Stock Market Performance of US Service Sector Firms during the Current Financial Crisis

Kwang Soo Cheong

Johns Hopkins University

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“How has the US service sector fared in terms of stock market performance in the current financial crisis?”

This study intends to find answers to this question by comparing the stock return and risk characteristics of US service sector firms between the pre-Lehman collapse and post-Lehman collapse periods.

US Service Sectors/Service-Providing Sectors

What is the service Sector?

Conceptual Definition

- “A service is the benefits of another person’s effort. It is an intangible object that one cannot claim ownership over, such as a haircut.”

- “A service is a change in the condition of a person, or a good belonging to some economic entity, brought about as the result of the activity of some other economic entity, with the approval of the first person or economic entity.”

- “We all know a good when we see one: We can look at it, feel it, weigh it, and, in some cases, eat it, sit on it, or swing a bat on it. Not so with a service: When you get a medical checkup, a haircut, or a car wash, the *effects* of the service may linger, but the service itself is used up the moment it is produced. Nonetheless, final services count in GDP in the same way as final goods.”

In Practice

- The service sector (or service providing sector) is a smorgasbord of firms providing widely different services. For example, Internet providers, the health care industry, the banking industry, the education system, and the entertainment industry.

- Services have become increasingly important in recent decades.

- The service sector has grown from a third of U.S. output in 1950 to well over half in 2009.

Share of Service Sector in the US Economy (%)

	Relative to Total Economy		Relative to Private Economy	
	Output	Employees	Output	Employees
1990	76.26	78.33	72.44	73.95
1991	77.44	79.16	73.67	74.85
1992	77.91	79.68	74.27	75.43
1993	78.17	79.95	74.63	75.81
1994	77.77	80.07	74.27	76.03
1995	77.95	80.26	74.54	76.34
1996	77.97	80.44	74.65	76.63
1997	78.07	80.55	74.88	76.83
1998	78.33	80.66	75.23	77.03
1999	78.86	81.03	75.90	77.49
2000	78.80	81.30	75.84	77.79
2001	79.98	81.89	77.14	78.44
2002	80.54	82.69	77.69	79.27
2003	80.72	83.22	77.85	79.88
2004	80.48	83.35	77.63	80.07
2005	80.32	83.40	77.48	80.17
2006	80.56	83.44	77.78	80.26
2007	81.11	83.85	78.39	80.75

Source: Economic Report of the President 2009

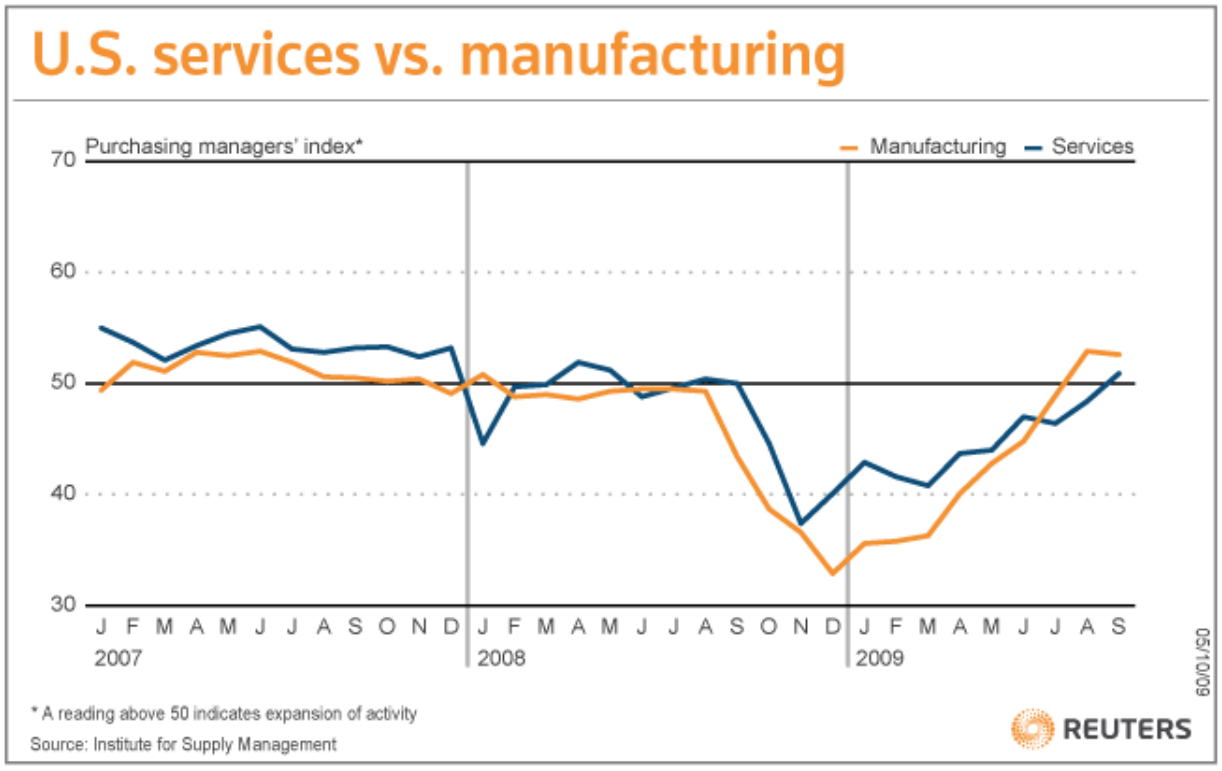
- Measured in terms of output, service sector has generally grown for decades but there were times when the sector shrank compared to the previous year.

- Measured in terms of employment, service sector has grown every year without exception.

