On Measuring Hyperinflation
Venezuela's Episode

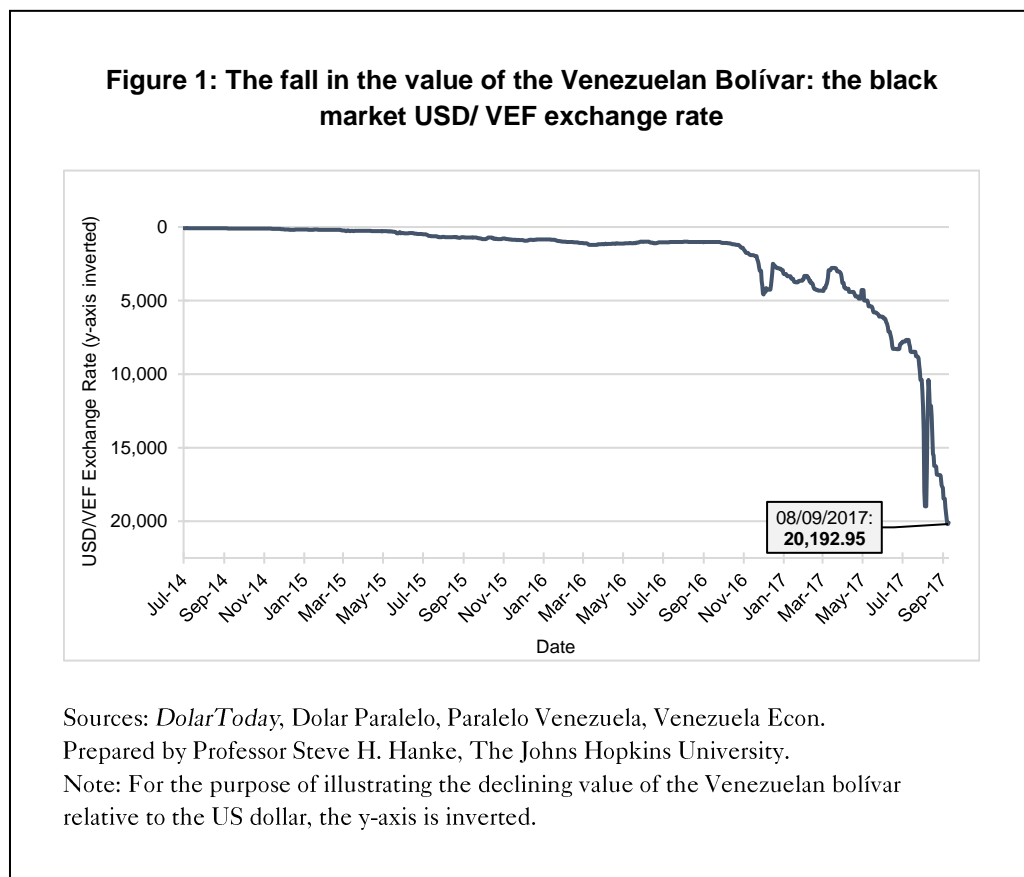*Steve H. Hanke and Charles Bushnell*

Key Points

- Venezuela now exhibits the 57th historic episode of hyperinflation as measured in the *Hanke–Krus World Hyperinflation Table*.

- Entry to the hyperinflation dataset depends on three qualifying criteria: inflation rates greater than 50% per month; the persistence of this rate for at least 30 consecutive days; and full documentation so that inflation estimates are replicable.

- This paper measures Venezuela's hyperinflation by transforming changes in the US dollar–Venezuelan bolivar exchange rate into implied inflation rates using the purchasing power parity doctrine.

- The purchasing power parity method is accurate during periods of hyperinflation. Venezuela's hyperinflation peaked with a monthly inflation rate of 219.7% on 30 November 2016.

Introduction

This paper addresses the measurement of hyperinflation. The first 56 verified episodes of hyperinflation are reported, and, for the first time, we report the world's 57th episode of hyperinflation: Venezuela's. We measure Venezuela's hyperinflation, which occurred during November/December 2016, by transforming changes in the US dollar–Venezuelan bolivar (USD/VEF) exchange rate into implied inflation rates using the purchasing power parity doctrine (PPP). During periods of hyperinflation, this method is incredibly accurate. Venezuela's hyperinflation peaked with a monthly inflation rate of 219.7% on 30 November 2016.

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On Error and Deception

The Grim Reaper has taken his scythe to the Venezuelan bolivar. The death of the bolivar is depicted in Figure 1. A bolivar has become virtually worthless, and, with its collapse, Venezuela is witnessing the world's worst inflation. As of 8 September 2017, Venezuela's annual rate of inflation (yr/yr) is a whopping 1,906% (see Figure 2).

Figure 1: The fall in the value of the Venezuelan Bolívar: the black market USD/ VEF exchange rate

Sources: *DolarToday*, Dolar Paralelo, Paralelo Venezuela, Venezuela Econ.
Prepared by Professor Steve H. Hanke, The Johns Hopkins University.
Note: For the purpose of illustrating the declining value of the Venezuelan bolívar relative to the US dollar, the y-axis is inverted.

