

Hyperinflations, Hysteria, and False Memories

James Montier



In the past, I've admitted to macroeconomics being one of my dark, guilty pleasures. To some "value" investors this seems like heresy, as Marty Whitman¹ once wrote, "Graham and Dodd view macro factors . . . as crucial to the analysis of a corporate security. Value investors, however, believe that macro factors are irrelevant." I am clearly a Graham and Doddite on this measure (and most others as well). I view understanding the macro backdrop (N.B. not predicting it, as Ben Graham said, "Analysis of the future should be penetrating rather than prophetic.") as one of the core elements of risk management.

In this paper I'd like to turn to a subject that has long fascinated me: hyperinflations. My interest in hyperinflations stems not from my background as an economist, but rather from a small collection of bank notes that my father gave to me. (A peculiar benefit of his smoking habit – bank notes were used as an incentive to purchase cigarettes.) Included in this collection is a one million mark note from the Weimar Republic; it is this note that is responsible for my interest in hyperinflations. To this day I collect bank notes from hyperinflations. The notes shown in the body of this paper come from my collection² and serve as decorative reminders of important historical hyperinflations.

My interest in these unusual events was reignited by my exposure whilst a student to the monetarist view of hyperinflation, which I found deeply unsatisfactory. This interest was then further kindled when I covered the Latin American markets in the wake of their hyperinflationary experiences.

The standard view

Ask almost anyone familiar with the subject what causes hyperinflations and at least 95% or more will trot out the stock view of economists: it is central banks printing money to finance government deficits. This view is based largely on Cagan's 1956 paper, "The Monetary Dynamics of Hyperinflation" and/or Sargent and Wallace's 1981 paper, "Some Unpleasant Monetarist Arithmetic."

The quantity theory of money states $MV = PY$, which reads as money times velocity equals price times output. This is an identity (it must be true). In order to turn this into something more useful, some behavioural aspects or causality must be imposed. So the monetarists argue that creating lots of money (M) given a stable velocity and a stable output leads to rises in P, or inflation.

According to this quantity-theory-of-money-based view, the origins of any inflationary process are to be found in the irresponsible fiscal policies of governments. Budget deficits lead to a rise in the supply of money (by central bank printing) and consequently result in higher prices. In essence this is the result of the ability of governments to impose an inflation tax (known as seignorage), which redistributes real resources to the currency issuers.

¹ Martin J. Whitman, *Value Investing: A Balanced Approach*, John Wiley & Sons, 1999.

² With the exception of Georgia's coupon, which has yet to find its way into my collection. The note you see on page 9, alas, was downloaded from the internet.

Hyperinflation is argued to occur when the government prints too much money, causing rising prices. As prices rise, the velocity of circulation increases – no one wants to hold cash for very long if its value keeps falling. Time horizons shorten as workers demand wages at increasingly regular intervals (weekly, daily, hourly, etc.), and dash out to spend their cash as soon as they can. This means that even though the money supply is growing as rapidly as the government can crank the handle of the printing press, it can never keep up with rising prices. As prices rise, velocity rises, and so forth.³ Against this backdrop, a government will run a deficit because tax revenue can't keep up with its spending, so it prints money to make up the gap.

The solution to an inflationary process from this perspective is to follow a path of austerity (reduce spending and/or raise revenues). This viewpoint clearly assumes that the money supply is exogenous and controlled by the central bank.

If you believe this line of argument, it is easy to see why you might well be worried about the deficits being run by countries such as the UK, the US, and Japan. Indeed, several investment banks have issued “hyperinflation” warnings over recent years, and some investors seem to regard the arrival of hyperinflation as simply a matter of time given the massive expansion of the central banks’ balance sheets.

A quick detour into false memories

To me the use of this quantity theory framework is reminiscent of the false memory problem in psychology.⁴ False memory refers to cases in which people remember events differently from the way they happened or, in the most dramatic cases, remember events that never happened at all. The most disturbing and tragic examples include so-called recovered or repressed memories of events such as abuse, which are “remembered” under the supervision of psychoanalysts. These repressed memories have ruined lives and yet are entirely fictional. False memories have been created in the lab as well as observed in the field.⁵ Researchers have shown that a week after people were told about a childhood experience in the form of a short story, 82% of the subjects made up some extra information concerning the entirely fictional event!

In fact, as this paper was making its merry way through our publication process, an exceptionally relevant new study landed on my desk.⁶ The abstract reads as follows:

“In the largest false memory study to date, 5,269 participants were asked about their memories for three true and one of five fabricated political events. Each fabricated event was accompanied by a photographic image purportedly depicting that event. Approximately half the participants falsely remembered that the false event happened ... Political orientation appeared to influence the formation of false memories, with conservatives more likely to falsely remember seeing Barack Obama shaking hands with the president of Iran, and liberals more likely to remember George W. Bush vacationing with a baseball celebrity during the Hurricane Katrina disaster.”