Different Recovery Speeds & Patterns

- Institute for Supply Management (ISM)'s Service Index: Service sector employment contracted slower in December than in November 2009, with a reading of 44.0 vs. 41.6.

- ADP Employment Report: the US economy lost 43,000 manufacturing jobs while adding 12,000 service sector jobs in December 2009.



Reuters graphic/Stephen Culp

Selected Service Sectors and Data

- Identification & Classification in US
  - Standard Industrial Classification (SIC)
  - North American Industry Classification System (NAICS) --- used in Service Annual Survey by Department of Commerce
  - Institute for Supply Management's Non-Manufacturing (Services) Index
  - Industry Classification Benchmark (ICB, http://www.icbenchmark.com/)

- Service Sectors: Consumer Service, Financial Services, Banks, Health Care Providers

- Benchmark Sectors: Consumer Goods, Aggregate (all US-traded stocks)

- Data were downloaded from Dow Jones Indexes (http://www.djindexes.com/mdsidx/index.cfm?event=showtotalMarketIndexData)

1. US Stocks ("Aggregate")

   95% market capitalization coverage of US stocks

2. Consumer Goods (#3000)

   Automobile, Food & Beverage, Household Goods such as appliances, toilet papers, consumer electronics, toys, clothing & shoes.

   Procter & Gamble, Coca Cola, PepsiCo, Philip Morris, Monsanto, Ford, etc.

3. Consumer Services (#5000)

   Retail, Media & Entertainment, Travel & Leisure, etc.

   Wal-Mart, McDonalds, Walt Disney, Home Depot, CVS, Amazon, Time Warner, etc.

4. Health Care Providers

   Health Care Sector (#4500) = Health Care Providers & Equipment (# 4530) + Pharmaceuticals & Biotechnology (#4570)

   United Health Group, Medco Health, Aetna, CIGNA, Quest Diagnostics, etc.

5. Financial Services

   Financial Sector (#8000) = Banks (#8300) + Insurance (#8500) + Real Estate (#8600) + Financial Services (#8700)

   Asset Managers, Credit Cards, Investment Services, Mortgage Finance, Investment Trusts, etc.: Goldman Sachs, American Express, VISA, Morgan Stanley, etc.

6. Banks (#8300)

   Retail banking: JP Morgan, Wells Fargo, Bank of America, Citigroup, etc.