As the bolivar plunged and inflation surged, the Banco Central de Venezuela (BCV) became an unreliable source of inflation data. Indeed, from December 2014 until January 2016, the BCV did not report inflation statistics. Then, in January 2016, the BCV pulled a rabbit out of its hat and reported a fanciful annual inflation rate for the third quarter of 2015. So,

Venezuela's last official inflation data are almost two years old. Clearly, timely reporting is not a priority.

The BCV, like many central banks, has followed a pattern that Oskar Morgenstern elegantly documents in his classic work *On the Accuracy of Economic Observations* (1963). Indeed, the BCV has failed to report data that would reflect poorly on the government, and when it has reported inflation statistics, it has lied and doctored the data. Instead of reporting Venezuela's 'real' open rate of inflation, the BCV has attempted to measure suppressed inflation.

Venezuela imposes a thick blanket of price controls and a maze of subsidies over the economy. List prices are artificially held down. Yet these suppressed prices are the ones that, in principle, the BCV attempts to measure and use to construct a price index for calculating the inflation rate. But this metric misses the mark. Arbitrage opportunities prevail under the Venezuelan regime of price controls and subsidies, because there is a gap between the items under price controls and the prices of those goods and services that are actually exchanged on the black market. And it is in the black market and underground economy that most of Venezuela's economic activity occurs. In consequence, there is a huge gap between the official inflation rate, which is based on artificially suppressed prices, and the 'real' open inflation rate, as shown in Figure 2. (Note: our method for measuring the 'real' open inflation rate is developed in a later section of this paper.)

Figure 2: Venezuela's annual inflation rate
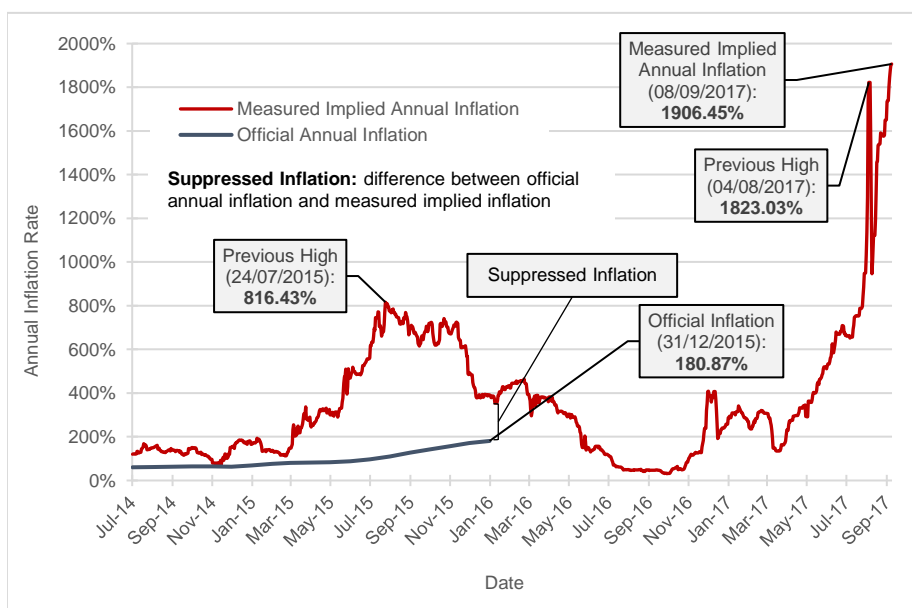
Sources: Banco Central de Venezuela, *DolarToday*, Dolar Paralelo, Paralelo Venezuela, Venezuela Econ. Calculations by Professor Steve H. Hanke, The Johns Hopkins University.
Note: These inflation rates are implied by the movements in the black market VEF/USD exchange rate.

So much for the BCV's errors and deceptions. What about the reportage in the financial press? We have been saving bits of misreported statistical strings about Venezuela's inflation, and it has become a giant ball. Most of the bits originate from the International Monetary Fund (IMF).

For one example, the IMF's *World Economic Outlook* (April 2016) forecasted that inflation would rise to 720% by the end of 2016. This number was nothing more than a guesstimate. Never mind. It became carved in stone. The media—from *Bloomberg*, *The New York Times*, the *Washington Post*, the *Wall Street Journal*, *The Financial Times*, *The Economist*, to countless other ostensibly credible sources—have repeated that guesstimate

ad nauseam. The financial press has great difficulty distinguishing between a measurement and a forecast. Indeed, they report forecasts as if these were measured values. The performance of the press on Venezuela confirms the 95 percent rule: 95% of what appears in the financial press is either wrong or irrelevant (Hanke, 2016).

So, while everyone agrees that Venezuela's inflation rate is very high, confusion reigns. To lift the shroud and shine a light on what has become the most recent episode of hyperinflation, we delve into the measurement of hyperinflation and Venezuela's episode.