It seems to me as if the standard view of hyperinflations is akin to a false memory. We have all heard that “central banks printing money leads to hyperinflations” so often that it must just be true. It is a simple, short narrative – exactly the kind that produces false memories.

An alternative view of hyperinflations

However, there is an alternative view of hyperinflations, one that I find much more credible than the quantity-theory-based argument outlined above. This alternative viewpoint recognizes that money supply is endogenous (and hence that interest rates are exogenous), and that budget deficits are often caused by hyperinflations rather than being the source of hyperinflations.

³ To make the quantity theory fit the hyperinflation scenario, Cagan basically had to abandon the “normal” assumption of a stable velocity of circulation.

⁴ Elizabeth F. Loftus, “Creating False Memories,” *Scientific American*, 1997.

⁵ Maryanne Garry and Kimberley A. Wade, “Actually, a Picture Is Worth Less Than 45 Words: Narratives Produce more False Memories Than Photographs Do,” *Psychonomic Bulletin & Review*, 12 (2), 359-366, 2005.

⁶ Steven J. Frenda, Eric D. Knowles, William Saletan, and Elizabeth F. Loftus, “False Memories of Fabricated Political Events,” *Journal of Experimental Social Psychology*, Vol. 49, Issue 2, March 2013.

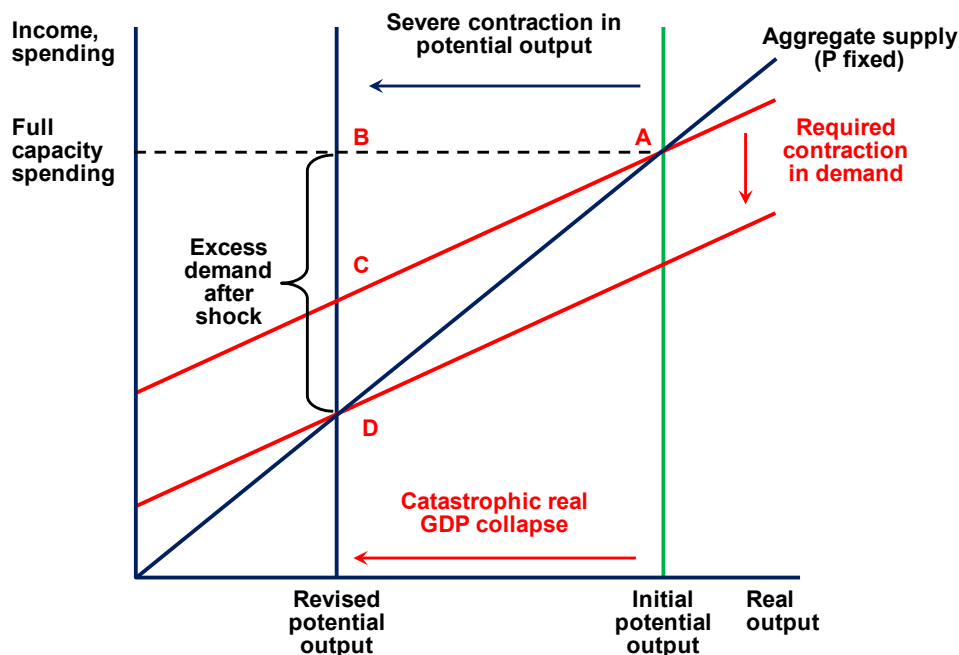
If simply “printing money” really did lead to hyperinflations, then we should expect to see hyperinflations all of the time. Any government that issues its own currency under a floating exchange rate effectively spends by printing money⁷ (as a matter of logic, if the government is the sole issuer of currency, it has to spend before it can collect any taxes at all, otherwise there is nothing to pay the taxes with). Yet, rather than two-a-penny, hyperinflations are thankfully rare events, representing occasions when populations lose complete faith in their currencies.

So if “printing money” isn’t a helpful hallmark of the hyperinflationary experiences we have witnessed, what is? When looking across the historical sampling of hyperinflations, several common characteristics⁸ stand out:

1. *Large supply shocks.* Often, but not always, wars of one form or another cause large supply shocks. Regime change is also often seen as a cause. The role of supply shocks is critical in the creation of hyperinflations. They represent a hit to potential output and thus are a key mechanism for creating the excess demand so often seen during hyperinflations.

If we think in terms of the quantity theory expression $MV = PY$, then the output shock is modeled by a big drop in Y , which, given unchanged M and V , means that P has to rise in order to maintain the relationship. Of course, unchanged V and M are not good assumptions as we will see, but note that the monetarist interpretation of the quantity is completely backwards.

The clearest explanation of the importance of supply shocks comes from Bill Mitchell.⁹ He uses the following simple diagram and accompanying text to make his case.



“It is not perfect but makes the point (you have to impose your own dynamic motion on the chart). The horizontal axis is real output and full-employment potential output is shown by the vertical green line (inferring no bio-unsustainable production levels!). The vertical axis is spending or demand in real terms. The trick is that the price

⁷ Keystrokes would be a better description of printing money these days.

