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# INTRODUCTION TO THE IMPLIED INFLATION RATE DATA SET

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*Currency Board Working Paper*

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# **Introduction to the Implied Inflation Rate Data Set**

**By Oliver Simon**

## **About the Series**

The *Studies in Applied Economics Series* is under the general direction of Professor Steve H. Hanke, Co-Director of the Institute for Applied Economics, Global health and Study of Business Enterprise ([hanke@jhu.edu](mailto:hanke@jhu.edu)).

This working paper is one in a series on hyperinflation. The authors are mainly students at The Johns Hopkins University in Baltimore. Some performed their work as research assistants at the Institute.

## **About the Author**

Oliver Simon ([osimon3@jhu.edu](mailto:osimon3@jhu.edu)) is a senior at The Johns Hopkins University in Baltimore, majoring in applied math and statistics and economics. He conducted this research for Professor Steve Hanke during the fall semester of 2013. He thanks Nicholas Krus and Kurt Schuler for their assistance.

## **Summary**

This paper introduces and describes the accompanying workbook, which contains data sets of both official and parallel (black market) exchange rates against the U.S. dollar for 110 countries from 1948 to 1999 annually. In addition, from these data sets implied inflation rates are calculated from both the official and parallel exchange rates using purchasing power parity (PPP).

The data provide a powerful resource to those researching black market exchange rates and inflation, and allows for comparisons on a country-by-country level with ease. It is my intention that this data set and spreadsheet will be used for future academic analysis.

## Research Goal

This paper aims to provide users with a digitized resource to study parallel (black market) exchange rates and inflation, and compare those rates with their official counterparts. While other economists have compiled these data sets in the past, they often contain missing subsets of the data, or are difficult to navigate in an efficient manner. My spreadsheet aims to remedy these two issues, first by filling in some of the gaps of other data sets, and second by offering an easily accessible portion of the spreadsheet that can be used to quickly compare official and parallel implied inflation rates.

Second, with the dataset I have done a small amount of analysis comparing the basic relationships between the official and parallel implied inflation rates in an effort to display just some of the many research opportunities it offers.

## Methodology

The data for this research paper was obtained from a number of sources. Data for official exchange rates were gathered first from the International Monetary Fund's International Financial Statistics (IFS) database. Data for the remaining official exchange rates, as well as the parallel exchange rates, was gathered from two sources. First, values from 1947 to 1998 were taken from *Pick's Currency Yearbook*, an annual publication that published observed exchange rates. I am indebted to Kurt Schuler, who had already digitized much of the data available in *Pick's* not already digitized by Ilzetski, Reinhart and Rogoff (2008) and who added some notes on which countries used other currencies rather than issuing their own. Second, the data for 1999 was obtained from the *MRI Banker's Guide to Foreign Currency*. All exchange rates are against the U.S. dollar.

With these two sets of exchange rates for each country in hand I employed Purchasing Power Parity (PPP) in order to calculate implied inflation rates using a formula from "On the Measurement of Zimbabwe's Hyperinflation" (Hanke and Kwok 2009). Purchasing Power Parity states that the ratio of price levels between two countries is the exchange rate between those countries. Mathematically, if  $P_A$  and  $P_B$  are the price levels in countries A and B respectively, and  $E_{AB}$  is the exchange rate between those two countries, then:

$$\frac{P_A}{P_B} = E_{AB}$$

From here we can derive the implied inflation rate as follows:

$$\frac{P_A}{P_B} = E_{AB}$$

$$\frac{1 + \frac{\Delta P_A}{P_A}}{1 + \frac{\Delta P_B}{P_B}} = 1 + \frac{\Delta E_{AB}}{E_{AB}} \quad (\text{assuming } \Delta P_B = 0)$$

$$\frac{\Delta P_A}{P_A} = \frac{\Delta E_{AB}}{E_{AB}}$$

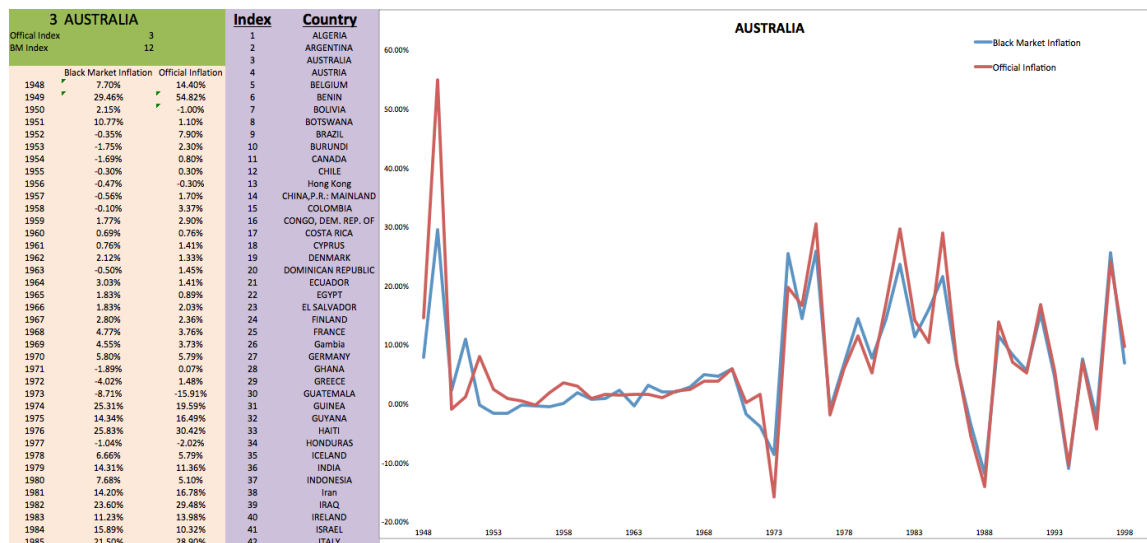
$$Inflation_A = \left[ (1 + Inflation_B) \times \left( 1 + \frac{\Delta E_{AB}}{E_{AB}} \right) \right]$$

