A Comparison of the Financial Characteristics of U.S. and Japanese Electrical and Electronics Equipment Manufacturing Firms

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Abstract

In this paper, we compare the financial characteristics of U.S. and Japanese firms in the electrical and electronics equipment manufacturing industry with the MANOVA (Multivariate Analysis of Variance) method. Our multivariate test statistics indicate that the financial characteristics of electrical and electronics equipment manufacturing firms in the two countries are significantly different. Our univariate ANOVA test statistics show that U.S. firms have higher liquidity ratios (i.e., U.S. firms have greater ability to meet their maturing obligations) compared with Japanese firms. U.S. firms are more profitable and they have a higher sales growth rate than Japanese firms. Although U.S. firms also have higher accounts receivable, fixed assets, and total assets turnover ratios, Japanese firms have higher inventory turnover ratios compared with their U.S. counterparts. High Japanese inventory turnover rates can be attributed to the widespread use of the just-in-time inventory system in the Japanese keiretsu business groups. U.S. firms use more debt financing compared with Japanese firms. It implies that U.S. firms have greater bankruptcy risk compared with Japanese firms.

I. Motivation for the Study

Comparing the financial characteristics of different groups of firms with financial ratios has long been a popular research methodology in finance. Altman (1968), Edmister (1972), and Dambolena and Khoury (1980) predict bankruptcy by comparing the financial ratios of bankrupt and healthy firms. Stevens (1973), Belkaoui (1978), Rege (1984), and Meric et al. (1991) use financial ratios to identify the financial characteristics of companies, which become targets in corporate takeovers. Uygur at al. (2012) use financial ratios to identify the financial characteristics of U.S. companies acquired by foreign companies. Hutchinson et al. (1988) use financial ratios to identify the financial characteristics of companies, which achieve stock market quotation. Meric et al. (2000) compare the financial characteristics of Japanese kieretsu-affiliated and independent firms with financial ratios.

manufacturing firms. Meric et al. (2007) study the effects of economic integration on the financial characteristics of EU manufacturing firms.

Although a number of studies have compared the financial characteristics of firms in different countries, inter-country industry comparisons have not received sufficient attention. The electrical and electronics equipment manufacturing industry is one of the most important industries in the world with many recent technological advances in computers, high-definition television sets, cameras, telephones, and other equipment. The U.S. and Japan are the most important countries leading many of such advances. And yet, the financial characteristics of U.S. and Japanese electrical and electronics equipment manufacturing firms have not been sufficiently studied and compared.

U.S. and Japanese electrical and electronics equipment manufacturing firms have a fierce competition to capture a greater market share in each other’s local markets and in the world’s other markets. Knowing how the financial characteristics of U.S. and Japanese firms in this industry compare and in what ways they may be superior to one another can provide valuable insights for U.S. and Japanese financial managers and for global investors. In this paper, we make a contribution on this subject by comparing the financial characteristics of U.S. and Japanese electrical and electronics equipment manufacturing firms.

II. A Brief Comparison of U.S. and Japanese Economies

United States

The U.S. is the largest and most technologically powerful economy in the world with a per capita GDP of $48,100. Its $15 trillion GDP is second largest in the world. The GDP growth rate in 2011 was 1.7%. Seventy nine per cent of the GDP is contributed by the service sector and 19% by the industrial sector. The U.S. is one of the world’s most technologically advanced producers of motor vehicles, electronics equipment, machine tools, steel and nonferrous metals, ships, chemicals, textiles, and processed foods.

The U.S. is the world’s third largest exporter with total exports of $1.49 trillion in 2011. Primary U.S. exports are capital goods (49%) and industrial goods (26%). Four percent of U.S. exports are to Japan, its fourth largest export partner. With a total import of $2.3 trillion, the U.S. was the world’s largest importer in 2011. Primary U.S. imports are industrial supplies, consumer goods, and capital goods. Japan is the fourth largest import partner of the U.S. (7.8%) (CIA World Factbook, 2012). Electrical and electronics products are an important source of export revenue for the U.S. Computer electronics account for 12.8% and electrical products account for 3.4% of U.S. exports (Business Insider.com, 2012).

