The impacts of the Japanese finance and insurance industry in the national economy: 1985-2005

Ubaidillah Zuhdi[1*], Yohan Kurniawan[2], Abdul Aziz Bandar Basag[3], Rizqi Putri Nourma Budiarti[4], Agung Firmansyah[5]

[1,5] Department of Management, Universitas Nahdlatul Ulama Surabaya, Surabaya, Indonesia
[2]Department of Educational Psychology and Counseling, Universiti Malaya, Selangor, Malaysia
[3]Department of Business and Administration, Sultan Muhammad Dipatuan Kudarat Islamic Academy Foundation, Inc., Maguindanao del Norte, Philippines
[4] Department of Information Systems, Universitas Nahdlatul Ulama Surabaya, Surabaya, Indonesia

*Email: ubaidillah.zuhdi@unusa.ac.id

Abstract. The purpose of this study is to analyze the impacts of the finance and insurance industry in the Japanese national economy. This study employs Input-Output (IO) analysis as an analysis tool. More specifically, this study uses the components of IO analysis, namely simple output multiplier, simple household income multiplier, index of the power of dispersion, and index of the sensitivity of dispersion as analysis apparatuses. The analysis period of this study is 1985-2005. The results show that, by using both multipliers, the analyzed industry did not include in the top five Japanese industrial sectors from 1985 to 2005. Based on this fact, one can argue that the investigated industry did not make the attractive impacts to the economy of Japan on the analysis period through an additional final demand. By using both indices, one can argue that the evaluated industry received high impacts from the changes of external aspects on the analysis period.

Keywords: Industry, National economy, IO analysis, Japan

Introduction

The industrial sectors are important gears in a national economy. Their contributions can be detected not only on the micro aspect, but also on the macro aspect of a country. Also, their important impacts can be seen both in developed and developing nations. One of the industries that worth to be discussed in this matter is the finance and insurance industry.

There are many previous studies discuss the finance and insurance aspects. For example, Cheema-Fox et al. (2022) develop a methodology to allocate currency pairs according to a nation's vulnerability and construct portfolios with declining vulnerability to physical risk by applying measures of physical risk

from climate change. Khan (2019) draws on prior academic literature and the idea of Environmental, Social, and Governance (ESG) materiality to expand new corporate governance and ESG metrics. Schnetzer and Hens (2022), on the other hand, develop a model of multi-asset evolutionary finance.

Meanwhile, Mantilla-Garcia et al. (2022) reorganize the factor hedging problem in a flexible regularization framework integrating an explicit control of the portfolio leverage that presents several key advantages over the unconstrained factor-matching method. Baltussen et al. (2023) scrutinize asset class and factor premiums across inflationary regimes. Boudoukh et al. (2019) explore optimal currency exposures in global equity portfolios via the lens of an altered mean-variance optimization framework. Idzorek (2023) develops a multi-account alpha-tracking error structure that at the same time optimizes across an investor's multiple accounts with dissimilar tax treatments, existing holdings, tax lots, and opportunity sets while considering taxes and trade costs in a single optimization.

Besides, Baltussen et al. (2021) employ 70 years of international data from the main bond markets to inspect bond return predictability through in-sample and out-of-sample assessments. Böni and Manigart (2022) observe net-of-fees private debt fund performance, performance persistence across funds organized by the identical general partner and a general partner's capability to time the market. On the other hand, Turkington and Yazdani (2020) construct an investment tactic that is theoretically similar to the carry trade, but they do not employ interest rates.

Based on the abovementioned previous studies, one can argue that the study to analyze the economic aspects of the finance and insurance industry in one particular Asian country is still needed. This study is conducted to fulfill the gap. One of the tools in conducting the analysis is Input-Output (IO) analysis, the tool in examining the linkages of industrial sectors in one or more countries. The importance and originality of this study are that it explores the impacts of the finance and insurance industry by applying several calculation approaches from IO analysis which focusing on the Japanese national economy.

