On Hyperinflation: New Evidence from Zambia, the Central African Franc Zone, and Belarus

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Key Points

- Adds four new hyperinflation episodes—Zambia (1984–86; 1988), CFA Franc Zone (1994), and Belarus (May 2011)—bringing the Hanke–Krus table to 71.
- Measures inflation via PPP using parallel-market exchange rates; applies Cagan's ≥50%/month for ≥30 days with full replicability.
- Peak rates: Zambia ~171%/mo and ~100%/mo; CFA Zone ~101%/mo; Belarus ~52.4%/mo.
- In Belarus, exchange-rate unification and tighter policies later eased inflation by early 2012.

Introduction

This paper addresses the measurement of Zambia, the CFA Franc Zone, and Belarus's monthly inflation rate during periods in which the countries faced economic challenges. It identifies four new hyperinflation episodes that took place in those countries. The calculations of the monthly inflation rates are carried out using parallel market exchange rate data for the Old Zambian kwacha, the CFA franc, and the Old Belarus ruble, and the measurements are made using the purchasing power parity doctrine (PPP). PPP has proven to be a measuring method that is highly accurate in hyperinflation periods.

The Hanke-Krus World Hyperinflation Table

The Hanke-Krus World Hyperinflation table was first published in 2013 in the *Routledge Handbook of Major Events in Economic History* (Hanke-Bushnell, 2017). The table contained every country that had experienced an episode of hyperinflation for a total of 56 countries. Since its initial publication, 11 additional episodes have been identified and included in the hyperinflation table.

Hyperinflation episodes are identified based on the following criteria:

1. To qualify as hyperinflation, the inflation rate must be at least 50%/month, following Phillip Cagan's definition of hyperinflation (1956).
2. The 50%/month or above inflation rate must persist for at least 30 consecutive days.
3. Once the monthly rate falls below 50 percent following 30 consecutive days, the period ends.
4. However, if it is within a year following the last consecutive day of the original period of hyperinflation, and the monthly inflation rate once again remains above 50 percent for another 30 consecutive days, the two periods are considered part of the same episode.
5. The hyperinflation episode must be fully replicable, and episodes must be fully documented.

The current Hanke-Krus Hyperinflation table can be found in the following pages. It includes the 67 episodes that have been identified so far and includes the four episodes introduced in this working paper: two episodes that took place in Zambia (1984–1986 and 1988), the Central African Franc Zone (1994), and Belarus (2011).

Table 1: The Hanke-Krus World Hyperinflation Table (2013, Amended 5/2025)

Location	Start Date	End Date	Month with Highest Inflation Rate	Highest Monthly Inflation Rate	Equivalent Daily Inflation Rate	Time Required for Prices to Double	Currency	Type of Price Index
Hungary[1]	Aug. 1945	Jul. 1946	Jul. 1946	4.19×10^{16}%	207%	15.0 hours	Pengö	Consumer
Zimbabwe[2]	Mar. 2007	Mid-Nov. 2008	Mid-Nov. 2008	7.96×10^{10}%	98.00%	24.7 hours	Dollar	Implied Exchange Rate*
Yugoslavia[3]	Apr. 1992	Jan. 1994	Jan. 1994	313,000,000%	64.60%	1.41 days	Dinar	Consumer
Republika Srpska†[4]	Apr. 1992	Jan. 1994	Jan. 1994	297,000,000%	64.30%	1.41 days	Dinar	Consumer
Germany[5]	Aug. 1922	Dec. 1923	Oct. 1923	29,500%	20.90%	3.70 days	Papiermark	Wholesale
Greece[6]	May 1941	Dec. 1945	Oct. 1944	13,800%	17.90%	4.27 days	Drachma	Exchange Rate‡
China§[7]	Oct. 1947	Mid-May 1949	Apr. 1949	5,070%	14.10%	5.34 days	Yuan	Wholesale for Shanghai
Free City of Danzig[8]	Aug. 1922	Mid-Oct. 1923	Sep. 1923	2,440%	11.40%	6.52 days	German Papiermark	Exchange Rate**
Armenia[9]	Oct. 1993	Dec. 1994	Nov. 1993	438%	5.77%	12.5 days	Dram & Russian Ruble	Consumer
Turkmenistan ††[10]	Jan. 1992	Nov. 1993	Nov. 1993	429%	5.71%	12.7 days	Manat	Consumer
Taiwan[11]	Aug. 1945	Sep. 1945	Aug. 1945	399%	5.50%	13.1 days	Yen	Wholesale for Taipei
Peru[12]	Jul. 1990	Aug. 1990	Aug. 1990	397%	5.49%	13.1 days	Inti	Consumer
Bosnia and Herzegovina[13]	Apr. 1992	Jun. 1993	Jun. 1992	322%	4.92%	14.6 days	Dinar	Consumer
General Government (Poland)[14]	Feb. 1944	Feb. 1944	Feb. 1944	321%	4.91%	14.8 days	Łódź Ghetto Mark	Exchange Rate***

