Studies in Applied Economics

VENEZUELA ENTERS THE RECORD BOOK
THE 57TH ENTRY IN THE HANKE-KRUS WORLD HYPERINFLATION TABLE

Steve H. Hanke and Charles Bushnell

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About the Series

The *Studies in Applied Economics* series is under the general direction of Prof. Steve H. Hanke, Co-Director of The Johns Hopkins Institute for Applied Economics, Global Health, and the Study of Business Enterprise (hanke@jhu.edu).

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In the past, Prof. Hanke taught economics at the Colorado School of Mines and at the University of California, Berkeley. He served as a Member of the Governor's Council of Economic Advisers in Maryland in 1976-77, as a Senior Economist on President Reagan's Council of Economic Advisers in 1981-82, and as a Senior Advisor to the Joint Economic Committee of the U.S. Congress in 1984-88. Prof. Hanke served as a State Counselor to both the Republic of Lithuania in 1994-96 and the Republic of Montenegro in 1999-2003. He was also an Advisor to the Presidents of Bulgaria in 1997-2002, Venezuela in 1995-96, and Indonesia in 1998. He played an important role in establishing new currency regimes in Argentina, Estonia, Bulgaria, Bosnia-Herzegovina, Ecuador, Lithuania, and Montenegro. Prof. Hanke has also advised the governments of many other countries, including Albania, Kazakhstan, and Yugoslavia.

Prof. Hanke has been awarded honorary doctorate degrees by the Bulgarian Academy of Sciences, the Universidad San Francisco de Quito, the Free University of Tbilisi, Istanbul Kültür University, and Varna Free University in honor of his scholarship on exchange-rate regimes. He is a Distinguished Associate of the International Atlantic Economic Society, a Distinguished Professor at the Universitas Pelita Harapan in Jakarta, Indonesia, a Professor Asociado (the highest honor awarded to international experts of

acknowledged competence) at the Universidad del Azuay in Cuenca, Ecuador, and a Profesor Visitante at the Universidad Peruana de Ciencias Aplicadas (the UPC's highest academic honor). In 1998, he was named one of the twenty-five most influential people in the world by *World Trade Magazine*.

Prof. Hanke is a well-known currency and commodity trader. Currently, he serves as a member of the Supervisory Board of Advanced Metallurgical Group N.V. in Amsterdam and Chairman Emeritus of the Friedberg Mercantile Group, Inc. in Toronto. During the 1990s, he served as President of Toronto Trust Argentina in Buenos Aires, the world's best-performing emerging market mutual fund in 1995.

Prof. Hanke's most recent books are *Zimbabwe: Hyperinflation to Growth* (2008) and *A Blueprint for a Safe, Sound Georgian Lari* (2010), *Juntas Monetarias para Paises en Desarollo* (2015), and *Currency Boards for Developing Countries: A Handbook* (2015).

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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 a hyperinflation – all 56 of them. With this paper, we amend the Table and add a 57th entry: Venezuela. On December 3, 2016, Venezuela's inflation met all the criteria required to qualify as a hyperinflation. Specifically, Venezuela's monthly inflation rate exceeded 50 percent per month for 30 consecutive days.

What was the genesis of the Hanke-Krus *World Hyperinflation Table*? What are the criteria required 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 the superior method? And 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, one of us (Hanke) was invited to write the survey article on hyperinflation for *The Routledge Handbook of Major Events in Economic History*. Hanke 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 hyperinflations – Yugoslavia (Hanke, 1999) and Zimbabwe (Hanke and Kwok, 2009). In addition, he had designed and implemented currency reforms that had stopped hyperinflations, notably Bulgaria's (Hanke, 2016).

While reflecting on the hyperinflation literature, 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 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 percent per month. Hanke adopted this convention.