The purpose of this study is to analyze the impacts of finance and insurance industry in the national economy of Japan. This study employs IO analysis as an analysis instrument. More specifically, this study uses the components of IO analysis, namely simple output multiplier, simple household income multiplier, index of the power of dispersion, and index of the sensitivity of dispersion as analysis devices. The analysis period of this study is from 1985 to 2005.

The rest of this paper is explained as follows. Section 2 clarifies the methodology of this study. Section 3 outlines the outcomes of calculations. Also, the discussions for the outcomes can be seen on this section. The next section, section 4, explicates the conclusions of this study and proposed further researches.

Methodology

The methodology of this study is clarified as follows. The first step is to describe the data used. This study uses Japanese IO tables for 1985, 1990, 1995, 2000, and 2005 as data. Originally, the tables consist

of 84, 91, 93, 104, and 108 industrial sectors, respectively. After performing the adjustment procedure, the tables have 78 industrial sectors. Those industries are showed in Appendix. The second step is to display the Japanese finance and insurance industry used in this study. Table 1 enlightens the industry.

Table 1: Japanese Finance and Insurance Industry Used in This Study

Sector Number	Sector Name
60	Finance and insurance

The third step is to conduct the calculations by using simple output multiplier and simple household income multiplier. Miller and Blair (2009) elucidate the equations of both multipliers as follows:

$$m(o)_j = \sum_{i=1}^{n} l_{ij} \quad (1)$$

$$m(h)_j = \sum_{i=1}^{n} a_{n+1}\, l_{ij} \quad (2)$$

The former model expresses the simple output multiplier while the latter one elucidates the simple household income multiplier. More specifically, $m(o)_j$, $m(h)_j$, $a_{n+1,i}$, n, and l_{ij} are simple output multiplier for sector j, simple household income multiplier for sector j, the coefficients of labor-input, the number of industries, and a sector-to-sector multipliers matrix, respectively.

The next step is to conduct the calculations in order to investigate the characteristics of Japanese industries on the analysis period, especially the Japanese finance and insurance industry. The approaches used in the calculations are index of the power of dispersion and index of the sensitivity of dispersion. The former index is applied to inspect the strength of one specific industry in inducing entire industries. A larger influence is aligned with the higher index value. The detail of the index is elucidated by Ministry of Internal Affairs and Communications Japan (n.d.) as follows:

$$\text{Index of the power of dispersion by sector} = \frac{b_{*j}}{\bar{B}} \quad (3)$$

In this index, the numerator is each sum of row in the table of inverse matrix coefficients while the denominator defines the mean value of the entire horizontal sum in the table of inverse matrix coefficients. Further, the equations of the numerator and denominator of the index are elucidated as follows:

$$b_{i*} = \sum_{j}^{n} b_{ij} \quad (7)$$

$$\bar{B} = \frac{1}{n}\sum_{i} b_{i*} = \frac{1}{n}\sum_{i}\sum_{j} b_{ij} \quad (8)$$

In order to get a compatibility sense with the previous index, equation (7) is slightly transformed from the original source. More specifically, the part describes the total number of industries, n, is added into the equation. As with the previous explanation, b_{ij} is the Leontief inverse value from sector i to sector j. Conclusions of the study and suggested further researches are clarified on the last step.

Results and Analysis

Tables 2, 3, 4, 5, and 6 show the top five Japanese industrial sectors viewed from the value of simple output multiplier in 1985, 1990, 1995, 2000, and 2005, respectively. Miller and Blair (2009) explicate that an output multiplier for sector j is the total value of production in all industrial sectors of the economy that is required in order to accomplish a currency's worth of final demand for the output of sector j. They also express that, for the simple output multiplier, the total value of production is coming from the households exogenous model.