Methods

Descriptive Analysis

Sharpe Ratios

Jensen's Alpha

Relative Risk

Tests for Spanning

Tests for Granger Causality

Standard Deviation of Index Component Returns

Tests for Dynamic Risk-Return Tradeoff

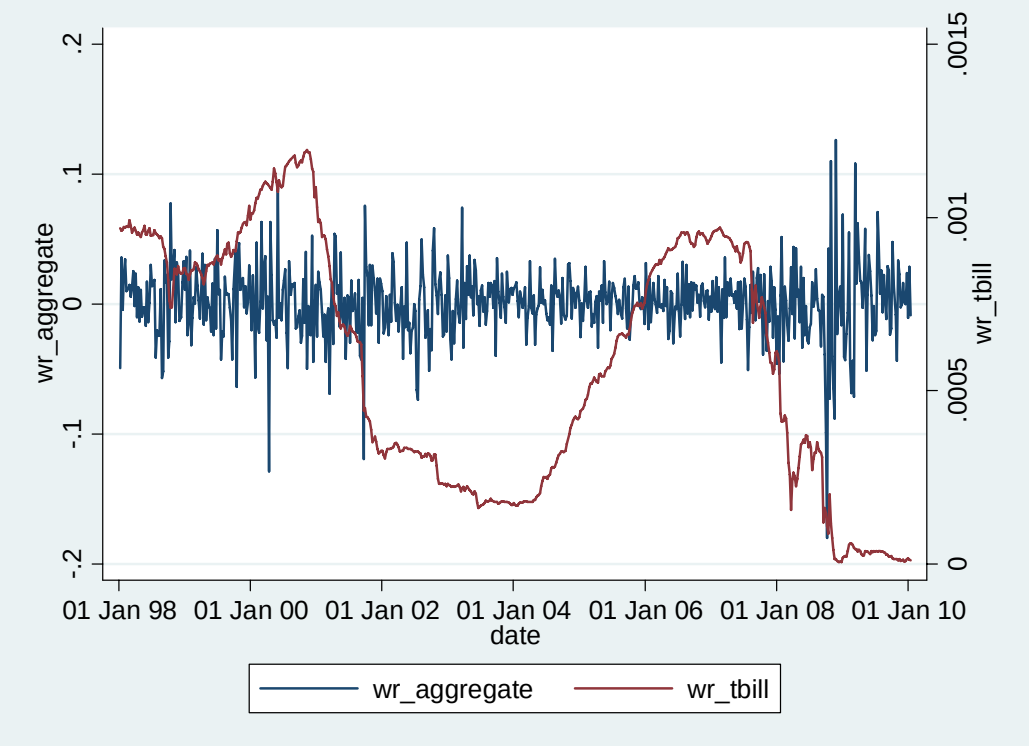
Tests for Endogenous Structural Break

(Somewhat related) Previous Studies

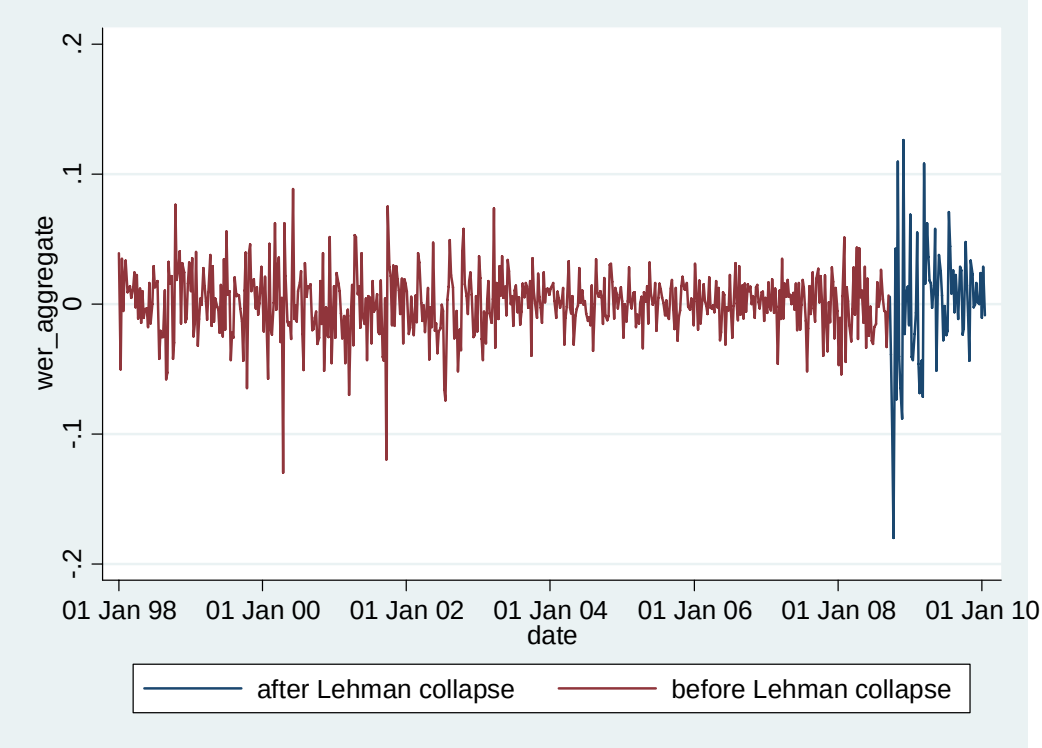
Industry structure and financial performance: Hou and Robinson (2006)

Industry-specific stock returns: Beller et al. (1998), Halla Yang (2007), Fairfield (2009)