France[15]	May 1795	Nov. 1796	Mid-Aug 1796	304%	4.77%	15.1 days	Mandat	Exchange rate
China[16]	Jul. 1943	Aug. 1945	Jun. 1945	302%	4.75%	15.2 days	Yuan	Wholesale for Shanghai
Ukraine[17]	Jan. 1992	Nov. 1994	Jan. 1992	285%	4.60%	15.6 days	Russian Ruble	Consumer
Poland[18]	Jan. 1923	Jan. 1924	Oct. 1923	275%	4.50%	16.0 days	Marka	Wholesale
Nicaragua[19]	Jun. 1986	Mar. 1991	Mar. 1991	261%	4.37%	16.4 days	Córdoba	Consumer
Congo (Zaire)[20]	Nov. 1993	Sep. 1994	Nov. 1993	250%	4.26%	16.8 days	Zaïre	Consumer
Russia††[21]	Jan. 1992	Jan. 1992	Jan. 1992	245%	4.22%	17.0 days	Ruble	Consumer
Bulgaria[22]	Feb. 1997	Feb. 1997	Feb. 1997	242%	4.19%	17.1 days	Lev	Consumer
Moldova[23]	Jan. 1992	Dec. 1993	Jan. 1992	240%	4.16%	17.2 days	Russian Ruble	Consumer
Venezuela[24]	Nov. 2016	Feb. 2019	Apr. 2018	234%	4.10%	17.3 days	Bolivar	Exchange Rate****
General Government (Poland)[25]	Mar. 1942	Mar. 1942	Mar. 1942	232%	4.09%	17.3 days	Łódź Ghetto Mark	Exchange Rate***
Russia / USSR[26]	Jan. 1922	Feb. 1924	Feb. 1924	212%	3.86%	18.5 days	Ruble	Consumer
Georgia[27]	Sep. 1993	Sep. 1994	Sep. 1994	211%	3.86%	18.6 days	Coupon	Consumer
Suriname[28]	Jun. 1993	Jun. 1993	Jun. 1993	208.0%	3.82%	18.7 days	Surinamese guilder	Exchange rate*****
Tajikistan††[29]	Jan. 1992	Oct. 1993	Jan. 1992	201%	3.74%	19.1 days	Russian Ruble	Consumer
Georgia[30]	Mar. 1992	Apr. 1992	Mar. 1992	198%	3.70%	19.2 days	Russian Ruble	Consumer
Argentina[31]	May 1989	Mar. 1990	Jul. 1989	197%	3.69%	19.3 days	Austral	Consumer
Zimbabwe[32]	Jun. 2023	Jul. 2023	Jun. 2023	193%	3.65%	19.3 days	Dollars	Implied Exchange Rate******
Zimbabwe[33]	Sep. 2017	Nov. 2017	Oct. 2017	185%	3.56%	20.1 days	Dollars	Implied Exchange Rate*******
Bolivia[34]	Apr. 1984	Sep. 1985	Feb. 1985	183%	3.53%	20.3 days	Boliviano	Consumer

Zambia[35]	**Nov. 1984**	**Oct. 1986**	**Oct. 1985**	**171%**	**3.38%**	**20.9 days**	**Old Zambian Kwacha**	**Exchange rate*******
Lebanon[36]	Jun. 2020	Jul. 2020	Jun. 2020	170%	3.37%	20.9 days	Lebanese Pound	Exchange Rate
Belarus††[37]	Jan. 1992	Feb. 1992	Jan. 1992	159%	3.22%	22.2 days	Russian Ruble	Consumer
Kyrgyzstan †† [38]	Jan. 1992	Jan. 1992	Jan. 1992	157%	3.20%	22.3 days	Russian Ruble	Consumer
Venezuela[39]	Apr. 2020	Dec. 2020	Apr. 2020	151%	3.11%	22.6 days	Bolivar	Exchange Rate***
Kazakhstan †† [40]	Jan. 1992	Jan. 1992	Jan. 1992	141%	2.97%	24.0 days	Russian Ruble	Consumer
Austria[41]	Oct. 1921	Sep. 1922	Aug. 1922	129%	2.80%	25.5 days	Crown	Consumer
Bulgaria[42]	Feb. 1991	Mar. 1991	Feb. 1991	123%	2.71%	26.3 days	Lev	Consumer
Uzbekistan ††[43]	Jan. 1992	Feb. 1992	Jan. 1992	118%	2.64%	27.0 days	Russian Ruble	Consumer
Azerbaijan[44]	Jan. 1992	Dec. 1994	Jan. 1992	118%	2.63%	27.0 days	Russian Ruble	Consumer
Congo (Zaire)[45]	Oct. 1991	Sep. 1992	Nov. 1991	114%	2.57%	27.7 days	Zaïre	Consumer
Peru[46]	Sep. 1988	Sep. 1988	Sep. 1988	114%	2.57%	27.7 days	Inti	Consumer
Taiwan[47]	Oct. 1948	May 1949	Oct. 1948	108%	2.46%	28.9 days	Taipi	Wholesale for Taipei
CFA Franc Zone[48]	**Jan. 1994**	**Jan. 1994**	**Jan. 1994**	**101%**	**2.35%**	**29.9 days**	**CFA Franc**	**Exchange rate*******
Zambia[49]	**May 1988**	**Oct. 1988**	**Oct. 1988**	**100%**	**2.34%**	**30 days**	**Old Zambian Kwacha**	**Exchange rate*******
Hungary[50]	Mar. 1923	Feb. 1924	Jul. 1923	97.9%	2.30%	30.9 days	Crown	Consumer
Chile[51]	Oct. 1973	Oct. 1973	Oct. 1973	87.6%	2.12%	33.5 days	Escudo	Consumer
Estonia †† [52]	Jan. 1992	Feb. 1992	Jan. 1992	87.2%	2.11%	33.6 days	Russian Ruble	Consumer
Angola[53]	Dec. 1994	Jan. 1997	May 1996	84.1%	2.06%	34.5 days	Kwanza	Consumer
Brazil[54]	Dec. 1989	Mar. 1990	Mar. 1990	82.4%	2.02%	35.1 days	Cruzado & Cruzeiro	Consumer