⁸ A database of hyperinflation experiences has recently been compiled by Steve H. Hanke and Nicholas Krus, “World Hyperinflations,” 2012. See the Appendix and visit <http://www.cato.org/sites/cato.org/files/pubs/pdf/WorkingPaper-8.pdf>.

⁹ Bill Mitchell – billy blog at <http://bilbo.economicoutlook.net/blog/?p=3773>

level is held constant in this diagram. The 45 degree line is the fixed-price aggregate supply curve indicating that firms will supply whatever is demanded at the fixed price up to capacity (Point A). After Point A, supply capacity would be exhausted and inflation would enter the picture.

The red line (top) which intersects Point A is the aggregate demand line and shows the current state of spending in the economy at different real income levels. It is upward sloping because consumption rises with national income and it is less than 45 degrees because not all income is consumed (some saving). So it is the sum of all demand components (consumption, investment, net exports and government spending).

If we assume that Shangri la prevails then we are initially at Point A. There will be full capacity output, stable prices, some non-government saving and a budget deficit to match.”

Now imagine that some supply shock occurs:

“Potential output would steadily contract and I have shown a particular revised potential line (a contraction of the overall capacity of the economy to produce).

If you think about current demand levels in relation to that new dramatically reduced supply potential you quickly see there is a huge excess demand (spending) measured by the gap between points B and D. But, in fact, as the income levels fall, the economy would actually contract along the top red aggregate demand line (as income falls, so does consumption and saving). At point C there is still excessive demand (spending) in relation to the new potential capacity.

So demand would have to be reduced downward (red line shifting down) until it intersected the new supply constraint at the 45 degree line at point D. Point C could theoretically be associated just as much with a budget surplus as a budget deficit – that is, you cannot directly implicate the conduct of fiscal policy with the excess spending automatically or even necessarily.

The upshot is that price level would be rising in this economy long before it reached point D from point A because of the chronic excess spending relative to the dramatically lower capacity.”

2. *Big debts denominated in a foreign currency.* This practice leads to the devaluation of the currency, which in turn leads to the rising price level. Quantity theorists argue the reverse causation.
3. *Distributive conflict/transmission mechanism.* Crucially, the need for this element was pointed out by Joan Robinson¹⁰ in 1938. She wrote “Neither exchange depreciation nor a budget deficit can account for inflation by itself. But if the rise in money wages is brought into the story, the part which each plays can be clearly seen. With the collapse of the mark in 1921, import prices rose abruptly, dragging home prices after them. The sudden rise in cost of living led to urgent demands for higher wages. Unemployment was low . . . profits were rising with prices, and the German workers were faced with starvation. Wage rises had to be granted. Rising wages, increasing both home costs and home money incomes, counteracted the effect of exchange depreciation in stimulating exports and restricting imports. Each rise in wages, therefore, precipitated a further fall in the exchange rate, and each fall in the exchange rate called forth a further rise in wages. This process became automatic when wages began to be paid on a cost-of-living basis.”

Without this form of transmission mechanism, hyperinflations would simply flare out.

Understanding these factors helps to explain why saying that hyperinflations are the result of printing money just isn't helpful; it is too simple and misses the major drivers of hyperinflations. The monetary response is endogenous to the process, not a driving force. As Robinson opined in her review, “A clear grasp of the distinction between a necessary and a sufficient condition seems to be all that is required to settle the controversy. It is true that a train cannot move when the brake is on, but it would be foolish to say that the cause of motion in a train is that the brake is removed.”

¹⁰ Joan Robinson, “The Economics of Hyperinflation,” a review of Bresciani-Turroni's *The Economics of Inflation*,” *Economic Journal*, No. 48, September 1938.

As Raul Prebisch¹¹ put it, “The general mistake persists of considering inflation as a purely monetary phenomenon... Inflation cannot be explained as something divorced from the economic and social maladjustments and stresses to which the economic development of our countries gives rise.”

Let’s look at some historical examples¹² and see how they map against the common characteristics mentioned above. I’ve tried to pick a broad mixture of hyperinflations across a wide range of history. Often hyperinflations have occurred in groups (hardly surprising because many of the large supply shocks witnessed have taken the form of wars, hence encompassing more than one nation), so I’ve generally just picked one country from any group to provide a sketch of the conditions under which hyperinflations tend to arise.



Weimar Republic Hyperinflation (1922-23)

We’ll start with the most commonly cited example, the Weimar Republic. Germany’s productive capacity had been significantly damaged by World War I, both in terms of the losses inflicted and the resources redirected to military use. Allied troops occupied the Ruhr Valley – the seat of much of Germany’s manufacturing base. These events clearly constituted a large supply shock.

The Republic faced very large foreign claims from war reparations,¹³ which had to be repaid in gold. Germany was supposed to export to earn the gold needed to make the payments, but with productive capacity not even capable of meeting domestic demand, there was no chance of exports coming to the rescue.

