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Hyperinflation and Stabilization in FR Yugoslavia: 1992-1994

Summary: This paper contributes to the literature on hyperinflation and stabilizations by analyzing the great Yugoslav hyperinflation and stabilization during the period 1992 to 1994. The paper makes three contributions. First, it provides updated and more accurate estimates of key economic variables on economic activity, public finances, and seigniorage revenues during hyperinflation based on most recent and updated data. Second, it identifies and analyzes salient features, causes, transmission mechanisms, and monetary consequences of the extreme Yugoslav hyperinflation in the period 1992-1994. It discusses what we call the fundamental equations of the Yugoslav hyperinflation and their implications for inflation expectations and subsequent stabilization. And third, it analyzes the implementation, achievements, and challenges of the currency reform and stabilization program that ended hyperinflation, highlighting the roles of the currency board, currency reform, and of the architect of the program, Dragoslav Avramović, the then governor of the Central Bank of FR Yugoslavia.

Keywords: Yugoslav hyperinflation, Stylized facts, Causes and dynamics, Currency reform, Stabilization program.

JEL: E31, E63, E65.

In this paper, we analyze salient features, causes, transmission mechanisms, and monetary consequences of the extreme Yugoslav hyperinflation in the period 1992-1994 as well as its subsequent currency reform and stabilization program, contributing to the limited body of literature on hyperinflations and their stabilization episodes. The paper updates and extends our earlier analyses (Željko Bogetić, Diana Dragutinović, and Pavle Petrović 1994; Petrović, Bogetić, and Zorica (Vujošević) Mladenović 1999). The term "Yugoslav" in this paper refers to the Federal Republic of Yugoslavia (FR Yugoslavia), which was formed in April 1994 by two republics, Serbia and Montenegro, as a successor state of the former Socialist Federal Republic of Yugoslavia. Steve H. Hanke and Nicholas Krus (2013), in a comprehensive review, record the total of 56 hyperinflations in recorded history. Since then, Venezuela hyperinflation has become the fifty seventh, as of writing (Hanke and Charles Bushnell 2016). The Yugoslav hyperinflation, which lasted 24 months, was one of the longest and highest in recorded history.

Following Cagan's pioneering paper (Phillip D. Cagan 1956), there was a surge of literature on hyperinflation and their stabilizations. Key contributions on the general issues of hyperinflation and stabilization included, for example, Rudiger Dornbusch

and Stanley Fischer (1986) and Peter Bernholz (1989, 1993). In addition, a number of specific country studies provided important, granular analyses of various hyperinflation episodes and their effects, e.g., Pierre Siklos (1989, 1991) on the Hungarian hyperinflation, Jeffrey D. Sachs (1986), Bernholz (1988), and Juan Antonio Morales (1991, 1993) on Bolivia, Elmus R. Wicker (1986) and Dornbusch (1992) on the Austrian hyperinflation.

The Yugoslav hyperinflation is historically important because of its extreme duration and peak as well as some specific features (e.g., informal channels of money creation, international embargo) and the stabilization and currency reform program which ended it. Compared with other recoded hyperinflations, it is the third highest in terms of its peak monthly inflation rate (after the second Hungarian and Zimbabwean hyperinflation). While it was the eighth according to duration, it was the most extreme when the peak monthly inflation rate and its duration are considered together. These characteristics make the Yugoslav hyperinflation more extreme than the more well-known and widely studied hyperinflations in Germany (1922) and Austria (1923).

In February 1992, monthly inflation in Serbia and Montenegro reached 50%, conventionally marking the beginning of hyperinflation. Inflation reached its peak in January 1994, just before the beginning of stabilization and currency reform, with officially recorded, monthly inflation rate of 313 million percent ($3.13*10^8$); an alternative measure of inflation, depreciation of the currency in the black market, indicated the peak monthly inflation rate of 2.35 million.

In late January and early February 1994, the economic team led by Dragoslav Avramović, a retired World Bank economist and architect of the stabilization program, implemented a successful currency reform with the introduction of the new dinar based on a variant of the currency board, stopping hyperinflation already in early February.

The organization of the paper is the following. Section 1 provides some stylized facts and describes the dynamic and volatility of hyperinflation. Section 2 analyzes the triggers and causes of hyperinflation, including political events, which led to the dissolution of the former Yugoslavia, and the fiscal sources of hyperinflation. Section 3 explores the transmission mechanism from increased money supply to currency depreciation, and inflation. Section 4 presents monetary consequences of hyperinflation, which underpinned a broad collapse of economic activity and massive impoverishment of the population. In this regard, we discuss the run of the households and businesses away from the local currency, the dinar, in response to hyperinflation. We then quantify the interaction between inflation and money supply and estimate the size of the seigniorage revenues. Section 5 focuses on the stabilization program with currency reform and its initial success in stopping hyperinflation. Section 6 analyzes the contribution of Dragoslav Avramović to the currency reform and inflation stabilization, as he was not only the main architect but also a key communicator of the program to the public, which enhanced its credibility and results.

1. Dynamic of the Yugoslav Hyperinflation

The basic stylized facts about the dynamic of the Yugoslav hyperinflation are threefold. It was extremely high and long in duration. It was very volatile. And it was frequently setting new monthly highs.

In February 1994, monthly rate in Serbia and Montenegro reached the 50%, meeting the conventional threshold for hyperinflation (Cagan 1956). After oscillating during much of 1992 at hyperinflation levels, in 1993, inflation rates exploded. Monthly inflation rate ranged from 200% at the beginning of 1993 to 400 percent in June and July, 2,000% in August and October, 20,000 in November, and 180,000 in December. During almost the entire period of hyperinflation, February 1992-January 1994, monthly inflation rate kept setting new highs, reaching the official peak of 313 million percent in January 1994. Table 1 documents the monthly inflation rates and their variability.

Table 1 Monthly Inflation Rates Measured by the Retail Price Index during the Hyperinflation and Stabilization: January 1992-December 1994

1992	Inflation		1993	Inflation		1994	Inflation	
	Discrete	Continuous		Discrete	Continuous		Discrete	Continuous
January	29.1%	25.5%	January	100.6%	69.6%	January	313563558.0%	1495.8%
February	50.7%	41.0%	February	211.8%	113.7%	February	2143.3%[a)]	311.1%
March	41.9%	35.0%	March	225.8%	118.1%	March	-6.7%	-6.9%
April	77.5%	57.4%	April	114.1%	76.1%	April	-0.4%	-0.4%
May	80.8%	59.2%	May	205.2%	111.6%	May	-0.3%	-0.3%
June	102.3%	70.4%	June	366.7%	154.1%	June	-1.4%	-1.4%
July	62.0%	48.2%	July	431.6%	167.1%	July	-1.3%	-1.3%
August	42.4%	35.4%	August	1880.6%	298.6%	August	-0.5%	-0.5%
September	64.4%	49.7%	September	643.2%	200.6%	September	0.2%	0.2%
October	49.8%	40.4%	October	1895.6%	299.4%	October	1.4%	1.4%
November	33.3%	28.7%	November	20190.1%	531.3%	November	7.0%	6.8%
December	46.6%	38.3%	December	178882%	749.0%	December	2.5%	2.5%

Notes: Discrete rates are calculated as $[(p_t/p_{t-1}) - 1]$, and continuous rates are calculated as the difference between the natural logarithms: $[lnp_t - lnp_{t-1}]$ where p_t and p_{t-1} denote price levels in the current (t) and previous period $(t - 1)$, respectively. Monthly inflation rate in February 1994 overstates inflation because it includes the effect of carryover inflation from the previous month. More granular, weekly data on inflation, which we provide, as an example in Table 5 below show that inflation was stopped one week after the introduction of the currency reform and stabilization program on January 24, 1994, and that inflation was brought down to almost to zero in February.

Source: Federal Bureau of Statistics, FR Yugoslavia.

During the hyperinflation, there were two misguided attempts to control inflation using administrative price controls, the first in June 1992 and the second in August 1993. One should distinguish between administrative price controls from the "price freeze". The price freeze effectively bans changing of the prices from a given level and, as such, are an extreme form of price control. Other controlled prices, which were under the "control regime", could, in principle, be changed upon a written justification based on the documented increase in the cost of inputs. Both mechanisms of price controls were tried. They were not only unsuccessful in reducing inflation but, predictably, resulted in mass shortages, further collapse of economic activity, and even higher, subsequent inflation. These attempts showed a basic lack of understanding among key policymakers about the sources and nature of hyperinflation and about how to stop it. But they also showed to policymakers and the public that price controls not only did not work but had deleterious economic and social impact.

2. The Origins of Hyperinflation

What were the key triggers that set into motion the Yugoslav hyperinflation? What were the factors that helped it continue for such a long time? What were the roles of money, public finance, and other factors of inflation? The following sections explore the answers to these questions.

2.1 Political Triggers of Hyperinflation

Historically, hyperinflations are usually a result of a special trigger event (or a series of events) that sets into motion the spiral of ever increasing and highly unstable changes in prices, exchange rate, and money. Most frequently, primary causes of such events include wars and chaotic disintegration of a country, accompanied by the massive printing of money financing a large fiscal deficit. It may also be triggered by a large external shock such as a debt crisis, sudden stop in capital flows or deterioration in the terms of trade during peacetime. In this regard, the Yugoslav hyperinflation was not an exception. In fact, its beginning and the sequence of events that led to it were especially similar to the Austrian hyperinflation during 1919-1923 following the disintegration of the Austro-Hungarian empire (Dornbusch 1992).