Weekly return of US Stocks vs. Risk-free rate of return

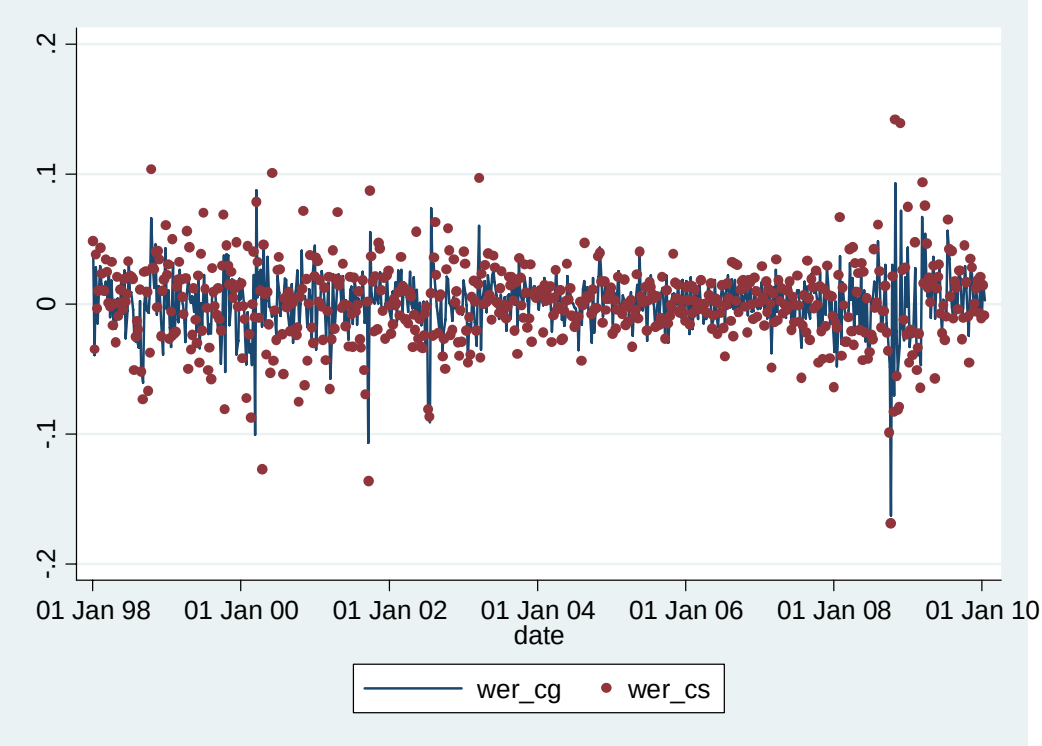


Weekly excess return of US Stocks

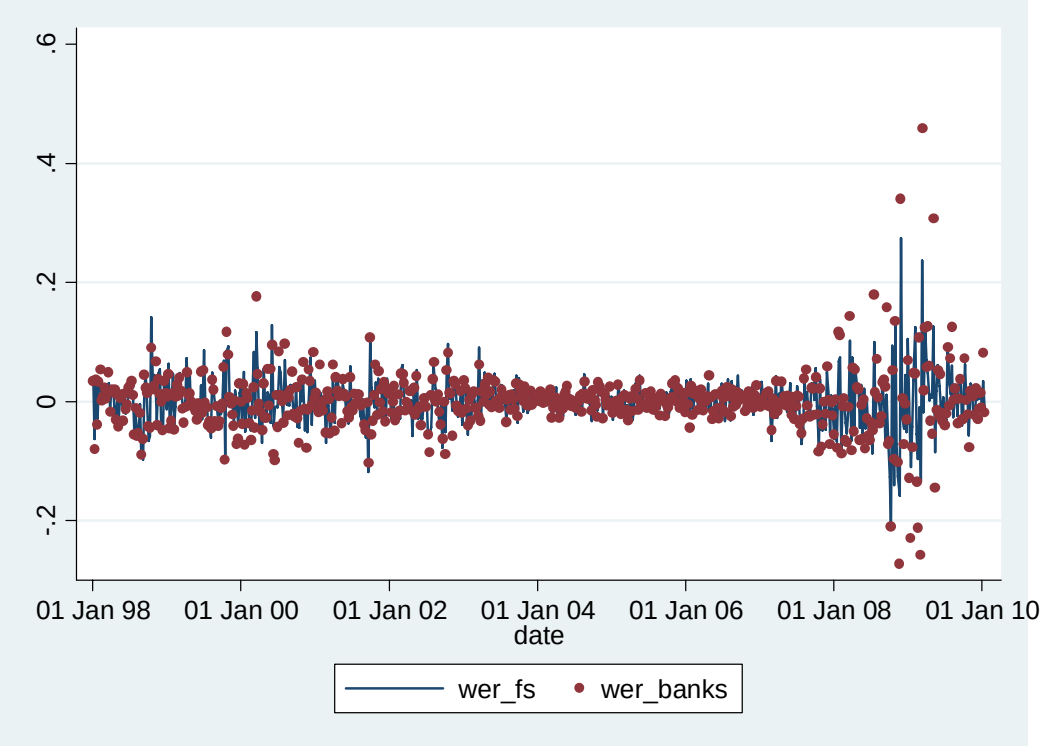


2008.9.15 --- Wall Street banking giant Lehman Brothers filed for Chapter 11 bankruptcy.

Consumer Goods vs. Consumer Services

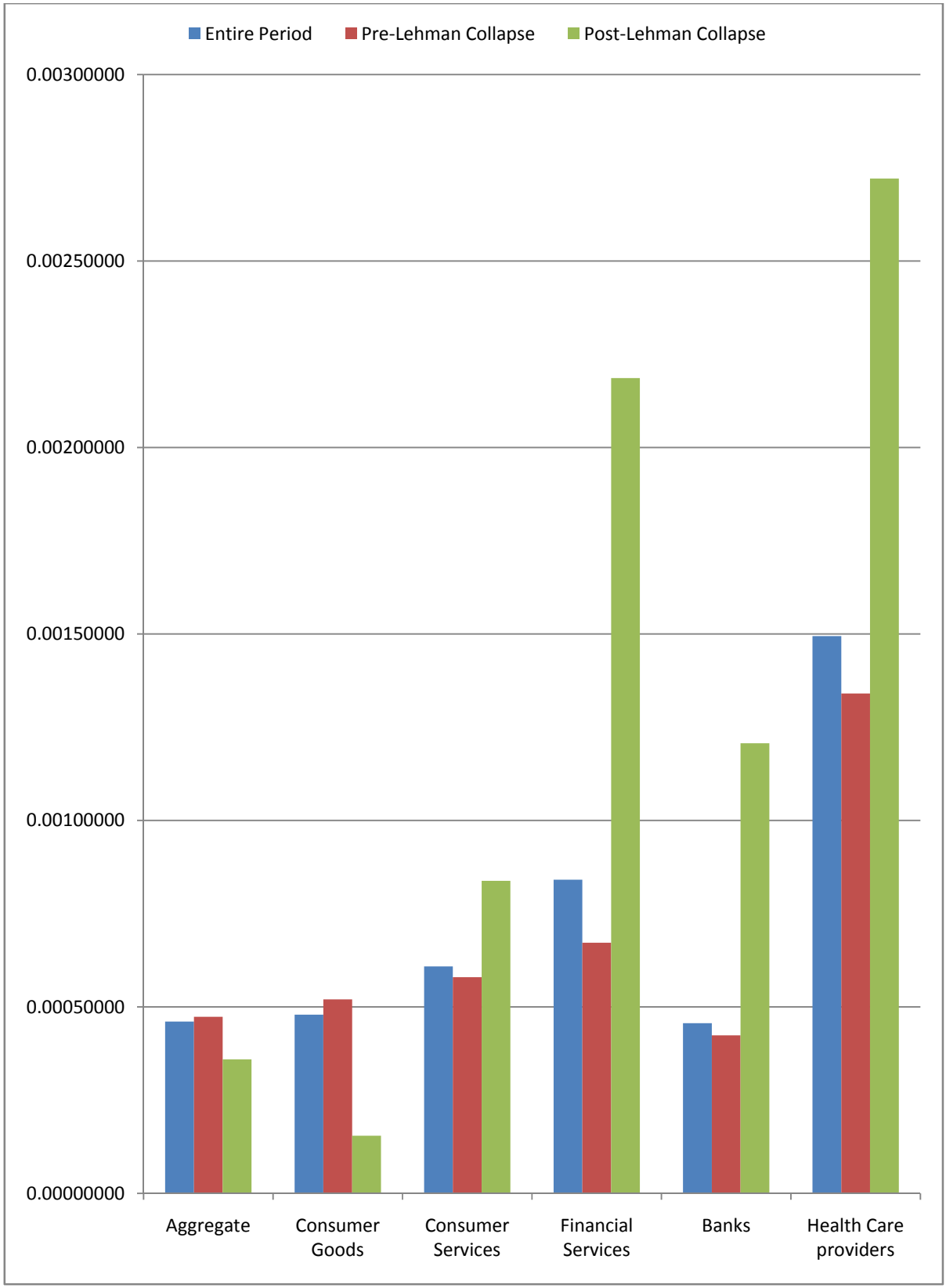


Financial Services vs. Banks



Mean of Weekly Returns

	Entire Period	Pre-Lehman Collapse	Post-Lehman Collapse
Aggregate	0.00046090	0.00047360	0.00035910
Consumer Goods	0.00047920	0.00051990	0.00015460
Consumer Services	0.00060860	0.00057980	0.00083800
Financial Services	0.00084080	0.00067200	0.00218630
Banks	0.00045630	0.00042350	0.00120690
Health Care providers	0.00149420	0.00134030	0.00272120


