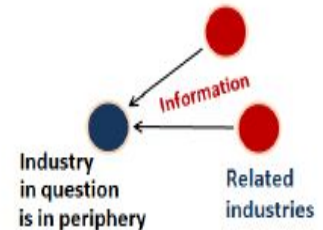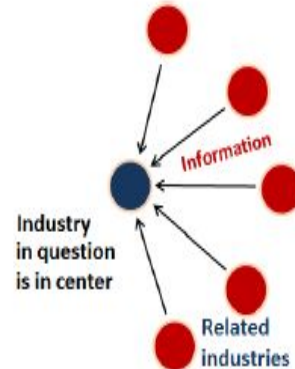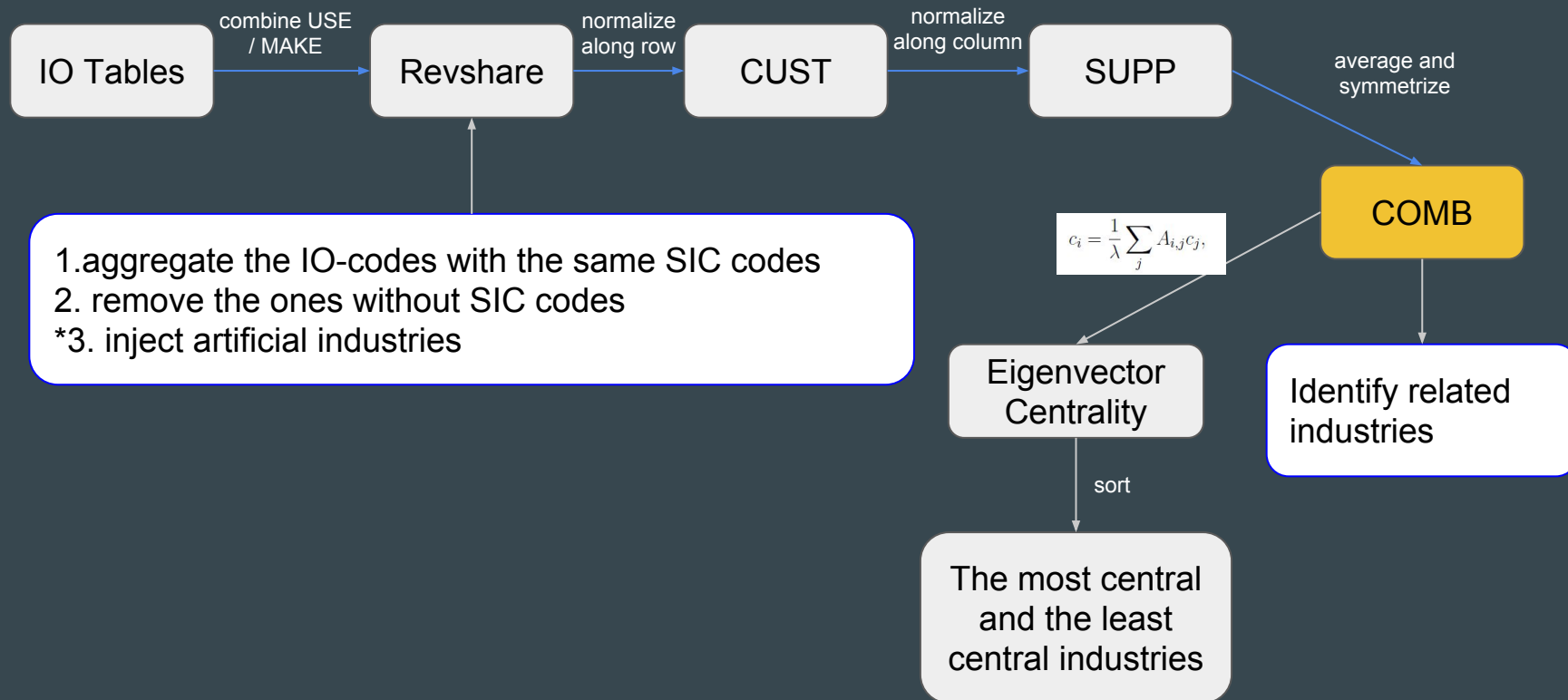# Industry Networks and Information Flow

