

2015

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Recommended Citation

Rohde, Valeria, "Correlation between Inflation Rates and Currency Values" (2015). *A with Honors Projects*. 153.
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Professor Bossaers

MAT 160

16 December 2015

Correlation between Inflation Rates and Currency Values

In the BRICS Economies

The purpose of this work was to find a relationship between the inflation rates and currency values of the countries of Brazil, Russia, India, China, and South Africa. In addition, I wanted to compare those relationships with the relationships of inflation rates and currency values of a group of randomly selected countries. To achieve this, I gathered statistical information by country from WorldBank.Org. The descriptions of Inflation, GDP deflator (annual %) and Official exchange rate (LCU per US\$, period average) as described by WorldBank.Org are:

Inflation as measured by the annual growth rate of the GDP implicit deflator shows the rate of price change in the economy as a whole. The GDP implicit deflator is the ratio of GDP in current local currency to GDP in constant local currency. Official exchange rate refers to the exchange rate determined by national authorities or to the rate determined in the legally sanctioned exchange market. It is calculated as an annual average based on monthly averages (local currency units relative to the U.S. dollar).

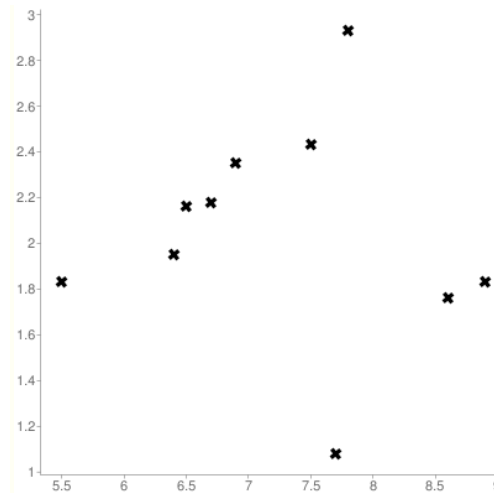
In this paper I present my findings by listing each country's individual statistical information followed by the analysis of the group of randomly selected countries. The analysis for this work was done by creating a scatter diagram, finding the sample linear correlation coefficient, r , and determining whether a linear correlation exists between the two sets of quantitative data. A Hypothesis Test was also completed on the statistical data for each of the countries for which this test was relevant.

BRAZIL

Inflation Rate	6.9	8.9	7.8	6.4	6.5	8.6	7.5	5.5	7.7	6.7
Currency Value	2.35	1.83	2.93	1.95	2.16	1.76	2.43	1.83	1.08	2.18

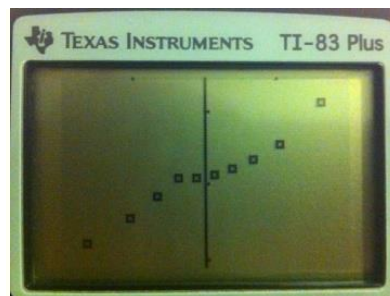
Let x = the inflation rate (explanatory variable)

Let y = the currency value (response variable)



Linear Correlation Coefficient:
$$r = \frac{\sum \left(\frac{x_i - \bar{x}}{s_x} \right) \left(\frac{y_i - \bar{y}}{s_y} \right)}{n-1} \quad r \approx -0.0866$$

The sample was obtained using random sampling by the use of the calculator function randInt to generate a simple random sample. The residuals we verified by constructing a normal probability plot and were found to be normally distributed.



Hypothesis Testing: Does a linear correlation exist between Brazil's inflation rates and currency values?

Null Hypothesis H_0 : $\beta = 0$

Alternative Hypothesis H_1 : $\beta \neq 0$

Level of Significance $\alpha = 0.05$

Reject H_0 if $p \leq 0.05$

LinRegTTest: $p \approx 0.812$

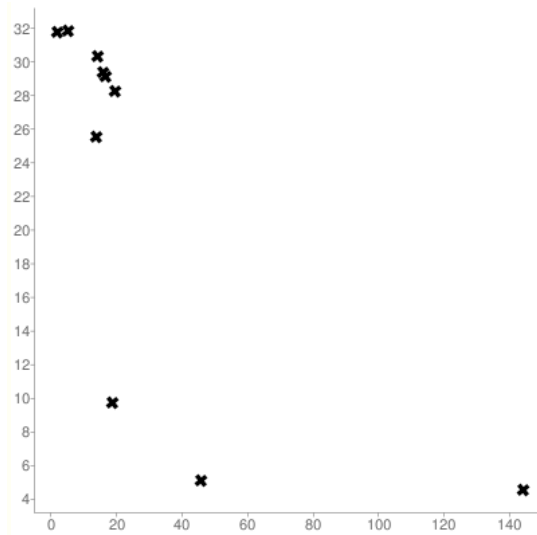
Since $p > 0.05$, we fail to reject the null hypothesis. The evidence suggests that there is no linear correlation between Brazil's inflation rate and currency value, at the 0.05 level of significance.