Entire Period
Pre-Lehman Collapse
Post-Lehman Collapse
0.00300000
0.00250000
0.00200000
0.00150000
0.00100000
0.00050000
0.00000000
Aggregate
Consumer Goods
Consumer Services
Financial Services
Banks
Health Care providers

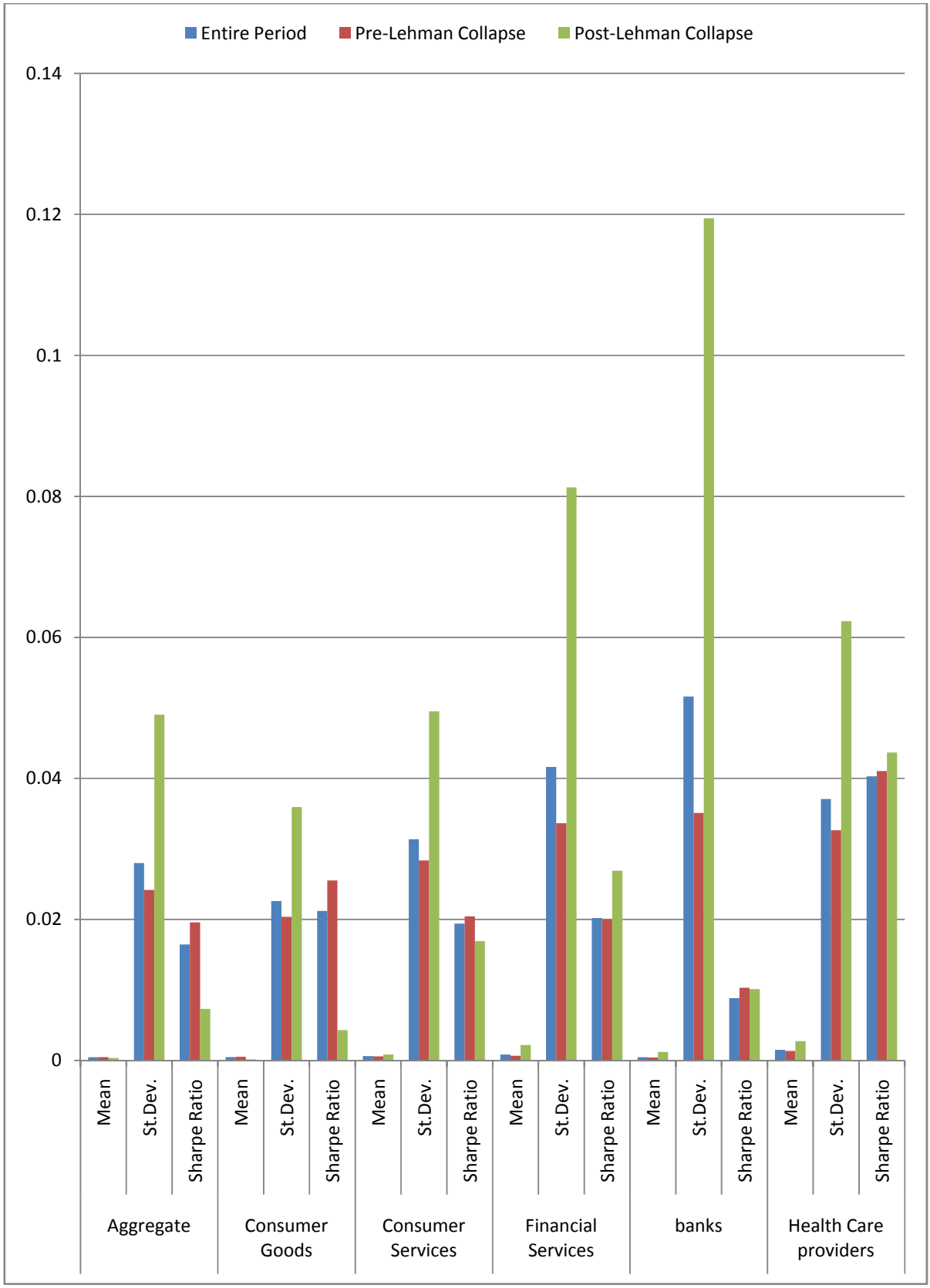
- The average (weekly) stock returns of service sector firms increased after the Lehman collapse, and the increase was most marked for Financial Services.

- In contrast, Consumer Goods had stock returns decreased after the Lehman collapse as is the case with an average US firm (the Aggregate Sector).

- A higher return could be only an artifact of higher risk, and we compared the risk-adjusted returns using the Sharpe Ratios, which is widely used as a performance measure of investment portfolios.