• • •

Jiyuan Ding
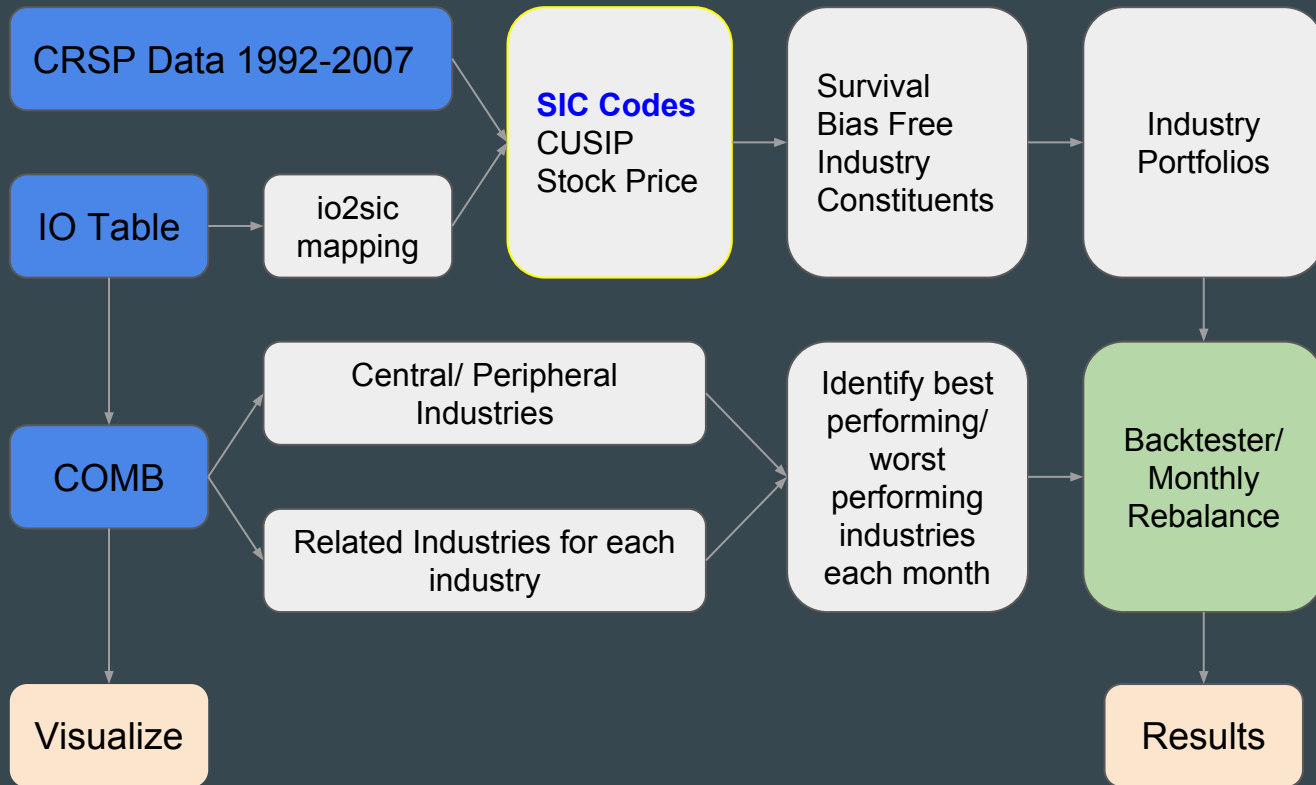Quan Zhou
Yunhao Zhang

Project Overview

- Industries are related. Can be analyzed using networks
- Central industries react slower and are more predictable because they need to process more information

Networks Construction

IO Tables — combine USE / MAKE → Revshare — normalize along row → CUST — normalize along column → SUPP — average and symmetrize → COMB

1. aggregate the IO-codes with the same SIC codes
2. remove the ones without SIC codes
*3. inject artificial industries

$$c_i = \frac{1}{\lambda} \sum_j A_{i,j} c_j,$$

COMB → Eigenvector Centrality — sort → The most central and the least central industries