RUSSIA

Inflation Rate	144.0	19.3	14.2	2.0	16.5	5.0	18.5	15.9	45.8	13.8
Currency Value	4.56	28.28	30.37	31.74	29.17	31.84	9.71	29.38	5.12	25.58

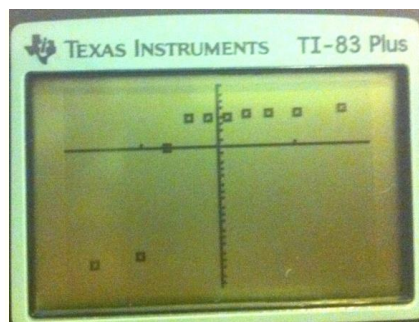
Let x = the inflation rate (explanatory variable)

Let y = the currency value (response variable)



Correlation Coefficient:
$$r = \frac{\sum \left(\frac{x_i - \bar{x}}{s_x} \right) \left(\frac{y_i - \bar{y}}{s_y} \right)}{n - 1} \quad r \approx -0.722$$

The sample was obtained using random sampling by the use of the calculator function randInt to generate a simple random sample. The residuals we verified by constructing a normal probability plot and were found not to be normally distributed. A hypothesis test cannot be performed due to this requirement not being met.

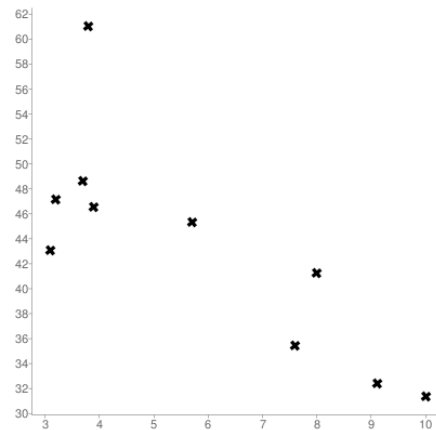


INDIA

Inflation Rate	7.6	3.9	3.7	3.2	3.8	3.1	5.7	8.0	9.1	10.0
Currency Value	35.43	46.58	48.61	47.19	61.03	43.06	45.32	41.26	32.43	31.37

Let x = the inflation rate (explanatory variable)

Let y = the currency value (response variable)

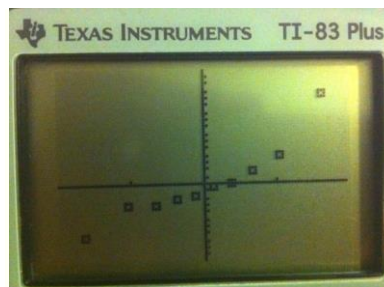


$$r = \frac{\sum \left(\frac{x_i - \bar{x}}{s_x} \right) \left(\frac{y_i - \bar{y}}{s_y} \right)}{n-1}$$

Correlation Coefficient: $r \approx -0.798$

By looking at the scatter diagram, there appears to be a negative linear correlation between inflation rates and currency values.

The sample was obtained using random sampling by the use of the calculator function randInt to generate a simple random sample. The residuals we verified by constructing a normal probability plot and were found to be normally distributed.



Hypothesis Testing: Does a negative linear correlation exist between India's inflation rates and currency values?

Null Hypothesis H_0 : $\beta = 0$

Alternative Hypothesis H_1 : $\beta < 0$

Level of Significance $\alpha = 0.05$

Reject H_0 if $p \leq 0.05$

LinRegTTest: $p \approx 0.00281$

Since $p < 0.05$, we reject the null hypothesis. There is enough evidence to suggest that there is a negative linear correlation between India's inflation rate and the currency value, at the 0.05 level of significance.

