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The Relative Financial Efficiency of Brazilian Firms and American Firms in the Manufacturing Sector: A Ratio Analysis

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Abstract

This paper evaluates the relative financial efficiency of twenty three matched-pairs of U.S. firms and Brazilian (BR) firms. In this study, efficiency is measured in terms of profitability, debt management, asset management, and liquidity management. Paired comparison is employed and ten hypotheses are tested on the basis of the defined ratios. Because matched pairs are used, an appropriate test is the Wilcoxon matched-pairs signed-ranked test. All the data for the study were compiled by the author from *Mergent on Line*. These include the most recent five-year time-series data that were available in 2013 for all the ten ratios that were tested. The analysis presented in this paper indicates the absence of any statistically significant differences between the two sets of firms with regard to most of the ratios examined, suggesting that the U.S and the Brazilian firms are similar to each other with respect to their financial efficiency. The only exception is that BR firms have higher return on equity (ROE) ratios than the United States firms.

JEL classification numbers: F14, F21, F23, F30, L25, M15, M40, N60
Keywords: Financial Efficiency, Brazil, the United States, Profitability, Debt, Management, Asset Management, Liquidity Management, and Financial Ratios.

1 Introduction

A newly industrialized nation, Brazil is the seventh wealthiest economy in the world. It is also the largest nation by area and population in Latin America and the Caribbean [1]. As one of the so called Bric nations, along with Russia, India and China, Brazil has one of the world's fastest growing major economies, and its economic reforms have given the nation new international recognition and influence. [2].

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In recent years, Brazil's GDP has grown by an average annual rate of over 5 percent, which exceeds the growth of the U.S. and Western Europe. This condition has contributed to the ability of this nation to survive the global financial crisis with relatively insignificant effects. Brazil was one of the last nations to plummet into recession in 2008 and among the first to resume growth in 2009. Following its economic recovery, Brazil experienced GDP real growth rate of 7.5 percent and 2.1 percent in year 2010 and 2011, respectively [3].

Although Brazil's rate of economic growth decreased in 2011, and 2012, strong policy support is predicted to enhance this country's rate of economic growth to 4 percent and 4.1 percent in years 2013 and 2014 respectively [4].

Given the impressive rate of growth of GDP in Brazil in recent years, many researchers have tried to investigate the elements that fuel the Brazilian firms' efficiency. However, no study has examined the relative efficiency of the Brazilian firms and American (U.S.) firms operating in the manufacturing sector. The purpose of this study is to evaluate the relative financial efficiencies of twenty-three matched-pair of American and Brazilian manufacturing firms by employing ratio analysis.

2 Survey of the Literature

There are only a few studies that concentrate on evaluating firms' efficiency in Brazil. However most of these studies concentrate on measuring production efficiency of the firms under consideration. In this section we review several of these studies and present their results.

In their study P. Tecles and B. M. Tabak [6] analyze the efficiency of the Brazilian banking sector over the post-privatization period of 2000-2007. Employing a Bayesian stochastic frontier approach, they compare across institutions and bank groups. Their results indicate that large banks are the most cost and profit efficient, confirming the concentration process observed in recent years. Additionally, they explain that foreign banks have achieved a good performance by either the establishment of new affiliates or the acquisition of local banks. The remaining public banks have portrayed improvements in cost efficiency; however, they are relatively profit inefficient. Finally, they find that the impact of capitalization on efficiency is positive.

In his study T. Kinda [7] employs a one-step stochastic frontier model for five developing countries, including Brazil, Morocco, Pakistan, South Africa and Vietnam. He concludes that foreign firms benefit from a better investment climate, which provides significant explanation for the higher efficiency of foreign firms as compared to domestic firms. The article also examines the importance of vertical spillovers, while controlling for the direct impact of the investment climate on efficiency. The results indicate that firms, especially small local firms that sell more of their output to multinationals, are more efficient, indicating the existence of vertical spillovers via backward linkages.

In their study N. Nazmi and J. E. Revilla [8] compare economic efficiency of Brazil, India, and China. They define economic efficiency as the gap between potential and actual output for a given input combination and technological factor. Using stochastic production frontier models, they measure the contributions of factors of production and technology to growth and estimate non-positive error terms that capture production inefficiencies in each nation. Their results indicate that China and India had relatively

inefficient production in the early 1980s but have since improved production efficiency substantially. In the same period, production efficiency in Brazil has declined to some extent from relatively high initial levels. Additionally, the gap between production efficiency between these nations has narrowed significantly, implying more rapid growth in China and India as compared to Brazil.