On the *Hanke–Krus World Hyperinflation Table*

The *Hanke–Krus World Hyperinflation Table* first appeared in the authoritative *Routledge Handbook of Major Events in Economic History*, which was published in 2013. The table contained every country that had ever experienced an episode of hyperinflation—all 56 of them. On 3 December 2016, Venezuela's inflation met all the criteria required to qualify as hyperinflation. Specifically, Venezuela's monthly inflation rate exceeded 50% per month for 30 consecutive days. Accordingly, the Hanke–Krus Table was amended to include Venezuela as the 57th episode of hyperinflation.

What was the genesis of the *Hanke–Krus World Hyperinflation Table*? What are the criteria for a country to qualify for the hyperinflation designation? What is the standard method for estimating inflation in countries that are experiencing elevated inflation rates, and why is this method superior to others? How is the standard method used to estimate Venezuela's inflation rates, and what are those rates? These are the main questions we address.

In 2010, Hanke was invited to write the survey article on hyperinflation for *The Routledge Handbook of Major Events in Economic History*. He accepted the invitation, thinking it would require routine work on his part and that he could complete the task in short order. He had already surveyed the literature on hyperinflation and had accurately estimated the inflation rates in several countries that had experienced hyperinflation. These included two relatively recent, dramatic episodes of hyperinflation—

Yugoslavia (Hanke, 1999) and Zimbabwe (Hanke and Kwok, 2009). In addition, he had designed and implemented currency reforms that had stopped episodes of hyperinflation, notably Bulgaria's episode (Hanke, 2016).

While reflecting on the existing literature on hyperinflation, Hanke was struck by its lack of uniformity and clarity. The literature was widely scattered in time and space; it had been written by many different researchers, and those researchers had used diverse methods to estimate and analyze the inflation episodes they studied.

So, Hanke concluded that the best way to 'clean up' the subject of hyperinflation was to create a 'World Hyperinflation Table.' In his mind, this table would include all of the world's hyperinflations. The data would be presented in a uniform and clear manner, so that all hyperinflations could be compared. But what criteria would be used for an episode of inflation to qualify as a hyperinflation? Hanke specified the following three qualifying criteria:

1. Following Phillip Cagan's (1956) classic article on hyperinflation, the economics profession adopted the following criterion: to qualify as a hyperinflation, the inflation rate had to be at least 50% per month. Hanke adopted this convention.
2. In addition, Hanke specified that the 50% rate had to persist for at least 30 consecutive days.
3. Lastly, he mandated that the inflation episode had to be fully documented and that inflation estimates had to be replicable.

It turned out that the third criterion was the most difficult one to satisfy. Fortunately, Hanke's chief research assistant at the time, Nicholas Krus, was capable and interested in taking on this research task. Hanke and Krus spent the better part of two years constructing what has come to be known as the *Hanke–Krus World Hyperinflation Table.* They documented and recalculated the inflation rates for all alleged hyperinflations in history. The project required the gathering of primary data for each potential case of hyperinflation. This proved to be very difficult and time-consuming. For

example, primary data for France's episode of hyperinflation from 1795 to 1796—the first verified case of hyperinflation—had to be obtained and analyzed. But, that was not the most difficult set of data to obtain. That 'prize' was awarded to the Republika Srpska, which experienced hyperinflation in the 1992–1994 period. Fortunately, Hanke was able to use his extensive contacts in former Yugoslavia to eventually obtain high-quality inflation data for the Republika Srpska.

After a long and onerous research effort, the *Hanke–Krus World Hyperinflation Table* was published. It is contained in 'World Hyperinflations,' which is a chapter in the *Routledge Handbook of Major Economic Events in History* (2013) co-authored by Hanke and Krus.

The Table (amended to include Venezuela) is reproduced below. The original Table contained 56 hyperinflation episodes. Several things are noteworthy and merit mention. The most famous and well-known hyperinflation episode is the Weimar Republic's hyperinflation. It peaked in October 1923 at 29,500% per month. This rate is well below Zimbabwe's November 2008 peak hyperinflation rate of 79.6 billion%—that is, 80 followed by nine zeros. But Zimbabwe's hyperinflation is only the world's second-highest recorded case. It is minuscule next to Hungary's July 1946 peak monthly rate of 41.9 quadrillion%—that is, 42 followed by fifteen zeros. While the German hyperinflation ranks fifth in the world hyperinflation rankings, its magnitude was much less than the top four inflations.

Table 1: The *Hanke–Krus World Hyperinflation Table* (2013, amended 2016)