The U.S. is a major player in the electrical and electronics equipment manufacturing industry accounting for 30.5% of the global market. Apple Inc. is the leading U.S. producer in the industry with revenues of $156.5 billion, and net income of 41.7 billion, in 2012 (Yahoo, 2013). Its major products include mobile phone and Internet communication devices such as iPhone, iPod, and iPad, desktop computers such as iMac, Mac Pro, and Mac mini, and portable computers such as MacBook Pro and MacBook Air. Other leading U.S. companies in the industry include Emerson Electric, Rockwell Automation, Cooper Industries, Amphenol, Molex, Hubbel, and AVX (Wuerth While Wily Wakenings, 2012).
Japan

Japan is a technologically advanced economy with a GDP of $5.8 trillion in 2011. Japanese GDP declined by 0.7% in 2011. Seventy percent of Japanese GDP is contributed by services and 27% by industrial products. Japan is one of the world’s largest producers of motor vehicles, electronics equipment, and machine tools. It is the world’s fifth largest exporter of motor vehicles, semiconductors, and auto parts with a total export of $788 billion. Electronics are a key industry for the Japanese economy. Semiconductors are the second largest source of export revenue for Japan (6.2%). Similarly semiconductors are the fourth important import item in Japan accounting for 3.5% of Japan’s total imports. The U.S. is Japan’s second largest export partner receiving 15.5% of its exports. Japan’s imports totaled $808 billion in 2011. The most important import items are petroleum, liquid natural gas, clothing, and semiconductors. The U.S. is not a major import partner of Japan (CIA World Factbook, 2012).

Japan has the largest electrical and electronics equipment manufacturing industry in the world. Japanese companies have been responsible for a number of important innovations in this industry, including the transistor radio, the first mass-produced laptops, the VHS recorder, solar cells, and LCD screens. Major Japanese companies in this industry include Canon, Citizen, Hitachi, JVC, Mitsubishi, Nikon, Nintendo, Panasonic, Pioneer, Ricoh, Sharp, Sony, TDK, and Toshiba (Wikipedia, 2013, http://www.en.wikipedia.org/wiki/Electronics_industry_in_Japan)

III. Data and Methodology

Our firm financial ratio data were obtained from the Research Insight/Global Vintage database in September 2012. Our research sample consists of 182 U.S. and 208 Japanese firms with no missing financial data in the database. We use the financial ratios presented in Table 1 in our comparisons of firm financial characteristics.

Multiple Discriminant Analysis (MDA) and Multivariate Analysis of Variance (MANOVA) are the two statistical methods most commonly used in previous studies to compare the financial characteristics of different groups of firms. In this study, we use the MANOVA method to compare the financial characteristics of U.S. and Japanese electrical and electronics equipment manufacturing firms. A detailed description of the MANOVA method can be found in Johnson and Wichern (2007).

ANOVA (Analysis of Variance) tests the significance of group differences between two or more groups. We use the ANOVA method to test the null hypothesis ($H_0$) that the mean value of a ratio in U.S. ($\mu_{us}$) and Japanese ($\mu_{j}$) firms are the same against the alternative hypothesis ($H_1$) that the two ratios are significantly different:
Table 1
Financial Ratios Used in the Study as Measures of Firm Financial Characteristics*

<table>
<thead>
<tr>
<th>Financial Ratio Name</th>
<th>Financial Ratio Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Liquidity</strong></td>
<td></td>
</tr>
<tr>
<td>Current Ratio (CR)</td>
<td>Current Assets / Current Liabilities</td>
</tr>
<tr>
<td>Quick Ratio (QR)</td>
<td>(Current Assets - Inventories) / Current Liabilities</td>
</tr>
<tr>
<td><strong>Asset Management (Turnover) Ratios</strong></td>
<td></td>
</tr>
<tr>
<td>Accounts Receivable Turnover (ART)</td>
<td>Sales / Accounts Receivable</td>
</tr>
<tr>
<td>Inventory Turnover (INT)</td>
<td>Sales / Inventory</td>
</tr>
<tr>
<td>Fixed Assets Turnover (FAT)</td>
<td>Sales / Net Fixed Assets</td>
</tr>
<tr>
<td>Total Assets Turnover (TAT)</td>
<td>Sales / Total Assets</td>
</tr>
<tr>
<td><strong>Financial Leverage</strong></td>
<td></td>
</tr>
<tr>
<td>Equity Ratio (ER)</td>
<td>Common Equity/Total Liabilities</td>
</tr>
<tr>
<td><strong>Profitability</strong></td>
<td></td>
</tr>
<tr>
<td>Net Profit Margin (NPM)</td>
<td>Net Income / Sales</td>
</tr>
<tr>
<td>Return on Assets (ROA)</td>
<td>Net Income / Total Assets</td>
</tr>
<tr>
<td>Return on Equity (ROE)</td>
<td>Net Income / Common Equity</td>
</tr>
<tr>
<td><strong>Growth</strong></td>
<td></td>
</tr>
<tr>
<td>Annual Sales Growth Rate (ASGR)</td>
<td>Average for the Last Three Years</td>
</tr>
</tbody>
</table>