In 1927, Karl Helfferich (a senior banker at Deutsche Bank) argued that the reparations were to blame for the hyperinflation. He noted that the unfavourable trade balance (lots of imports but no exports) led to depreciation of the currency: “The depreciation of the mark was the beginning of this chain of cause and effect; inflation is not the cause of the increase in prices and of the depreciation of the mark; but depreciation of the mark is the cause of the increase in prices and of the paper mark issues.”¹⁴

As noted above, Robinson outlined the transmission mechanism, which allowed hyperinflation to rage.

¹¹ Raul Prebisch, “Economic Development or Monetary Stability: The False Dilemma,” 1961. If you don’t know of Raul Prebisch, he is quite probably the greatest economist you have never heard of. He is often, quite correctly, referred to as Latin America’s Keynes.

¹² These thumbnail sketches can’t possibly do justice to the experience of hyperinflations and leave out many important details, but hopefully they will illustrate the common characteristics of hyperinflations.

¹³ Keynes wrote his book *The Economic Consequences of the Peace* in 1919. In it he outlined the dangers posed by the enormous reparations that had been imposed upon Germany.

¹⁴ Found in Constantino Bresciani-Turroni’s *Economics of Inflation: A Study of Currency Depreciation in Post-War Germany*, 1931.



Hungarian Hyperinflation (1945-46)

It appears as if nothing was learnt from the experience of the Weimar Republic as the Hungarian hyperinflation following the end of World War II followed almost exactly the same dynamics. Interesting from my perspective, Hungary poses a real challenge for the quantity theory approach because, for at least a couple of months of its hyperinflation, the authorities literally could not print currency: the retreating fascists had stolen the currency printing plates!

War was once again the terrible supply shock that was visited upon Hungary. Some estimates suggest that as much as 50% of Hungary's capital stock was destroyed (and some 90% damaged) due to Hungary's role as a battlefield. Reparations again played their part. Hungary faced requirements to pay financial reparations as well as payments in goods to the occupying Soviet army.

The transmission mechanism seems to have involved a decision by the Hungarian authorities to accommodate the inflationary surge. As Grossman and Horvath pointed out, quoting a member of parliament in 1946, "This inflation . . . could only be barred by methods that would have made it impossible to design a realistic governmental budget." The authorities believed that their only feasible or viable path was to accommodate the inflation.

In a bid to stabilize tax revenues, the government launched a separate currency for the collection of taxes – the tax pengo. This led to index deposit accounts, and created a situation where all tax payments and pretty much everything else were indexed to the inflation rate.



Chinese Hyperinflation (1937-49)

War (both international and civil) once again played a part in this particular hyperinflation as Japan invaded China in 1937. The Japanese army occupied more than one-third of China and, as a result, important tax revenues from the eastern cities were lost to the Japanese. When the conflict finally ended, it was replaced with a civil war. These terrible events clearly provided a massive and prolonged supply shock to the economy.

Between 1937 and 1949, three governments – the Nationalists, the Japanese, and the Communists – occupied China. Each one issued its own currency (indeed, multiple currencies were issued by each authority). These bodies effectively engaged in monetary warfare, with each producing “propaganda stating that the currency of their enemies was falling rapidly in value.”¹⁵ Depreciation of the various currencies was just a fact of life. This lack of faith created a vicious feedback cycle common in hyperinflations as people held onto the currencies for as little time as possible.

The transmission mechanism was yet again a form of indexation. As people became accustomed to living in high inflation, their wages rose “as fast as prices and even discounted anticipated inflation.”¹⁶

Botched attempts at stabilization actually exacerbated the supply shock. As Campbell and Tullock wrote, “Imagine the plight of business firms that had borrowed at rates of 1 or 2 per cent per day when the government decided to stop printing more money. A scramble for currency followed, borrowers were unable to pay their debts, and bankruptcies flourished.”



Bolivian Hyperinflation (1984-85)

The roots of the Bolivian experience with hyperinflation can be traced to its near monoculture export base and its heavy reliance on external finance. The former feature meant that when mineral prices fell in the early 1980s (especially tin prices) it had a very serious impact upon GDP and inflation – effectively a classic supply shock.

Bolivia also struggled with heavy external borrowing. Between 1973 and 1981, public long-term external debt rose from \$640 million to \$2.7 billion. This, of course, left the country vulnerable to any “capital stops.” In the wake of the Mexican default in 1982, such a capital stop occurred.

Add into this mix a newly democratically elected government and the scene was set for disaster. In an effort to de-dollarise¹⁷ the economy, President Hernán Siles Zuazo ordered the conversion of all domestic dollar-denominated contracts into peso terms. This unfortunately created yet another run on the peso. The Bolivian authorities also attempted to honour the external debt, creating domestic unrest.

