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QUANTUM SOFTWARE DEVELOPMENT



PUC-SP



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STATS TESTS ANOVA

ANALYSIS OF VALUE ADDED AND ITS DISTRIBUTION IN **BOVESPA BANKS**

2024

STUDY MOTIVATION



- **Objective:** Study the generation and distribution of wealth among different groups in listed banks.
- **Description:** Introduction to DVA and its importance for transparency and socioeconomic policies.

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Key Points:

- **Relevance of corporate transparency.**
- **Importance of fair wealth distribution.**
- **Evolution of corporate social and environmental responsibility concept.**

Tabela 1 - Stakeholders Classification

Stakeholders	Description
Employees	Salaries and social charges, training received, profit-sharing, retirement plans, and other direct and indirect benefits.
Government	Taxes, fees, and contributions at federal, state, or municipal levels.
Financiers	Interest and charges on costly debt, rent.
Owners	Dividends and interest on equity.
Retained Earnings	Undistributed profits to be reinvested in activities.

- **Description:** Quantitative research with statistical analysis using ANOVA and Levene's test.
- **Test Objectives:**
 - Verify the equality of value-added means among studied banks.
- **Hypotheses:** H0 (equal means) and H1 (significant differences).

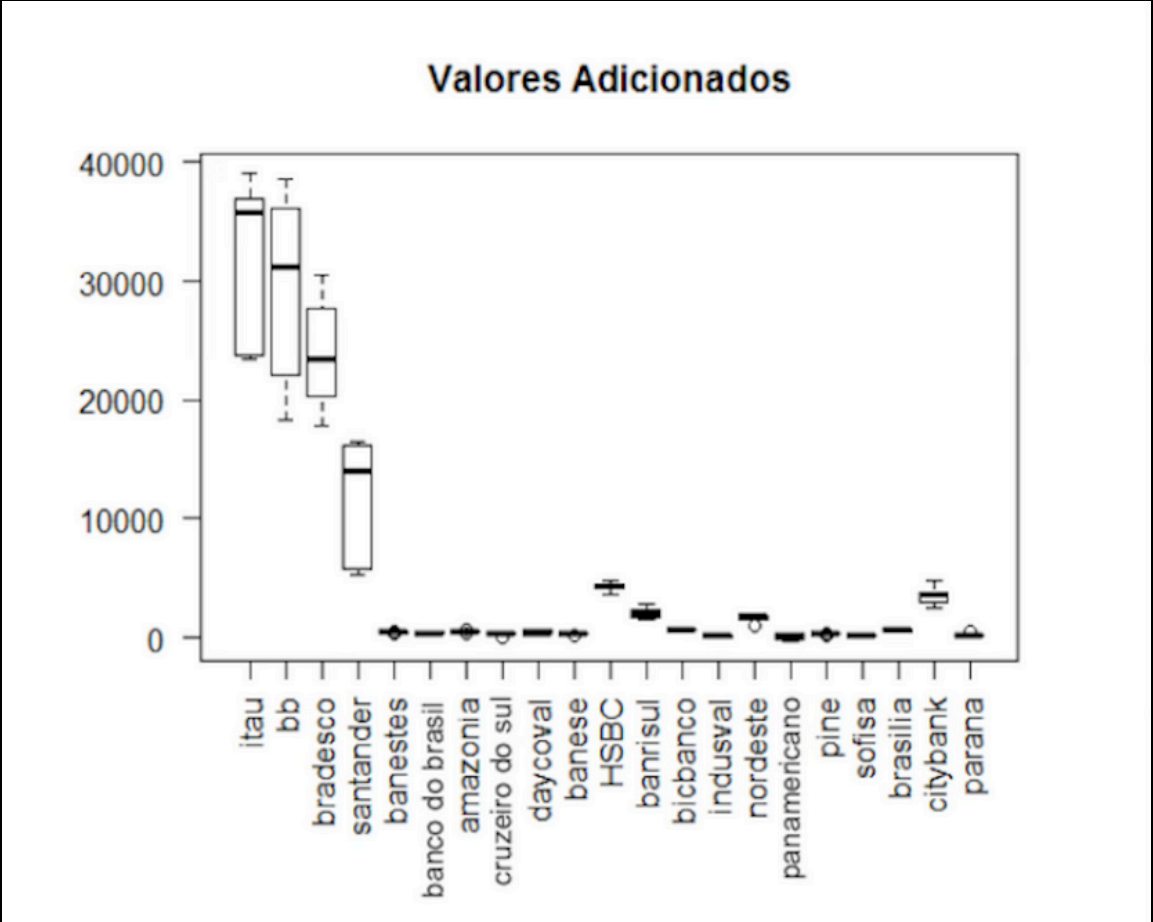


Table 2: Banks that did not participate in the research (including reasons for exclusion)