* The ratios were obtained from the Research Insight/Global Vintage database in September 2012.

\[ H_0 : \mu_{us} = \mu_j \]
\[ H_1 : \mu_{us} \neq \mu_j \] (1)

F statistic is used to determine if the two ratio mean values are significantly different.

In ANOVA there is only one dependent variable (i.e., one financial ratio). MANOVA is a multivariate test with two or more dependent variables (i.e., two or more financial ratios). In MANOVA, the null hypothesis of the equality of the vectors of dependent variables in the two groups is tested:

\[ \mu_{11} = \mu_{12} \]
\[ \mu_{21} = \mu_{22} \]
\[ H_0 : \mu_{31} = \mu_{32} \]
\[ \ldots \]
\[ \mu_{p1} = \mu_{p2} \] (2)

where p is the number of different attributes of ratios. The test statistics commonly used in hypothesis testing in MANOVA are Wilks lambda, Pillai-Bartlett trace, Lawley-Hotelling trace, Roy’s greatest root, and multivariate F tests (Wikipedia, http://www.en.wikipedia.org/wiki/Multivariate_analysis_of_variance).
IV. Empirical Findings

Our MANOVA test results are presented in Table 2. The multivariate F-value test statistics in the table indicate that the overall financial characteristics of U.S. and Japanese electrical and electronics equipment manufacturing firms are significantly different at the 1-percent level. Our univariate F-value test statistics show that the financial characteristics of U.S. firms are significantly different from the financial characteristics of Japanese firms in terms of all of the financial ratios.

U.S. firms appear to have more liquidity compared with their Japanese counterparts. The current ratio is significantly higher at the 1-percent level and the quick ratio is higher at the 5-percent level in U.S. firms than in Japanese firms. These results imply that U.S. firms are better able to meet their maturing obligations compared with Japanese firms.

The most significant difference between the two groups of firms is in terms of the accounts receivable turnover ratio. The F-value statistic for this ratio is 139.507, which is highly significant at the 1-percent level. This result implies that Japanese firms have more credit sales and they carry larger amounts of accounts receivable compared with U.S. firms.

The inventory turnover ratio is higher in Japanese firms than in U.S. firms. The univariate F-value statistic is significant at the 1-percent level. This result implies that Japanese firms carry less inventories compared with U.S. firms. This result may be due to the widespread use of the just-in-time inventory management system in keiretsu-affiliated firms in Japan.

The fixed assets turnover ratio is significantly higher in U.S. firms than in Japanese firms. The univariate F-value statistic is highly significant for this ratio at the 1-percent level. This result implies that U.S. firms may have more efficient fixed asset management compared with Japanese firms. U.S. firms are able to generate more sales, compared with their Japanese counterparts, with their fixed-asset investments.

Total assets turnover ratio is significantly higher in U.S. firms than in Japanese firms. The univariate F-value statistic is significant at the 5-percent level. Total assets turnover ratio is one of the key determinants of the return on equity. Along with the use of more debt financing (i.e., greater financial leverage), a higher total assets turnover ratio help U.S. firms achieve a higher rate of return on equity compared with Japanese firms.

All three profitability ratios are significantly higher in U.S. firms than in Japanese firms. U.S. firms earn higher profit margins on sales, higher returns on asset investments, and higher returns on equity investments compared with Japanese firms. The univariate F-value statistics for all three profitability ratios are significant at the 1-percent level. The univariate F-values indicate that the greatest U.S. superiority appears to be in terms of the net profit margin ratio. This implies that U.S. firms may be able to get better prices for their products and/or they may be producing their products more efficiently at a lower cost compared with Japanese firms.