The familiar transmission mechanism of indexation was once again present. One of Zuazo’s policies was to 100% index the minimum wage, with adjustments made with each 40% increase in the price level. This set the standard for other workers who demanded similar treatment. By 1984, there was a policy of 100% indexation for all wages, with a four-month adjustment period. This eventually shrank to just one month. The classic wage-price spiral resulted.

¹⁵ Colin D. Campbell and Gordon C. Tullock, “Hyperinflation in China, 1937-49,” *Journal of Political Economy*, Vol. 62, No. 3, June 1954.

¹⁶ Op. cit.

¹⁷ Dollarisation is a process whereby a foreign currency replaces the domestic currency. This process makes devaluation of the domestic currency more inflationary faster than it would otherwise have been by creating direct pass-through of exchange rate movements to domestic prices.

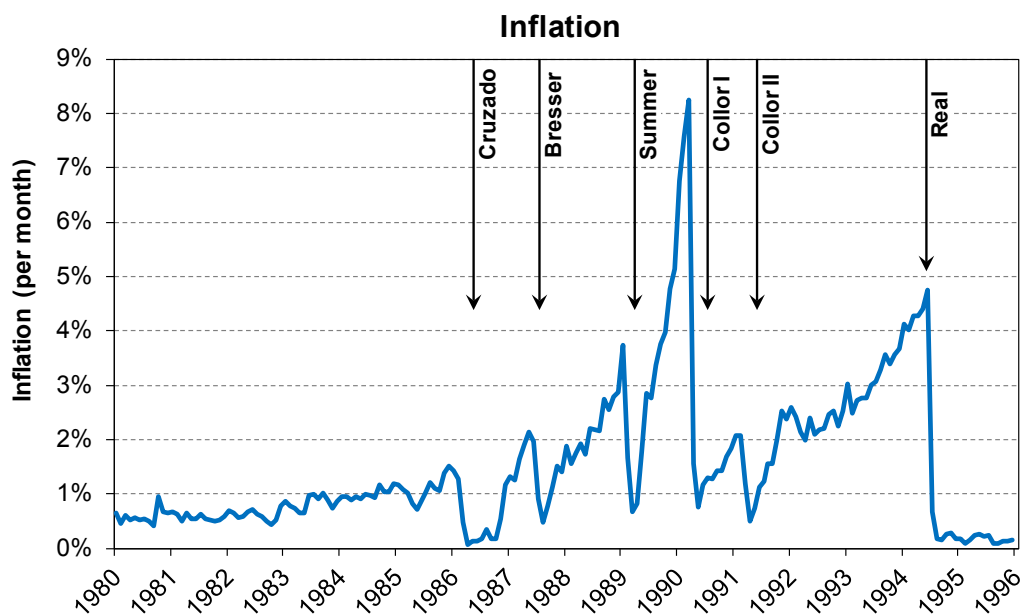


Brazilian Hyperinflation (1987-94)

As with Bolivia, Brazil was subject to the same supply shocks (both physical [oil] and capital related [external debt financing]) in the early 1980s. However, Brazil managed to postpone the arrival of outright hyperinflation longer than many of its neighbours at the cost of very high inflation for a prolonged period (see Exhibit 1).

Exhibit 1

Hyperinflation can only be deferred so long (Brazilian CPI % pm)



Source: IMF; Datastream

Several elements seemed to account for the postponement of outright hyperinflation (and the high inertial inflation). One was widespread indexation. This practice is often part of the wage-price spiral that characterizes hyperinflation. However, in Brazil's case it predated the hyperinflation and was a well-established practice that gave inflation a strong inertial component.

As Bresser-Pereira and Nakano note, "Inertial inflation tends to be rigid downwards, since future inflation is strongly linked to past inflation. But it also tends to hinder the acceleration of inflation, as long as it avoids or postpones the dollarisation of the economy . . . In Brazil economic agents could protect their financial assets by buying index bonds . . . to buy dollars was risky, first because the parallel exchange rate tended to be artificially high, and second because it would fluctuate markedly."

As the exhibit highlights, another component of delayed hyperinflation was the various stabilization attempts made by the authorities (five before the Real Plan). Each of these, though ultimately failing, helped reduce inflation on a temporary basis (often due to price freezes). However, each of these plans inflicted a set of costs upon the economy, which cumulatively took their toll (witness the very high levels of capital flight that Brazil suffered) as everyone got used to the “tricks” deployed. The effect was that the failure of each plan resulted in higher and higher movements in prices. This continued until, with the failure of the Summer Plan, the indexation that had long existed in Brazil cracked because past inflation was no longer seen as a reasonable guide to future inflation and the long-deferred hyperinflation erupted with a vengeance.



Federal Republic of Yugoslavian Hyperinflation (1992-1994)

The Federal Republic of Yugoslavian hyperinflation (Serbia and Montenegro) once again had war serving as the large supply shock. The country began to disintegrate in 1990 when elections in each of the six republics essentially foretold the end of the union. One of the most terrible conflicts seen in modern times ensued as the former Yugoslavia tore itself apart.