O. Yeboah, V. Ofori-Boadu and T. Li [9], employ Data Envelopment Analysis (DEA) to measure and compare the efficiency of ethanol production in China and Brazil. They develop an output oriented model to estimate the extent that output can be proportionally enhanced without altering the input quantities used in each nation. Their results indicate that China has been relatively more efficient in ethanol production than Brazil since the year 2007.

E. P. Ribeiro, V. Prochnik and J. DeNegri [10] examine productivity and growth in the Brazilian informatics industry (ISIC 30 office, accounting and computing machinery). This industry which is one of the fastest growing sectors in manufacturing in the world receives special tax breaks in Brazil. Using both interview method and econometric model, they investigate this sector after its liberalization. The interviews suggest that firm growth is based either on product differentiation in the business machines subsector (using close software complementarities) or retail chains as distribution channels in computer manufacturing. Their econometric analysis indicates that although the Informatics Law has an overall positive impact on the firms, its effect on the productivity growth is not significant. On average, less productive firms receive more Informatics Law benefit. Their findings cast doubt on the efficiency of R&D incentives in its current form in Brazil.

N. Mulder, S. Montout and L. Lopes [11] examine the relative labor productivity performances of Brazil and Mexico in manufacturing as compared to United States, during the 1970-1999 Period. Using the International Comparisons of Output and Productivity (ICOP), they compare Brazil separately with the U.S. in 1985 and 1988. Their results indicate that labor productivity in Brazil was 43 per cent of the U.S. level in 1985, and labor productivity in Mexico was 27 percent of the U.S. in 1988. The extrapolation to the 1970-99-period indicates that the productivity gaps between the Latin countries and the U.S widened, especially in the 1980s. Although Brazil was able to stabilize its productivity differential, Mexico continued to widen its productivity gap relative to the U.S.

3 The Method of Analysis

In this study, financial efficiency is defined in terms of profitability, debt management, asset management, and liquidity management. Profitability is measured by return on assets, return on equity, and return on investment. Debt management is measured by long-term debt to equity and total debt to equity. Asset management is measured by total asset turnover, receivable turnover, and inventory turnover. Liquidity management is measured by quick ratio and current ratio.

The following ten financial ratios are used in the analysis:

1. ROA: Return on Assets = $\frac{\text{Net Income}}{\text{Asset}}$

2. ROE: Return on Equity = $\frac{\text{Net Income}}{\text{Common Equity}}$

3. ROI : Return on Investment = $\frac{\text{Net Income}}{\text{Investment}}$

4. LTDE: LT Debt to Equity = $\frac{\text{Long} - \text{Term Debt}}{\text{L}-\text{T Debt} + \text{Preferred Stock} + \text{Common Stock}}$

5. TDTE: Total Debt to Equity = $\frac{\text{Total Liabilities}}{\text{Shareholder's Equity}}$

6. TATO: Total Asset Turnover = $\frac{\text{Revenue}}{\text{Assets}}$

7. RTO: Receivable Turnover = $\frac{\text{Net Credit Sales}}{\text{Average Account Receivable}}$

8. ITO: Inventory Turnover = $\frac{\text{Sales}}{\text{Inventory}}$

9. QR: Quick Ratio = $\frac{\text{Cash} + \text{Account Recievable} + \text{S}-\text{T or Marketable Securities}}{\text{Current Liabilities}}$

10. CR: Current Ratio = $\frac{\text{Current Assets}}{\text{Current Liabilities}}$

4 The Limitations of the Study and the Sample Size

The problems of measurement in comparative analysis have been discussed by a number of researchers (see [8] & [9]). Measurement problems, as related to firm comparison, center around two main issues. First, the choice of industries, and second the kind of data. As for the first issue, ideally the two groups of firms should be similar with regard to product heterogeneity and size. They should also operate in a similar environment and market structure. However, the limitations of the sample size in most of the empirical studies call for restriction in choosing firms for comparison.

The second question has to do with accounting differences that exist between countries. These differences might lead to biases in the measurement of the ratios employed in the analysis. For example, measurement's problem could arise because the two countries may use different procedures for the valuation of income producing assets which affects income statements. In one country, marketable securities may be treated at the lower of cost or market value (LCM), whereas cost method could be utilized in another country. These differences might affect comparability of the two countries with regard to asset turnover, and profitability ratios.

Today, one of the challenges faced by regulatory accounting agencies globally is how to diminish or eradicate the asymmetry of information appearing in reports that are prepared according to the standards of various nations. Numerous international agencies such as the International Accounting Standards Board (IASB), and the International Federation of Accountants (IFAC), have tried to develop highly reliable international accounting standards. In achieving this task, they attempt to foster the merging of different local

accounting standards into an international accounting standard. As a result, the 'international financial reporting standards' (IFRS) are increasingly acquiring global acceptance. This is evident by the number of firms that have adopted international accounting standards in their financial statements. In January 2005, roughly 7,000 companies listed with the European Union converted their statements to the IFRS requirements [12]. Today, about 113 nations worldwide require or permit IFRS reporting for domestic listed companies [13].