2.   In addition, Hanke specified that the 50 percent rate had to persist for at least 30 consecutive days.

3.   Lastly, Hanke 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. 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 the French hyperinflation of 1795 to 1796 – the first verified

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 a hyperinflation in the 1992-1994 period. Fortunately, Hanke was able to use his extensive contacts in the 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 German hyperinflation. It peaked in October 1923 at 29,500 percent per month. This rate is many times below Zimbabwe's November 2008 peak hyperinflation of 79.6 billion percent – that is 80 followed by nine zeros. But, Zimbabwe's hyperinflation was only the world's second highest. It was miniscule next to Hungary's July 1946 peak monthly rate of 41.9 quadrillion percent – that is 42 followed by 15 zeros. While the German hyperinflation ranked 5th in the world hyperinflation rankings, its magnitude is much less than the top four inflations.

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}%	98.0%	24.7 hours	Dollar	Implied Exchange Rate*
Yugoslavia[3]	Apr. 1992	Jan. 1994	Jan. 1994	313,000,000%	64.6%	1.41 days	Dinar	Consumer
Republika Srpska†[4]	Apr. 1992	Jan. 1994	Jan. 1994	297,000,000%	64.3%	1.41 days	Dinar	Consumer
Germany[5]	Aug. 1922	Dec. 1923	Oct. 1923	29,500%	20.9%	3.70 days	Papiermark	Wholesale
Greece[6]	May. 1941	Dec. 1945	Oct. 1944	13,800%	17.9%	4.27 days	Drachma	Exchange Rate‡
China§[7]	Oct. 1947	Mid-May 1949	Apr. 1949	5,070%	14.1%	5.34 days	Yuan	Wholesale for Shanghai
Free City of Danzig[8]	Aug. 1922	Mid-Oct. 1923	Sep 1923	2,440%	11.4%	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

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
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	221%	3.96%	17.8 days[23]	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 1989	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
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

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
Peru[38]	Sep. 1988	Sep. 1988	Sep. 1988	114%	2.57%	27.7 days	Inti	Consumer
Taiwan[39]	Oct. 1948	May 1949	Oct. 1948	108%	2.46%	28.9 days	Taipi	Wholesale for Taipei
Hungary[40]	Mar. 1923	Feb. 1924	Jul. 1923	97.9%	2.30%	30.9 days	Crown	Consumer
Chile[41]	Oct. 1973	Oct. 1973	Oct. 1973	87.6%	2.12%	33.5 days	Escudo	Consumer
Estonia †† [42]	Jan. 1992	Feb. 1992	Jan. 1992	87.2%	2.11%	33.6 days	Russian Ruble	Consumer
Angola[43]	Dec. 1994	Jan. 1997	May 1996	84.1%	2.06%	34.5 days	Kwanza	Consumer
Brazil[44]	Dec. 1989	Mar. 1990	Mar. 1990	82.4%	2.02%	35.1 days	Cruzado & Cruzeiro	Consumer
Democratic Republic of Congo[45]	Aug. 1998	Aug. 1998	Aug. 1998	78.5%	1.95%	36.4 days	Franc	Consumer
Poland[46]	Oct. 1989	Jan. 1990	Jan. 1990	77.3%	1.93%	36.8 days	Zloty	Consumer
Armenia †† [47]	Jan. 1992	Feb. 1992	Jan. 1992	73.1%	1.85%	38.4 days	Russian Ruble	Wholesale
Tajikistan[48]	Oct. 1995	Nov. 1995	Nov. 1995	65.2%	1.69%	42.0 days	Tajikistani Ruble	Wholesale
Latvia[49]	Jan. 1992	Jan. 1992	Jan. 1992	64.4%	1.67%	42.4 days	Russian Ruble	Consumer
Turkmenistan ††[50]	Nov. 1995	Jan. 1996	Jan. 1996	62.5%	1.63%	43.4 days	Manat	Consumer
Phillipines[51]	Jan. 1944	Dec. 1944	Jan. 1944	60.0%	1.58%	44.9 days	Japanese War Notes	Consumer
Yugoslavia[52]	Sep. 1989	Dec. 1989	Dec. 1989	59.7%	1.57%	45.1 days	Dinar	Consumer
Germany[53]	Jan. 1920	Jan. 1920	Jan. 1920	56.9%	1.51%	46.8 days	Papiermark	Wholesale
Kazakhstan[54]	Nov. 1993	Nov. 1993	Nov. 1993	55.5%	1.48%	47.8 days	Tenge & Russian Ruble	Consumer
Lithuania[55]	Jan. 1992	Jan. 1992	Jan. 1992	54.0%	1.45%	48.8 days	Russian Ruble	Consumer
Belarus[55]	Aug. 1994	Aug. 1994	Aug. 1994	53.4%	1.44%	49.3 days	Belarusian Ruble	Consumer
Taiwan[57]	Feb. 1947	Feb. 1947	Feb. 1947	50.8%	1.38%	51.4 days	Taipi	Wholesale for Taipei