Table 2: Top Five Japanese Industrial Sectors Viewed from the Value of Simple Output Multiplier, 1985 (Source: Zuhdi et al. (2021))

No.	Sector Number	Sector Name	Simple Output Multiplier
1	36	Steel products	3.456
2	65	Self-transport by private cars	3.283
3	23	Synthetic resins	3.266
4	22	Chemical basic and intermediate products	3.197
5	35	Pig iron and crude steel	3.183

Table 3: Top Five Japanese Industrial Sectors Viewed from the Value of Simple Output Multiplier, 1990 (Source: Zuhdi et al. (2021))

No.	Sector Number	Sector Name	Simple Output Multiplier
1	47	Motor vehicles and repair of motor vehicles	3.104
2	36	Steel products	3.097
3	65	Self-transport by private cars	2.852
4	35	Pig iron and crude steel	2.850
5	23	Synthetic resins	2.805

Table 4: Top Five Japanese Industrial Sectors Viewed from the Value of Simple Output Multiplier, 1995 (Source: Zuhdi et al. (2021))

No.	Sector Number	Sector Name	Simple Output Multiplier
1	47	Motor vehicles and repair of motor vehicles	3.063
2	36	Steel products	2.887
3	65	Self-transport by private cars	2.748
4	11	Feeds and organic fertilizer, n.e.c.	2.717
5	35	Pig iron and crude steel	2.672

Table 5: Top Five Japanese Industrial Sectors Viewed from the Value of Simple Output Multiplier, 2000 (Source: Zuhdi et al. (2021))

No.	Sector Number	Sector Name	Simple Output Multiplier
1	47	Motor vehicles and repair of motor vehicles	3.112
2	36	Steel products	2.967
3	23	Synthetic resins	2.916
4	22	Chemical basic and intermediate products	2.882
5	65	Self-transport by private cars	2.820

Table 6: Top Five Japanese Industrial Sectors Viewed from the Value of Simple Output Multiplier, 2005 (Source: Zuhdi et al. (2021))

No.	Sector Number	Sector Name	Simple Output Multiplier
1	47	Motor vehicles and repair of motor vehicles	3.449
2	23	Synthetic resins	3.302
3	22	Chemical basic and intermediate products	3.296
4	36	Steel products	3.237
5	65	Self-transport by private cars	2.952

Analyzed finance and insurance industry do not include in the tables. By using this result, one can say that the industry did not make the attractive impact to the economy of Japan on the analysis period through an additional final demand. The other interesting fact from the multiplier is the industry number 36, steel products, can be seen in the tables. This fact explains the consistency of the industry in attracting the Japanese economy from 1985 to 2005.

The same phenomenon can be observed on the sector 65, self-transport by private cars. The other interesting phenomenon is the sector number 47, motor vehicles and repair of motor vehicles, occupies the first position in almost all tables. For example, the sector occupies the first rank in table 3 which the value is 3.104. This result explicates that in order to satisfy a yen's worth of final demand for the sector's output in 1990, all Japanese industries required to yield the products which the total value was ¥3.104.

Figure 1 shows the simple output multiplier values of analyzed industry on the analysis period. Based on the information in the figure, the industry had the specific pattern on the period. More specifically, the industry had the increasing pattern from 1985 to 2005.

Tables 7, 8, 9, 10, and 11 define the top five Japanese industrial sectors viewed from the values of simple household income multiplier in 1985, 1990, 1995, 2000, and 2005, respectively. Miller and Blair (2009) outline that the multiplier is used to elucidate the economic influences of new final demand as measured by new households income by using the households exogenous model. The structures of the tables are not same with the ones of the tables of the previous multiplier.