The disintegration of the former Yugoslavia (Socialist Federal Republic of Yugoslavia, or SFRY) was accompanied by wars on its territory and a near-complete secession of inter-republic trade and financial flows, leading to the breakup of the previously single Yugoslav market. The economies of Serbia and Montenegro were, in particular, much more reliant on the internal Yugoslav market than on the external markets, which resulted in a large drop in economic activity in many sectors of their economy. Also, in May 1992, the UN introduced strict international sanctions on almost all commercial transactions, including foreign trade, financial transactions, and transport with FR Yugoslavia. The impact of sanction became especially pronounced a few months later, in the second half of 1992, when inventories of many imported goods dwindled and new imports and exports were severely curtailed. As a result, the sanctions did not cause hyperinflation, which had started earlier, in February 1992, before the embargo. However, with sanctions beginning to impact the economy significantly in the second half of 1992, and with their tightening in November 1992 and in April 1993, they significantly accelerated the collapse of the economy, contributing to hyperinflation in its latter stage.

2.2 Fiscal Causes of Hyperinflation: Budget Deficit and the Government's Revenues from Inflation

Before analyzing hyperinflation, we needed to resolve two major statistical issues: the lack of official figures on public consumption, fiscal deficit, and public debt, and an official, reliable measure of economic activity - Gross Domestic Product (GDP) - during the period of hyperinflation. Needless to say, without reliable estimates of these key aggregates, it would not be possible to conduct a meaningful analysis of hyperinflation and its linkages with the budget and economic activity. To fill these gaps, we approached this problem as follows.

2.2.1 Estimating the Level and Changes of Economic Activity during Hyperinflation

From the beginning of the end of the former Yugoslavia, it was very difficult to ascertain accurately the size of public consumption in the economy, for the country as a whole, and for one of its successor states - FR Yugoslavia. Accurate and timely statistics on public consumption and public finances generally were not available nor accessible to the public for the mundane reason that they ceased to be produced at the time. During the tumult of the disintegration of the country, public finance statistics was not a policy priority.

The data that were available suffered from several deficiencies. First, instead of consolidated fiscal data that combine public finance data at different levels of governments, only gross data were available as a simple sum of fiscal revenues (as well as expenditures) at different levels of government (federal budget, republican, regional, and local government budgets as well as the social insurance funds). This has clearly overstated both the true, consolidated revenue and expenditure sides of budget because of the sizeable inter-budgetary transfers among different levels of government. Second, expenditure data posed a more difficult problem than revenue data because there were alternative sources of information about revenues from tax administration on the basis of which it was possible to consolidate the revenue side of the budget and reconstruct a fairly clear picture of the overall level and structure of revenues. Third, unfortunately, neither economic nor functional classification of public expenditures was available. Fourth, there were no publicly available data on fiscal deficit and public debt. Finally, Federal Bureau of Statistics was publishing only the material concept of "domestic material product", which excludes from the standard GDP the contribution of health, education, financial services as well as services of housing. As a result, there were only indirect estimates of GDP based on the estimate that the GMP of FR Yugoslavia suggesting that the latter (GMP) was approximately about 80-90% of GDP.

As a result of these data problems, academic economists and analysts were left with their own estimates, which varied. On the assumption that the gross material product (GMP), as well as the gross domestic product (GDP) were overstated, most of the economists in FR Yugoslavia estimated the public consumption to be around 50% of GDP on average during 1991-1993 period, corresponding to 70% of GMP at the time (Avramović 2007).

Contrary to the prevailing views, we have, at that time (Bogetić, Dragutinović, and Petrović 1994), made a more moderate estimate of public consumption. This estimate was prepared based on fragmented fiscal data, by cross-checking of data on government revenues and data on the final financial reports of the federal government, republican, local governments, and the funds for social insurance (after consolidating i.e., eliminating interbudgetary transfers), and, finally, by comparing and making these aggregate data consistent with developments in monetary aggregates. Also, contrary to the well-known errors which overstated GDP, we have identified errors in the opposite direction. Netting out these effects, we have concluded that the GDP was substantially underestimated. More recently officially reconstructed series of GDP for 1995-2002 period have confirmed this. The Republican Bureau of Statistics for Serbia has published preliminary data on both GDP and GMP showing that the GDP during the period 1995-2002 was, on average, about 25 percent higher than those for GMP. More importantly, after several revisions of GDP data (note that GMP data were not

revised), the Federal Bureau of Statistics published the final figure showing that the GDP during the period 1995-2002 were, on average, about 19 percent higher than those for preliminary GDP. It is these "hard", official figures of GDP for the subsequent period 1995-2002, which we used for our estimates of GDP during the period before and during hyperinflation and stabilization.

To calculate the missing data for GDP for Serbia in the 1990-94 period, which are important for the understanding of the economic trends during hyperinflation period, we anchored that estimate in the official GDP figure for 1995 and the changes in GMP on the basis of which we reconstructed the GDP series back to 1990. Next, we checked our resulting GDP estimates for 1990-1994 for Serbia against the official Slovenia's GDP for 1990 and 1991, as Slovenia was at that time still part of the SFRY. Specifically, we compared our GDP estimates for Serbia with the GDP estimates implied by the Slovenia's GDP estimates and existing differences in GDP and GDP *per capita* in the two republics. The two approaches resulted in the identical estimates of Serbia's GDP in the 1990-91 period, providing a robustness check. Those reconstructed GDP figures for the hyperinflationary period are shown in Table 2 that provides an overview of key economic trends, which are important for understanding the fiscal sources of the Yugoslav hyperinflation.

Table 2 FR Yugoslavia: Key Macroeconomic Indicators, 1991-1993

Macroeconomic variables	1991	1992	1993
Inflation, annual average a)	116.8	9,437.9	1.145×10^{14}
Inflation, monthly average a)	10.7	56.7	17,095.6
Inflation, monthly average, annualized a)	238	21,888.0	6.70×10^{28}
GDP (in billions of USD)	28.4	20.4	13.4
Real growth rate (in percent)	-11.62%	-27.90%	-30.76%
Population, in millions	10.41	10.45	10.48
GDP per capita (in USD)	2,728	1,952	1,279
Average monthly wages/salaries (in USD)	165	51	24
Real money supply M1 (1991 = 100)	100	31,5	1,2
Real exchange rate, index, 1989 = 100 b)	67	112	733
Seigniorage on M1 (percent of GDP)	12.8%	11.9%	17.7%
Seigniorage on base money (percent of GDP)	8.5%	7.4%	8.2%
Tax revenues, based on monthly data (percent of GDP)	23.5%	13.6%	9.6%
Tax revenues, based on annual data (percent of GDP) c)	27.6%	16.1%	9.6% c)
Tax revenues (percent of GDP) d)	38.4%	32.1%	32.2%
Budget deficit (percent of GDP) d)	10.8%	15.9%	22.6%

Notes: a) Inflation rates are calculated as discrete rates. b) An increase in the index of the real exchange rate denotes depreciation. Excluding the extreme observation for December 1993 (which might reflect noise from inadequate data collection during the social and economic chaos at the peak of hyperinflation), the estimate of the real exchange rate index is much lower, 156. We believe that this number better reflects the true measure of real depreciation of the currency during the hyperinflationary 1993. c) Annual data for tax revenues for 1993 were not published. As a result, we used monthly data from the Social Accounting/Auditing Service. d) Estimates of the authors.

Source: Authors' updated estimates based on more recent (and, we believe, more consistent and better quality) data from the National Bank of Yugoslavia and the Federal Bureau of Statistics. It may be of interest to researchers to compare these with earlier estimates of GDP, fiscal flows, and seignorage revenues during hyperinflation, see Petrović, Bogetić, and Vujošević (Mladenović) (1999) as well as our original paper on hyperinflation, Bogetić, Dragutinović, and Petrović (1994), which were based on the available data and estimates at that time.

Reflecting a massive, cumulative loss of economic output, real GDP in 1993 was not higher than about 50% of the 1991 level. This was accompanied by a huge increase in unemployment, especially hidden unemployment, as well as a measured drop in real monthly wages in the formal sector, down to 15% of the 1991 wage level. In reality, the loss of real purchasing power of workers was somewhat less sharp, broadly in line with the decline in real GDP, because of the controlled prices of basic infrastructure services and food products.

2.2.2 Stylized Facts on Changes in Government Revenues and Expenditures

Regarding public finances, our estimates below show that total revenues and expenditures had been, in fact, considerably lower than what had been a prevailing view at the time of hyperinflation. It also suggests that the basic fiscal problem was not excessively high public expenditures *per se* (which were sometimes thought to be in excess of 50% of GDP) but a more traditional fiscal variety: the rapid loss of real fiscal revenues under conditions of inflation and economic collapse, rigid structure of expenditures, including the large military spending, resulting in the growing fiscal deficit financed by printing money.

The first stylized fact to note on public finances is that during the period 1991-1993, both revenue and expenditure to GDP ratios fell substantially.

Second, the decline in the revenue-to-GDP ratio was much steeper than that of expenditure, resulting in a sharp increase in the budget deficit as percent of GDP, from 10.8% in 1991 to 22.6% in 1993, even though in USD terms, the deficit remained broadly unchanged, about $3 billion. These stylized facts are similar to most hyperinflation episodes.

Third, inflation eroded the real value of government expenditures, especially public sector wages, pensions, and social assistance expenditures.