It is striking how few hyperinflations have occurred – only 56 as of 2013, when the Table was first constructed. However, at that time, there was probably a 57th hyperinflation. 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 was 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 seven of the original 56 hyperinflations. Those are: Argentina (1989), Bolivia (1984), Brazil (1989), Chile (1973), Nicaragua (1986), and Peru (1988 and 1990).
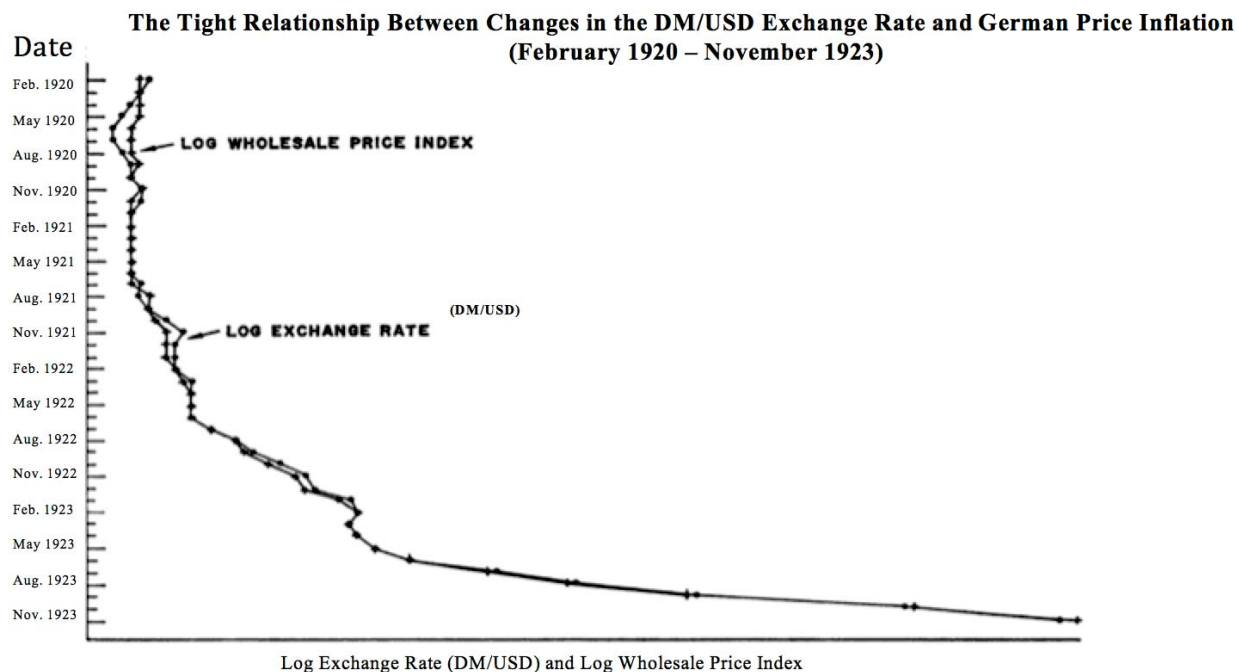
With this paper, we amend the Table and add Venezuela to the Rogues Gallery of hyperinflations. Venezuela passed the hyperinflation threshold on December 3, 2016. Venezuela is the 57th country to meet the three criteria required to qualify as a hyperinflation. Venezuela is now in the "record book." It appears in the new, amended Hanke-Krus *World Hyperinflation Table* at the 23rd rank, with a peak monthly inflation rate of 221 percent recorded in November 2016. This puts Venezuela in between the USSR, which recorded a peak monthly inflation rate of 212 percent in February 1924 and Moldova, whose peak monthly inflation of 240 percent occurred in January 1992.