Democratic Republic of Congo[55]	Aug. 1998	Aug. 1998	Aug. 1998	78.5%	1.95%	36.4 days	Franc	Consumer
Poland[56]	Oct. 1989	Jan. 1990	Jan. 1990	77.3%	1.93%	36.8 days	Zloty	Consumer
Armenia †† [57]	Jan. 1992	Feb. 1992	Jan. 1992	73.1%	1.85%	38.4 days	Russian Ruble	Wholesale
General Government (Poland)[58]	Jan. 1940	Jan. 1940	Jan. 1940	71.4%	1.81%	39.1 days	Zloty	Consumer
Tajikistan[59]	Oct. 1995	Nov. 1995	Nov. 1995	65.2%	1.69%	42.0 days	Tajikistani Ruble	Wholesale
Latvia[60]	Jan. 1992	Jan. 1992	Jan. 1992	64.4%	1.67%	42.4 days	Russian Ruble	Consumer
Turkmenistan ††[61]	Nov. 1995	Jan. 1996	Jan. 1996	62.5%	1.63%	43.4 days	Manat	Consumer
Phillipines[62]	Jan. 1944	Dec. 1944	Jan. 1944	60.0%	1.58%	44.9 days	Japanese War Notes	Consumer
Yugoslavia[63]	Sep. 1989	Dec. 1989	Dec. 1989	59.7%	1.57%	45.1 days	Dinar	Consumer
Suriname[64]	Oct. 1994	Oct. 1994	Oct. 1994	58.6%	1.54%	45.7 days	Surinamese guilder	Exchange rate*****
Germany[65]	Jan. 1920	Jan. 1920	Jan. 1920	56.9%	1.51%	46.8 days	Papiermark	Wholesale
Kazakhstan[66]	Nov. 1993	Nov. 1993	Nov. 1993	55.5%	1.48%	47.8 days	Tenge & Russian Ruble	Consumer
General Government (Poland)[67]	Aug. 1944	Aug. 1944	Aug. 1944	54.4%	1.46%	48.6 days	Zloty	Consumer
Lithuania[68]	Jan. 1992	Jan. 1992	Jan. 1992	54.0%	1.45%	48.8 days	Russian Ruble	Consumer
Belarus[69]	Aug. 1994	Aug. 1994	Aug. 1994	53.4%	1.44%	49.3 days	Belarusian Ruble	Consumer
Belarus[70]	**May 2011**	**May 2011**	**May 2011**	**52.5%**	**1.41%**	**49.9 days**	**Belarusian Ruble**	**Exchange rate*******
Taiwan[71]	Feb. 1947	Feb. 1947	Feb. 1947	50.8%	1.38%	51.4 days	Taipi	Wholesale for Taipei

***Source**:*

Hanke, Steve H., and Nicholas Krus. "World Hyperinflations." Routledge Handbook of Major Events in Economic History, Edited by Robert Whaples and Randall Parker. London, Routledge, 2013.

Amendments: Hanke, Steve H., and Erik Bostrom. "Zimbabwe Hyperinflates, Again: The 58th Episode of Hyperinflation in History." Studies in Applied Economics no. 90 (2017). Johns Hopkins Institute for Applied Economics, Global Health, and the Study of Business Enterprise, Oct. 2017.

Notes:

- When a country experiences periods of hyperinflation that are broken up by 12 or more consecutive months with a monthly inflation rate below 50%, the periods are defined as separate episodes of hyperinflation.