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	3.13×10^{6}%	64.60%	1.41 days	Dinar	Consumer
Republika Srpska†[4]	Apr. 1992	Jan. 1994	Jan. 1994	2.97×10^{6}%	64.30%	1.41 days	Dinar	Consumer
Germany[5]	Aug. 1922	Dec. 1923	Oct. 1923	29500%	20.90%	3.70 days	Papiermark	Wholesale
Greece[6]	May. 1941	Dec. 1945	Oct. 1944	13800%	17.90%	4.27 days	Drachma	Exchange Rate‡
China§[7]	Oct. 1947	Mid-May 1949	Apr. 1949	5070%	14.10%	5.34 days	Yuan	Wholesale for Shanghai
Free City of Danzig[8]	Aug. 1922	Mid-Oct. 1923	Sep-23	2440%	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
France[14]	May 1795	Nov. 1796	Mid-Aug 1796	304%	4.77%	15.1 days	Mandat	Exchange rate
China[15]	Jul. 1943	Aug. 1945	Jun. 1945	302%	4.75%	15.2 days	Yuan	Wholesale for Shanghai
Ukraine[16]	Jan. 1992	Nov. 1994	Jan. 1992	285%	4.60%	15.6 days	Russian Ruble	Consumer
Poland[17]	Jan. 1923	Jan. 1924	Oct. 1923	275%	4.50%	16.0 days	Marka	Wholesale
Nicaragua[18]	Jun. 1986	Mar. 1991	Mar. 1991	261%	4.37%	16.4 days	Córdoba	Consumer
Congo (Zaire)[19]	Nov. 1993	Sep. 1994	Nov. 1993	250%	4.26%	16.8 days	Zaïre	Consumer
Russia††[20]	Jan. 1992	Jan. 1992	Jan. 1992	245%	4.22%	17.0 days	Ruble	Consumer
Bulgaria[21]	Feb. 1997	Feb. 1997	Feb. 1997	242%	4.19%	17.1 days	Lev	Consumer
Moldova[22]	Jan. 1992	Dec. 1993	Jan. 1992	240%	4.16%	17.2 days	Russian Ruble	Consumer
Venezuela[23]	Nov. 2016	Ongoing	Nov. 2016	219%	3.94%	17.9 days	Bolivar	Exchange Rate***
Russia / USSR[24]	Jan. 1922	Feb. 1924	Feb. 1924	212%	3.86%	18.5 days	Ruble	Consumer
Georgia[25]	Sep. 1993	Sep. 1994	Sep. 1994	211%	3.86%	18.6 days	Coupon	Consumer
Tajikistan††[26]	Jan. 1992	Oct. 1993	Jan. 1992	201%	3.74%	19.1 days	Russian Ruble	Consumer
Georgia[27]	Mar. 1992	Apr. 1992	Mar. 1992	198%	3.70%	19.3 days	Russian Ruble	Consumer
Argentina[28]	May-89	Mar. 1990	Jul. 1989	197%	3.69%	19.4 days	Austral	Consumer
Bolivia[29]	Apr. 1984	Sep. 1985	Feb. 1985	183%	3.53%	20.3 days	Boliviano	Consumer
Belarus††[30]	Jan. 1992	Feb. 1992	Jan. 1992	159%	3.22%	22.2 days	Russian Ruble	Consumer

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
Kyrgyzstan †† [31]	Jan. 1992	Jan. 1992	Jan. 1992	157%	3.20%	22.3 days	Russian Ruble	Consumer
Kazakhstan †† [32]	Jan. 1992	Jan. 1992	Jan. 1992	141%	2.97%	24.0 days	Russian Ruble	Consumer
Austria[33]	Oct. 1921	Sep. 1922	Aug. 1922	129%	2.80%	25.5 days	Crown	Consumer
Bulgaria[34]	Feb. 1991	Mar. 1991	Feb. 1991	123%	2.71%	26.3 days	Lev	Consumer
Uzbekistan ††[35]	Jan. 1992	Feb. 1992	Jan. 1992	118%	2.64%	27.0 days	Russian Ruble	Consumer
Azerbaijan[36]	Jan. 1992	Dec. 1994	Jan. 1992	118%	2.63%	27.0 days	Russian Ruble	Consumer
Congo (Zaire)[37]	Oct. 1991	Sep. 1992	Nov. 1991	114%	2.57%	27.7 days	Zaïre	Consumer
Peru[38]	Sep. 1988	Sep. 1988	Sep. 1988	114%	2.57%	27.7 days	Inti	Consumer
Taiwan[39]	Oct. 1948	May-49	Oct. 1948	108%	2.46%	28.9 days	Taipi	Wholesale for Taipei
Hungary[40]	Mar. 1923	Feb. 1924	Jul. 1923	97.90%	2.30%	30.9 days	Crown	Consumer
Chile[41]	Oct. 1973	Oct. 1973	Oct. 1973	87.60%	2.12%	33.5 days	Escudo	Consumer
Estonia †† [42]	Jan. 1992	Feb. 1992	Jan. 1992	87.20%	2.11%	33.6 days	Russian Ruble	Consumer
Angola[43]	Dec. 1994	Jan. 1997	May-96	84.10%	2.06%	34.5 days	Kwanza	Consumer
Brazil[44]	Dec. 1989	Mar. 1990	Mar. 1990	82.40%	2.02%	35.1 days	Cruzado & Cruzeiro	Consumer
Republic of Congo[45]	Aug. 1998	Aug. 1998	Aug. 1998	78.50%	1.95%	36.4 days	Franc	Consumer
Poland[46]	Oct. 1989	Jan. 1990	Jan. 1990	77.30%	1.93%	36.8 days	Zloty	Consumer
Armenia †† [47]	Jan. 1992	Feb. 1992	Jan. 1992	73.10%	1.85%	38.4 days	Russian Ruble	Wholesale
Tajikistan[48]	Oct. 1995	Nov. 1995	Nov. 1995	65.20%	1.69%	42.0 days	Tajikistani Ruble	Wholesale
Latvia[49]	Jan. 1992	Jan. 1992	Jan. 1992	64.40%	1.67%	42.4 days	Russian Ruble	Consumer
Turkmenistan ††[50]	Nov. 1995	Jan. 1996	Jan. 1996	62.50%	1.63%	43.4 days	Manat	Consumer
Philippines[51]	Jan. 1944	Dec. 1944	Jan. 1944	60.00%	1.58%	44.9 days	Japanese War Notes	Consumer
Yugoslavia[52]	Sep. 1989	Dec. 1989	Dec. 1989	59.70%	1.57%	45.1 days	Dinar	Consumer
Germany[53]	Jan. 1920	Jan. 1920	Jan. 1920	56.90%	1.51%	46.8 days	Papiermark	Wholesale
Kazakhstan[54]	Nov. 1993	Nov. 1993	Nov. 1993	55.50%	1.48%	47.8 days	Tenge & Russian Ruble	Consumer
Lithuania[55]	Jan. 1992	Jan. 1992	Jan. 1992	54.00%	1.45%	48.8 days	Russian Ruble	Consumer
Belarus[55]	Aug. 1994	Aug. 1994	Aug. 1994	53.40%	1.44%	49.3 days	Belarusian Ruble	Consumer
Taiwan[57]	Feb. 1947	Feb. 1947	Feb. 1947	50.80%	1.38%	51.4 days	Taipi	Wholesale for Taipei