In the case of our study, Brazil (BR), on July 13, 2007, the Securities and Exchange Commission of Brazil - Comissão de Valores Mobiliários, or CVM required listed companies to publish their consolidated financial statements according to IFRSs, starting with reporting periods ending in 2010. Although the United States still adheres to GAAP financial reporting, the Securities and Exchange Commission voted on August 27th, 2008 to publish for public comment a proposed 'roadmap' that could lead to the use of IFRS by U.S. issuers beginning in 2014.

Given the aforementioned limitations, the findings should be interpreted with caution. Following the most acceptable criteria set by empirical studies, each pair of firms chosen in this study consists of one U.S. firm and one BR firm producing similar products and having approximately the same size. All the data for the study were compiled by the author from *Mergent on Line.* These include the most recent five-year time-series data for all the ten ratios that were available in 2013. Table 1 shows Industry SIC code, description and number of matched pairs that were selected from the manufacturing sector in each country.

Table 1: The Industrial Sectors and the Number of Matched Pairs of Firms

Industry SIC code	**Description**	**No. of Pairs**
2812	Alkalies and chlorine	1
2819	Industrial inorganic chemicals	1
2833	Medicinals and botanicals	1
2834	Pharmaceutical preparations	1
2851	Paints and allied products	1
2865	Cyclic crudes and intermediates	1
2869	Industrial organic chemicals	1
2875	Fertilizers, mixing only	1
2911	Petroleum refining	1
3312	Blast furnaces and steel mills	1
3313	Electrometallurgical products	1
3317	Steel pipe and tubes	2
3321	Gray and ductile iron foundries	1
3357	Nonferrous wiredrawing & insulating	1
3441	Metal cans	1
3443	Fabricated plate work (boiler shops)	1
3531	Construction machinery	1
3751	Motorcycles, bicycles, and parts	1
3661	Telephone and telegraph apparatus	1
3711	Motor vehicles and car bodies	1
3714	Motor vehicle parts and accessories	2
Total Number of Pairs		**23**

5 The Testing of Hypotheses

Paired comparison is used to compare the relative financial managerial efficiency of U.S. and BR firms. Ten hypotheses are tested on the basis of ROA, ROE, ROI, LTDE, TDTE, TAT, RTO, ITO, QR, and CR. In all of these cases the null hypothesis states that there is no difference between U.S. and BR firms with regard to the ratio that is being compared. The alternative hypothesis explains that these ratios are different. Matched pairs are used, an appropriate test is the Wilcoxon Matched-pairs Signed-ranked test. This test is ideal because it is a nonparametric test, not requiring a large sample size. This test gives more weight to pairs that show a large difference than pairs indicating small ones. In this manner the Wilcoxon test is similar to the t-test but it deals with ordinal data. This test is one of the most powerful non-parametric tests. Even for small samples its power is about 95 percent of that of the t-tests (see [14], [15], & [16]). To conduct the Wilcoxon test, first the differences between each pair, with regard to the ratios that are being compared, are computed. Then these differences are ranked on the basis of their absolute values. Next, the sums of the ranks of the positive and negative differences are used as the test statistics T-, and T+, respectively. Finally, the appropriate absolute T value in each table is chosen as the test statistic and is compared to the critical value given in the table of critical values for the Wilcoxon test, for the number of observations (N).

5.1 Profitability

The results of the tests for profitability, measured by ROA, ROE, and ROI, are shown in Tables 2 through 4. The values of the test statistic (T) in these tables indicate that all of the null hypotheses of similarities between ROA (Table 2) and ROI (Table 4) cannot be rejected at the 5% level of significance. ROA similarities mean that U.S. firms and BR firms are similar in terms of efficiency by which they use assets to generate profit. The similarities of ROI means that the U.S. firms and Brazilian firms are similar with regard to the efficiency by which they manage the invested capital to generate profit.
The null hypothesis that ROE of U.S. firms and Brazilian firms does not differ is rejected at 5% level of significance, indicating that BR firms have higher ROE ratios as compared to U.S. firms. This means Brazilian firms are more efficient than U.S. firms in terms of generating income for their shareholders.

5.2 Debt Management

The results of the tests for debt management, measured by LTDE and TDTE are shown in Tables five and six, respectively. The values of the test statistic (T) in these tables indicate that all of the null hypotheses of similarities of between the U.S. firms and Brazilian firms with regard LTDE (Table 5) and TDTE (Table 6) cannot be rejected at the 5% level of significance. This implies that U.S. firms and BR firms are similar with regard to the efficiency by which they manage their total debt and long term debts.