Bank	Reason for Exclusion
BTG Pactual	Did not publish DVA in 2007 and 2008
Alfa Holding	Did not publish DVA in 2007
Banco Patagonia	Did not publish DVA in 2010 and 2011
Banco Mercantil	Did not publish DVA in 2007
Banpará	Did not publish DVA in 2007

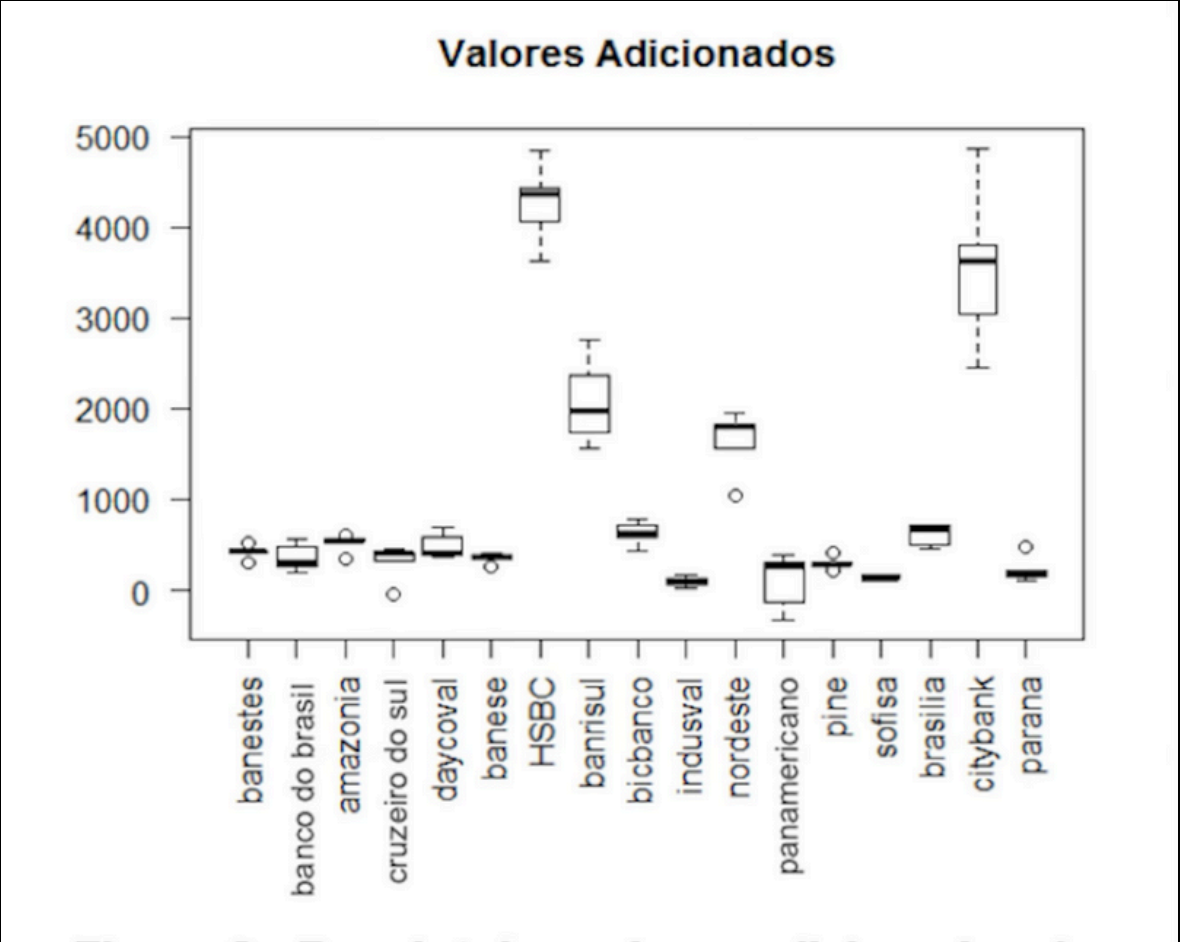
- **Levene's F Test (less than 5%):** not all variances of all banks are equal.
- **Figure 1:** Itaú, Banco do Brasil, Bradesco, and Santander account for **85%** of the added value of all banks.
- **Figure 2:** HSBC, Citibank, Banrisul, and Nordeste stand out compared to others, which have a median below **R\$ 1 million**.