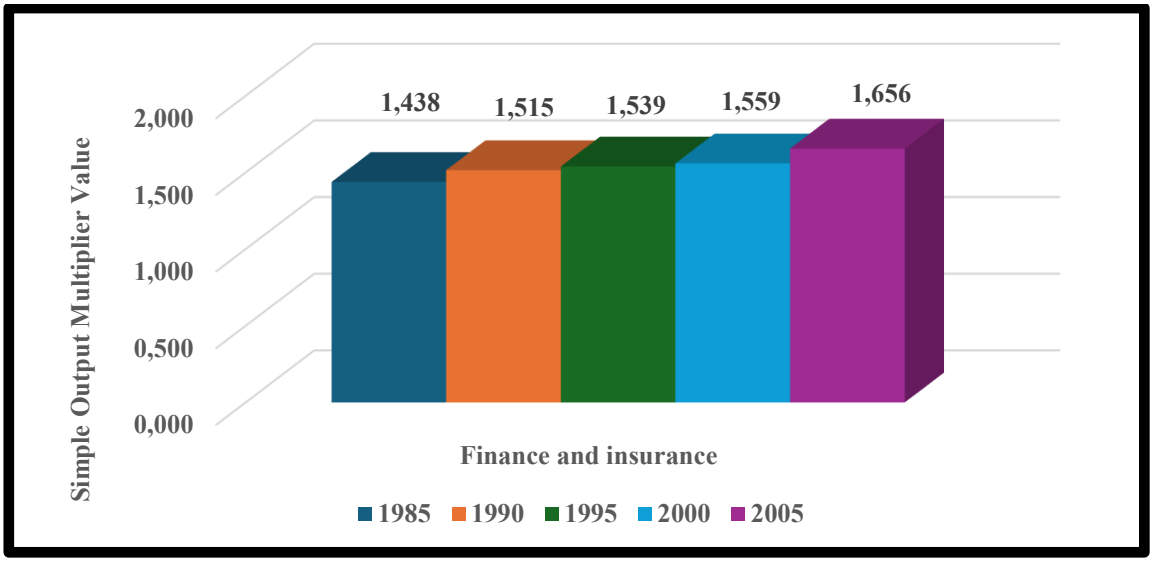

Figure 1. The Simple Output Multiplier Values of the Analyzed Industry, 1985-2005

Table 7: Top Five Japanese Industrial Sectors Viewed from the Value of Simple Household Income Multiplier, 1985 (Source: Zuhdi et al. (2021)

No.	Sector Number	Sector Name	Simple Household Income Multiplier
1	63	Railway	0.848
2	73	Education	0.836
3	64	Road transport (except transport by private cars)	0.736
4	58	Waste management service	0.719
5	72	Public administration and activities not elsewhere classified	0.691

Table 8: Top Five Japanese Industrial Sectors Viewed from the Value of Simple Household Income Multiplier, 1990 (Source: Zuhdi et al. (2021)

No.	Sector Number	Sector Name	Simple Household Income Multiplier
1	73	Education	0.833
2	58	Waste management service	0.739
3	64	Road transport (except transport by private cars)	0.720
4	72	Public administration and activities not elsewhere classified	0.719
5	76	Other public services	0.709

Table 9: Top Five Japanese Industrial Sectors Viewed from the Value of Simple Household Income Multiplier, 1995 (Source: Zuhdi et al. (2021)

No.	Sector Number	Sector Name	Simple Household Income Multiplier
1	73	Education	0.838
2	72	Public administration and activities not elsewhere classified	0.723
3	76	Other public services	0.721
4	64	Road transport (except transport by private cars)	0.720
5	74	Research	0.706

Table 10: Top Five Japanese Industrial Sectors Viewed from the Value of Simple Household Income Multiplier, 2000 (Source: Zuhdi et al. (2021)

No.	Sector Number	Sector Name	Simple Household Income Multiplier
1	73	Education	0.795
2	74	Research	0.715
3	76	Other public services	0.712
4	64	Road transport (except transport by private cars)	0.709
5	75	Medical service, health and social security	0.688

Table 11: Top Five Japanese Industrial Sectors Viewed from the Value of Simple Household Income Multiplier, 2005 (Source: Zuhdi et al. (2021)

No.	Sector Number	Sector Name	Simple Household Income Multiplier
1	73	Education	0.780
2	76	Other public services	0.716
3	64	Road transport (except transport by private cars)	0.684
4	75	Medical service, health and social security	0.676
5	74	Research	0.658

One of the interesting facts from the second multiplier is two industries include in the tables, namely road transport (except transport by private cars) and education. In 1985, the values of those industrial sectors were 0.736 and 0.836, respectively. These values show that, in 1985, an additional yen of final demand for the industries would generate ¥0.736 and ¥0.836 of new household incomes, respectively, when all direct and indirect impacts were transformed into yen estimates of incomes. The other interesting point is the analyzed finance and insurance industry do not include in the tables. This fact is same with the calculation outcomes of the previous multiplier.