U.S. firms have achieved an impressive positive average growth rate of about 4% per year during the last three years. Japanese firms have had an average decline of about -1.7% per year during the same period. The univariate F-value test statistic for the difference between the two percentages is highly significant at the 1-percent level.
Table 2
MANOVA Statistics

<table>
<thead>
<tr>
<th>Financial Ratios</th>
<th>Means and Standard Deviations†</th>
<th>Univariate Statistics</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>United States</td>
<td>Japan</td>
<td>F Value</td>
<td>P Value</td>
</tr>
<tr>
<td><strong>Liquidity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current Ratio</td>
<td>4.148 (3.401)</td>
<td>3.062 (1.014)</td>
<td>11.183**</td>
<td>0.001</td>
</tr>
<tr>
<td>Quick Ratio</td>
<td>3.037 (3.101)</td>
<td>2.369 (2.681)</td>
<td>5.214*</td>
<td>0.023</td>
</tr>
<tr>
<td><strong>Asset Management (Turnover) Ratios</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acc. Receivable Turnover</td>
<td>7.286 (3.319)</td>
<td>4.223 (1.614)</td>
<td>139.507**</td>
<td>0.000</td>
</tr>
<tr>
<td>Inventory Turnover</td>
<td>4.619 (2.232)</td>
<td>5.979 (4.351)</td>
<td>14.454**</td>
<td>0.000</td>
</tr>
<tr>
<td>Fixed Assets Turnover</td>
<td>10.922 (11.643)</td>
<td>6.373 (8.469)</td>
<td>19.789**</td>
<td>0.000</td>
</tr>
<tr>
<td>Total Assets Turnover</td>
<td>1.012 (0.431)</td>
<td>0.927 (0.351)</td>
<td>4.588*</td>
<td>0.033</td>
</tr>
<tr>
<td><strong>Financial Leverage</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equity Ratio</td>
<td>3.260 (3.432)</td>
<td>10.158 (3.187)</td>
<td>7.168**</td>
<td>0.008</td>
</tr>
<tr>
<td><strong>Profitability</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net Profit Margin</td>
<td>6.044% (11.431%)</td>
<td>1.007% (7.703%)</td>
<td>26.586**</td>
<td>0.000</td>
</tr>
<tr>
<td>Return on Assets</td>
<td>4.672% (9.226%)</td>
<td>1.161% (5.409%)</td>
<td>21.633**</td>
<td>0.000</td>
</tr>
<tr>
<td>Return on Equity</td>
<td>8.987% (22.886%)</td>
<td>2.424% (11.741%)</td>
<td>13.697**</td>
<td>0.000</td>
</tr>
<tr>
<td><strong>Growth</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual Sales Growth Rate</td>
<td>3.993% (11.720%)</td>
<td>-1.717% (7.769%)</td>
<td>32.877**</td>
<td>0.000</td>
</tr>
<tr>
<td><strong>Multivariate Statistics:</strong></td>
<td></td>
<td></td>
<td>22.376**</td>
<td>0.000</td>
</tr>
</tbody>
</table>

† The figures in parentheses are the standard deviations.
** *, * indicate that the difference is significant at the 1-percent and 5-percent levels, respectively.
V. Summary and Conclusions

Electrical and electronics equipment manufacturing industry is one of the most important industries in the world. The U.S. and Japan are the two leading countries in the world in terms of most technological developments in this industry. And yet, the financial characteristics of U.S. and Japanese electrical and electronics equipment manufacturing firms have not been sufficiently studied and compared. Such a comparison could provide valuable insights for U.S. and Japanese financial managers and global investors. In this paper, we make a contribution on this subject by comparing the financial characteristics of U.S. and Japanese electrical and electronics equipment manufacturing firms. We use financial ratios as measures of firm financial characteristics and the MANOVA (Multivariate Analysis of Variance) statistical methodology in our comparisons. Our major findings are as follows:

Liquidity

We find that U.S. firms have significantly higher liquidity ratios compared with Japanese firms. It would imply that U.S. firms have less technical insolvency risk compared with Japanese firms (i.e., U.S. firms are better able to meet their maturing obligation compared with Japanese firms).