Sharpe Ratios

		Entire Period	Pre-Lehman Collapse	Post-Lehman Collapse
Aggregate	Mean	0.0004609	0.0004736	0.0003591
	St.Dev.	0.0279953	0.0241738	0.0490351
	Sharpe Ratio	0.0164619	0.0195922	0.0073236
Consumer Goods	Mean	0.0004792	0.0005199	0.0001546
	St.Dev.	0.0225965	0.0203662	0.0359361
	Sharpe Ratio	0.0212054	0.0255269	0.0043018
Consumer Services	Mean	0.0006086	0.0005798	0.000838
	St.Dev.	0.0313766	0.028363	0.0495175
	Sharpe Ratio	0.0193966	0.0204431	0.0169224
Financial Services	Mean	0.0008408	0.000672	0.0021863
	St.Dev.	0.0416197	0.0336368	0.0812705
	Sharpe Ratio	0.020201	0.0199772	0.0269011
banks	Mean	0.0004563	0.0004235	0.0012069
	St.Dev.	0.0516212	0.0351017	0.1194467
	Sharpe Ratio	0.0088386	0.0103156	0.0101039
Health Care providers	Mean	0.0014942	0.0013403	0.0027212
	St.Dev.	0.0370748	0.0326501	0.0623157
	Sharpe Ratio	0.0403034	0.0410511	0.0436681


Entire Period
Pre-Lehman Collapse
Post-Lehman Collapse
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Mean
St.Dev.
Sharpe Ratio
Aggregate
Consumer Goods
Consumer Services
Financial Services
banks
Health Care providers

- Only the two sectors of Financial Services and Health Care Providers showed improved performance after the Lehman collapse.

- Consumer Services and Banks experienced a greater increase in risk, which outweighed the increase in return after the Lehman collapse.

- Consumer Goods outperformed all three service sectors but Health Care Providers before the Lehman collapse, but it became outperformed by all service sectors after the Lehman collapse.

- Overall Health Care Providers showed the highest performance.

- Consumer Goods experienced the most significant decrease after the Lehman collapse.

A more systematic assessment of stock market performance was conducted using three kinds of statistical tests based on the regression results obtained with the Newey-West standard errors:

(i) Tests on the existence of Jensen's Alpha: whether a service sector systematically performs better than the benchmark sector.

(ii) Tests on the magnitude of relative risk: whether a service sector is characterized by higher risk than the benchmark sector.

(iii) Tests on mean-variance spanning by the benchmark portfolio: whether the performance of a service sector can be replicated by the benchmark sector.

Results of All Three Tests

	Sample Period	Tests about Jensen's Alpha	Tests about Relative Risk	Tests about Spanning	Benchmark
		"Has no extra (risk-adjusted) return in comparison with the benchmark."	"Has no extra risk in comparison with the benchmark."	"Has the (mean-variance) performance replicated by the benchmark."	
Consumer Goods	Pre-Lehman Collapse	Yes	No (but less than 1)	No	Aggregate
	Post-Lehman Collapse	Yes	No (but less than 1)	No	
Consumer Services	Pre-Lehman Collapse	Yes	Yes	Yes	Aggregate
	Post-Lehman Collapse	Yes	Yes	Yes	
	Pre-Lehman Collapse	Yes	Yes	Yes	Consumer Goods
	Post-Lehman Collapse	Yes	No (but greater than 1)	No	
Health Care Providers	Pre-Lehman Collapse	Yes	No (less than 1)	No	Aggregate
	Post-Lehman Collapse	Yes	Yes	Yes	
	Pre-Lehman Collapse	Yes	No (less than 1)	No	Consumer Goods
	Post-Lehman Collapse	Yes	Yes	Yes	
Financial Services	Pre-Lehman Collapse	Yes	No (but greater than 1)	No	Aggregate
	Post-Lehman Collapse	Yes	No (but greater than 1)	No	
	Pre-Lehman Collapse	Yes	Yes	Yes	Consumer Goods
	Post-Lehman Collapse	Yes	No (but greater than 1)	No	

Banks	Pre-Lehman Collapse	Yes	Yes	Yes	Aggregate
	Post-Lehman Collapse	Yes	No (but greater than 1)	No	
	Pre-Lehman Collapse	Yes	Yes	Yes	Consumer Goods
	Post-Lehman Collapse	Yes	No (but greater than 1)	No	
	Pre-Lehman Collapse	Yes	No (less than 1)	No	Financial Services
	Post-Lehman Collapse	Yes	No (but greater than 1)	Yes	
	Sample Period	Tests about Jensen's Alpha	Tests about Relative Risk	Tests about Spanning	Benchmark
		"Has no extra (risk-adjusted) return in comparison with the benchmark."	"Has no extra risk in comparison with the benchmark."	"Has the (mean-variance) performance replicated by the benchmark."	

(i) Tests on the existence of Jensen's Alpha:

- None of the four service sectors considered exhibited non-negligible Jensen's Alpha regardless of the benchmarks (Consumer Goods or Aggregate) and sample periods (pre-Lehman collapse or post-Lehman collapse).

- In other words, we do not find evidence that service sector firms had systematically high excess return relative to the consumer goods manufacturing sector.

(ii) Tests on the magnitude of relative risk with Consumer Goods serving as the benchmark sector.

- The test results on relative risks are mixed and dependent upon the sectors and sample periods considered.

- The three sectors of Consumer Services, Financial Services and Banks showed no extra risk during the pre-Lehman collapse period, but Health Care Providers showed relatively less risk.

- However, the relative risk for Health Care Providers increased to the level comparable to Consumer Goods after the Lehman collapse.

- This phenomenon of increased risk is, in fact, found for the other three sectors in that their relative risk became higher than Consumer Goods after the Lehman collapse.