Figure 2 clarify the simple household income multiplier values of analyzed industry on the period of analysis. Based on the information in this figure, one can argue that the analyzed industry had the different pattern on the analysis period compared with the previous pattern. More specifically, the industry had the increasing-decreasing pattern from 1985 to 2005 from the point of view of the simple household income multiplier.

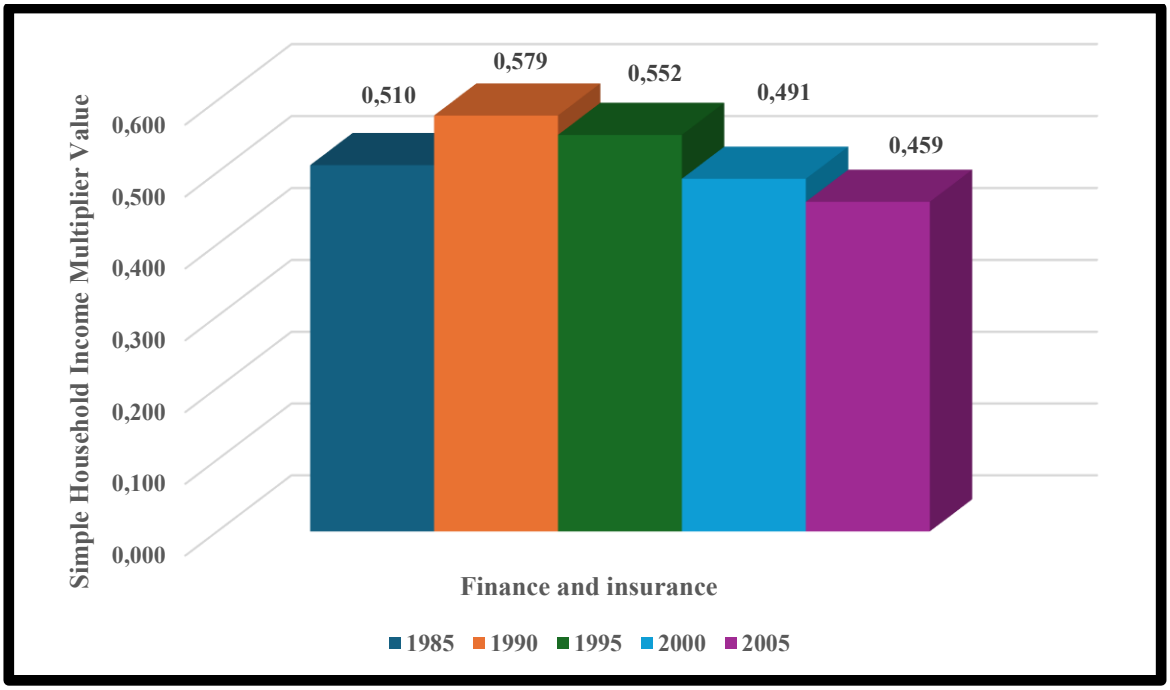

Figure 2. The Simple Household Income Multiplier Values of the Analyzed Industry, 1985-2005

Table 12 reviews the quadrants of analyzed industry on the analysis period. The quadrants come from the combination of both indices employed in this study, namely the index of the power of dispersion and the index of the sensitivity of dispersion. Four quadrants are produced from the combination.

Each quadrant has exclusive features. More specifically, quadrant I is a position where the values of both indices are more than one. In other words, the industries lie in this quadrant are those most influenced by the external aspects as well as have strong impacts on the whole industries. The opposite phenomena can be detected on the industries which lie in quadrant III.