Fourth, the much smaller decline of public expenditures reflects the fact that FR Yugoslavia took over from the other four republics the financing of sizeable expenditures of the federal government of the former, much larger country (primarily the Yugoslav People's Army, diplomacy, federal administration, economic development of underdeveloped regions, and firm subsidies). Wars in the neighborhood (the escalation of the conflict in Croatia and Bosnia and Herzegovina) and deteriorating regional security situation have reflected increased public expenditures, including because of the transfers to the Krajina as well as the rising costs of attending to the needs of the refugees and the wounded. The term Krajinas, in line with usage at the time, refers here to the two entities, one within the administrative borders of Croatia (Republika Srpska Krajina) and the other within Bosnia and Hercegovina (Republika Srpska), which emerged, at that time, in the course of the wars during the disintegration of the former Yugoslavia. These two entities were the main recipients of these external fiscal and quasi-fiscal transfers from FR Yugoslavia.

Tax revenues fell for three reasons.

First, it was the *collapse of the underlying economic activity* and associated the tax base because of the sudden stop in mutual trade between FR Yugoslavia and the breakaway republics, the impact of external U.N. sanctions, and a precipitous drop in wages and salaries.

Second, tax revenues also fell because of the *shift of economic activity* from the formal sector to the informal, illegal or "gray" economy, which does not pay taxes (tax evasion), as well as increasing practice of legal tax avoidance. "Gray" economy includes unregistered economic activity and incomes from illegal production and trade and transport of otherwise legal goods and services, irrespective of whether they were financial or barter transactions. Therefore, this includes all economic activity that could have been subject of taxation had they been properly reported to tax authorities. While tax evasion consists of unregistered income of individual entrepreneurs as well as incomes from or acquisition of property from unregistered economic activity, tax avoidance consists of utilization of various legal means and opportunities leading to the reduction of the tax burden (e.g., payment of part of wages/salaries in physical goods, cash payments of only untaxed incomes such as meals, rebates, daily benefits for official travel, and additional hiring of workers on term contracts, which is subject to lower taxes compared with full time workers with benefits). Because of high *de jure* taxes and large benefits from the contradictory tax regulations and lack of compliance because of low cost of non-compliance, was low tax collection. Both tax evasion and tax avoidance were widespread during 1991-1993.

Third, tax revenues fell because of a strong *Keynes-Olivera-Tanzi effect* during 1992-1993, which reduced the value of real government revenues in the face of inflation and lags in the collection of revenues. Under high inflation, whenever there are significant time lags between the earning of income, its reporting to tax authorities (tax accounting), and the collection (payment of taxes), there is also a significant loss of real tax revenues. The impact of this effect was strong, despite the efforts of the fiscal authorities to limit these time lags through a variety of measures: inflation was always faster than the tax collectors. Under disinflation, by contrast, this effect works in the opposite direction, thereby resulting in the increase in real value of tax revenues (Vito Tanzi 1977).

2.2.3 Estimating the Impact of the Keynes-Olivera-Tanzi Effect on Tax Revenues

Estimated tax payment lag for the general turnover tax and social contributions (labor taxes), which accounted for the bulk of tax revenues, were 20 days in the first quarter, 15 days in the second quarter, 10 days in the third quarter, and 5 days in the fourth quarter of 1993 (CES-Mecon 1994). The resulting loss of tax revenues because of the powerful Keynes-Olivera-Tanzi effect in corresponding quarters were: 48.8%, 43.4%, 52.3% and 58.4% (Table 3).

Table 3 The Inflationary Erosion of Tax Revenues in FR Yugoslavia in 1993 (%)

Quarter	Monthly inflation rate *	Time lag in the collection of taxes (in days)			
		5 days	10 days	15 days	20 days
First	173				48,8
Second	212			43,4	
Third	822		52,3		
Forth	19.112	58,4			

Notes: Inflation rates are geometric averages of discrete rates.

Source: The authors' estimates.

3. Transmission Mechanisms among Money, Exchange Rate, and Prices

A visual inspection of the data on inflation, nominal depreciation of the dinar, and the growth of money supply suggests that the money supply growth necessary for the financing of the fiscal deficit preceded currency depreciation until October 1993 and that inflation was adjusting to currency depreciation (Figure 1). In the subsequent, final period of hyperinflation, October-December 1993, lags between the growth of money, currency depreciation, and inflation are becoming shorter. So, the transmission of impulses from the growth of money to currency depreciation, and inflation had become extremely rapid, almost instantaneous. This is a phenomenon typically observed during other hyperinflation episodes (Figure 1).
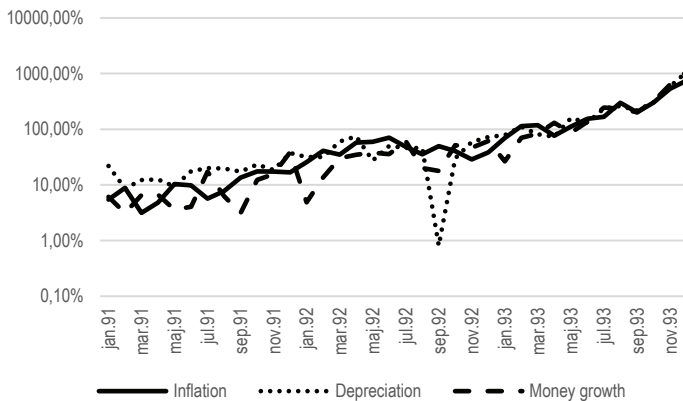
Source: The authors' estimates based on the data from the National Bank of Yugoslavia and the Federal Bureau of Statistics of FR Yugoslavia.

Figure 1 Inflation, Currency Depreciation, and the Growth of Money Supply (Monthly Rates of Growth, in Percent)

      Black market exchange rate was a key financial variable, closely watched by all economic agents, households, firms, and governments. During the hyperinflation, the most common opening to a street conversation in Belgrade was: "how much is the German mark today?" The answer would provide an indication of the expected inflation rate for the following day. Equally important, daily changes in value of the domestic currency in the black market were universally known; official exchange rate did not matter.

      There was a fundamental *information asymmetry* at work between the open and widely followed black market for domestic currency, the dinar, on the one hand, and the information about growth of money and inflation, which was not widely known and followed only by the specialized economists, statisticians, bankers and individuals in the government with access to these data. Black market exchange rates were monitored carefully by almost everyone, from street black market cash currency traders to households and bank and enterprise managers. This information was extremely

valuable because one could make money by engaging in almost daily arbitrage of exchanging domestic currency into German marks if one had a roughly correct guess about the exchange rate for the next day. So, almost "everyone" was basing their economic decisions on the actual and expected black market exchange rates. However, many, by virtue of their work, age, infirmity, and other constraints, could not participate in the profitable but time consuming and intensive, daily black-market casino with one way-bet against the local currency - lost time and money.

Under these conditions, it was to be expected that the dynamic of inflation was under the dominant influence of the depreciation of the local currency in what was a highly "dollarized" (in German mark) economy. Every increase in domestic money supply quickly and fully translated into the black market and the exchange rate between the dinar and the German mark.

3.1 The Fundamental Equations of the Yugoslav Hyperinflation

These observations based on the visual inspection and anecdotal explanations of the postulated transmission mechanism are, in fact, supported by robust econometric estimates, which characterize causality and transmission mechanism of the Yugoslav hyperinflation. In the system of equations consisting of three variables at monthly frequency: depreciation of the dinar (de), growth of the money supply (dm), and the rate of inflation (dp), two cointegrating vectors are identified. The first cointegrating vector shows that depreciation of the dinar and the rate of inflation are in long-term alignment; the second vector shows the long-term alignment between the depreciation of the dinar and the growth of the money supply. In both cointegration equations, the coefficient of the independent variable is close to 1 (unity), which in the case of price equation, shows the almost perfect, one-to-one transmission from the depreciation of the currency to inflation (see also Petrović and Mladenović 2015). Tests of exogeneity confirm that causality runs from the currency depreciation to inflation in the first equation, and from the growth of money supply to the currency depreciation in the second equation. Finally, this estimated system of equations confirms that in this system the growth of money is the only exogenous variable, which means that the causality in the process of the Yugoslav inflation runs from money to the exchange rate and then from the exchange rate to prices (Petrović, Bogetić, and Vujošević (Mladenović) 1999).

$$dp(t) = 1.17 \cdot de(t)$$
$$de(t) = 0.96 \cdot dm(t)$$

Thus, the identified system of cointegrated equations support fiscal explanation of the Yugoslav hyperinflation, as monetization of fiscal deficit triggers money supply growth, and the latter then drives currency depreciation and inflation. Moreover, the first equation shows that inflation (dp) adjust completely, within the month, to currency depreciation, indicating an absence of backward-looking inflation inertia and pointing to a major influence of forward-looking inflation expectations, reflected in exchange rate changes, as a key determinant of hyperinflation.

This forward-looking nature of inflation based on currency depreciation was also found in other hyperinflation episodes (e.g., Bolivia (Sachs 1986) and Germany

(Dornbusch, Federico Sturzenegger, and Holger Wolf 1990)). This is also consistent, and helped, with the almost momentary halt of inflation within one week of the introduction of the new currency, the new dinar in relation 1:1 to the German mark. Newly formed, credible expectation of a fixed exchange rate to the German mark was enough to stop inflation in its tracks - working through the first fundamental equation of the Yugoslav equation above. Of course, this was supported by the complete halt of printing money in the old dinars, which broke the back of the second transmission mechanism, or the second equation of the Yugoslav hyperinflation, running from the growth of money supply to currency depreciation.