Figura 1



Boxplot of the added values of all banks from 2007 to 2011

Figura 2



Boxplot of the added values of all banks excluding Itaú, Banco do Brasil, Bradesco, and S Santander) from 2007 to 2011

ANALYSIS WITH GROUP SEGMENTATION



- Groups Formed:

- **Banks with added values > R\$ 5 million:** Itaú, Banco do Brasil, Bradesco, Santander
- **Banks between R\$ 1 and R\$ 4.999 million:** Banrisul, Citibank, HSBC, Nordeste



Table 3 - Levene's F Test for banks with added values above R\$ 5 million

Item	Test Statistic	p-value	Interpretation
Added Value	2.1211	0.1377	p-value > 0.05. Therefore, the ANOVA test can be performed.
Personnel	1.5834	0.2324	p-value > 0.05. Therefore, the ANOVA test can be performed.
Government	1.6702	0.2123	p-value > 0.05. Therefore, the ANOVA test can be performed.
Third-party Capital Rem.	0.3188	0.7333	p-value > 0.05. Therefore, the ANOVA test can be performed.
Own Capital Rem.	1.1301	0.3666	p-value > 0.05. Therefore, the ANOVA test can be performed.

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Above R\$ 5 million:

- **Levene's F Test:** All p-values are above 0.05, so ANOVA test can be performed in all categories.
- **ANOVA Test:** The hypothesis of equal means is rejected in almost all categories, cept for Third-Party Capital Remuneration.
- In all cases (except the exception), the pairs **Itaú and BB**, **Bradesco and BB** have **p-values above 5%**, while the **Bradesco and Santander pair are below**.



Table 4 - ANOVA p-value for banks with added values above R\$ 5 million

Item	p-value	Interpretation
Added Value	0.0007396	Rejection of the null hypothesis of equal means. Pairwise testing between banks should be performed.
Personnel	0.0006945	Rejection of the null hypothesis of equal means. Pairwise testing between banks should be performed.
Government	0.0008252	Rejection of the null hypothesis of equal means. Pairwise testing between banks should be performed.
Third-party Capital Rem.	0.06381	At a 5% significance level, there is no evidence to reject the null hypothesis of equal means for values allocated to third-party capital. Thus, on average, all four banks allocate the same amount to third parties.
Own Capital Rem.	0.00149	Rejection of the null hypothesis of equal means. Pairwise testing between banks should be performed.

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Between R\$ 1 and 5 million:

- **Levene's F Test:** All p-values are above 0.05, so ANOVA test can be performed in all categories.
- **ANOVA Test:** The hypothesis of equal means is rejected in almost all categories, except for government.
- **p-value > 0.05:** Banrisul and Nordeste in added value and personnel. HSBC and Citibank in added value and Own Capital Remuneration.
- **p-value < 0.05:** Both Nordeste and Citibank, and HSBC and Banrisul in added value and personnel. Also in all cases of Third-Party Capital Remuneration, and Own Capital Remuneration (the latter except for HSBC and Citibank).



Table 5: Levene's F Test for banks with added values between R\$ 1 and R\$ 4.99 million

Item	Test Statistic	p-value	Interpretation
Added Value	1.2536	0.3235	p-value > 0.05. Therefore, the ANOVA test can be performed.
Personnel	0.5946	0.6276	p-value > 0.05. Therefore, the ANOVA test can be performed.
Government	0.4124	0.1047	p-value > 0.05. Therefore, the ANOVA test can be performed.
Third-party Capital Rem.	0.8406	0.4914	p-value > 0.05. Therefore, the ANOVA test can be performed.
Own Capital Rem.	2.5193	0.09483	p-value > 0.05. Therefore, the ANOVA test can be performed.

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CONCLUSIONS AND REFLECTIONS



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- This study analyzed the creation and distribution of added value by banks listed on BOVESPA (2007-2011), **comparing wealth distribution between foreign and national banks** through **Analysis of Variance (ANOVA)**.
- **Significant differences were observed**, especially in **remuneration policies** and **tax burden** among banks.
- **Santander** and **HSBC** adopt **different remuneration strategies** for their **employees**.
- **Santander** shows a **higher tax burden** and **differs** in terms of **added value**, own capital remuneration, and taxes, although **similar to Bradesco** regarding personnel remuneration.

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REFLECTIONS AND IMPLICATIONS



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- **HSBC differs** in the distribution of value **to personnel**, while **own capital** remuneration is **equal** between **HSBC** and **Citibank**, as **well** as between **Banrisul** and **Banco do Nordeste**.
- The **similarities** between **Banco Itaú (private)** and **Banco do Brasil (public)** show an **unexpected** alignment in **value distribution**.
- **Reflection:** There is an **urgent need** for greater **alignment** in **social** and **environmental** responsibility practices and **greater equity** in **wealth distribution among banks in Brazil**.

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