The difference is more significant with current ratio than with quick ratio. Unlike quick ratio, current ratio includes inventories in the numerator. Many Japanese firms operate in keretsu business groups and they carry less inventories compared with U.S. firms because they are able to obtain inventories from other firms in the keretsu easily when needed. This inventory system is known as just-in-time inventory system, which is quite widespread in Japan (Wikipedia, 2013, http://www.en.wikipedia.org/wiki/Keiretsu).

Keretsu groups include a core bank. Therefore, although their quick ratios may be lower compared with U.S. firms, Japanese firms that are members of a keretsu group are able to raise their liquidity level quickly by borrowing from the keretsu’s core bank easily with a short notice when needed.

Equity Ratio and Financial Leverage

We find that Japanese firms have significantly higher equity ratios compared with U.S. firms. It indicates that U.S. firms use more debt financing (i.e., U.S. firms have higher financial leverage) compared with Japanese firms. A high debt ratio implies greater bankruptcy risk. Therefore, our finding in this study implies that U.S. firms have greater bankruptcy risk compared with Japanese firms. One reason why Japanese firms do not have too much debt in their balance sheets is that many of them belong to keretsu business groups and they are able to borrow from the keretsu’s core a bank easily with a short notice when they need to borrow.

Profitability

We find that U.S. firms have significantly higher net profit margins compared with Japanese firms. This can be mainly attributed to high labor costs in Japan. According to figures released by the EU statistics agency Eurostat, Japan’s employers pay higher hourly labor cost than their counterparts in the U.S. and EU (World Trade, 2013). The labor cost in Japan, including wages and social security payments, is 21.9
euros per hour compared to 17.8 euros in the U.S. and an average of 21.5 euros in the EU.

Mean return on assets is significantly higher in U.S. firms than in Japanese firms. In the basic DuPont equation (Brigham and Ehrhardt, 2011), return on assets (ROA) is equal to the product of net profit margin (NPM) and total assets turnover (TAT). Since both net profit margin and total assets turnover are significantly higher in U.S. firms than in Japanese firms, return on assets is also significantly higher in U.S. firms than in Japanese firms.

Mean return on equity is also significantly higher in U.S. firms than in Japanese firms. In the extended DuPont equation (Brigham and Ehrhardt, 2011), return on equity (ROE) is equal to the product of return on assets (ROA) and equity multiplier (EM, total assets/common equity). Return on assets is significantly higher in U.S. firms than in Japanese firms. U.S. equity ratio (ER, common equity/total liabilities) is significantly lower in U.S. firms than in Japanese firms (i.e., U.S. firms use significantly more debt financing, or they have significantly higher financial leverage) compared with Japanese firms. Therefore, equity multiplier is significantly higher in the U.S. than in Japan. Since both return on assets and equity multiplier are significantly higher in the U.S. than in Japan, return on equity is significantly higher in the U.S. than in Japan.

Asset Utilization

Our test statistics show that U.S. firms have significantly higher accounts receivable, fixed assets, and total assets turnover ratios compared with their Japanese counterparts. However, Japanese firms have significantly higher inventory turnover ratios compared with U.S. firms.

The significantly higher accounts receivable, fixed assets, and total assets turnover ratios in U.S. firms compared with Japanese firms imply that there is more efficient asset management in U.S. firms than in Japanese firms. The significantly higher inventory turnover ratio in Japanese firms compared with U.S. firms is the result of the use of the just-in-time inventory system in keretsu business groups in Japan.

Growth

We find that the annual average sales growth rate of U.S. electrical and electronics equipment manufacturing firms has been about 4% during the last three years. Japanese firms have experienced an average annual sales decline of about 1.7% during the same period. The difference is statistically highly significant at the 1-percent level. The high U.S. sales growth rate is mainly due to the tremendous growth in Apple’s sales in recent years (Seeking Alpha, 2013). The decline in the Japanese sales growth rate reflects the effects of the 2007-2009 global recession and the stiff competition Japanese electronics firms are facing from U.S. (e.g., Apple) and South Korean (e.g., Samsung) competitors in recent years.
References