It is striking how few cases of hyperinflation have occurred—only 56 as of 2013, when the Table was first constructed. However, at that time, there was probably a 57th hyperinflation episode. It likely occurred in North Korea during the 2009–2011 period. But North Korea was not included in the Table because the only reliable price data from North Korea were for rice; so the hyperinflation estimates were for rice price inflation, not for a general, broad measure of North Korean price changes.

Another striking feature of the Table is that Latin America, a region burdened with endemic inflation, only accounts for 7 of the original 56 hyperinflations. Those are: Argentina (1989), Bolivia (1984), Brazil (1989), Chile (1973), Nicaragua (1986), and Peru (1988 and 1990).
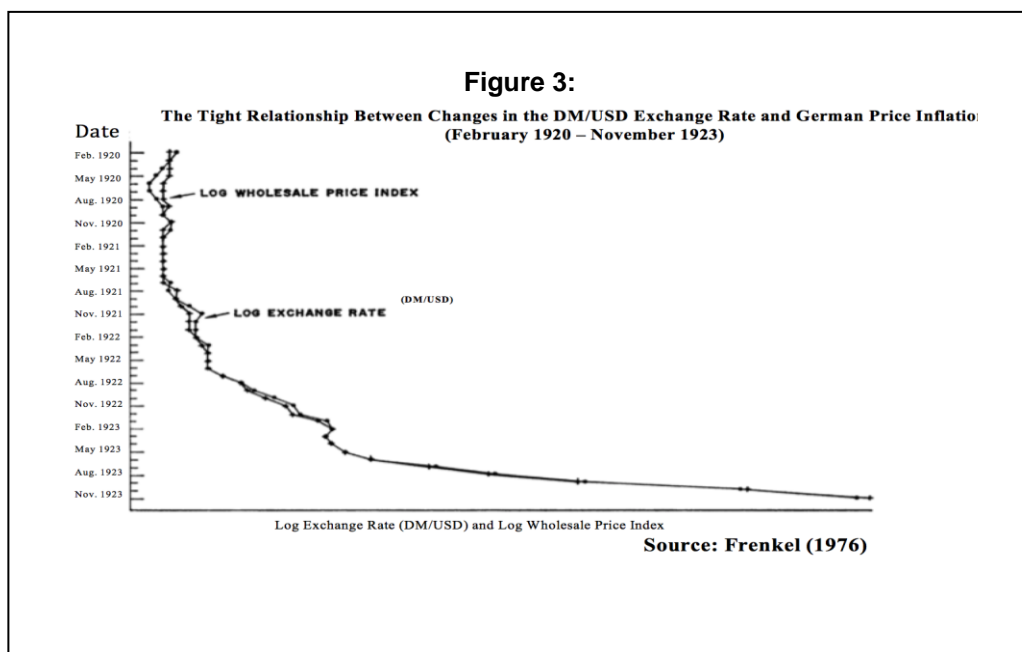
On 3 December 2016, Venezuela's inflation bout became the 57th episode of hyperinflation. Meeting all three criteria, Venezuela now appears in the new, amended *Hanke–Krus World Hyperinflation Table* at the 23rd rank, with a peak monthly inflation rate of 219% recorded in November 2016. This puts Venezuela in between the USSR, which recorded a peak monthly inflation rate of 212% in February 1924, and Moldova, whose peak monthly inflation of 240% occurred in January 1992.