5.3 Asset Management

The results of the tests for asset management, measured by TATO, RTO, ITO are shown in Tables seven through nine, respectively. The values of the test statistic (T) in these tables indicate that all the null hypotheses of similarities between the U.S. firms and

Brazilian firms with regard to TATO (Table 7), RTO (Table 8), and ITO (Table 9) cannot be rejected at the 5% level of significance. This implies that U.S. firms and Brazilian firms are similar with regard to the efficiency by which they manage their assets.

5.4 Liquidity Management

The results of the tests for liquidity management, measured by QR and CR are shown in Tables ten and eleven, respectively. The values of the test statistic (T) in these tables indicate that all the null hypotheses of similarities between the U.S. firms and Brazilian firms with regard to QR (Table 10), and CR (Table 11) cannot be rejected at the 5% level of significance. This implies that U.S. firms and Brazilian firms are similar with regard to the efficiency by which they manage their liquidities.

6 Concluding Remarks

This study evaluates the relative financial efficiency of U.S. firms, and Brazilian firms, using a sample of five-year time-series data for a set of 23 matched firms that are chosen from seven industries.

To the extent that the data are not biased in the context of the limitations set in this study, the foregoing analysis suggests although Brazilian firms are more efficient than the U.S. firms in terms of ROE, they are similar in terms of the other two profitability ratios of ROA and ROI.

The results of the analysis of this study also indicate that there are no significant differences between the U.S. firms and Brazilian firms with regard to their efficiency by which they manage their debts, assets, and liqidity.

In an earlier study Liu and O'Farrell examine the potential differences in financial ratios between Brazilian and U.S. companies with 60 matched-pairs of companies from three major manufacturing industries that are most attractive to U.S. investors for the year 2006. They conclude that Brazilian firms have lower long term debt to total capital, and asset turnover ratios, but higher duration of payables. This study differs from their study because each matched pair examined in their study is based on a one-year data in 2006, but this study employs all the five-year data that were available in 2013.

This study examined the comparative efficiencies of the BR and U.S. firms in terms of profitability, a debt management asset management, and liquidity, portraying the relative effectiveness of the executives of these firms in managing their finances. It would be helpful to compare production efficiencies of the BR firms with the U.S. firms to see if BR firms are as efficient as their counterparts in the U.S. in managing their production process. This would require the measurement of total factor productivity, capital productivity and labor productivity and could be the subject of further research in this area.

Table 2: The Wilcoxon Test for the Comparison of ROA Ratios of U.S. and BR Firms

PAIR	$\sum_{i=1}^{n} ROA_{ki}^{BR}$	$\sum_{i=1}^{n} ROA_{ki}^{US}$	DK	ABS	RD	PRS	NRS
1	-249.06	-54.51	-194.55	194.55	22		22
2	54.11	-45.82	99.93	99.93	21	21	
3	36.49	36.01	0.48	0.48	1	1	
4	18.07	16.33	1.74	1.74	3	3	
5	-1.66	-691.27	689.61	689.61	23	23	
6	3.16	34.11	-30.95	30.95	14		14
7	6.66	7.44	-0.78	0.78	2		2
8	24.52	46.56	-22.04	22.04	11		11
9	-1.40	0.60	-2.00	2.00	4		4
10	6.94	22.89	-15.95	15.95	7		7
11	-18.55	4.29	-22.84	22.84	13		13
12	20.23	4.26	15.97	15.97	7	7	
13	27.74	-6.97	34.71	34.71	15	15	
14	68.99	19.79	49.20	49.20	17	17	
15	24.81	44.19	-19.38	19.38	9		9
16	7.98	22.40	-14.42	14.42	5		5
17	12.05	-5.17	17.22	17.22	8	8	
18	5.91	28.75	-22.84	22.84	12		12
19	-7.38	34.17	-41.55	41.55	16		16
20	31.42	-29.36	60.78	60.78	18	18	
21	-50.98	-143.50	92.52	92.52	20	20	
22	44.13	22.51	21.62	21.62	10	10	
23	-76.86	-8.89	-67.97	67.97	19		19
TOTAL						**T+=143**	**T-=93**

$ROA_{ki}^{U.S.}$= ROA of the kth U.S. firm in the ith yea; i = 1...5; k = ...23
ROA_{ki}^{BR} = ROA of the kth BR firm in the ith year; i = 1...5; k = ...23
RD = Rank of DK; DK = $\sum_{i=1}^{n} ROA_{ki}^{U.S.}$ - $\sum_{i=1}^{n} ROA_{ki}^{BR}$; PRS = Positive rank sum; NRS = Negative rank sum.