- The currency listed in the chart is the one that, in a particular location, is associated with the highest monthly rate of inflation. The currency may not have been the only one that was in circulation, in that location, during the episode.

- We are aware of one other likely case of hyperinflation: North Korea. We reached this conclusion after calculating inflation rates using data from the foreign exchange black market, and also by observing changes in the price of rice. Based on our estimates, this episode of hyperinflation most likely occurred from December 2009 to mid- January 2011. Using black-market exchange-rate data, and calculations based on purchasing power parity, we determined that the North Korean hyperinflation peaked in early March 2010, with a monthly rate of 496% (implying a 6.13% daily inflation rate and a price-doubling time of 11.8 days). When we used rice price data, we calculated the peak month to be mid-January 2010, with a monthly rate of 348% (implying a 5.12% daily inflation rate and a price-doubling time of 14.1 days). All of these data were obtained 13August 2012 from *Daily NK*, an online newspaper that focuses on issues relating to North Korea (http://www.dailynk.com/english/market.php). We also acknowledge that our investigation was aided by reports from Good Friends USA, a Korean-American advocacy and research organization, as well as from Marcus Noland at the Peterson Institute for International Economics.

(*) The authors calculated Zimbabwe's inflation rate, using changes in the price of the stock, Old Mutual, which was traded both on the Harare and London stock exchanges. The stock prices yielded an implied exchange rate for Zimbabwe dollars, under purchasing power parity.

(†) The Republika Srpska is a Serb-majority, semi-autonomous entity within Bosnia and Herzegovina. From 1992 until early 1994, the National Bank of Republika Srpska issued its own unique currency, the Republika Srpska dinar.

(‡) Greece's inflation rate was estimated by calculating the drachma / gold sovereign exchange rate.

(§) The peak monthly inflation rate listed for China in the Table differs from that presented in one of the authors' previous pieces on hyperinflation (Hanke and Kwok, 2009). This revision is based on new data from a number of sources, which were recently obtained from the Library of Congress in Washington, D.C.

(**) We calculated the Free City of Danzig's inflation rate using German inflation data, since the German papiermark was in circulation in Danzig during this time. It is worth noting that Germany and Danzig experienced different peak months of hyperinflation. This is the case because the last full month in which the German papiermark circulated in the Free City of Danzig was September 1923. Germany continued to circulate the papiermark beyond this point and subsequently experienced its peak month of hyperinflation (October 1923).

(††) The data for many of the post-Soviet countries were only available in the World Bank's Statistical Handbook: States of the Former USSR. In this publication, the authors stated that the data should be viewed with an extra degree of caution because the statistics were taken from the corresponding official internal government source and not independently reviewed by the World Bank. However, these statistics are official and are the only source of data available for the corresponding time periods for each country.

(***) The authors use USD/Reichsmark exchange rate data obtained from Prof. Harold James (Princeton) and Dr. Kurt Schuler (Center for Financial Stability)

(****) We calculated PPP implied inflation for Venezuela using black-market exchange rate data from AirTM, a currency exchange platform

(*****) PPP implied inflation for Suriname, Zambia, the CFA Region, and the 2011 Episode in Belarus was calculated was calculated using black-market exchange rate data from Carmen Reinhart and Kenneth Rogoff's parallel exchange rate data set, which includes digitized data on black market exchange rates for the Surinamese guilder from Pick's World Currency Reports.

(******) We calculated PPP implied inflation for Zimbabwe using black market exchange rate data from ZimPriceCheck.com

(*******) The authors calculated Zimbabwe's inflation rate, using changes in the price of the stock, Old Mutual, which was traded both on the Harare and London stock exchanges. The stock prices yielded an implied exchange rate for "New Zim dollars", under purchasing power parity.

On the Method of Purchasing Power Parity

The economic principle of Purchasing Power Parity (PPP) allows for the transformation of changes in the free-market exchange rate of a country into measurements of inflation (Hanke-Kwok, 2009). Having access to parallel market exchange rate data, PPP can be used to estimate monthly inflation in the four cases this paper addresses.

According to PPP, the ratio of price levels between two countries is equal to the exchange rate between their currencies. The ratio of price levels has a strong correlation with changes in the exchange rate, and the linkage between the exchange rate and the price level is maintained by price arbitrage (Hanke-Kwok, 2009).