Regression Line: $\hat{y} \approx 58.7 - 2.67x$

Domain for \hat{y} : [3.1, 10.0]

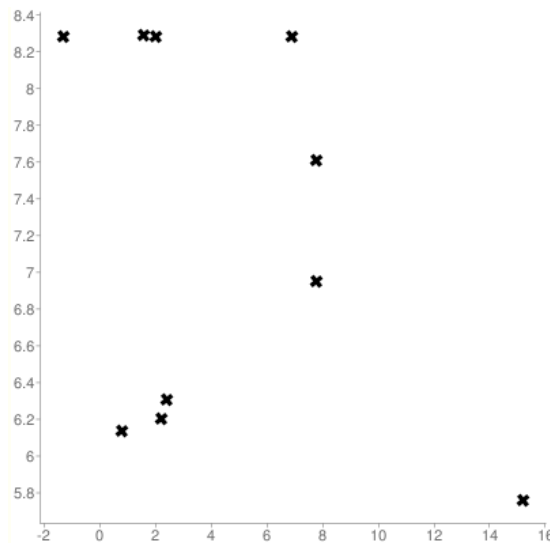
Slope interpretation: It is estimated that for every 0.1 point increase in India's inflation rate, there will be a 0.267 decrease in its currency value.

CHINA

Inflation Rate	2.0	1.6	-1.3	2.4	6.9	7.8	0.8	2.2	7.8	15.2
Currency Value	8.28	8.29	8.28	6.31	8.28	6.95	6.14	6.20	7.61	5.76

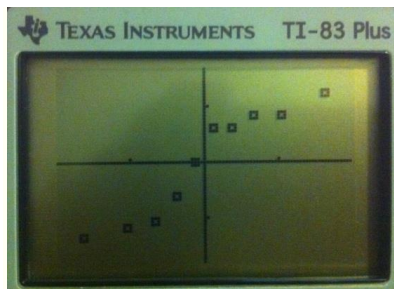
Let x = the inflation rate (explanatory variable)

Let y = the currency value (response variable)



Correlation Coefficient: $r = \frac{\sum \left(\frac{x_i - \bar{x}}{s_x} \right) \left(\frac{y_i - \bar{y}}{s_y} \right)}{n-1}$ $r \approx -0.355$

The sample was obtained using random sampling by the use of the calculator function randInt to generate a simple random sample. The residuals we verified by constructing a normal probability plot and were found to be normally distributed.



Hypothesis Testing: Does a linear correlation exist between China's inflation rates and currency values?

Null Hypothesis $H_0: \beta = 0$

Alternative Hypothesis $H_1: \beta \neq 0$

Level of Significance $\alpha = 0.05$

Reject H_0 if $p \leq 0.05$

LinRegTTest: $p \approx 0.314$

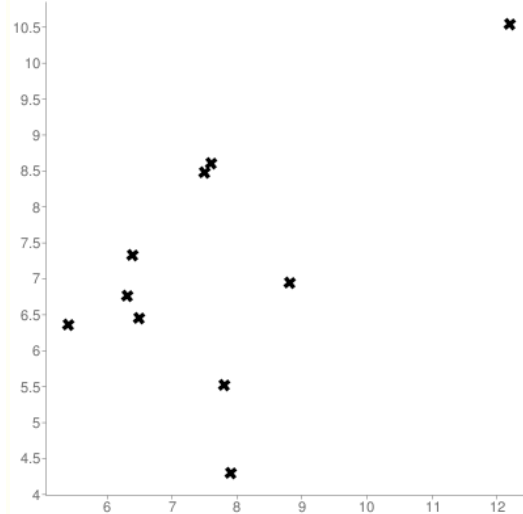
Since $p > 0.05$, we fail to reject the null hypothesis. There is evidence to suggest that there is no linear correlation between China's inflation rate and the currency value, at the 0.05 level of significance.

SOUTH AFRICA

Inflation Rate	5.4	7.8	7.5	8.8	7.6	6.5	7.9	6.4	12.2	6.3
Currency Value	6.36	5.53	8.47	6.94	8.61	6.46	4.30	7.32	10.54	6.77

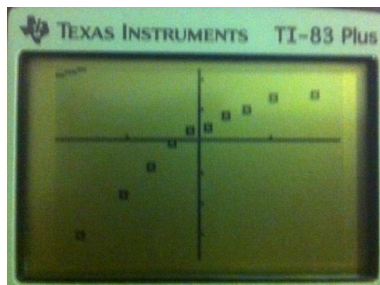
Let x = the inflation rate (explanatory variable)

Let y = the currency value (response variable)



Correlation Coefficient:
$$r = \frac{\sum \left(\frac{x_i - \bar{x}}{s_x} \right) \left(\frac{y_i - \bar{y}}{s_y} \right)}{n-1} \quad r \approx 0.569$$

The sample was obtained using random sampling by the use of the calculator function randInt to generate a simple random sample. The residuals we verified by constructing a normal probability plot and were found to be normally distributed.