Table 3: The Wilcoxon Test for the Comparison of ROE Ratios of U.S. and BR Firms

PAIR	$\sum_{i=1}^{n} ROE_{ki}^{BR}$	$\sum_{i=1}^{n} ROE_{ki}^{US}$	DK	ABS	RD	PRS	NRS
1	*	-3340.03	*	*	*		
2	112.12	-534.56	646.68	646.68	19	19	
3	108.06	85.20	22.86	22.86	6	6	
4	50.50	20.89	29.61	29.61	8	8	
5	-2.73	*		*			
6	5.05	124.30	-119.25	119.25	15		15
7	16.94	22.50	-5.56	5.56	3	3	
8	62.07	60.32	1.75	1.75	1	1	
9	-2.23	1.32	-3.55	3.55	2		2
10	37.84	74.38	-36.54	36.54	10		10
11	-42.61	33.61	-76.22	76.22	13		13
12	30.31	12.22	18.09	18.09	5	5	
13	196.57	-32.96	229.53	229.53	18	18	
14	110.88	42.30	68.58	68.58	11	11	
15	62.15	187.49	-125.34	125.34	16		16
16	24.33	37.47	-13.14	13.14	4		4
17	19.71	-8.02	27.73	27.73	7	7	
18	7.39	115.10	-107.71	107.71	14		14
19	-24.75	50.10	-74.85	74.85	12		12
20	59.50	-95.34	154.84	154.84	17	17	
21	-1236.74	-175.33	-1061.41	1061.41	20		20
22	58.67	26.60	32.07	32.07	9	9	
23	-90.06	-1320.29	1230.23	1230.23	21	21	
TOTAL						**T+=125**	**T- =106**

*Data not available

$ROE_{ki}^{U.S.}$= ROE of the kth U.S. firm in the ith year; i = 1...5; k = 1...21
ROE_{ki}^{BR}= ROE of the kth BR firm in the ith year; i = 1...5; k = 1...21
RD = Rank of DK; DK = $\sum_{i=1}^{n} ROE_{ki}^{U.S.}$ - $\sum_{i=1}^{n} ROE_{ki}^{BR}$; PRS = Positive rank sum; NRS = Negative rank sum

Table 4: The Wilcoxon Test for the Comparison of ROI Ratios of U.S. and BR Firms

PAIR	$\sum_{i=1}^{n} ROI_{ki}^{BR}$	$\sum_{i=1}^{n} ROI_{ki}^{US}$	DK	ABS	RD	PRS	NRS
1	*	-6.86	*				
2	182.97	-75.19	107.78	107.78	13.00	13.00	
3	83.17	116.14	199.31	199.31	19.00	19.00	
4	41.99	26.40	68.39	68.39	9.00	9.00	
5	-1.98	*	*				
6	-2.89	142.26	139.37	139.37	15.00	15.00	
7	37.58	19.08	56.66	56.66	8.00	8.00	
8	123.13	99.09	222.22	222.22	20	20	
9	-8.23	10.29	2.06	2.06	1	1	
10	126.07	70.53	196.60	196.60	17	17	
11	-5.33	24.46	19.13	19.13	4	4	
12	29.94	13.51	43.45	43.45	6	6	
13	12.44	-9.98	2.46	2.46	2	2	
14	109.30	56.00	165.30	165.30	16	16	
15	66.62	130.84	197.46	197.46	18	18	
16	27.22	85.38	112.60	112.60	14	14	
17	23.48	-6.19	17.29	17.29	3	3	
18	2.08	86.71	88.79	88.79	11	11	
19	7.60	79.06	86.66	86.66	10	10	
20	91.46	0.15	91.61	91.61	12	12	
21	*	*	*				
22	9.55	33.69	43.24	43.24	6	6	
23	43.24	-1.49	41.75	41.75	5	5	
TOTAL						T+=209	T-=0

*Data not available

$ROI_{ki}^{U.S.}$= ROI of the kth U.S. firm in the ith year; i = 1...5; k = 1...20
ROI_{ki}^{BR} = ROI of the kth BR firm in the ith year; i = 1...5; k = 1...20
RD = Rank of DK; DK = $\sum_{i=1}^{n} ROI_{ki}^{U.S.}$ - $\sum_{i=1}^{n} ROI_{ki}^{BR}$; PRS = Positive rank sum; NRS = Negative rank sum.