Let:

PA = the price level of the foreign currency

PB = the price level of the United States in US dollars (USD)

SA/B = the exchange rate (foreign currency per unit of USD)

Purchasing Power Parity in the absolute form states that:

$$\frac{P_A}{P_B} = S_{A/B}{}^{*}$$

Then, we can convert Absolute PPP to Relative PPP:

$$\frac{1+\frac{\Delta P_A}{P_A}}{1+\frac{\Delta P_B}{P_B}} = 1+\frac{\Delta S_{A/B}}{S_{A/B}}$$

The terms can then be rearranged to obtain the following relationship:

$$\frac{\Delta P_A}{P_A} = \left[\left(1+\frac{\Delta P_B}{P_B}\right)\left(1+\frac{\Delta S_{\frac{A}{B}}}{S_{\frac{A}{B}}}\right)\right] - 1$$

On the Data used for Calculations

In 2004, Dr. Carmen Reinhart and Dr. Kenneth Rogoff published "The Modern History of Exchange Rate Arrangements: A Reinterpretation" in the *Quarterly Journal of Economics*. The paper analyzed and reclassified historical exchange rate regimes and was accompanied by a monthly dataset covering 153 countries from 1946. This dataset utilizes monthly data on official and market-determined exchange rates, and was expanded for the paper "Exchange Arrangements Entering the 21st Century: Which Anchor Will Hold?" (Ilzetzki, Reinhart, and Rogoff, 2019). Pre-1999 market-determined exchange rates were sourced from *Pick's Currency Yearbook*, *Pick's Black-Market Yearbooks*, and *World Currency Reports*, with end-of-month exchange rate quotes (Reinhart & Rogoff, 2004). Starting 1999, the authors noted that monthly market-determined exchange rates "come from the original country sources (i.e., the central banks), for those countries where there are active parallel markets for which data are available" (Reinhart & Rogoff, 2004: 5).

The calculations in this working paper incorporate historical data for the Consumer Price Index: All Items (US Bureau of Labor Statistics, 2025). Hyperinflation calculations in this paper are conducted with parallel market (rather than official) exchange rates. Parallel market exchange rates were obtained from Dr. Reinhart and Dr. Rogoff's dataset (Reinhart & Rogoff, 2004; Ilzetzki, Reinhart, and Rogoff, 2019).

The Cases

First Case: Zambia

To understand the economic events that took place in Zambia in the 1980s and early 1990s, it is necessary to provide a background on its economic history, and especially economic events that took place in the country in the 1970s. A notable feature of Zambia's economy is its dependence on its copper industry. In the mid-20th century, Zambia experienced export-led economic growth due to copper mining. This activity raised real gross domestic product per capita in the country from 1931 until 1965. During this era of economic expansion, Zambia went from being a pre-industrial to semi-industrial economy, and in 1965, GDP per capita was higher than every other country in sub-Saharan Africa, except for South Africa (Seekings and Tembo, 2022).

In 1970, the price of copper started to decline. The fall in the price of this commodity was one of the main reasons behind Zambia's economic decline after 1965 (Seekings and Tembo, 2022; Seshamani, 1992). During the 1970s, Zambia also faced several external shocks, such as the oil crisis of 1973 and the copper price crash of 1974 (Seshamani, 1992). Being a country that depended heavily on its copper industry, the resulting decreased contributions to revenues of mineral taxes and import duties led to an increase in Zambia's government budget deficit, which was financed through domestic and foreign borrowing. Foreign exchange shortages limited the country's import capacity, further reducing production levels and GDP (Seshamani, 1992). According to Seshamani (1992) "The fundamental cause of Zambia's economic problems was the static and inflexible economic structure inherited at independence and the lack of any serious attempts to render that structure more dynamic and resilient." (van der Hoeven, 1982, as cited in Seshamani, 1992: 117). "Even after the 1975 debacle, the fond hope lingered that the decline in copper prices would be transient and that once these prices picked up the economy would again become buoyant. The perception that the decline was an established, long-term trend only dawned in the 1980s. By that time, however, the country's economic problems had already assumed the proportions of a crisis" (Seshamani, 1992: 117).

Despite relatively stable inflation rates prior to 1982, the situation deteriorated sharply between 1982 and 1993. Inflation surged, driven by extensive deficit financing through central bank borrowing and the depreciation of the kwacha following its flotation via an auction system between 1985 and