On the Method and Use of Purchasing Power Parity to Estimate Venezuela's Inflation Rate

As previously mentioned, reliable official inflation statistics for Venezuela are not available. Fear not, lack of reliable inflation data is a 'problem' that can be overcome. The most important price in an economy is the exchange rate between the local currency and the world's reserve currency—the US dollar. As long as there is an active black market (read: free market) for currency and the black market data are available, changes in the black market exchange rate can be reliably transformed into accurate estimates of countrywide inflation rates. The economic principle of purchasing power parity (PPP) allows for this transformation and the accurate estimates of countrywide inflation rates.

Jacob Frenkel's (1976) path-breaking work on the German hyperinflation established once and for all why, at high rates of inflation, the use of PPP

yields very accurate inflation estimates (Manzur, 1990). Frenkel ran six regressions of the German mark–US dollar exchange rate on various German price indices (Frenkel, 1976). The results of these regressions confirm the theory of PPP and strongly support its application during episodes of hyperinflation. Indeed, Frenkel found a near one-to-one relationship between changes in exchange rate and price levels during the German hyperinflation. Figure 3 shows that relationship. McNown and Wallace (1989) reinforced Frenkel's findings and confirmed that PPP held for countries that were experiencing elevated rates of inflation, as did Taylor and Taylor (2004).

Figure 3:

The Tight Relationship Between Changes in the DM/USD Exchange Rate and German Price Inflation
(February 1920 – November 1923)

Log Exchange Rate (DM/USD) and Log Wholesale Price Index

Source: Frenkel (1976)

Venezuela employs a multiple exchange-rate regime, coupled with exchange controls (Crooks, 2015). In consequence, the official exchange rates are not free-market rates. To obtain the free-market exchange rates required for the application of PPP, we use black market exchange rates. Black market rates are efficient processors of information when political and economic circumstances make the official exchange rate unreliable or irrelevant (Arbetman and Kugler, 1997). The course of the Venezuelan

bolivar–US dollar (VEF/USD) black market rate is shown in Figure 1. The value of the bolivar against the dollar has collapsed. PPP suggests that Venezuela is experiencing a dramatic inflation surge.

We can employ PPP to accurately transform changes in the bolivar's black market exchange rate into accurate estimates of Venezuela's inflation. One form is Absolute PPP. It states that the price of a standard market basket of goods, when measured in a common currency, is the same in all countries because of international arbitrage (Manzur, 1993). Formally, this can be written as $S=P/P^*$, where S is the spot market exchange rate, P is the price of the basket in domestic currency, and P^* is the price of the basket in foreign currency. With Absolute PPP, the Law of One Price holds. That is, all goods sell at the same price when converted into a common currency. However, three major factors can cause the Law of One Price to not hold in the short run. They are: transportation costs and barriers to trade; different speeds of adjustment in the foreign exchange market and goods markets; and differences in the composition of 'market baskets' (Mahdavi and Zhou, 1994).

The shortcomings of Absolute PPP can be overcome with the use of a second form of PPP: Relative PPP. This accounts for the factors that can cause deviations from Absolute PPP and adjusts for transaction costs and barriers to trade (Manzur, 1993). Relative PPP relates the percentage change in the exchange rate between two currencies to the inflation rate differential between two countries. It holds, even if Absolute PPP does not (Mahdavi and Zhou, 1994). Relative PPP can be written as $S'=P'-P^{*'}$, where S' is the percentage change in the spot market exchange rate, P' is the percentage change in the price of the basket in domestic currency, and $P^{*'}$ is the percentage change in the price of the basket in foreign currency (Manzur, 1993).

We apply Relative PPP to calculate inflation in Venezuela. Let

P_A = the Venezuelan price level in bolivars,

P_B = the United States price level in US dollars, and

$S_{A/B}$ = the exchange rate (bolivars/US dollar).

Then, PPP in the absolute form states that:

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

We can convert Absolute PPP to Relative PPP:

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

We can then rearrange these terms to obtain the following relationship:

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

Thus, if we know the US inflation rate and the change in the exchange rate between the bolivar and the dollar over the given period, we can calculate the inflation rate in Venezuela. In order to make the calculations, we use the Consumer Price Index for All Urban Consumers: All Items. This index is reported by the US Bureau of Labor Statistics, and the black market exchange rate for the bolivar against the dollar is reported by *DolarToday*.

Our calculations show that monthly inflation broke through the 50% threshold on 3 November 2016, when the black market exchange rate deteriorated to 1682.12 VEF/USD. At that time, the monthly inflation rate in the USA was 0.16%. On 3 November 2016, Venezuela's monthly inflation was:

$$Inflation_{Venezuela} = \left[(1 + 0.0016) \left(1 + \frac{1682.12 - 1084.63}{1084.63} \right) \right] - 1 = 0.548$$

Since inflation is expressed in percentage terms, monthly inflation on 3 November 2016 was 54.8%. The monthly inflation rate, as shown in Figure 4 below, continued to stay above 50% for each day between 3 November 2016 and 14 December 2016.