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

Reliable official inflation statistics for Venezuela are not available. Indeed, from December 2014 until January 2016, the Banco Central De Venezuela did not report inflation statistics. The lack of reliable official inflation data is a "problem" that can be overcome, however. The most important price in an economy is the exchange rate between the local currency and the world's
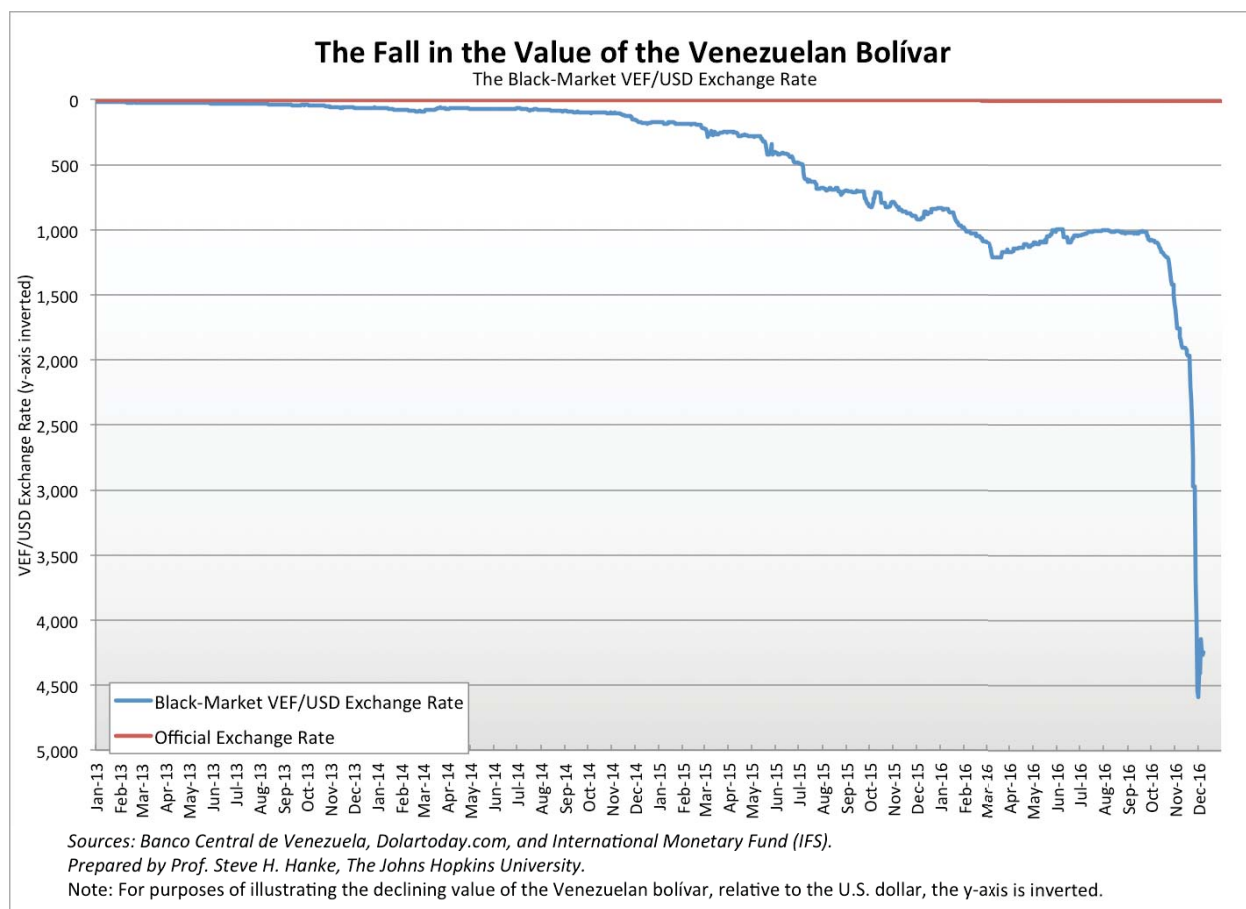
reserve currency – the U.S. dollar. As long as there is an active black market (read: free market) for currency and the black market data are available, changes in the black market exchange rate can be reliably transformed into accurate estimates of countrywide inflation rates. The economic principle 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-U.S. 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 hyperinflations. Indeed, Frenkel found a near one-to-one relationship between changes in exchange rate and price levels during the German hyperinflation. The chart below shows that tight linkage. McNown and Wallace (1989), as did Taylor and Taylor (2004), reinforced Frenkel's findings and confirmed that PPP held for countries that were experiencing elevated rates of inflation.