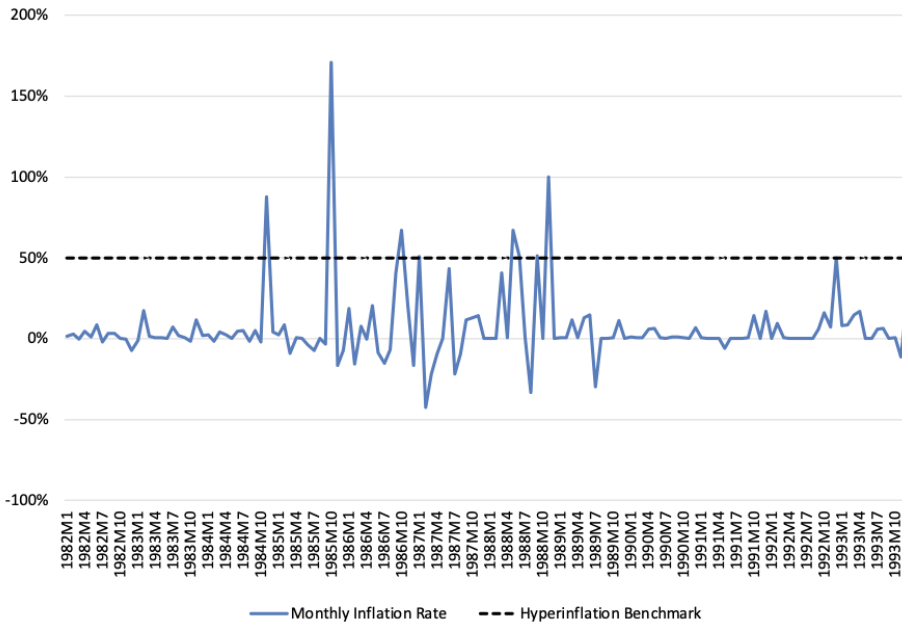
1987 (Chipili, 2021). Before its flotation, Zambia operated under a fixed exchange rate regime, in which the kwacha was linked to the US dollar (Bank of Zambia, 2024). Related to the auction system, Chipili (2021) mentions: "to eliminate the parallel market for foreign exchange which had emerged during the fixed regime, improve the allocation of foreign exchange previously allocated on nonprice criteria, and allow supply and demand to interact in determining the exchange rate, the Kwacha was allowed to float against major currencies in October 1985 via a Dutch auction system. However, the auction was suspended in January 1987 and a fixed exchange rate system reinstated after the Kwacha lost over 530% [sic] of its value against the US dollar over a 16-month period" (2021: 34).

According to our calculations, monthly inflation in Zambia passed the 50%/month inflation rate five times between 1984 and 1989. The first instance took place on November 1984. In that month, the Old Zambian kwacha (ZMK) to US dollar exchange rate had reached 4.167 ZMK/USD, compared to 2.222 ZMK/USD the month before. The US monthly inflation rate for November 1984 was 0%. The monthly inflation calculation in Zambia for that month is shown below.

$$Inflation_{Zambia\ (November\ 1984)} = \left[(1+0)\left(1+\frac{4.167\ -\ 2.222}{2.222}\right)\right] - 1$$
$$= 0.875\ =\ 87.5\%$$

Using the same calculation as above with data for the corresponding months, Zambia exceeded the 50%/mo threshold in October 1985 (171%/mo), October 1986 (67%/mo), and May, June, September, and October of 1988 (67%/mo, 51%/mo, 51%/mo, and 100%/mo, respectively). It is worth noting that in December 1992, Zambia's monthly inflation rate reached 49.9%/mo but did not surpass the 50% threshold. The observations from 1984, 1985, and 1986 occurred within 12 months of each other and are therefore grouped as part of the same hyperinflation episode. The three observations from 1988 occurred more than a year after October 1986, forming a separate hyperinflation episode.

Figure 1: Monthly Inflation Rate in Zambia (1982–1994)



Sources:
US Bureau of Labor Statistics. Parallel market data for the Old Zambian kwacha was obtained from the dataset supporting the following working paper:
Reinhart, C. & Rogoff, K. (2004). The modern history of exchange rate arrangements: A reinterpretation. *Quarterly Journal of Economics*. **119**, 1, pp. 1–48.
Calculations by Professor Steve H. Hanke and Nicole Saade, The Johns Hopkins University.

Beginning in 1994, the Zambian government undertook significant economic reforms to restore macroeconomic stability, which included trade and foreign exchange liberalization, price deregulation, and stricter financial management. The government also implemented a cash budgeting system in addition to tight monetary policies to restrain excessive monetary expansion. Inflation in Zambia fell after the implementation of these measures (Chipili, 2021).

Second Case: The CFA Franc Zone

The CFA Franc Zone comprises 14 countries in sub-Saharan Africa, divided into two economic unions. The West African Economic and Monetary Union (WAEMU), established in 1994 and built on the foundation of the West African Monetary Union, includes Benin, Burkina Faso, Côte d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal, and Togo. The Central African Economic and Monetary Union (CEMAC) encompasses Cameroon, the Central African Republic, Chad, the Republic of Congo, Equatorial Guinea, and Gabon. These two unions use the CFA franc as their currency (International Monetary Fund, 2005).

The CFA franc was created in December 1945 after the French government ratified the Bretton Woods Agreement. The CFA franc then became the currency of the French Colonies of Africa. The acronym CFA stands for *Communauté Financière Africaine* (which translates into African Financial Community) in WAEMU, and *Communauté Financière en Afrique Centrale* in CEMAC. Historically, the CFA franc was pegged to the French franc, ensuring stability but also limiting flexibility in monetary policy (International Monetary Fund, 2005).

