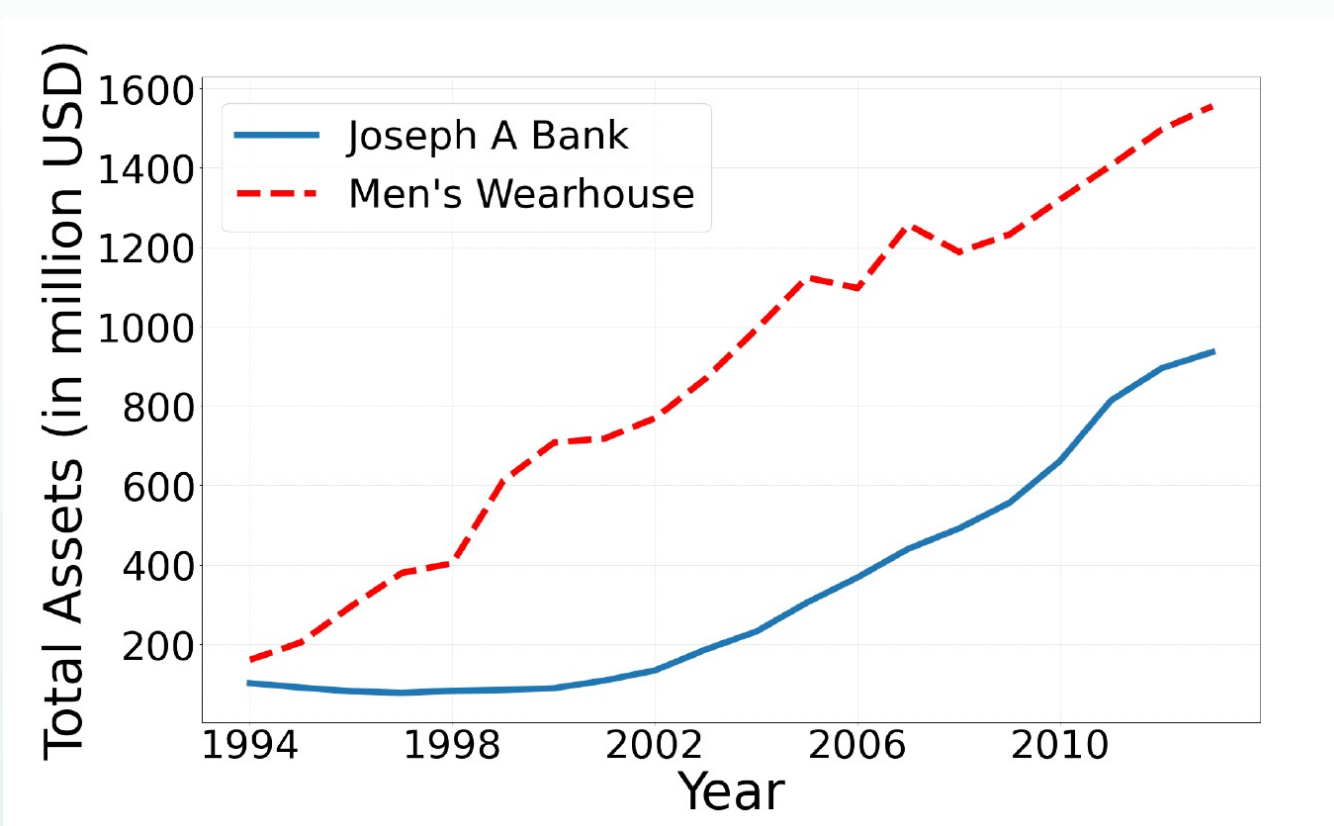
Joseph A Bank

Men's Wearhouse

Concluding Remarks

- Stock returns and ROA of retailers are influenced by inventory turnover, operating profits, and their interaction effect

- Inventory turnover has a persistent positive impact on stock returns for all retailers (Alan et al. 2014)

- Interaction effect is positive and persistent only for small retailers when inventory turnover exceeds a threshold value

- Inventory turnover should be used in factor models to calculate the cost of capital. Otherwise, retailers would face financial instability and unhealthy growth

Thank you

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