COMB → Identify related industries

Data Processing

Comparison With Literature

Eigenvector Centrality

	Our	Paper
Mean	0.037	0.038
Standard deviation	0.028	0.027
Minimum	0.012	0.01
5th percentile	0.019	0.018
10th percentile	0.021	0.021
25th percentile	0.025	0.025
50th percentile	0.030	0.033
75th percentile	0.040	0.04
90th percentile	0.060	0.056
95th percentile	0.074	0.068
Maximum	0.341	0.347
Number of Obs	462	465

## 21 Most Central Industris

Match Rate: 17 / 21

Automotive repair shops and services	Banking
Banking	Blast furnaces and steel mills
Blast furnaces and steel mills	Bottled and canned soft drinks
Bread, cake, and related products	Bread, cake, and related products
Commercial construction industries	Eating and drinking places
Construction industries	Electric services (utilities)
Eating and drinking places	Hospitals
Electric services (utilities)	Industrial inorganic and organic chemicals
Hospitals	Maintenance and repair of farm and nonfarm residential structures
Industrial inorganic and organic chemicals	Malt beverages
Miscellaneous plastics products	Miscellaneous plastics products, n.e.c.
Motor vehicle parts and accessories	Motor vehicle parts and accessories
Motor vehicles and passenger car bodies	Motor vehicles and passenger car bodies
Paper and paperboard mills	Other repair and maintenance construction
Paperboard containers and boxes	Paper and paperboard mills
Petroleum refining	Paperboard containers and boxes
Real estate agents, managers, and operators	Petroleum refining
Retail trade, except eating and drinking	Real estate agents, managers, operators, and lessors
Telephone, telgraph communications, and communications	Retail trade, except eating and drinking
Trucking and courier services, except air	Trucking and courier services, except air
Wholesale trade	Wholesale trade

21 Least Central Industries

Match Rate: 17 / 21

Boot and shoe cut stock and ☐ndings	Boot and shoe cut stock and findings
Burial caskets	Chewing and smoking tobacco and snuff
Chewing and smoking tobacco and snuff	Cigars
Cigars	Costume jewelry
Costume jewelry	Hoists, cranes, and monorails
Hosiery	Hosiery, n.e.c.
Jewelers' materials and lapidary work	Industrial process furnaces and ovens
Leather gloves and mittens	Jewelers' materials and lapidary work
Leather goods	Leather gloves and mittens
Manufactured ice	Leather goods, n.e.c.
Nonferrous metal ores, except copper	Manufactured ice
Personal leather goods	Personal leather goods, n.e.c.
Petroleum, natural gas, solid mineral exploration	Petroleum, natural gas, and solid mineral exploration
Professional sports clubs and promoters	Professional sports clubs and promoters
Racing, including track operation	Racing, including track operation
Schiffli machine embroideries	Rolling mill machinery and equipment
Special product sawmills	Schiffli machine embroideries
Tobacco stemming and redrying	Thread mills
Women's handbags and purses	Tobacco stemming and redrying
Women's hosiery, except socks	Women's handbags and purses
X-ray apparatus and tubes	Women's hosiery, except socks

Network
Visualization
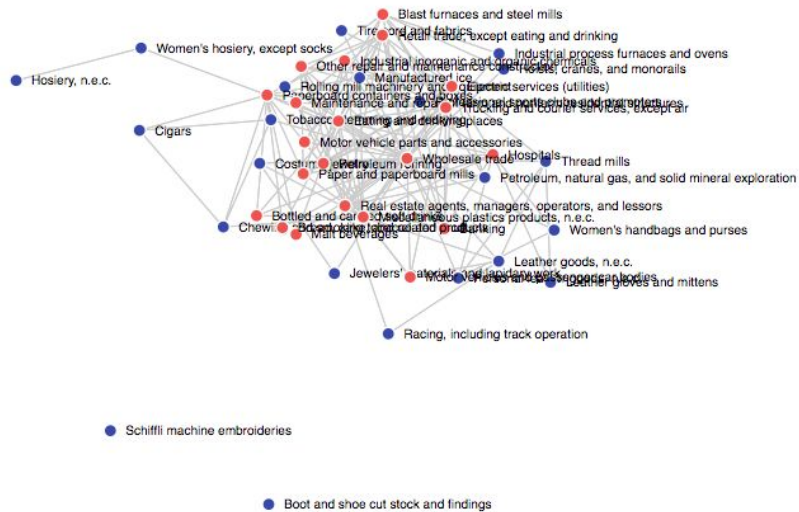
Example of Long-Short Portfolio: 1992-02-28