Table 5: The Wilcoxon Test for the Comparison of LTDTE Ratios of U.S. and BR Firms

PAIR	$\sum_{i=1}^{n} LTDTE_{ki}^{BR}$	$\sum_{i=1}^{n} LTDTE_{ki}^{US}$	DK	ABS	RD	PRS	NRS
1	*	3.61					
2	0.53	2.75	-2.22	2.22	10		10
3	3.26	2.15	1.11	1.11	7	7	
4	0.16	0.24	-0.08	0.08	1		1
5	0.05	*					
6	*	0.48					
7	0.82	1.86	-1.04	1.04	6		6
8	3.14	*					
9	0.01	0.59	-0.58	0.58	4.5		4.5
10	6.42	4.92	1.50	1.50	8	8	
11	9.04	6.67	2.37	2.37	12	12	
12	*	0.76					
13	0.23	3.71	-3.48	3.48	14		14
14	1.42	3.71	-2.29	2.29	11		11
15	4.06	5.91	-1.85	1.85	9		9
16	0.08	0.32	-0.24	0.24	2		2
17	0.11	0.69	-0.58	0.58	4.5		4.5
18	0.12	2.51	-2.39	2.39	13		13
19	0.65	0.14	0.51	0.51	3	3	
20	0.07	8.99	-8.92	8.92	15		15
21	*	0.78					
22	0.52	*					
23	1.30	*					
TOTAL						**T+=30**	**T-=90**

*Data not available

$LTDTE_{ki}^{U.S.}$= LTDTE of the kth U.S. firm in the ith year; i = 1...5; k = 1...15
$LTDTE_{ki}^{BR}$ = ROE of the kth BR firm in the ith year; i = 1...5; k = 1...15
RD = Rank of DK; DK = $\sum_{i=1}^{n} LTDTE_{ki}^{U.S.}$ - $\sum_{i=1}^{n} LTDTE_{ki}^{BR}$; PRS = Positive rank sum; NRS = Negative rank sum.

Table 6: The Wilcoxon Test for the Comparison of TDTE Ratios of U.S. and BR Firms

PAIR	$\sum_{i=1}^{n} TDTE_{ki}^{BR}$	$\sum_{i=1}^{n} TDTE_{ki}^{US}$	DK	ABS	RD	PRS	NRS
1	*	5.13					
2	0.53	2.75	-2.22	2.22	10		10
3	3.26	2.42	0.84	0.84	7	7	
4	0.16	0.24	-0.08	0.08	2		2
5	0.05	*					
6	*	0.72					
7	0.82	1.93	-1.11	1.11	8		8
8	3.38	*					
9	0.01	0.59	-0.58	0.58	5		5
10	6.42	6.50	-0.08	0.08	2		2
11	23.89	9.10	14.79	14.79	15	15	
12	*	0.85					
13	0.23	4.05	-3.82	3.82	13		13
14	1.42	3.82	-2.40	2.40	11		11
15	4.06	6.20	-2.14	2.14	9		9
16	0.08	0.35	-0.27	0.27	3		3
17	0.11	0.79	-0.68	0.68	6		6
18	0.12	2.97	-2.85	2.85	12		12
19	0.65	0.14	0.51	0.51	4	4	
20	0.07	9.02	-8.95	8.95	14		14
21	*	1.56					
22	0.52	*					
23	7.20	*					
TOTAL						**T+=26**	**T-=71**

*Data not available

$LTDTE_{ki}^{U.S.}$= LTDTE of the kth U.S. firm in the ith year; i = 1...5; k = 1...15
$LTDTE_{ki}^{BR}$ = ROE of the kth BR firm in the ith year; i = 1...5; k = 1...15
RD = Rank of DK; DK = $\sum_{i=1}^{n} LTDTE_{ki}^{U.S.}$ - $\sum_{i=1}^{n} LTDTE_{ki}^{BR}$; PRS = Positive rank sum; NRS = Negative rank sum.

Table 7: The Wilcoxon Test for the Comparison of TATO Ratios of U.S. and BR Firms

PAIR	$\sum_{i=1}^{n} TATO_{ki}^{BR}$	$\sum_{i=1}^{n} TATO_{ki}^{US}$	DK	ABS	RD	PRS	NRS
1	6.72	7.41	-0.69	0.69	6		6
2	7.48	5.95	1.53	1.53	14	14	
3	6.42	6.92	-0.50	0.50	4		4
4	0.65	1.76	-1.11	1.11	11		11
5	0.76	4.51	-3.75	3.75	19		19
6	2.46	4.43	-1.97	1.97	15		15
7	2.26	1.24	1.02	1.02	8	8	
8	3.46	7.22	-3.76	3.76	20		1
9	0.01	0.65	-0.64	0.64	5		5
10	3.73	6.33	-2.60	2.60	16		16
11	0.34	3.46	-3.12	3.12	18		18
12	0.90	1.36	-0.46	0.46	3		3
13	1.48	1.58	-0.10	0.10	1		1
14	4.51	5.57	-1.06	1.06	9	9	
15	3.71	13.73	-10.02	10.02	21	21	
16	5.74	4.60	1.14	1.14	12	12	
17	1.47	0.18	1.29	1.29	13	13	
18	0.02	3.00	-2.98	2.98	17		17
19	2.62	3.71	-1.09	1.09	10		10
20	16.55	2.51	14.04	14.04	22	22	
21	0.19	*					
22	0.81	0.37	0.44	0.44	2	2	
23	54.40	0.94	53.46	53.46	7		7
TOTAL						**T+=101**	**T-=133**