4. Monetary Dynamic of the Yugoslav Hyperinflation

In this section, we provide more granularity to explain several monetary phenomena, typical of hyperinflation episodes (e.g., demand for money), which we observed also during the Yugoslav hyperinflation, as well some which were specific to the Yugoslav hyperinflation (e.g., multiple sources of informal money creation).

The first is the "escape" from the local currency reflected in the drop in the real demand for money (nominal money deflated by the price index) which results from high inflation. Under hyperinflation, prices increase faster than the money supply so that the real value of the money supply ultimately ends up a small fraction of its initial value. Seemingly paradoxically, during hyperinflation when there is a typical deluge of printed money, the end result is *demonetization*, i.e., the near complete abandonment of the local currency by economic agents in favor or a stable, foreign currency.

The second phenomenon is the dependence of the monetary dynamics on the seigniorage revenues. Monetary dynamics is explained by the fact that printing money is a simple way for a government to obtain real financial resources, by relying on seigniorage, which is the difference between the nominal value of the printed paper money and minted coins on the one hand and the cost of printing and minting money. By printing paper money and minting coins at low cost while purchasing real goods and services at their higher, nominal value, the government gets real "money for nothing".
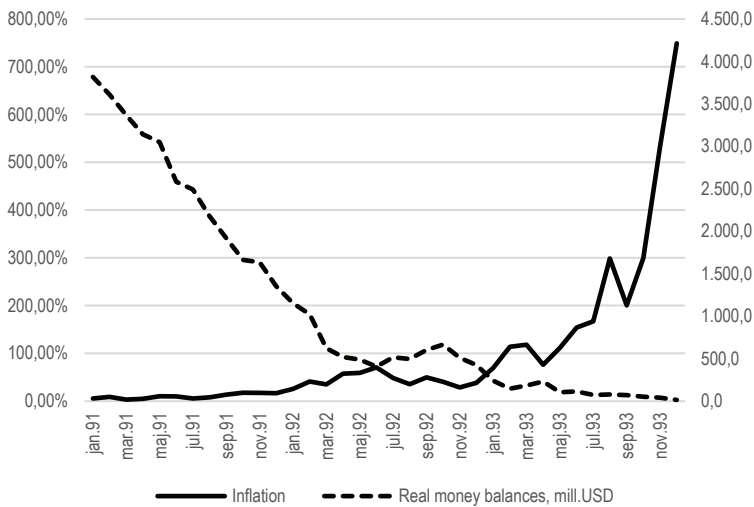
4.1 Demand for Money

The dramatic drop in the real demand for money during the Yugoslav hyperinflation is perhaps best illustrated by the fact that on the final day of hyperinflation, January 24, 1994, real money supply (M1) was only 1% of its pre-hyperinflation level.

The decline in demand for money during hyperinflation follows directly from the Cagan's (1956) function of demand for money. Cagan was the first to notice that during hyperinflations, inflation expectations overwhelm other factors of demand for real money. This simplifies the basic model of demand for money because one can ignore the changes in real income and real interest rates because their variations become very small compared with the monetary factors. As a result, in the simplified Cagan model, real demand for money depends only on inflation expectations and it rises and falls with the rise and fall of expected inflation.

This further means that there is a Laffer curve type relation between seigniorage revenues and inflation i.e., there exists a rate (equal to the inverse of semi-elasticity of demand for money) at which the seigniorage revenues is at the maximum. The dynamics of money during hyperinflation can be explained with the efforts of the government to ensure a rising or at least non-declining seigniorage revenues.

The dynamic of money and inflation rate during the Yugoslav hyperinflation is shown in Figure 2. It shows that the real demand for money is broadly consistent with the Cagan model in that the increase in inflation leads to the decline in the real money held by the population and businesses.

Source: The authors' calculations based on the data from the National Bank of Yugoslavia and the Federal Bureau of Statistics.

Figure 2 Real Money and Inflation: January 1991-November 1993

Empirical estimates of the real demand for money showed that the Cagan model, estimated for the Yugoslav hyperinflation using monthly data (Petrović and Vujošević (Mladenović) 1996, 2000) could not fully explain the dynamics of hyperinflation, especially its most extreme period between September 1993 and January 1994. Also, according to this model, there was a huge gap between the actual and optimal level of monthly inflation rate of about 27%, the so-called Cagan's paradox. However, a more granular estimate of the demand for money based on daily data resolves the Cagan's paradox (Mladenović and Petrović 2010). This model explains well the final six months of hyperinflation, which also indicates that during the extreme hyperinflation, economic agents, indeed, adjust their monetary decisions on a daily basis. The results show that the government's drive to exact the maximum seigniorage revenues from the population and the economy (the holders of money) was the driving force behind hyperinflation as long as the government could collect a non-declining amount of seigniorage revenues.

4.2 Money Supply and Seignorage Revenues

The practice of large monetization of the budget deficit, i.e., printing money to finance the budget deficit began already in March 1991. As was the case in other hyperinflations, the increased seigniorage revenues preceded hyperinflation. Seigniorage revenues collected on the increased money supply (M1) is a better indicator of the inflationary financing of the budget deficit than the base money issued by the Central Bank because of other, decentralized sources of deposit money that was also being created outside the control of the NBY.

The main channels of this informal issuance of money, sometimes referred to in local parlance as "gray issuance" operated in the triangle among the republican (Central Bank of Serbia, Central Bank of Montenegro) and regional central banks (Regional Bank of Vojvodina and Regional Bank of Kosovo and Metohija), the Social Accounting/Auditing Service (SDK in the local acronym, which was in charge of the unified payment system and financial audits and controls), and select clients (banks and companies).

Specifically, "gray" money was created when the deposit account of a client (formally monitored and controlled by the SDK) or of the central banks were illegally increased, without the compensating decrease in another account. This has compromised the integrity of financial monitoring, audits, and payment system. This was done, for example, by simply adding zeros to the existing amounts in the receiving accounts. Next, the client who received the "new money" would then request from SDK the cash payment of the said amount and then turn around and, using currency dealers, purchase foreign currency (German mark), locking in the value of the issued gray money in hard currency. After a period of time, the difference between the nominal deposits in the banking system and those in the central bank balance sheet would be eliminated *ex post* by way of Federal Central Bank or regional central banks providing credits, which the privileged client would repay after a loan period to those banks by selling foreign exchange for dinars at much more depreciated dinar exchange rate, pocketing the profit on the two-way currency exchange. Of course, all this was illegal, but during hyperinflation, it was widespread. Various government and political organizations also got in on the game. They also created negative balances or fictitious, positive balances on the gyro (checking) accounts of these organizations, and those of privileged citizen clients and banks. This meant that the illegal creation of "gray money" led to subsequent, nominally legal, cash purchases of real goods and services, or, more often, foreign currency. So, the budget deficit broadly defined was increasingly financed through these informal, "gray" channels of money creation, outside the direct control (but undoubtedly with the knowledge) of the National Bank of Yugoslavia. The largest part of the gray issuance of money was in the form of "liquidity loans" to commercial banks by the regional central banks.

The seigniorage revenues, in US dollar terms, collected in 1993 through inflationary "taxation" of different monetary aggregates is shown in Tables 4 and 4a. Black market exchange rate was used as a deflator. In Table 4, monthly changes in money were deflated by the corresponding average exchange rate in the same month while Table 4a provides the monthly sum of daily changes in monetary aggregates deflated by the daily exchange rate.

Table 4   Seigniorage Revenues in 1993 Calculated on the Basis of Monthly Data (in Millions of US Dollars)

Seigniorage revenues						
	Loans to the government	Loans to banks	Total loans	Base money	Cash	Money supply (M1)
Monthly average	31	28	59	88	41	166
Total for the year	369	335	714	1051	496	1988
Percent of GDP a)	2.8%	2.5%	5.3%	7.8%	3.7%	14.8%

Notes: GDP, the most recent estimate by the authors.

Source: Authors' estimations.

Table 4a   Seigniorage Revenues in 1993 Calculated on the Basis of Daily Data (in Millions of USD)
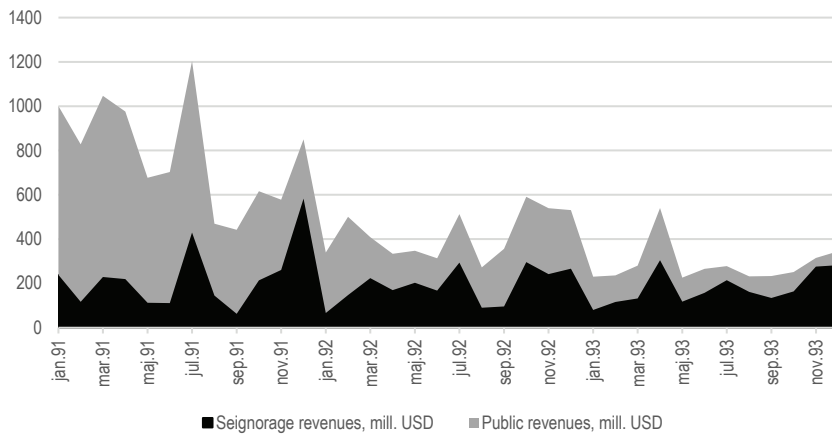
Seigniorage revenues						
	Loans to the government	Loans to banks	Total loans	Base money	Cash	Money supply (M1)
Monthly average	26,5	31	57,5	99	48	200
Total for the year	318	371	689	1192	578	2406
Percent of GDP a)	2.4%	2.8%	5.1%	8.9%	4.3%	18.0%

Notes: GDP, the most recent estimate by the authors.