Aggregate Sector as the benchmark:

- Consumer Services and Banks had the same risk as the benchmark, Health Care Providers had relatively less risk, and Financial Services had higher risk until the Lehman collapse.

- After the Lehman collapse, Health Care Providers, Financial Services and Banks showed increased relative risk whereas Consumer services showed the same risk relative to the benchmark.

- Given that the general trend is showing increased risk relative to the US average stock, what stands out as an interesting case is Consumer Services, which showed the relatively same risk as the average stock both before and after the Lehman collapse.

(iii) Tests on mean-variance spanning by the benchmark portfolio with Consumer Goods serving as the benchmark sector.

- No service sector had the same answer before and after the Lehman collapse. Consumer Services, Financial Services and Banks were spanned in the pre-Lehman collapse period but not spanned any longer in the post-Lehman collapse period.

- In contrast, Health Care Providers became spanned after the Lehman collapse.

- In this sense, the Lehman collapse was a significant "structural break" event, which triggered a substantial change in the performance patterns of service sector firms.

- An additional spanning test for Banks against Financial Services finds that Banks were not spanned before the Lehman collapse but became spanned afterwards.

Aggregate Sector as the benchmark:

- The same results remain for Health Care Providers and Banks; however, Consumer Services and Financial Services showed different results.

- Consumer Services remained spanned but Financial Services remained unspanned.

- It is an interesting contrast that Consumer Services were spanned both before and after the Lehman collapse whereas Consumer Goods were never spanned.

Remember the question:

“How has the US service sector fared in terms of stock market performance in the current financial crisis?”

Now my answers are…

- Different service sectors exhibited different stock market performances assessed using various risk and return characteristics.

- While their risk-adjusted return became higher than the consumer goods manufacturing sector after the Lehman collapse, no single pattern covers the four service sectors considered when comparing the pre-Lehman and post-Lehman periods.

- In fact, this non-uniformity is also found in the additional analyses conducted to examine dynamic relationships among sectors, such as the Granger Causality tests.

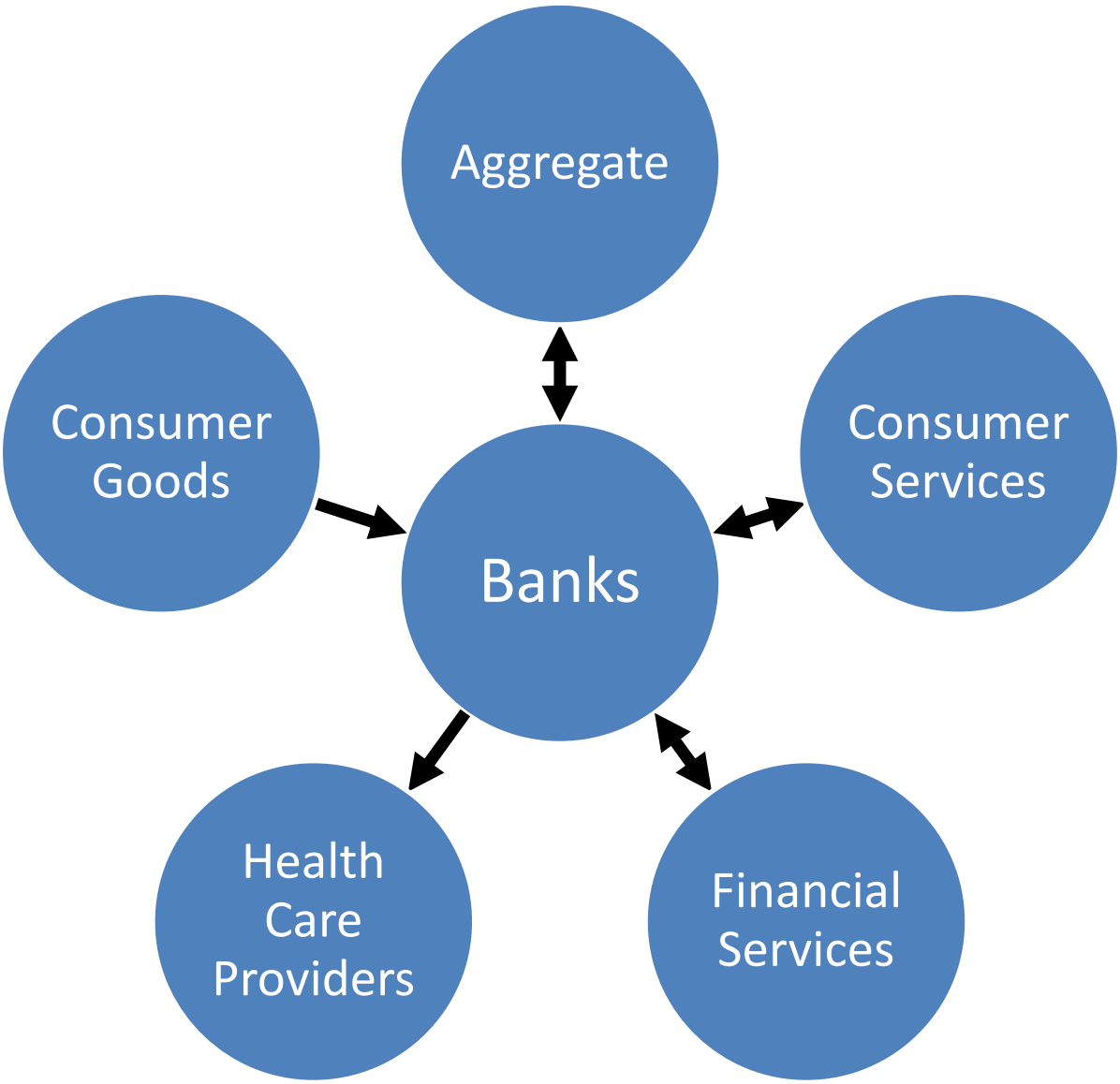
- One Sentence Conclusion: Therefore, it seems to be fair to conclude that the US service sector firms have fared better than the consumer goods manufacturing sector in the current financial crisis, but the details vary depending on the sectors considered.