In May 1992, the United Nations imposed international sanctions on the Federal Republic of Yugoslavia, which effectively prohibited almost all trade and transactions. The output shock of war and sanctions was enormous, on a similar scale, based on some estimates, to that seen during the Hungarian hyperinflation. As one might imagine, the budget deficit exploded (as tax revenues imploded), rising from 3% of GDP in 1990 to 28% of GDP in 1993.

As is often the case (as we have seen above), dollarisation (based on the German mark) of the economy occurred, such that all exchange-rate depreciations created price spirals in the domestic setting.



Georgian Hyperinflation (1992-94)

When Georgia became independent in 1991, it was tightly integrated with Russia and the other members of the former Soviet Union (FSU). In particular, Georgia was a massive importer of energy (gas and refined oil products); its exports were to other FSU states and relied on the railway and road routes to Russia.

The large supply shock underlying the Georgian hyperinflation experience was clearly the break-up of the FSU and its wider impact. The key terms of trade moved sharply against Georgia in 1992 and 1993 as the prices of its key energy imports soared. Added to this nightmare mix were civil unrest and the severing of Georgia's rail link to Russia. Output collapsed, with a 56% decline recorded between 1991 and 1992.

As has often been observed in the previous examples, the fiscal position of the government deteriorated massively as tax receipts collapsed and expenditure levels were maintained in the face of the terrible domestic situation and import needs. The deficit went from 3% of GDP in 1991 to 26% in 1993. Nearly 80% of the deficit was financed by external loans (or grants).

As the ruble zone ceased to exist, the Central Bank of Russia stopped supplying bank notes to the FSU states, so Georgia introduced the coupon in April 1993 and it became the sole legal tender in August of that year. The Georgian National Bank had to accommodate the spending by the government, and having exhausted its foreign exchange reserves, the currency began to depreciate massively.

As in many of the other instances of hyperinflation outlined above, this created an exchange-rate-driven inflation. As the IMF put it, "The market exchange rate depreciation led the price index change during the hyperinflation period," just as Helfferich had argued so many years prior with respect to the Weimar Republic hyperinflation. Dollarisation proved once again to be the key transmission mechanism.



Zimbabwean Hyperinflation (2007-09)

For our final thumbnail, let's turn to one of the most recent examples of hyperinflation – Zimbabwe. The usual suspects for generating hyperinflation all seemed to play their role here. Zimbabwe began its descent into economic chaos in 1999 when a drought impacted the large agricultural sector. Land reallocation in 2000 and 2001 further increased the supply shock as farms went from those with productive owners to those with little or no interest in farming. Output fell by 50% between 2000 and 2008, with tobacco (a major export earner) dropping 64%, and maize by 76%.

Agriculture wasn't the only sector to suffer. The infrastructure of the economy was crumbling: the national rail system could no longer transport the country's mining exports. In 2007 there was a 57% decline in export mineral shipments. Manufacturing was crucified as well, with output falling 29% in 2005, 18% in 2006, and 28% in 2007. The result of this carnage was an unemployment rate of 80%!

The agricultural collapse created the second of characteristics – large debts in a foreign currency. Of course, Zimbabwe already had a large external debt, but this was largely to official creditors, who kept adding the non-payment to the loan itself. However, with virtually no domestic food production, Zimbabwe was forced to import and pay for those imports in foreign currencies.

Given this backdrop, Zimbabwe witnessed large-scale emigration, decreasing the tax base further and worsening the budget deficit situation. Of course, dollarisation of the economy ensued.

Conclusions

To say that the printing of money by central banks to finance government deficits creates hyperinflations is far too simplistic (bordering on the simple-minded). Hyperinflation is not purely a monetary phenomenon. To claim that is to miss the root causes that underlie these extraordinary periods. It takes something much worse than simply printing money. To create the situations that give rise to hyperinflations, history teaches us that a massive supply shock, often coupled with external debts denominated in a foreign currency, is required, and that social unrest and distributive conflict help to transmit the shock more broadly.

On the basis of these preconditions, I would argue that those forecasting hyperinflation in nations such as the US, the UK, or Japan are suffering from hyperinflation hysteria. If one were to worry about hyperinflation anywhere, I believe it would have to be with respect to the break-up of the eurozone. Such an event could create the preconditions for hyperinflation (an outcome often ignored by those discussing the costs of a break-up). Indeed, the past warns of this potential outcome: the collapse of the Austro-Hungarian Empire, Yugoslavia, and the Soviet Union all led to the emergence of hyperinflation!

References and Further Reading

Alcino Câmara and Matias Vernengo, "The German Balance of Payment School and the Latin American Neo-structuralists," in Essays on Horizontalism, 2001.

Bill Mitchell, "Zimbabwe for Hyperventilators 101," billy blog, July 2009.