Source: Authors' estimations.

The second estimate in Table 4a is more reliable because it takes into account a more realistic, daily dynamics of these variables, which is quantitatively significant in the case of seigniorage revenues on M1, because it gives a larger estimate of the seigniorage revenues by 20%. Average monthly value of seigniorage revenues in 1993 was about USD 58 million, measured by the inflationary "taxation" of the loans by the Central Bank, USD100 million, measured by the "taxation" of the base money in the last four months of 1993, and USD 200 million, measured by "taxing" M1, which represented 5.1%, 8.9% and 18% of GDP, respectively. The large difference between the 5.1% of GDP, seigniorage revenues on central bank loans, which is the only official source of money supply, and the 18% percent of GDP, seigniorage revenues on M1, indicates that had the overall fiscal deficit, which drove inflation, been equal to the central bank loans, the inflation would have been much lower, possibly even below hyperinflationary levels. So, it was the complete breakdown of the system of money creation and gray issuance of money that accounts for the very large seigniorage revenues and long duration of the Yugoslav hyperinflation.

Figure 3 shows trends in tax revenues and seigniorage revenues collected because of the expansion of the money supply from legal as well as the described, illegal channels of money creation. Despite their monthly variability, there is the trend of a decline in tax revenues while the seigniorage revenues fluctuates around the value of about USD 200 million during the entire period 1991-1993.

Source: The authors' calculations based on the data from the National Bank of Yugoslavia and the Federal Bureau of Statistics.

Figure 3 Tax Revenues and Seigniorage Revenues during 1991-1993

5. Currency Reform and Stabilization: Key Features and Initial Results

Before the beginning of the stabilization program on January 24, 1994, inflation had already peaked, exceeding 313 million percent per month and real money fell to about 1 percent of its average level in 1991 before the beginning of hyperinflation. Average monthly wage bottomed out at an incredible level of only USD 10. The external embargo had resulted in the collapse of much of formal economic activity and trade. With dire social situation, there was a rapidly rising risk of mass social unrest.

5.1 Key Features of the Currency Reform and Stabilization Program

Following long debates about the content and the speed of implementation, the stabilization program, which had been under preparation since November 1993, had been adopted and launched on January 24, 1994 under the leadership of Dragoslav Avramović, a former World Bank official who subsequently became the governor of the National Bank of FR Yugoslavia (Avramović 2007). It is of interest to compare and contrast the key features of the Avramović's program and a competing program.

An alternative stabilization program, which was prepared for the federal government by the Center for Economic Studies CES-Mecon (1993), did not receive political support, ostensibly because it was viewed as more restrictive than the Avramović's program. The CES-Mecon program emphasized the need for fiscal adjustment in the early phase of stabilization as well as related incomes policy (i.e., control of wages in the public sector), after the initial stabilization phase, which was absent in the official program. The CES-Mecon program did not feature fixed exchange rate but left the possibility open of fixing of the exchange rate after inflation was stabilized. By contrast, Avramović's program was essentially a currency reform program, which introduced fixed exchange rate and new currency within a variant of the currency board but without explicit and longer term commitment to making fiscal policy and interest

rates consistent with the requirements of the currency board to make the currency board fixed exchange rate sustainable; *de facto*, it was a program with a single, currency board backed exchange rate anchor, also featuring a tax reform, but without supporting commitments on expenditure policy, wage policy, and interest rates. It explicitly promised and promoted the fixed exchange rate, new currency, convertibility, and the halt of inflation while not being explicit about the difficult, supporting policies needed for long-term sustainability of the program. By contrast, the CES-Mecon program was a flexible exchange rate based, multiple-anchor program, targeting upfront monetary and fiscal adjustment and the use of wage policy and active use of interest rate policy to ensure longer-term sustainability of disinflation; it did not rule out eventual fixing of the exchange rate but it was not part of the design in the initial stage. Interestingly, however, during implementation, the official program was being adjusted and de facto taken on board certain elements of the CES-Mecon program (Madžar 1994).

The Avramović's official program was launched on January 24, 1994. It featured the following:

- A currency reform, i.e., an introduction of the new currency, the new dinar, at the fixed exchange rate 1:1 to the German mark.
- The fixed exchange rate was backed by a stock of gold and foreign exchange reserves *in the country* in the amount of about USD 300 million consisting of gold reserves (about USD 80 million) and foreign exchange reserves (USD 220 million). Foreign exchange reserves of commercial banks *abroad* were blocked because of the sanctions so they could not be used during the stabilization program. Fixed exchange rate in a currency board like system was a key element of the new monetary-exchange regime and macroeconomic policy in the country. The reserves backing the new currency were many times larger than the real value of the old currency, which at the beginning of the program were less than USD 20 million.
- Issuance of new currency - the new dinar - in the amount of USD 200 million, which was released into the economy by way of regular, monthly payments of public expenditures, and not, as was more conventional, via the banking sector.
- The printing of the old dinar was stopped and the exchange rate with the new dinar was fixed to 12 million old dinars to 1 new dinar (or, equivalently, the German mark). The remaining, limited amounts of old dinars were allowed to circulate for the following several months, until they were completely withdrawn in July 1994.
- Mr. Avramović's decision to stop the printing of old dinar but let it circulate for a while was inspired by the idea of the parallel currency which circulated during the 1920s during the Russian hyperinflation. During the Russian hyperinflation, people and businesses switched to foreign currency and gold coins in most transactions. To prevent that, the government issued a new, convertible currency, Chervonetz (red ruble) but with the parallel issuance of the old ruble. Note that in contrast to Chervonetz, in the Yugoslav program, the old dinar did *not* play a role of the parallel currency because its issuance was stopped, and it played a negligible role for a short period of time compared with the newly issued new dinar (Hanke, Lars Jonung, and Kurt Schuler 1993).

There were three specific features of the currency reform and the stabilization program that require some explanation: (i) limited convertibility in the context of a new quasi-currency board system; (ii) the treatment of the old dinars; and (iii) the way in which the new dinar was introduced into the economy through payments of government expenditures.

By explicitly tying the issuance of the new dinar to the existing gold and foreign exchange reserves, National Bank of Yugoslavia, introduced a variant of the currency board. However, in contrast to the standard currency board in which the domestic currency is convertible, the Yugoslav variant featured an *asymmetric convertibility*: households and firms could purchase new dinars for foreign currency but they could only purchase a limited amount of foreign currency for the new dinars. The limit for purchases of the German mark using new dinars for the population was 100 German marks per transaction. Companies could seek larger amounts based on import permits from the Ministry of External Economic Affairs showing that they need hard currency for their vital business needs.

Also, commercial banks had to sell their foreign exchange to obtain loans from the central banks. Apparently, this limited convertibility of the new currency based on the currency board aimed to strike balance between two conflicting objectives, one, to ensure the credibility of the new currency, which required full convertibility (or at least its perception), and, the other, to limit the possibility of a rapid loss of foreign exchange reserves in case of a rapid loss of confidence or capital outflows. *De facto*, it was a variant of a currency board with limited convertibility and capital controls. To further reduce the possibility of large capital outflows and increase tax revenues, the government introduced an exit tax payable in hard currency on all travels outside the country.

Issuing the new, partially convertible currency, backed by gold and foreign exchange reserves, was to ensure stability of prices in new dinars while stopping the printing of the old dinar aimed to halt inflation in the old dinars. In the beginning, it was not clear how long the old dinar was to be used and when it was to be eliminated from circulation. Even though the stock of remaining dinars in real terms was small, the government used it to make certain payments while the population had gradually exchanged the old for new dinars, which was much more practical and convenient in daily exchange. As the volume of new dinars grew, the remaining amount of old dinars became soon negligible part of the overall money supply and the old dinar was officially withdrawn from circulation on July 22, 1994 by the decision of the National Bank of Yugoslavia (No. 141, July 21, 1994). It is important to note that this was *not* the case of parallel currencies (which presupposes active issuance of two currencies circulating in parallel), as it has sometimes been erroneously referred to in the local and international press, because the old dinar was no longer issued. After the introduction of the new dinar, the old dinar issuance was stopped so it became a minor, residual means of payment, which was used for a period time before it was retired.

5.2 The Innovative Introduction of the New Dinar

The introduction of the new dinar into the economy was unorthodox and innovative. Instead of introducing the new currency through the banking system, which was more conventional, the program initially bypassed the banks and introduced the new dinars

directly into the economy by making payments of government expenditures: pensions, public sector wages, social assistance, and other budgetary payments. As a result, the economy immediately received an injection of new purchasing power in new dinars.

But in contrast to the uncontrolled issuance of old dinars in the past, this issuance of new dinars was fully backed on the underlying stock of gold and foreign exchange reserves, which immediately established currency stability. As a result, the monthly salaries jumped in a matter of days from 10-15 dollars (denominated in the old dinars) to 110 dollars (in new dinars). This has also resulted in an increase in private and public consumption within the growing, legal and formal economy. Overnight, incentives for exchanging of the currency as the main form of economic activity up to that point, disappeared. Shortage goods returned to the stores featuring simple to read, often low, single digit prices in new dinars. This decision, which was made by Mr. Avramović, that the new dinar be introduced to the economy through budgetary expenditures rather than through commercial banks (which would then exchange it for the old currency) was important. It had a more direct and faster, positive impact on the purchasing power of the population and private and public sector firms. As a result, it had an important impact on the sorely needed, overall recovery of economic activity, which was critical to the credibility of the program in its early days.