- Long: Miscellaneous plastics products, n.e.c., 'Trucking and courier services, except air, Blast furnaces and steel mills, Eating and drinking places, 'Petroleum refining, Hospitals, Electric services (utilities), Maintenance and repair of farm and nonfarm residential structures, Real estate agents, managers, operators, and lessors, Bread, cake, and related products

- Short: Bottled and canned soft drinks, Malt beverages, Wholesale trade, Banking, Retail trade, except eating and drinking, Motor vehicle parts and accessories, Paper and paperboard mills, Other repair and maintenance construction, Industrial inorganic and organic chemicals, Motor vehicles and passenger car bodies
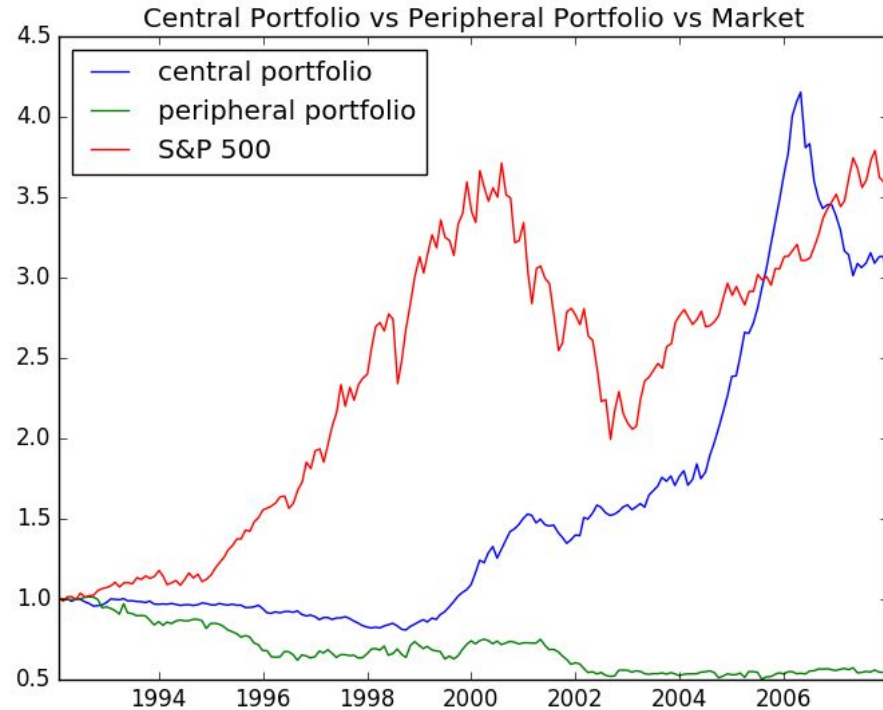
Central

vs.

Peripheral

Portfolios

- Long: Thread mills, Hoists, cranes, and monorails, Petroleum, natural gas, and solid mineral exploration, Rolling mill machinery and equipment, Leather goods, n.e.c., Industrial process furnaces and ovens, Costume jewelry, Boot and shoe cut stock and findings, Women's hosiery, except socks, Schiffli machine embroideries

- Short: Chewing and smoking tobacco and snuff, Women's handbags and purses, Hosiery, n.e.c., Manufactured ice, Professional sports clubs and promoters, Leather gloves and mittens, Cigars, Tobacco stemming and redrying, Racing, including track operation, Personal leather goods, n.e.c.

Back-Test Performance

Central Portfolio vs Peripheral Portfolio vs Market

- central portfolio
- peripheral portfolio
- S&P 500

Back-Test Stats

1992-2007	Central	Peripheral	Market
Monthly Return	0.29%	-0.59%	0.64%
Annualized Return	3.52%	-7.12%	7.64%
Monthly Sharpe	0.11	-0.21	0.15
Jensen's Alpha	0.24%	-0.65%	0
Beta	0.09	0.09	1
FF5 Alpha	0.20%	-0.57%	-

Conclusion

- ❏ We can observe excess returns not explained by market factors
- ❏ Central industries can be better predicted with their related industries than peripheral industries can