*Data not available

$TATO_{ki}^{U.S.}$= TATO of the kth U.S. firm in the ith year; i = 1...5; k = 1...22
$TATO_{ki}^{BR}$ = ROE of the kth BR firm in the ith year; i = 1...5; k = 1...22
RD = Rank of DK; DK = $\sum_{i=1}^{n} TATO_{ki}^{U.S.}$ - $\sum_{i=1}^{n} TATO_{ki}^{BR}$; PRS = Positive rank sum; NRS = Negative rank sum.

Table 8: The Wilcoxon Test for the Comparison of RTO Ratios of U.S. and BR Firms

PAIR	$\sum_{i=1}^{n} RTO_{ki}^{BR}$	$\sum_{i=1}^{n} RTO_{ki}^{US}$	DK	ABS	RD	PRS	NRS
1	26.89	45.55	-18.66	18.66	15		15
2	73.36	50.92	22.44	22.44	16	16	
3	24.71	42.50	-17.79	17.79	14		14
4	1.66	8.09	-6.43	6.43	6		6
5	5.10	20.52	-15.42	15.42	13		13
6	13.56	14.52	-0.96	0.96	2		2
7	15.48	6.99	8.49	8.49	9	9	
8	25.36	25.01	0.35	0.35	1	1	
9	6.56	4.58	1.98	1.98	3	3	
10	89.21	36.47	52.74	52.74	19	19	
11	88.81	14.99	73.82	73.82	22	22	
12	5.04	11.85	-6.81	6.81	7		7
13	12.23	10.04	2.19	2.19	5	5	
14	24.29	38.65	-14.36	14.36	12		12
15	39.08	110.82	-71.74	71.74	21		21
16	16.37	84.86	-68.49	68.49	20		20
17	8.66	14.91	-6.25	6.25	5		5
18	2.88	15.52	-12.64	12.64	10		10
19	10.10	17.42	-7.32	7.32	8		8
20	55.17	20.80	34.37	34.37	18	18	
21	*	*					
22	22.04	49.30	-27.26	27.26	17		17
23	69.60	12.81	56.79	56.79	11		11
TOTAL						**T+=93**	**T-=161**

*Data not available

$RTO_{ki}^{U.S.}$= RTO of the kth U.S. firm in the ith year; i = 1...5; k = 1...22
RTO_{ki}^{BR} = ROE of the kth BR firm in the ith year; i = 1...5; k = 1...22
RD = Rank of DK; DK = $\sum_{i=1}^{n} RTO$ - $\sum_{i=1}^{n} RTO_{ki}^{BR}$; PRS = Positive rank sum; NRS = Negative rank sum.

Table 9: The Wilcoxon Test for the Comparison of ITO Ratios of U.S. and BR Firms

PAIR	$\sum_{i=1}^{n} ITO_{ki}^{BR}$	$\sum_{i=1}^{n} ITO_{ki}^{US}$	DK	ABS	RD	PRS	NRS
1	51.51	124.40	-72.89	72.89	19		19
2	34.85	79.97	-45.12	45.12	18		18
3	36.96	24.13	12.83	12.83	11	11	
4	7.45	2.93	4.52	4.52	5	5	
5	8.18	7.94	0.24	0.24	1	1	
6	5.33	13.02	-7.69	7.69	8		8
7	11.68	9.08	2.60	2.6	3	3	
8	26.96	480.03	-453.07	453.07	20		20
9	0.06	5.05	-4.99	4.99	6		6
10	27.53	59.19	-31.66	31.66	17		17
11	16.54	9.56	6.98	6.98	7	7	
12	4.28	6.35	-2.07	2.07	2		2
13	16.05	4.91	11.14	11.14	10	10	
14	8.68	24.86	-16.18	16.18	12		12
15	57.64	74.74	-17.10	17.1	13		13
16	21.32	25.68	-4.36	4.36	4		4
17	11.13	*					
18	1.04	25.75	-24.71	24.71	14		14
19	12.85	20.60	-7.75	7.75	9		9
20	38.69	9.45	29.24	29.24	16	16	
21	7.42	*					
22	37.21	*					
23	0.00	26.75	-26.75	26.75	15		15
TOTAL						**T+=53**	**T-=157**

*Data not available

$ITO_{ki}^{U.S.}$= ITO of the kth U.S. firm in the ith year; i= 1...5; k = 1...20
ITO_{ki}^{BR} = ROE of the kth BR firm in the ith year; i= 1...5; k = 1...20
RD = Rank of DK; DK = $\sum_{i=1}^{n} ITO$ - $\sum_{i=1}^{n} ITO_{ki}^{BR}$; PRS = Positive rank sum; NRS = Negative rank sum.