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 bolivar-U.S. dollar (VEF/USD) black-market rate is shown in the chart below. The value of the bolivar against the dollar has collapsed. PPP suggests that Venezuela is experiencing a dramatic inflation surge.

The Fall in the Value of the Venezuelan Bolívar
The Black-Market VEF/USD Exchange Rate

Sources: Banco Central de Venezuela, Dolartoday.com, and International Monetary Fund (IFS).
Prepared by Prof. Steve H. Hanke, The Johns Hopkins University.
Note: For purposes of illustrating the declining value of the Venezuelan bolívar, relative to the U.S. dollar, the y-axis is inverted.

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. But, three major factors can cause the Law of One Price not to 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 1994).

The shortcomings of Absolute PPP can be overcome with the use of a second form of PPP: Relative PPP. It 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 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 Venezuela price level in bolivars,

P_B = the United States price level in U.S. dollars, and

$S_{A/B}$ = the exchange rate (bolivars/ U.S. 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:
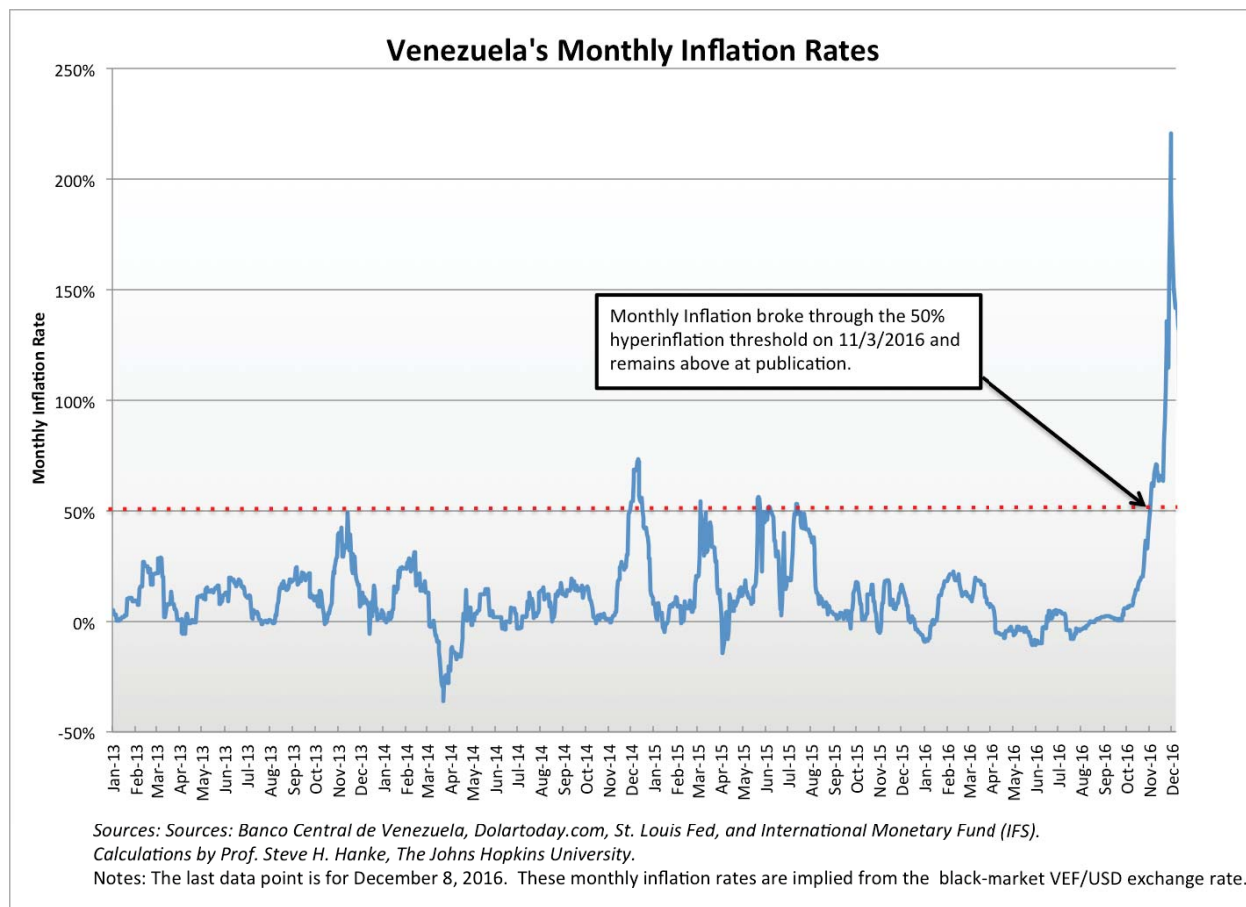
$$\frac{\Delta P_A}{P_A} = \left[\left(1 + \frac{\Delta P_B}{P_B}\right)\left(1 + \frac{\frac{\Delta S_A}{B}}{\frac{S_A}{B}}\right)\right] - 1.$$