On the other hand, quadrant II is a location where the value of the index of the power of dispersion is less than one while the value of the other index is more than one. One can claim that the industries lie in this quadrant are those which have weak effects on the entire industries, but they get high impacts from the fluctuations of external aspects. The opposite features are owned by the industrial sectors which lie in quadrant IV. Based on the information in the table, analyzed industry consistently lied in quadrant II from 1985 to 2005. In other words, the analyzed industry received high impacts from the changes of external aspects on the analysis period.

Table 12: The Quadrants of Japanese Finance and Insurance Industry, 1985-2005

Sector Number	Sector Name	Quadrant				
		1985	1990	1995	2000	2005
60	Finance and insurance	II	II	II	II	II

Conclusions and Further Researches

This study examines the impact of Japanese finance and insurance industry in the Japanese national economy by employing IO analysis. More specifically, this study uses simple output multiplier, simple household income multiplier, index of the power of dispersion, and index of the sensitivity of dispersion as analysis apparatuses. The analysis period of this study is from 1985 to 2005.

The results show that, by using both multipliers, the analyzed industry did not include in the top five Japanese industrial sectors from 1985 to 2005. Based on this fact, one can claim that the investigated industry did not make the attractive impacts to the economy of Japan on the analysis period through an additional final demand. By using both indices, one can argue that the evaluated industry received high impacts from the changes of external aspects on the analysis period.

The understanding regarding the impacts of Japanese finance and insurance industry in the Japanese national economy on the period of analysis is gained from the current study. However, the study would obtain a broader insight about the impacts if the study could use the longer analysis period. Therefore, as one of the further studies, this study recommends the same analysis by applying the longer period of analysis, such as from 1985 through 2015. One of the important points that must be considered when conducting this recommended further study is the prices and industrial sectors used on the analyzed IO tables should be same with the current study.

The other proposed further research from this study is to organize an international comparison using the same approaches. The comparison can be focused on developed-developed, developed-developing, or developing-developing countries. The comparison might explore the impacts of the finance and insurance industry of compared nations so the similarities and differences among those regarding the industry can be inspected. One of the examples regarding this proposed further research is the comparison between Japan and Malaysia.

Acknowledgment

The authors would like to thank Universitas Nahdlatul Ulama Surabaya for providing the internal grant.

Appendix

The Japanese Industries (Source: Zuhdi et al. (2014) with Slight Modifications)

Sector Number	Sector Name
1	Crop cultivation
2	Livestock
3	Agricultural services
4	Forestry

5	Fisheries
6	Metallic ores
7	Non-metallic ores
8	Coal mining, crude petroleum, and natural gas
9	Foods
10	Beverage
11	Feeds and organic fertilizer, n.e.c.
12	Tobacco
13	Textile products
14	Wearing apparel and other textile products
15	Timber and wooden products
16	Furniture and fixtures
17	Pulp and paper
18	Paper products
19	Publishing and printing
20	Chemical fertilizer
21	Basic industrial inorganic chemicals
22	Chemical basic and intermediate products
23	Synthetic resins
24	Synthetic fibers
25	Final chemical products, n.e.c.
26	Petroleum refinery products
27	Coal products
28	Plastic products
29	Rubber products
30	Leather, fur skins, and miscellaneous leather products
31	Glass and glass products
32	Cement and cement products
33	Pottery, china, and earthenware
34	Other ceramic, stone, and clay products
35	Pig iron and crude steel

36	Steel products
37	Steel castings and forgings, and other steel products
38	Non-ferrous metals
39	Non-ferrous metal products
40	Metal products for construction and architecture
41	Other metal products
42	General industrial machinery
43	Special industrial machinery
44	Other general machines
45	Machinery for office and service industry
46	Electrical appliance
47	Motor vehicles and repair of motor vehicles
48	Ships and repair of ships
49	Other transportation equipment and repair of transportation equipment
50	Precision instruments
51	Miscellaneous manufacturing products
52	Building construction
53	Repair of construction
54	Civil
55	Electricity
56	Gas and heat supply
57	Water supply
58	Waste management service
59	Commerce
60	Finance and insurance
61	Real estate agencies and rental services
62	House rent
63	Railway
64	Road transport (except transport by private cars)
65	Self-transport by private cars
66	Water transport