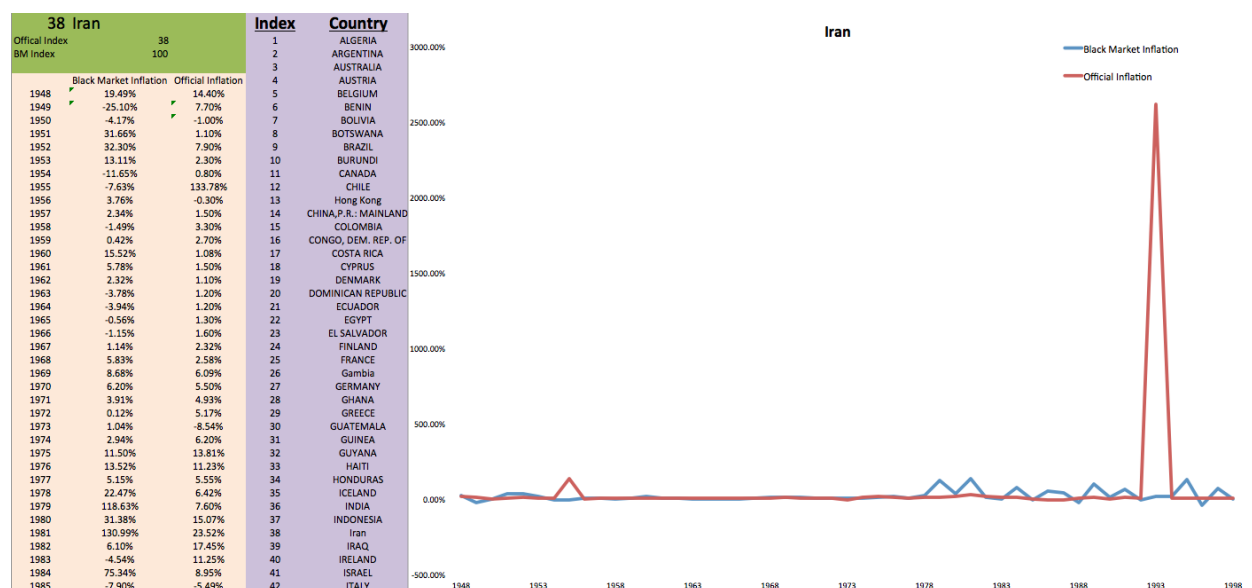
In my calculations, “country B” is the United States and the exchange rate is the rate against the U.S. dollar.

## Data Presentation

The accompanying spreadsheet displays the data I have organized in two ways. First, the data can be view as a number of traditional time series for each country. The tabs “Black Market End of Year” and “Official End of Year” show exchange rate data, while “Black Market Inflation” and “Official Inflation” show the calculated implied annual inflation rates. Note that “Official Inflation” is not the officially reported consumer price index, but an implied rate calculated from the exchange rate.

Second, and more digestibly, the “Compare” tab of the accompanying spreadsheet allows the user to select a country via its index and view the corresponding time series as well as a chart that plots end of year implied inflation calculated from both official and parallel rates. The “Compare” tab is designed to make viewing and interacting with the data as easy as possible. The images below show two such country outputs: Australia, where the two implied inflation series are virtually identical, and Iran, where there is significant disparity. Additional information for how to use the accompanying spreadsheet can be found in the “Read Me” tab.





## Analysis

The analysis I performed using the data set is certainly not robust or complete, but rather serves to show just some of the conclusions that the implied inflation data can help lead researchers to. To that end I performed two simple tests.

The first test I performed on the data set was a correlation comparison between the implied official inflation rates and the corresponding implied black market-based inflation rates. These correlations range from -33.8% to 99.24% and average 39.9%. This average is biased downward, however, as it represents the average correlation over all countries and all years, which includes periods where there are missing data. Missing data are usually from the parallel exchange rate information, and evaluates for zero, correlating poorly with the official data.

A second test I performed was to correlate the correlations of countries official and parallel implied inflation rates with that countries respective Chinn-Ito value for 1998. The Chinn-Ito index is a measure of financial openness, which ranges from -1.86 to 2.44 for the countries and period included here. This test showed a relatively weak correlation of 17%. This weak result could be a result of a weak test as the correlations consider the entire time series, while Chinn-Ito values are an annual statistic. Nonetheless, many countries have consistent Chinn-Ito indices for long periods of time, and thus this result suggests that further work could be devoted developing quantitative methods to identify financial openness.

## Further Research and Conclusion

There are a number of different opportunities for further academic work with this data set. First, the parallel rate data is not complete, as a number of countries are missing large portions of the time series. I do not believe these pieces of data can be found in editions of *Pick's Currency Yearbook*, and thus researchers would need to identify other sources of parallel rate information. Second, this data set could be expanded past 1999. Though I was unable to locate additional editions of the *MRI Banker's Guide* during my semester of research for this paper, they are certainly available, and could be used to add to this data set.

In addition to bolstering the existing data set, further research could be devoted to comparing the relationship between parallel and official implied inflation to other metrics of economic openness. If official and parallel inflation rates generally mirror each other, as in the case of Australia above, one could conclude that the economy in that country is relatively open. To the contrary, if the above is not true, one could identify that the country might not be reporting accurate economic data and pursue further analysis.

The implied inflation data set provides users with a robust resource to utilize and study, and invites researchers to investigate further.

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