Thus, if we know the U.S. inflation rate and the change in the exchange rate between the bolivar and the dollar over the given time 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 U.S. 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 percent threshold on November 3, 2016, when the black-market exchange rate deteriorated to 1682.12 VEF/USD. At that time, the monthly inflation rate in the U.S. was 0.125%. On November 3, 2016, Venezuela's monthly inflation was:

$$Inflation_{Venezuela} = \left[(1 + .00125)\left(1 + \frac{1682.12 - 1084.63}{1084.63}\right)\right] - 1 = 0.5528$$

Since inflation is expressed in percentage terms, monthly inflation on November 3, 2016 was 55.3 percent. The monthly inflation rate, as shown in the chart below, has continued to stay above 50 percent for each day since November 3, 2016.

Venezuela's Monthly Inflation Rates

Monthly Inflation broke through the 50% hyperinflation threshold on 11/3/2016 and remains above at publication.

Sources: Sources: Banco Central de Venezuela, Dolartoday.com, St. Louis Fed, and International Monetary Fund (IFS).
Calculations by Prof. Steve H. Hanke, The Johns Hopkins University.
Notes: The last data point is for December 8, 2016. These monthly inflation rates are implied from the black-market VEF/USD 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 16th 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 20th 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 use 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 1994, Manzur 1990, McKinnon 1979, McNown and Wallace 1989, and Taylor and Taylor 2004). As Petrovic, Bogetic, 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," (Petrovic 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-a-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 a hyperinflation, the currency of the hyperinflating country is plunging in value rapidly and prices are soaring 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 Markovic in 1990-1991, and where he anticipated the great hyperinflation of 1992-1994 (Hanke, 2016). Compared to Venezuela's, Yugoslavia's hyperinflation was "great." The peak monthly rate of inflation in Yugoslavia was 313,000,000 percent. This is a daily rate of 64.4 percent. The comparable figures for Venezuela are only 221 percent per month and 4.0 percent per day.

To appreciate how the "short" 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 November 10, 1993. The same kilo of potatoes went for 8,000,000,000,000,000 dinars two months later (Gordy, 1999). On January 16, 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." 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.

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Hanke-Krus *World Hyperinflation Table* Notes and Sources

- 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 August 13, 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, from August to November 2008, 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 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.

(***) We calculated PPP implied inflation for Venezuela using black-market exchange rate data from dolartoday.com.

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