Figure 4: Venezuela's monthly inflation rate
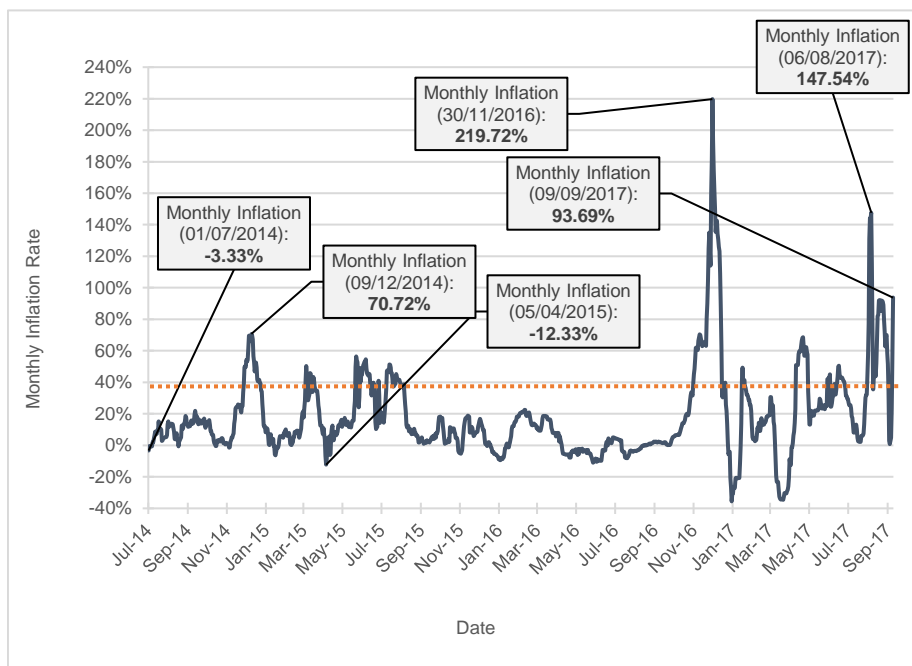
Sources: Banco Central de Venezuela, *DolarToday*, Dolar Paralelo, Paralelo Venezuela, Venezuela Econ. Calculations by Professor Steve H. Hanke, The Johns Hopkins University.
Note: These monthly inflation rates are implied by the black market USD/VEF exchange rate.

Reflections on Why Purchasing Power Parity is Powerful During Hyperinflation

Versions of purchasing power parity theory date back to the Salamanca School in sixteenth-century Spain and the work of Gerard de Malynes in England in 1601 (Manzur, 1993). The theory was largely neglected until the Swedish economist Gustav Cassel began an extensive investigation of exchange rates and price levels in the early twentieth century (Manzur, 1993). Cassel's conjecture was that movements in exchange rates reflected

movements in relative purchasing power. He plotted monthly changes in prices in different countries and compared those to movements in exchange rates during the same period. Countries with weaker currencies (read: stronger currency depreciations) suffered high rates of inflation. He found that the linkage between an increase in exchange-rate depreciation and increased inflation was tight. Cassel dubbed the theory the Purchasing Power Parity Doctrine (1916 and 1918). In a study of the relationship between the German mark's exchange rate and German inflation, Cassel found that Absolute PPP did not hold, and concluded that PPP is 'one of the most intricate, most actual, and practically most important chapters of economic science' (Cassel, 1919).

Even though Cassel continued to embrace the Absolute Purchasing Power Parity doctrine, his work opened the door for the development of Relative Purchasing Power Parity, which is the form we have used to estimate inflation in Venezuela. It is this form of PPP, as applied to countries with elevated inflation rates, which provides the standard used by the economics profession. The reason is clear: in high-inflation countries, Relative PPP holds and yields very accurate results (for example, see Frenkel, 1976; Mahdavi and Zhou, 1994; Manzur, 1990; McKinnon, 1979; McNown and Wallace, 1989; and Taylor and Taylor, 2004). As Petrović, Bogetić, and Vujošević put it: 'At moderate rates of inflation, prices adjust to past inflation and currency depreciation does not play a prominent role. As inflation accelerates, currency depreciation becomes increasingly important for price adjustments' (Petrović et al., 1999). Ronald McKinnon agrees and pointedly specifies Relative PPP as the standard for high-inflation countries: 'The relative version of PPP performs most impressively, however, when inflation in a single country is extraordinarily high *vis-à-vis* the outside world" (McKinnon, 1979).

In concluding these reflections on Relative PPP, it is worth noting that the empirical evidence shows that it holds in the 'long run,' when arbitrage has time to work its magic. The debates on the topic always swirl around whether it holds in the 'short run.' This debate does not appear when hyperinflation is the order of the day. During an episode of hyperinflation, the currency of the relevant country plunges in value rapidly and prices soar

in lockstep. In these circumstances, a foreign currency becomes the reference unit of account, and the 'short run' becomes the 'long run' and vice versa. With this equivalence, Relative PPP holds, as it always does in the 'long run,' because the 'long run' can occur in an hour.