Appendix: Additional Results

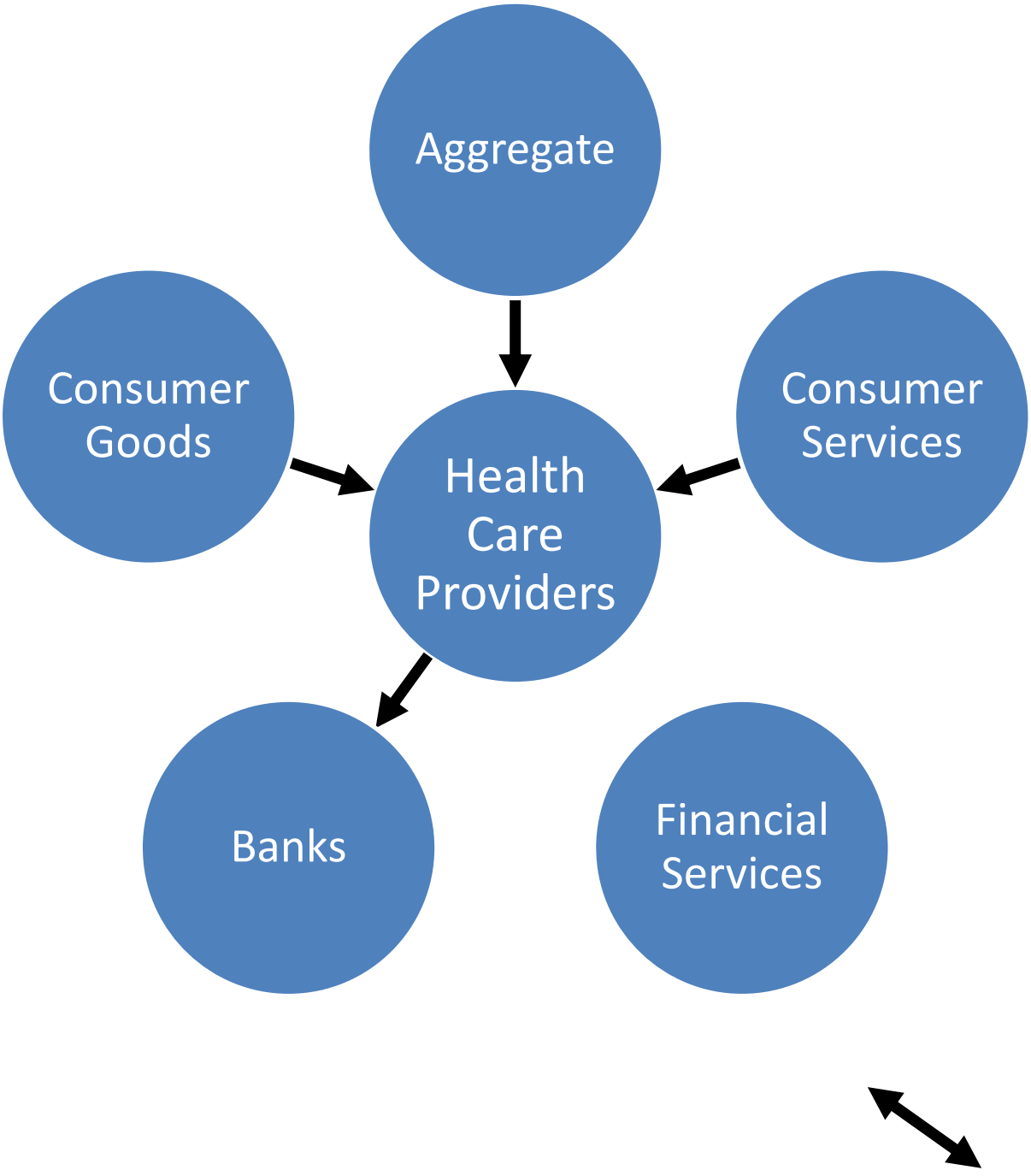
1. Tests for Granger Causality

Based on Vector Autoregressive Regression (VAR) models with 4-4 lags.

Granger Causality Relationships among Sector Index Returns for Pre-Lehman Collapse Period (10% significance level)



Granger Causality Relationships among Sector Index Returns for Post-Lehman Collapse Period (10% significance level)



2. Standard Deviation of Index Component Returns

- Standard deviation of index component returns as a measure of risk

- Are the service sectors equally risky?

	Has the same Return Dispersion as Consumer Goods?	
	Pre-Lehman Collapse Period	Post-Lehman Collapse Period
Consumer Services	No	No
Health Care Providers	No	Yes
Financial Services Plus Banks	No	No

3. Dynamic Risk-Return Tradeoff

- In light of Merton's dynamic risk-return relationship:

$$return_t = b_0 + b_1 risk_t$$

- Is b_1 positive and statistically significant?

	Exhibit no (dynamic) trade-off between return and risk?	
	Pre-Lehman Collapse Period	Post-Lehman Collapse Period
Consumer Goods	Positive Tradeoff	No Tradeoff
Consumer Services	Positive Tradeoff	Positive Tradeoff
Health Care Providers	No Tradeoff	No Tradeoff
Financial Services Plus Banks	Positive Tradeoff	Positive Tradeoff