5.3 The Roles of Tax Policy and Expenditure Adjustment

The program also featured a tax reform, with short-term goal of rehabilitation of government revenues and the medium-term goal of improving the tax structure. Still, much hope was placed in the reverse Keynes-Olivera-Tanzi effect, to automatically result in an increase in government revenues in line with the rapid disinflation. To further increase government revenues, the government introduced some new taxes (e.g., road tax, travel tax on exit from the country etc.), and some existing taxes which were marginal before, such as the firm tax, were reformed into a significant tax instrument (Dejan Popović 2022). At the same time, there was a reform towards lower and simpler tax structure for the key turnover tax, corporate income tax, and wage tax, as well as the broadening of the tax base and a reduction of the number of exemptions.

It was interesting that the program was silent on a key issue, the need to bring the public expenditures closer in line with revenues to keep the budget deficit manageable, consistent with extremely limited, domestic sources of financing, given that there was no external financing available. This was a key inconsistency in the design. It also ran against the experience of successful stabilizations, which typically required fiscal consolidations to eliminate the fiscal roots of inflation. In 1994, the overall fiscal situation remained dire, despite the initial success of the program. Revenues, while growing, fell well short of expenditures. And FR Yugoslavia was still saddled with large federal military, diplomatic, and other, public sector institutional expenditures designed earlier for a much larger country. So, it was difficult to conceive how fiscal deficit can be brought down to reasonable levels without significant expenditure adjustment.

Even though it was clear to the governor Avramović that long-term fiscal consolidation was needed, in the initial public communications, he put the emphasis on the introduction of the new dinar, the creation of the new purchasing power, and the

beneficial effects that this will immediately have on people's incomes and employment. His intention was to entrench the new, low inflation expectation among the public, knowing full well how important inflation expectations were for the initial results and overall success of the currency reform and stabilization program. The program had featured a projected budget deficit of 10% of GDP in 1994, corresponding to 15% of GMP at the time (Avramović 2007), which was clearly at odds with price stability. Beyond the governor Avramović, it is unclear whether his economic team members believed that the reduction of public expenditures was not necessary or whether the lack of planned fiscal adjustment was a political selling point of the program, to the policymakers and the public. In the event, however, in the course of program implementation, some public expenditures began to decline and the government rhetoric has slowly, albeit inconsistently, begun to emphasize the need to control public expenditures and reduce budget deficit as a way to safeguard the sustainability of the program.

5.4 Early Results

As the government's printing press ceased printing old dinars, inflation was stopped within one week of the introduction of the program on January 24, 1994. Table 5 shows weekly inflation rates in the period January 17 to March 10, 1994.

Table 5   Weekly Inflation Rates Measured by Retail Price Inflation, January 17-March 10, 1994

Jan. 17 - Jan. 20	Jan. 24 - Jan. 27	Jan. 31 - Feb. 3	Feb. 7 - Feb. 10	Feb. 14 - Feb 17	Feb. 21 - Feb. 24	Feb. 28 - March 3	March 7 - March 10
8,527%	890%	-0.5%	1.5%	0.3%	-1.8%	-0.3%	0.9%

Source: Federal Bureau of Statistics, FR Yugoslavia.

Early results of the program during the first six months of 1994 were impressive in terms of disinflation, remonetization, nominal interest rates, wages, and tax revenues.

The rapid *disinflation* reflected the end of printing of the old dinars, the introduction of the new dinar, and a mass return of the goods (which had been previously hoarded) back to the stores. With the surge of the purchasing power of the population and demand for goods from the extremely low base, businesses rushed to supply it, resulting in the virtuous cycle of rising purchasing power and increasing supply and employment, and incomes now denominated in the new, stable currency. Inflation remained low during 1994, which helped a rapid process of remonetization i.e., increasing the real demand for money (Table 6).

During the period of rapid *remonetization*, from February to July 1994, money supply (M1) grew rapidly and banks did not experience liquidity problems. This was an expected "honeymoon" effect, typical of other hyperinflation stabilizations. The issuance of the new dinar, which began through the payments of public expenditures, has helped finance the budget deficit in the content of a rapid increase in the demand for money. The rapid remonetization of the economy resulted in significant increase in deposit, allowing the recovery of credit activity by commercial banks.

Table 6 Monetary Aggregates and Inflation during the Period of Stabilization

Months, February-December 1994	Base money	Money (M1)	Cash	Deposit money	Inflation
	In million dinars				%
February	569.4	745.2	163.1	582.1	0.0/a
March	657.0	1,292.8	305.8	987.0	-6.7
April	662.6	1,345.4	359.0	986.4	-0.4
May	691.3	1,519.1	369.1	1,150.0	-0.3
June	768.9	1,546.7	574.4	972.3	-1.4
July	897.9	1,742.4	697.3	1,045.1	-1.3
August	1,098.3	2,029.1	783.3	1,245.8	-0.5
September	1,247.4	2,352.4	1,003.2	1,349.2	0.2
October	1,326.5	2,439.1	1,112.4	1,326.7	1.4
November	1,340.1	2,445.6	1,134.0	1,311.6	7.0
December	1,331.0	2,435.1	1,073.8	1,361.3	2.5

Notes: On the basis of weekly data. As noted in the note to Table 1, monthly data overstate true inflation rate in February 1994. Inflation is measured as percent change in the retail price index.

Source: National Bank of Yugoslavia.

Nominal interest rates fell very quickly. In less than six weeks from the start of the program, interest rates on loans fell to about 9% and remained at that level during 1994. This was a direct consequence of the behind the scene moral suasion, administrative pressure, and the gentlemen's agreement between the central bank and commercial banks with the important political goal of financing the all-important early agricultural cycle at interest rates acceptable to politically influential constituency of agricultural producers and related state-owned enterprises and industries.

The increase in money supply was accompanied by the increase in wages and salaries. The average *monthly wages* net of taxes increased from USD 10 in December 1993 by more than ten times to about USD 110-120 in the last quarter of 1994 with indications that this rapid increase was not sustainable.

Initially, after the introduction of the new dinar, price stability was accompanied by a rapid turnaround in public finances, mainly on the *revenue* side of the budget, for several reasons. First, the structure of government revenues changed dramatically, from the seigniorage revenues, the dominant instrument during hyperinflation, to tax revenues collected in new dinars during stabilization (tax revenues were no longer collected in old dinars, although the old dinar was allowed to circulate until July 1994). Second, tax revenues, which grew rapidly, reached a peak of USD 550 million in the last quarter of 1994. Inverse Keynes-Olivera-Tanzi effect resulting in the rapid raise in real government revenues during disinflation proved more powerful than initially expected. As an illustration, during hyperinflation, it took seven months for real tax revenues to decline from USD 100 million in June 1993 to USD 27 million in January 1994. By contrast, during the first month of stabilization, this inverse effect resulted in the eightfold increase in government revenues. As a result of the combined inverse Keynes-Olivera-Tanzi effect and the tax reform, tax revenues reached almost 30% of GDP in 1994. This was without a doubt, in addition to stopping hyperinflation, the most significant achievement of the program. Had there been political will, with the

hindsight, it was possible to build on these results and begin longer term fiscal reforms and gradual restructuring of the economy, despite the extremely difficult external environment.

There was a rapid recovery of economic activity, especially industrial production, in the first six months of the program (Figure 4). This was related to the expansionary impact of the new currency and the associated injection of the purchasing power through the payments of budgetary expenditures. It was also a result of a steep decline in transaction costs in the formal economy, which helped move economic activity from the informal to the formal economy. To a lesser extent, the economic recovery was related to the decline in the nominal and real interest rates.
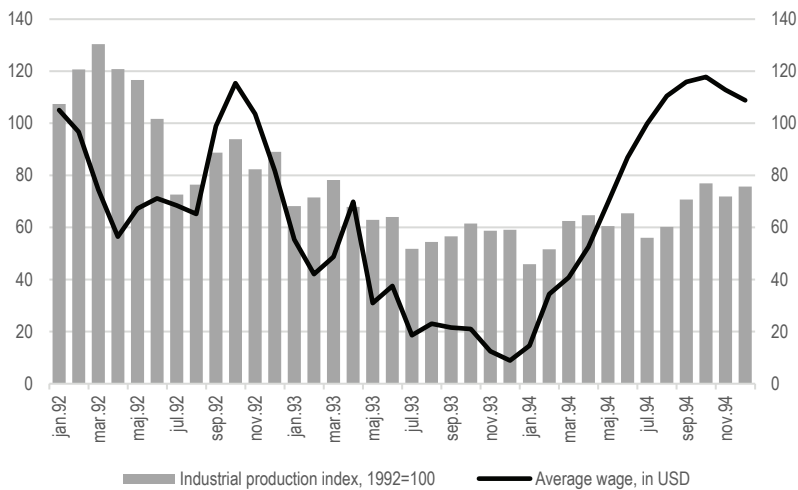
Source: Federal Bureau of Statistics and the authors' calculations based on the data from the Federal Bureau of Statistics.