To put this point into perspective, we use an illustration from Yugoslavia, where Hanke served as the adviser to the government of Ante Marković in 1990–91, and where he anticipated the great hyperinflation of 1992–4 (Hanke, 2016). Compared to Venezuela's episode of hyperinflation, Yugoslavia's was 'great.' The peak monthly rate of inflation in Yugoslavia was 313 million%. This is a daily rate of 64.4%. The comparable figures for Venezuela are only 219% per month and 4.0% per day.

To appreciate how the 'short run' and 'long run' became one in Yugoslavia, consider how fast prices were changing: literally in front of Yugoslavs' eyes. A kilogram of potatoes was 4,000 dinars on 10 November 1993. The same kilo of potatoes went for 8 quadrillion dinars two months later (Gordy, 1999). On 16 January 1994, one of Belgrade's prominent newspapers, *Politika*, reported that 'yesterday [morning] the price of the [Deutsche] Mark on the black market was 2.0 million dinars, and around 3:00 p.m., it was 2.5 million dinars. Belgrade dealers were reluctant to sell marks, as they expected the exchange rate to reach 5 million dinars (per DM 1) by evening' (Gordy, 1999). Talk about speed and the compression of time periods.

Concluding Remarks

Venezuela, welcome to the record books. You have now entered the inglorious sphere of hyperinflation. It is a world of economic chaos, wrenching poverty, and death. Its purveyors should be incarcerated, and the keys should be thrown away.

References

Arbetman, Marina and Jacek Kugler (1997). *Political Capacity and Economic Behavior.* Boulder, CO: Westview Press.

Cagan, Phillip (1956). The monetary dynamics of hyperinflation. In: Milton Friedman (ed.), *Studies in the Quantity Theory of Money*. Chicago: University of Chicago Press.

Cassel, Gustav (1916). The present situation of the foreign exchanges. *The Economic Journal* **26**, 101, pp. 62–5.

Cassel, Gustav (1918). Abnormal deviations in international exchange. *Economic Journal* **81**, 3, pp. 413–5.

Cassel, Gustav (1919). The depreciation of the German mark. *The Economic Journal* **29**, 116, pp. 492–6.

Crooks, Nathan (2015). Venezuela, the country with four exchange rates. *Bloomberg*, February 19. Available at: www.bloomberg.com/news/articles/2015-02-19/venezuela-the-country-with-four-exchange-rates.

Frenkel, Jacob (1976). A monetary approach to the exchange rate: doctrinal aspects and empirical evidence. *The Scandinavian Journal of Economics* **78**, 2, pp. 200–224.

Gordy, Eric D. (1999). *The Culture of Power in Serbia: Nationalism and the Destruction of Alternatives*. University Park, PA: Pennsylvania State University Press.

Hanke, Steve H. (1999). Yugoslavia destroyed its own economy. *Wall Street Journal*, April 28. Available at: https://www.wsj.com/articles/SB925239570247458388, accessed 26 September 2017.

Hanke, Steve H. (2016). Remembrances of a currency reformer: some notes and sketches from the field. Johns Hopkins Institute for Applied Economics, Global Health, and the Study of Business Enterprise. Studies in Applied Economics **55**.

Hanke, Steve H. and Alex Kwok (2009). On the measurement of Zimbabwe's hyperinflation. *Cato Journal* **29**, 2, pp. 353–64.

Hanke, Steve H. and Nicholas Krus (2013). World hyperinflations. In: Robert Whaples and Randal Parker (eds), *Routledge Handbook of Major Events in Economic History.* New York, NY: Routledge.

International Monetary Fund (2016). World Economic Outlook Database. Available   at: https://www.imf.org/external/pubs/ft/weo/2016/01/weodata/index.aspx, accessed April 2016.

Mahdavi, Saeid and Su Zhou (1994). Purchasing power parity in high-inflation countries: further evidence. *Journal of Macroeconomics* **16**, 3, pp. 403–422.

Manzur, Meher (1990). An international comparison of prices and exchange rates: a new test of purchasing power parity. *Journal of International Money and Finance* **9**, 1, pp. 75–91.

Manzur, Meher (1993). *Exchange Rates, Prices, and World Trade: New Methods, Evidence, and Implications.* London: Routledge.

McKinnon, Ronald (1979). *Money in International Exchange: the Convertible Currency System.* New York: Oxford University Press.

McNown, Robert and Myles Wallace (1989). National price levels, purchasing power parity, and cointegration: a test of four high inflation economies. *Journal of International Money and Finance* **8**, 4, pp. 533–45.

Morgenstern, Oskar (1963). *On the Accuracy of Economic Observations.* Princeton, NJ: Princeton University Press.

Petrović, Pavle et al. (1999). The Yugoslav hyperinflation of 1992–1994: causes, dynamics, and money supply process. *Journal of Comparative Economics* **27**, 2, pp. 335–53.

Taylor, Alan and Mark Taylor (2004). The purchasing power parity debate. *National Bureau of Economic Research* **18**, 4, pp. 135–58.