In the early 1990s, goods produced in the CFA Franc Zone were becoming increasingly uncompetitive in global markets. The reason for this was an artificially strong exchange rate. As a result, the economies of the countries that belonged to the region grew little or not at all during the 1980s and early 1990s (International Monetary Fund, 2000). In consultation with one another and with the International Monetary Fund, CFA Franc Zone members opted for a devaluation to restore competitiveness, foster sustainable growth, and reintegrate into global trade (International Monetary Fund, 2000). On January 13, 1994, the CFA franc was devalued by 50% against foreign currencies, and this devaluation was followed by an initial surge in prices (Clement, 1995).

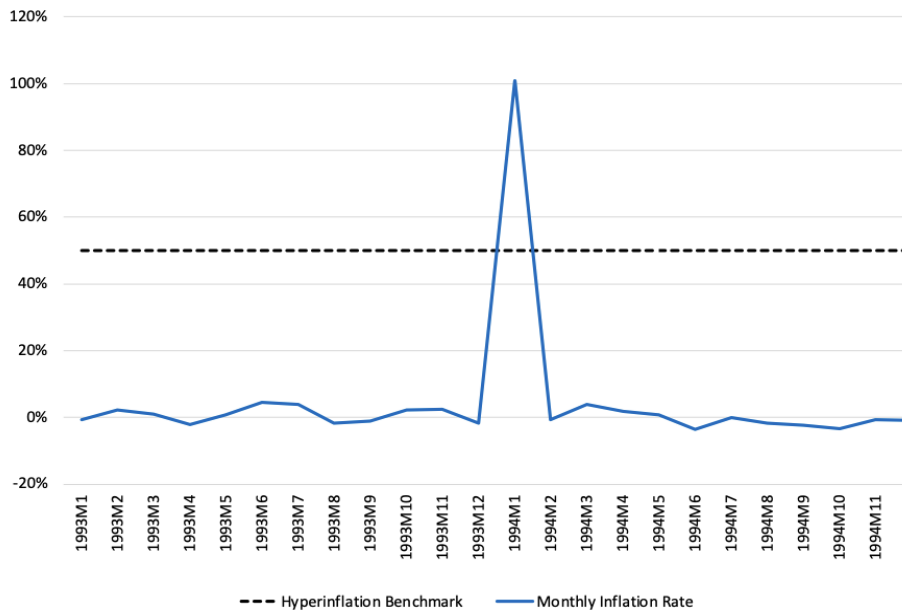
IMF reports indicate that governments across the CFA Franc Zone maintained firm control over public sector wages, a strategy that was soon mirrored by the private sector (International Monetary Fund, 2005). According to the IMF, this rigorous fiscal discipline helped mitigate the initial inflationary surge and stabilize prices in the medium term (International Monetary Fund, 2005). However, part of the literature related to the 1994 devaluation highlights that sectors in some countries experienced negative effects. For instance, findings by Creevey, Vengroff, and Gaye (1995) explain that "in at least one African country, namely Senegal, devaluation in the short term [had] been experienced as primarily, but moderately, negative by making small businesses

more difficult, limiting expansion, and clouding future prospects" (Creevey, Vengroff, and Gaye, 1995: 682).

Using PPP, our estimates show that monthly inflation surpassed the 50% level in January 1994. The exchange rate in December 1993 was 297 XAF/USD, rising to 595 XAF/USD in January 1994 after the devaluation. The monthly inflation rate for the US in January 1994 was 0.27%.

$$Inflation_{CFA\ zone\ (January\ 1994)} = \left[(1 + 0.0027)\left(1 + \frac{595 - 297}{297}\right)\right] - 1$$
$$= 1.0087 = 100.87\%$$

Figure 2: Monthly Inflation Rate in the CFA Zone (1993–1994)



Sources:
US Bureau of Labor Statistics. Parallel market data for the Zambian kwacha was obtained from the dataset supporting the following working paper:
Reinhart, C. & Rogoff, K. (2004). The modern history of exchange rate arrangements: A reinterpretation. *Quarterly Journal of Economics*. **119**, 1, pp. 1–48.
Calculations by Professor Steve H. Hanke and Nicole Saade, The Johns Hopkins University.