Hypothesis Testing: Does a linear correlation exist between South Africa’s inflation rates and currency values?

Null Hypothesis $H_0: \beta = 0$

Alternative Hypothesis $H_1: \beta \neq 0$

Level of Significance $\alpha = 0.05$

Reject H_0 if $p \leq 0.05$

LinRegTTest: $p \approx 0.0862$

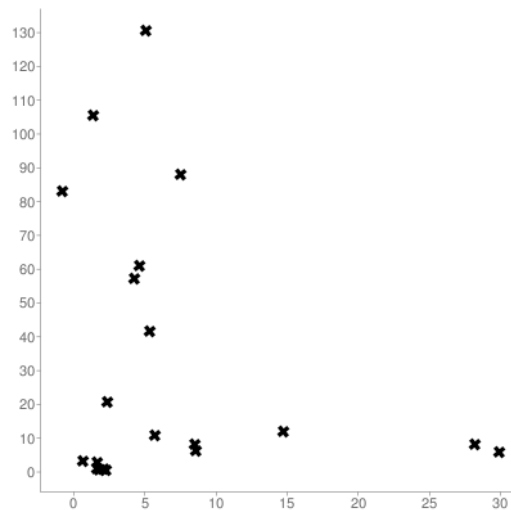
Since $p > 0.05$, we fail to reject the null hypothesis. There is enough evidence to suggest that there is no linear correlation between South Africa’s inflation rate and the currency value, at the 0.05 level of significance.

OTHER Randomly Selected Countries

Inflation Rate	1.4	1.6	4.6	-0.8	2.4	1.6	7.5	8.5	2.3	0.6	5.1	29.9	5.7	14.7	1.8	8.6	2.1	5.3	28.2	4.3
Currency Value	105.48	1.11	61.03	83.11	20.76	2.70	87.92	7.99	0.75	3.15	130.56	5.74	10.85	11.89	0.61	6.15	1.00	41.73	8.08	57.25

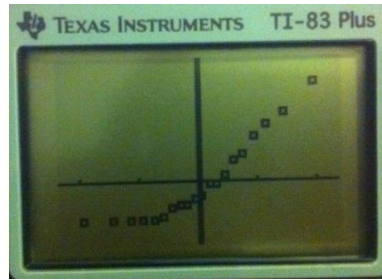
Let x = the inflation rate (explanatory variable)

Let y = the currency value (response variable)



Linear Correlation Coefficient:
$$r = \frac{\sum \left(\frac{x_i - \bar{x}}{s_x} \right) \left(\frac{y_i - \bar{y}}{s_y} \right)}{n - 1} \quad r \approx -0.217$$

The sample of 20 countries was obtained using random sampling by the use of the calculator function randInt to generate a simple random sample. The year was also chosen at random by the same function. The residuals we verified by constructing a normal probability plot and were found to be roughly normally distributed.



Hypothesis Testing: Does a linear correlation exist between inflation rates and currency values of other randomly selected countries?

Null Hypothesis H_0 : $\beta = 0$

Alternative Hypothesis H_1 : $\beta \neq 0$

Level of Significance $\alpha = 0.05$

Reject H_0 if $p \leq 0.05$

LinRegTTest: $p \approx 0.358$

Since $p > 0.05$, we fail to reject the null hypothesis. The evidence suggests that there is no linear correlation between inflation rates and currency values of other randomly selected countries, at the 0.05 level of significance.

To conclude this study, I believe it is fair to say that according to the tests performed in this work, except for India in which a negative linear correlation exists, there is no strong evidence of a correlation between inflation rates and currency values in most the BRICS countries or other countries in general. Therefore, a prediction cannot generally be made about a country's official exchange rate depending only on its inflation, as presented by the GDP implicit deflator.

<http://data.worldbank.org/indicator/NY.GDP.DEFL.KD.ZG>

<http://data.worldbank.org/indicator/PA.NUS.FCRF>