Figure 4 Index of Industrial Production and Wages in USD

The decline in interest rates did not play a significant role in the recovery of production, for several reasons. The stabilization has resulted in the commercial banks providing new loans to the economy, increasing access to credits in the new, stable currency where there was none before. So, it was the reopening of access to bank credit that helped support economic activity rather than the fall in interest rates. Furthermore, the normalization of the payment system in the context of stable currency and the elimination of illegal issuance of "gray money" reduced the cost of production and trade in the formal sector of the economy compared with the speculative and illegal activities in the black markets. The good agricultural year 1994 also had little to do with changes in the interest rates. Moreover, at least in one of the well documented hyperinflation episodes (Germany 1923), production increased during stabilization *despite* much higher real interest rates. Also, as the domestic enterprise debt had been wiped out by hyperinflation, most of these enterprises found themselves able to take on new commercial bank loans at interest rates which were prevailing, or even higher, during the stabilization period. For these reasons, it is likely that the observed increase in

economic activity and industrial production would have taken even if the interest rates were higher.

5.5 Signs of Trouble

Only several months after the currency reform and the beginning of stabilization, there emerged early signs of trouble with the program, reflecting development with public sector wages and interest rates, two key variables for the sustainability of the budget deficit and the fixed exchange rate.

Given the lack of wage control as an additional anchor in the program, wages in the government and in public sector institutions and state-owned enterprises grew rapidly. This started putting pressure on the broader government expenditures. This resulted in the pressure on the budget deficit, which was ended up at 4% of GDP in 1994 (5.5% of GDP, including quasi-fiscal expenditures), lower than the 10% of GDP expected at the beginning of the program, but nevertheless large enough to put the pressure on central bank to finance it anew by inflationary printing of money (Table 7). It is worth reminding that there were also underlying, systemic issue at work behind the inability of the government and the economy to control the wage growth and large quasi-fiscal deficits in the enterprise sector: the Yugoslav economy at the time remained unreformed with self-managed enterprises as the dominant form of business organization with its well-known ownership and incentives problems (Madžar 2022).

Table 7   The State of Public Finances in 1994

	% BDP
Revenues	30.0
Turnover tax	5.7
Excises	1.4
Income tax	6.0
Customs	1.3
Social security contributions	12.5
Other	3.1
Expenditures, including quasi-fiscal expenditures	35.5
Expenditures, excluding quasi-fiscal expenditures	34.0
Current expenditures	32.6
Wages	5.9
Operations and maintenance	6.6
Military expenditures	5.1
Social insurance	10.2
Subsidies	4.0
Reserve	0.3
Other	0.5
Capital expenditures	1.4
Budget deficit, including quasi-fiscal expenditures	-5.5
Budget deficit, excluding quasi-fiscal expenditures	-4.0

Notes: Extra-budgetary transfers are included in the last three items of current expenditures, which implies that there was a significant decline in these expenditures compared to the previous three years.

         Source: Official data of the Federal bureau of statistics about the revenues, and the authors' estimates of expenditures.

Another problem resulted from increasing administrative pressures to keep interest rates low, below market levels. Importantly, the new dinar's fixed exchange rate in the system of a currency board required interest rates to be fully flexible, determined by the market forces in the money market. In such a system, any attempt to administratively suppress interest rates below market levels leads to the breakdown of the fixed exchange rate. This is what began to happen in the summer of 1994 with the gradual re-emergence of the black-market exchange rate.

Reflecting these pressures, after a rapid remonetization during January-September 1994 period, the growth of M1 slowed significantly and in December it started to decline, and banks began experiencing liquidity problems.

The short-lived remonetization of the economy reflected the fact that the new dinar was largely used as a means of payment. This, in turn, suggests that the credibility of the new dinar as a store of value as well as the trust in the banking system remained low. There were at least two reasons behind the slowdown in remonetization and the lack of long-term financial saving. The first was the unresolved issue of the massive loss of foreign currency deposits by the population, which were lost during the hyperinflation, including in some commercial banks which were running classic Ponzi schemes. Until these losses were recognized and compensated, credibility of the banking system and the local currency, however initially stable, was going to remain low. The second reason was the unusual path of the nominal interest rates, not reflecting market forces but various administrative and state-owned enterprise pressures on rates to remain low. As inflation accelerated in the final months of 1994, nominal interest rates remained unchanged, which means that real interest rates declined; this interest rate path was substantially different from those in other successful hyperinflation stabilizations.

5.6 The End of the Currency Board Regime

Already in August 1994, the Central Bank yielded to the political pressures to extend credits to agricultural and other state enterprises, officially changing the stance on Central Bank credits for fiscal and quasi-fiscal purposes, and directly undermining the basic tenet behind the concept of the currency board. So, the two basic rules of operation of the currency board - no control over interest rates, and no financing of the fiscal deficit by the Central Bank - were fully abandoned already in August 1994.

This has effectively hanged the monetary-exchange regime of the country from the rules-based, currency board to that of the Central Bank discretion in financing the fiscal deficit. As an institution, the Central Bank was subject of huge political pressure and lobbying influence from the banks and enterprise sectors (even though Mr. Avramović, who became governor in April 1994, continued to fight a good but losing fight against these pressures until he was ousted in 1996).

The Central Bank has continued extending credits to co-called "other clients", which meant indirect fiscal financing to institutions and agencies connected with the budget but formally outside the budget process. And the Central Bank started a new practice of targeted sector credits that additionally subsidized priority sectors of the economy (e.g., maintenance expenses of the state Electricity company and Railways, state purchases of the harvest, short-term credits for financing of wheat production).

Finally, there remained a legal possibility for the government to take on loans from commercial banks, directly or indirectly, by selling Treasury bills.

As a result of the changed monetary-exchange regime, the supply of dinars which exceeded the Central Bank gold and foreign exchange reserves and demand for money resulted in the emergence of the black market for the new dinar in the second half of 1994. The black-market exchange rate premium over the 1:1 parity with the new dinar quickly increased to 20-30% above the official parity of the dinar *vis-a-vis* the German mark. As a result, inflation returned in November and December 1994. The main signals of inconsistencies in macroeconomic policies - the very rapid increase in wages, the black-market exchange rate, and inflation - became clear to households and enterprises, threatening the new cycle of currency depreciation and inflation that drove the hyperinflation. In response, in December 1994, the discretionary printing of money was stopped and wages were brought under administrative control until the summer of 1996. Nevertheless, the prices and black-market exchange rate continued to rise. The impact of artificially low nominal and real interest rates on commercial bank deposits was a key factor driving the black-market exchange rate and currency depreciation. Expansionary credit policy of commercial banks contributed to a lesser extent. So, a combination of the moderate Central Bank issuance of credits combined with negative real interest rates again resulted to the resurgence of inflation and depreciation of the dinar. In December 1995, average inflation and depreciation of the dinar both exceeded 100% annually.

5.7 The Program II - The Last Stand for Stabilization and Reform

Following the Dayton Agreement in November 1995, which ended the war in Bosnia and Herzegovina, U.N. international trade sanctions on FR Yugoslavia were lifted. In response, Mr. Avramović proposed the "Program II" as the next stage of the currency reform and stabilization program of 1994 (Avramović 1995). In contrast to the original currency reform and stabilization program, which, as we noted was de facto falling apart, the Program II aimed to reestablish macroeconomic stability by asserting the fiscal discipline, ensuring consistency between monetary policy and exchange rate, and using the opportunity of lifting of the sanctions to reopen the economy, take advantage of international trade recovery, obtain external financing, and initiate the transition from the socialist economy, dominated by self-managed and state enterprises, to a market economy.

The Program II, unfortunately, was dead on arrival, predictably, for political reasons. It immediately showed deep faultlines between the governor Avramović on the one hand, who advocated these reforms, and the political leadership of the country and other policymakers on the other, which saw market reforms as anathema to the status quo and associated vested interests. There was neither political will nor critical mass of political support for market reform at that time. There was an especially strong opposition to the idea of hardening of the budget constraint on enterprises as a precondition for the overall fiscal and financial discipline and enterprise restructuring. These disagreements only grew over time and culminated in Mr. Avramović's release from the governor's position at a parliamentary session in May 1996. Nevertheless, the policymakers made sure that hyperinflation did not return. Whenever inflation showed

indication of moving towards extremely high levels, the Central Bank would react by substantially reducing monetary growth, resulting in stop-go cycles of inflation and currency depreciation.

6. An Assessment of the Contribution of Dragoslav Avramović: Concept, Credibility, and Communication

In this section, we briefly assess the contribution of Dragoslav Avramović to the currency reform and stabilization, focusing on the concept of reform, as well as credibility and communication, which were critical during its introduction and implementation. Key elements of the concept and its implementation have been assessed in the Section 5 above. Here, we emphasize Mr. Avramović's personal role and contribution.

6.1 The Concept and Implementation

Broadly speaking, Avramović's concept of currency reform and stabilization was technically sound; to a large extent, it was consistent in terms of its key elements. Its implementation, however, was a different story.