Third Case: Belarus

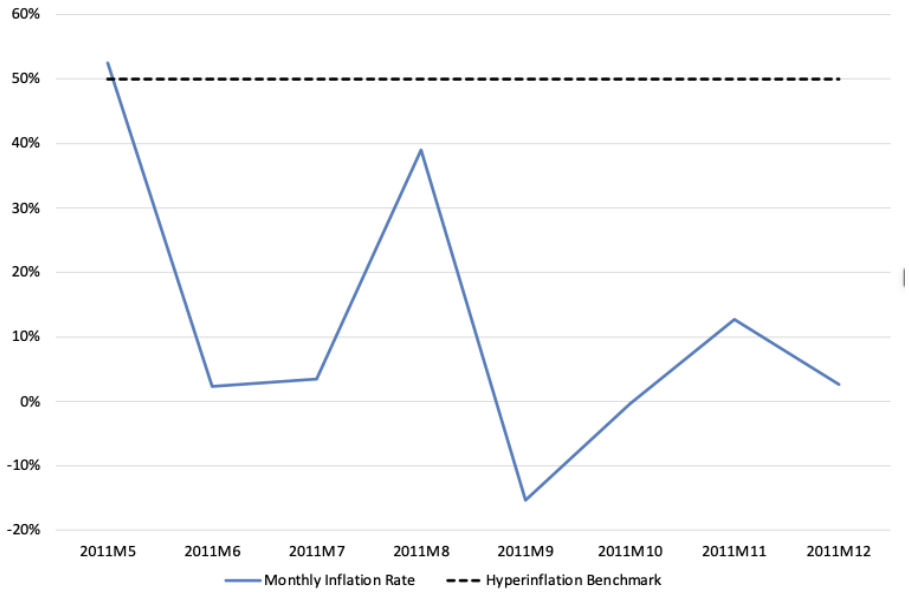
Following significant economic turbulence in the 1990s, Belarus, a former republic of the Soviet Union located in Eastern Europe, experienced a period of robust recovery during the 2000s. Between 2001 and 2008, Belarus experienced an average annual real GDP growth rate of over 8 percent, and the exchange rate of its currency, the Belarusian ruble, was relatively stable. This situation changed shortly after, with the country entering periods of economic crisis in 2009, 2011 and 2014. These crises were preceded with a widening of the current account deficit, as authorities tried to preserve exchange rate stability through foreign borrowing and FX interventions (Misjuk, Ouliaris, and Pranovich, 2015).

The 2011 crisis is of particular interest. According to a 2011 Country Report on Belarus by the International Monetary Fund, ahead of the 2010 presidential elections, Belarusian authorities loosened policies significantly. This led to an increase of the current account deficit, and subsequent pressure on reserves (International Monetary Fund, 2011). At the time, Belarus operated under a de facto fixed exchange rate system, pegged to the U.S. dollar. To maintain this system, the National Bank of Belarus nearly exhausted its FX reserves in the first quarter of 2011 (de la Rubia et al., 2012). Consequently, confidence in the ruble fell (International Monetary Fund, 2011; de la Rubia et al., 2012). Soon after, a black market for the currency emerged (International Monetary Fund, 2011).

According to de la Rubia, Kirchner, and Zaretzky (2012), in March of 2011, the government responded to the crisis by implementing capital controls, while at the same time introducing a multiple exchange rate regime. In May 2011, a depreciated official exchange rate was introduced. The new exchange rate was of 4930 Old Belarusian rubles (BYR) per US dollar, compared to 3155 BYR/USD the month before (de la Rubia et al., 2012). This new exchange rate was stronger than the one traded in the black market, which indicated that this rate was not yet in equilibrium (de la Rubia et al., 2012). In the parallel market, the exchange rate for April 2011 had been 4052.11 BYR/USD. In May 2011, the exchange rate reached 6148.45 BYR/USD (Reinhart and Rogoff, 2019). Using the black-market exchange rates for April and May of 2011, our calculations show that monthly inflation broke through the 50% threshold in May of 2011. During this month, monthly inflation in the US was 0.47%. Below is the inflation calculation for May 2011 in Belarus:

$$Inflation_{Belarus\ (May\ 2011)} = \left[(1 + 0.0047)\left(1 + \frac{6148.45 - 4052.11}{4052.11}\right)\right] - 1$$
$$= 0.524 = 52.4\%$$

Figure 1: Monthly Inflation Rate in Belarus (2011)



Sources: US Bureau of Labor Statistics.
Parallel market data for the Zambian kwacha was obtained from the dataset supporting the following working paper:
Reinhart, C. & Rogoff, K. (2004). The modern history of exchange rate arrangements: A reinterpretation. *Quarterly Journal of Economics*. **119**, 1, pp. 1–48.
Calculations by Professor Steve H. Hanke and Nicole Saade, The Johns Hopkins University.

In October 2011, authorities ended the multiple exchange-rate regime by unifying the various rates into a single exchange rate system. Coupled with stringent macroeconomic policies introduced in the latter half of 2011, this unification helped stabilize the economy. As a result of these measures, by early 2012, inflation rates in Belarus started to noticeably decline (de la Rubia et al., 2012).

Conclusion

Using parallel market data, we were able to identify four new hyperinflation cases that took place in Zambia, the CFA Franc Zone, and Belarus. In Zambia, two episodes took place from 1988 and 1994–1996. During Zambia's two episodes, the highest inflation rates were 171%/mo and 100%/mo, respectively. The hyperinflation episode in the CFA Franc Zone took place in 1994, when the monthly inflation rate reached 101%/mo. Finally, Belarus experienced hyperinflation in May 2011, when the monthly inflation rate reached 52.4%/mo. These are the first recorded hyperinflation instances in Zambia and the CFA Franc Zone, and the second recorded hyperinflation episode for Belarus. With these additions, the Hanke-Krus hyperinflation table now records 71 cases.

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