Colin D. Campbell and Gordon C. Tullock, "Hyperinflation in China, 1937-49," *Journal of Political Economy*, Vol. 62, No. 3, June 1954.

Constantino Bresciani-Turroni, The Economics of Inflation: A Study of Currency Depreciation in Post-War Germany, Università Bocconi, 1931.

Fernando F. Filho and Luiz F. de Paula, "The Legacy of the Real Plan and an Alternative Agenda for the Brazilian Economy," *Investigación Económica*, Vol. 62, No. 244, April/June 2003.

J.A. Kregel, "Was There an Alternative to the Brazilian Crisis?" *Brazilian Journal of Political Economy*, Vol. 19, No. 3 (75), July/September 1999.

Jian-Ye Wang, "The Georgian Hyperinflation and Stabilization," IMF Working Paper, 99/65, May 1999.

Joan Robinson, "The Economics of Hyperinflation," a review of Bresciani-Turroni's The Economics of Inflation," *Economic Journal*, No. 48, September 1938.

Katarina Juselius and Zorica Mladenovic, "High Inflation, Hyperinflation and Explosive Roots: The Case of Yugoslavia," Institute of Economics, University of Copenhagen, 2002.

Luis C. Bresser-Pereira and Yoshiaki Nakano, "Hyperinflation and Stabilization in Brazil: The First Collor Plan," paper written in April-May 1990, and presented to the Post-Keynesian Conference, Knoxville, Tennessee, June 1990.

Manuel Pastor, Jr., "Bolivia: Hyperinflation, Stabilization, and Beyond," Manuscript, Occidental College, 1988.

Márcio G.P. Garcia, "Avoiding some of the Costs of Inflation and Crawling toward Hyperinflation: The Case of the Brazilian Domestic Currency Substitute," *Journal of Development Economics*, Vol. 51, 1996.

Pavle Petrovic, Zeljko Bogetic, and Zorica Vujosevic, "The Yugoslav Hyperinflation of 1992-1994: Cause, Dynamics, and Money Supply Process," *Journal of Comparative Economics*, Vol. 27, Issue 2, June 1999.

Peter Grossman, "The Dynamics of the Hungarian Hyperinflation, 1945-6: A New Perspective," (with János Horváth), *Journal of European Economic History*, 29 (2-3), Fall/Winter 2000, pp. 405-427.

Peter J. Montiel, "Empirical Analysis of High-Inflation Episodes in Argentina, Brazil, and Israel," IMF Working Paper, 88/68, 1988.

Raul Prebisch, "Economic Development or Monetary Stability: The False Dilemma," 1961.

William A. Bomberger and Gail E. Makinen, "The Hungarian Hyperinflation and Stabilization of 1945-1946," *Journal of Political Economy*, Vol. 91, No. 5, October 1983.