Table 10: The Wilcoxon Test for the Comparison of QR Ratios of U.S. and BR Firms

PAIR	$\sum_{i=1}^{n} QR_{ki}^{BR}$	$\sum_{i=1}^{n} QR_{ki}^{US}$	DK	ABS	RD	PRS	NRS
1	0.45	0.44	0.01	0.01	1	1	
2	2.19	3.85	-1.66	1.66	9		9
3	6.20	2.05	4.15	4.15	13	13	
4	1.80	6.83	-5.03	5.03	15		15
5	3.81	*					
6	1.57	1.73	-0.16	0.16	3	3	
7	1.69	2.30	-0.61	0.61	5	5	
8	5.41	19.86	-14.45	14.45	16		16
9	0.13	0.30	-0.17	0.17	4		4
10	1.43	3.23	-1.80	1.8	10		10
11	0.04	*					
12	1.99	0.54	1.45	1.45	8	8	
13	0.57	1.92	-1.35	1.35	7		7
14	7.65	6.48	1.17	1.17	6	6	
15	*	4.07					
16	3.71	3.63	0.08	0.08	2	2	
17	2.30	0.30	2.00	2	11	11	
18	5.50	1.66	3.84	3.84	12	12	
19	*	4.86					
20	9.74	14.64	-4.90	4.9	14		14
21	*	*					
22	*	15.47					
23	*	2.21					
TOTAL						**T+=61**	**T-=75**

*Data not available

$QR_{ki}^{U.S.}$= QR of the kth U.S. firm in the ith year ; i = 1...5; k = 1...16
QR_{ki}^{BR} = ROE of the kth BR firm in the ith year; i = 1...5; k = 1...16
RD = Rank of DK; DK = $\sum_{i=1}^{n} QR$ - $\sum_{i=1}^{n} QR_{ki}^{BR}$; PRS = Positive rank sum; NRS = Negative rank sum.

Table 11: The Wilcoxon Test for the Comparison of CR Ratios of U.S. and BR Firms

PAIR	$\sum_{i=1}^{n} CR_{ki}^{BR}$	$\sum_{i=1}^{n} CR_{ki}^{US}$	DK	ABS	RD	PRS	NRS
1	0.65	1.88	-1.23	1.23	8		8
2	6.06	6.46	-0.40	0.4	3		3
3	9.06	4.84	4.22	4.22	13	13	
4	2.07	9.19	-7.12	7.12	16		16
5	4.16	0.07	4.09	4.09	12	12	
6	3.86	3.67	0.19	0.19	1	1	
7	3.19	3.84	-0.65	0.65	5		5
8	10.32	21.14	-10.82	10.82	17		17
9	0.23	0.95	-0.72	0.72	6		6
10	3.37	5.64	-2.27	2.27	9		9
11	0.15	3.51	-3.36	3.36	11		11
12	2.16	1.80	0.36	0.36	2	2	
13	1.29	5.94	-4.65	4.65	14		14
14	14.47	14.93	-0.46	0.46	4		4
15	5.97	7.02	-1.05	1.05	7		7
16	46.48	5.51	40.97	40.97	22	22	
17	24.98	1.04	23.94	23.94	20	20	
18	37.07	2.62	34.45	34.45	21	21	
19	2.68	7.44	-4.76	4.76	15		15
20	212.38	20.36	192.02	192.02		23	
21	0.11	2.81	-2.70	2.7	10		10
22	8.01	19.32	-11.31	11.31	18		18
23	15.47	3.09	12.38	12.38	19	19	
TOTAL						**T+=1331**	**T-=143**

*Data not available

$CR_{ki}^{U.S.}$= CR of the kth U.S. firm in the ith year; i = 1...5; k = 1...23
CR_{ki}^{BR} = ROE of the kth BR firm in the ith year; i = 1...5; k = 1...23
RD = Rank of DK; DK = $\sum_{i=1}^{n} CR$ - $\sum_{i=1}^{n} CR_{ki}^{BR}$; PRS = Positive rank sum; NRS = Negative rank sum.

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