67	Air transport
68	Storage facility service
69	Services relating to transport
70	Communication
71	Broadcasting
72	Public administration and activities not elsewhere classified
73	Education
74	Research
75	Medical service, health, and social security
76	Other public services
77	Business and office supplies
78	Personal services

References

Baltussen, G., Martens, M., & Penninga, O. (2021). Predicting Bond Returns: 70 Years of International Evidence. *Financial Analysts Journal*, *77*(3), 133–155. https://doi.org/10.1080/0015198X.2021.1908775

Baltussen, G., Swinkels, L., van Vliet, B., & van Vliet, P. (2023). Investing in Deflation, Inflation, and Stagflation Regimes. *Financial Analysts Journal*. https://doi.org/10.1080/0015198X.2023.2185066

Böni, P., & Manigart, S. (2022). Private Debt Fund Returns, Persistence, and Market Conditions. *Financial Analysts Journal*. https://doi.org/10.1080/0015198X.2022.2092384

Boudoukh, J., Richardson, M., Thapar, A., & Wang, F. (2019). Optimal Currency Hedging for International Equity Portfolios. *Financial Analysts Journal*, *75*(4), 65–83. https://doi.org/10.1080/0015198X.2019.1628556

Cheema-Fox, A., Serafeim, G., & Wang, H. (2022). Climate Change Vulnerability and Currency Returns. *Financial Analysts Journal*. https://doi.org/10.1080/0015198X.2022.2100233

Idzorek, T. M. (2023). Personalized Multiple Account Portfolio Optimization. *Financial Analysts Journal*, 1–16. https://doi.org/10.1080/0015198x.2023.2212581

Khan, M. (2019). Corporate Governance, ESG, and Stock Returns around the World. *Financial Analysts Journal*, *75*(4), 103–123. https://doi.org/10.1080/0015198X.2019.1654299

Mantilla-Garcia, D., Martellini, L., Milhau, V., & Ramirez-Garrido, H. E. (2022). Improving Interest Rate Risk Hedging Strategies through Regularization. *Financial Analysts Journal*. https://doi.org/10.1080/0015198X.2022.2095193

Miller, R. E., & Blair, P. D. (2009). Input-output analysis: Foundations and extensions, second edition. In *Input-Output Analysis: Foundations and Extensions, Second Edition*. https://doi.org/10.1017/CBO9780511626982

Ministry of Internal Affairs and Communications Japan. (n.d.). *CHAPTER IV COEFFICIENTS FOR INPUT-OUTPUT ANALYSIS AND COMPUTATION METHODS § 1 Input Coefficients*.

Schnetzer, M., & Hens, T. (2022). Evolutionary Finance for Multi-Asset Investors. *Financial Analysts Journal*, *78*(3), 115–127. https://doi.org/10.1080/0015198X.2022.2071581

Turkington, D., & Yazdani, A. (2020). The Equity Differential Factor in Currency Markets. *Financial Analysts Journal*, *76*(2), 70–81. https://doi.org/10.1080/0015198X.2020.1712924

Zuhdi, U., Kurniawan, Y., & Budiarti, R. P. N. (2021). Do the Energy Industries Have Important Roles in the Japanese Economy? *Academy of Entrepreneurship Journal*, *27*(Special Issue 5), 1–16.

Zuhdi, U., Mori, S., & Kamegai, K. (2014). Statistical Analysis of Influences of ICT on Industrial Structure Changes from 1985 through 2005: The Case of Japan. *Journal of Computers*, *9*(6). https://doi.org/10.4304/jcp.9.6.1291-1299