Appendix

THE HANKE-KRUS HYPERINFLATION TABLE

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	$4.19 \times 10^{16}\%$	207%	15.0 hours	Pengő	Consumer Implied Exchange Rate*
Zimbabwe ²	Mar. 2007	Mid-Nov. 2008	Mid-Nov. 2008	$7.96 \times 10^{10}\%$	98.0%	24.7 hours	Dollar	Consumer
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
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	Zaire	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
Russia / USSR ²³	Jan. 1922	Feb. 1924	Feb. 1924	212%	3.86%	18.5 days	Ruble	Consumer
Georgia ²⁴	Sep. 1993	Sep. 1994	Sep. 1994	211%	3.86%	18.6 days	Coupon	Consumer
Tajikistan†† ²⁵	Jan. 1992	Oct. 1993	Jan. 1992	201%	3.74%	19.1 days	Russian Ruble	Consumer
Georgia ²⁶	Mar. 1992	Apr. 1992	Mar. 1992	198%	3.70%	19.3 days	Russian Ruble	Consumer
Argentina ²⁷	May 1989	Mar. 1990	Jul. 1989	197%	3.69%	19.4 days	Austral	Consumer
Bolivia ²⁸	Apr. 1984	Sep. 1985	Feb. 1985	183%	3.53%	20.3 days	Boliviano	Consumer
Belarus†† ²⁹	Jan. 1992	Feb. 1992	Jan. 1992	159%	3.22%	22.2 days	Russian Ruble	Consumer
Kyrgyzstan†† ³⁰	Jan. 1992	Jan. 1992	Jan. 1992	157%	3.20%	22.3 days	Russian Ruble	Consumer
Kazakhstan†† ³¹	Jan. 1992	Jan. 1992	Jan. 1992	141%	2.97%	24.0 days	Russian Ruble	Consumer
Austria ³²	Oct. 1921	Sep. 1922	Aug. 1922	129%	2.80%	25.5 days	Crown	Consumer
Bulgaria ³³	Feb. 1991	Mar. 1991	Feb. 1991	123%	2.71%	26.3 days	Lev	Consumer
Uzbekistan†† ³⁴	Jan. 1992	Feb. 1992	Jan. 1992	118%	2.64%	27.0 days	Russian Ruble	Consumer
Azerbaijan ³⁵	Jan. 1992	Dec. 1994	Jan. 1992	118%	2.63%	27.0 days	Russian Ruble	Consumer
Congo (Zaire) ³⁶	Oct. 1991	Sep. 1992	Nov. 1991	114%	2.57%	27.7 days	Zaire	Consumer
Peru ³⁷	Sep. 1988	Sep. 1988	Sep. 1988	114%	2.57%	27.7 days	Inti	Consumer
Taiwan ³⁸	Oct. 1948	May 1949	Oct. 1948	108%	2.46%	28.9 days	Taipei	Wholesale for Taipei
Hungary ³⁹	Mar. 1923	Feb. 1924	Jul. 1923	97.9%	2.30%	30.9 days	Crown	Consumer
Chile ⁴⁰	Oct. 1973	Oct. 1973	Oct. 1973	87.6%	2.12%	33.5 days	Escudo	Consumer
Estonia†† ⁴¹	Jan. 1992	Feb. 1992	Jan. 1992	87.2%	2.11%	33.6 days	Russian Ruble	Consumer
Angola ⁴²	Dec. 1994	Jan. 1997	May 1996	84.1%	2.06%	34.5 days	Kwanza	Consumer
Brazil ⁴³	Dec. 1989	Mar. 1990	Mar. 1990	82.4%	2.02%	35.1 days	Cruzado & Cruzeiro	Consumer
Democratic Republic of Congo ⁴⁴	Aug. 1998	Aug. 1998	Aug. 1998	78.5%	1.95%	36.4 days	Franc	Consumer
Poland ⁴⁵	Oct. 1989	Jan. 1990	Jan. 1990	77.3%	1.93%	36.8 days	Zloty	Consumer
Armenia†† ⁴⁶	Jan. 1992	Feb. 1992	Jan. 1992	73.1%	1.85%	38.4 days	Russian Ruble	Wholesale
Tajikistan ⁴⁷	Oct. 1995	Nov. 1995	Nov. 1995	65.2%	1.69%	42.0 days	Ruble	Wholesale
Latvia ⁴⁸	Jan. 1992	Jan. 1992	Jan. 1992	64.4%	1.67%	42.4 days	Russian Ruble	Consumer
Turkmenistan†† ⁴⁹	Nov. 1995	Jan. 1996	Jan. 1996	62.5%	1.63%	43.4 days	Manat	Consumer
Philippines ⁵⁰	Jan. 1944	Dec. 1944	Jan. 1944	60.0%	1.58%	44.9 days	Japanese War Notes	Consumer
Yugoslavia ⁵¹	Sep. 1989	Dec. 1989	Dec. 1989	59.7%	1.57%	45.1 days	Dinar	Consumer
Germany ⁵²	Jan. 1920	Jan. 1920	Jan. 1920	56.9%	1.51%	46.8 days	Papiermark	Wholesale
Kazakhstan ⁵³	Nov. 1993	Nov. 1993	Nov. 1993	55.5%	1.48%	47.8 days	Tenge & Russian Ruble	Consumer

Source: Steve H. Hanke and Nicholas Krus (2012) "World Hyperinflation", Cato Working Paper no. 8, August 15. *Forthcoming in*: Randall Parker and Robert Whaples (eds.) (2013) *The Handbook of Major Events in Economic History*, London: Routledge Publishing. (expected publication date: Summer 2013).

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 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.

Mr. Montier is a member of GMO's Asset Allocation team. Prior to joining GMO in 2009, he was co-head of Global Strategy at Société Générale. Mr. Montier is the author of several books including "Behavioural Investing: A Practitioner's Guide to Applying Behavioural Finance; Value Investing: Tools and Techniques for Intelligent Investment"; and "The Little Book of Behavioural Investing." Mr. Montier is a visiting fellow at the University of Durham and a fellow of the Royal Society of Arts. He holds a B.A. in Economics from Portsmouth University and an M.Sc. in Economics from Warwick University.

Disclaimer: The views expressed are the views of Mr. Montier through the period ending February 15, 2013 and are subject to change at any time based on market and other conditions. This is not an offer or solicitation for the purchase or sale of any security. The article may contain some forward looking statements. There can be no guarantee that any forward looking statement will be realized. GMO undertakes no obligation to publicly update forward looking statements, whether as a result of new information, future events or otherwise. Statements concerning financial market trends are based on current market conditions, which will fluctuate. References to securities and/or issuers are for illustrative purposes only. References made to securities or issuers are not representative of all of the securities purchased, sold or recommended for advisory clients, and it should not be assumed that the investment in the securities was or will be profitable. There is no guarantee that these investment strategies will work under all market conditions, and each investor should evaluate the suitability of their investments for the long term, especially during periods of downturns in the markets.

Copyright © 2013 by GMO LLC. All rights reserved.