The basic concept behind the currency reform was the introduction of the new currency in the system of the currency board. Conceptually, currency board is a monetary-exchange regime of a permanently fixed exchange rate in which the domestic currency is tied to the foreign, "reserve" currency at fixed parity that is not intended to change by design (Bogetić 1998; Hanke 2002). In contrast to the Central Bank, which operates a variety of monetary-exchange regimes (e.g., floating, fixed with occasional adjustments, inflation targeting), reflecting considerable discretion on the part of the Central Bank, importantly, the currency board is an *automatic* system of monetary authority, fully subject to several institutional rules that ensure the maintenance of a permanently fixed exchange rate. This is made possibly thanks to the currency board requirement that the entire value of domestic money supply is backed at any moment by 100 percent reserves in foreign or "reserve" currency, in this case, the German mark. For every new dinar introduced into the economy, there was an equivalent value of German marks and gold in the National Bank of Yugoslavia. In the currency board, there is no independent monetary policy. The currency board cannot influence interest rates, for example, as they automatically rise (fall) in response to the inflows (outflows) of the capital in reserve currency, while the exchange rate remains fixed. Needless to say, the currency board money is by design a *convertible* currency. When the economy is experiencing inflows of foreign currency, there is equivalent increase in domestic money, a decline in interest rates, and an increase in economic activity. When the economy is experiencing outflows, the process works in reverse with a decline in domestic money, a rise in interest rates, and a downward pressure on economic activity, all the while exchange rate remains fixed. The permanently fixed exchange rate, in turn, anchors the domestic prices and inflation expectation, delivering lasting price stability.

In a nutshell, this was the concept behind the Avramović's program, with one important qualification. Specifically, the program did not intend to completely stop financing of the budget deficit from the monetary authorities. This was evidenced by

the program's planned budget deficit of 10% of GDP, clearly inconsistent with the currency board requirement and currency stability. Nor was the program explicit about the need to move away from the large fiscal deficit towards budget balance, which would, at least over time, establish consistency of fiscal policy with the requirements of the currency board. This, in fact, was a key difference between the Avramović's program and the competing CES-Mecon (1993) program, which emphasized fiscal consolidation in parallel with the hyperinflation stabilization based on monetary and wage policy anchors. It is likely that the absence of fiscal adjustment in the program was a concession to the political and interest groups' pressures to keep the central bank floodgates open to finance the fiscal and quasi-fiscal deficits, even though it was clearly inconsistent with lasting disinflation. It was an early sign of how far Mr. Avramović could push the stabilization program during implementation.

So, overall, our assessment of Mr. Avramović's concept of currency reform and stabilization is favorable, while recognizing the key omission of the need to bring fiscal policy in line with the new monetary-exchange regime of the country.

Implementation of the concept was much more mixed, especially with the passage of time.

On the positive side, as noted in Section 5, the introduction of the new dinar was innovative, by making budgetary payments of pensions, public sector salaries, and social assistance and other payments directly to the population and the economy. This was Mr. Avramović's idea and one that has helped inject new purchasing power into the economy more rapidly than if it had been done indirectly, and more conventionally, through the banking system. The budgetary channel was also distributionally more progressive than the banking channel: it helped increase the purchasing power of the poorer segments of the population immediately at the start of the currency reform, which contributed to the popularity of the new dinar. Furthermore, and to the surprise of some of the critics of the program who noted the issue of the lack of planned fiscal adjustment, fiscal deficit in 1994 did turn out to be much lower than the planned 10% of GDP, reflecting, in good part better-than-expected revenue performance but also some caution over non-wage, non-pension public expenditures. Finally, in response to pressures from the social and state enterprises for wages, which increased tenfold during the first six months of the year, wage controls were introduced, *de facto* acting as a new, additional anchor of the program that had not been planned at the outset.

On the negative side, administrative and informal controls and pressures to keep interest rates below market levels was a key element of implementation, which ultimately led to the emergence of the black market for the new dinar and the formal abandonment of the currency board in August 1994. Also, while fiscal outturn in 1994 was better than hoped for, with the passage of time, it became clear that the government was not ready to abide by the currency board rules and, therefore, engage in a meaningful fiscal consolidation and restrictions on central bank financing of the budget deficit. The later was kept within relative limits during 1994, however, apparently out of fear that it might trigger another hyperinflation with attendant political consequences, rather than the concern about macroeconomic stability per se. Finally, despite the initial pronouncement that the new dinar was a convertible currency, it turned out that it was not. Instead, it was fully convertible from new dinars to German marks, but only

partially so the other way around. Conversions of German marks to new dinars were limited to 100 marks per person per transactions; this alone has undermined the credibility of the new dinar in addition to the fact that it undermined the key adjustment mechanism underpinning the currency board: the free inflow and outflow and conversion of foreign currency in both directions. Last but not least, the inability of the country to access external financing during 1994 because of continuing U.N. sanctions also acted as a major constraint on the budget.

The cumulative impact of the negatives of the program, in concept and, especially, implementation - the issues of fiscal adjustment, interest rates, convertibility, and the continuing impact of sanctions - ultimately resulted in its demise. Underpinning it was the lack of political will and broader political support for lasting macroeconomic stability because it implied substantial adjustment in the budget and restructuring of social and state enterprises and banks.

6.2 Credibility

We highlight two sides of the credibility issue in this hyperinflation episode. The first highlights the difficulty of achieving credibility of macroeconomic policy, including stabilization, even under best of circumstances. And the second stresses Mr. Avramović's personal role in establishing credibility of the program.

The first is the well-known problem of time inconsistency in macroeconomic policy, which results in the government that may credibly commit ex ante finds itself that, because of different constraints and behavior of economic agents, it cannot keep its commitment and credibility *ex post* (Finn Kydland and Edward Prescott 1977; Robert Barro and David Gordon 1983; Torsten Persson 1987). In this sense, the fact that the government and the Avramović's program could not fully commit *ex ante* to the strict rules of operation of the currency board that implied balanced budget and the secession of central bank financing of the deficit, meant that the program was, in fact, *ex ante* not fully credible. *Ex post*, as we have seen, credibility was further undermined on multiple counts through the implementation of measures contrary to the operation of the currency board and macroeconomic stability. Initial constraints to the Yugoslav program, coming from the political leadership and centers of policy making other than the central bank, the enterprises and the banks, were weaker than the ones that emerged several months after the beginning of the program. As a result, the initial concept came increasingly into conflict with the political constraints that ultimately led to its end. What the economic theory says is that even when the government was able to commit to the stabilization requirements of the currency board fully and credibly, *ex post*, after a period of time, as various constraints on its operation became more binding, it would be difficult for the government to maintain its program credibility - without changing its objective function. Indeed, while the objective of the currency board and stabilization was currency and price stability, for it to be sustainable, the government needed over time to shift focus to the longer-term problems of fiscal sustainability and restructuring the economy. This, however, did not happen because of the political constraint on reform.

The second element of credibility of the program, on which economic literature is much more sparse, is the role played by the stabilization program architects.

Specifically, Mr. Avramović has personally brought a good dose of credibility to his program with his reputation as a seasoned international economist with a long, productive career in economic policy and policy research, from the National Bank and Ministry of Finance of post-second world war Yugoslavia, to the World Bank's development economics department, and, later, in UNCTAD. He was a member of the Yugoslav delegation at the conference in Savannah, Georgia, U.S., which laid the foundations to the post-second world war international financial system. Subsequently, he worked on sensitive issues in the National Bank and Ministry of Finance, including the return of the gold of the pre-war Yugoslavia from the United States into the country. And in the World Bank, initially working under Rosenstein-Rodan, he has done research, participated in debates, and published papers on major economic policy issues of the time, including the sustainability of the external debt as well as the impact of commodity prices on commodity importers (Avramović 1996). In the internal and public debate that preceded the preparation and adoption of his program of currency reform and stabilization, his expertise and experience showed against many inconsistent proposals and critics and ultimately led to his receiving political support and the mandate to implement the program. There was nothing inevitable about this outcome, however, and with the hindsight, one must note Avramović's rare ability in the local political arena to understand the goals and incentives of different actors and their constraints and motivations, articulate his own program with singular vision and clarity, and sway the decisionmakers to his side. That required not only professional credibility but credibility build on the consistency between words and action through a long process of debates and discussions before the adoption of the program. It is also arguable that had he not been selected to lead the program which he had constructed, the implementation and results would have worse, perhaps considerably worse.

6.3 Communication

Avramović played a key role in communicating the program to the public, influencing expectations, and debating with his critics to ensure that the program remains on track. He was the chief architect, manager, and communicator of the program throughout 1994 and he remained so, despite increasing political headwinds, until he ousted as the Central Bank governor in 1996. Indeed, his communication of the program's early results have helped guide people's expectation and enhanced the adoption of the new currency. By emphasizing early benefits of the program and by guiding expectations, he has helped the process of adoption of the new dinar by the public and the economy at large. Furthermore, he had a rare ability to explain complex economic problems in simple terms that people could understand, explaining what is happening during the early period of remonetization, and what is likely to happen in the near term. He clearly understood in practical terms what "a growing body of research and experience demonstrates that clear communication is itself a vital tool for increasing the efficacy and reliability of monetary policy" (Janet L. Yellen 2012). So, Mr. Avramović had combined the trust of the public with his talent for communication to engender the credibility of the program.

In the event, however, neither his credibility nor communication skills could compete with the political and interest groups that aimed to undermine key policies,

such as fiscal policy, liberalization of interest rates, the privatization and restructuring of public enterprises etc., which were needed for the program to have a lasting impact on macroeconomic stability and economic transformation. These interest groups were lobbying for continued central bank financing of the deficit, fiscal and quasi-fiscal transfers to loss-making enterprises, below-market interest rates and loans to those enterprises, along with guarantees that their restructuring would not happen. As a result, in May 1996, Mr. Avramović was voted out of the office in the parliament because of his open conflict with the policymakers. On his departure, the overall economic situation continued to deteriorate until the end of the Milošević's regime in October 2000 with further disintegration process of FR Yugoslavia underway.

From the current perspective of almost thirty years after this stabilization program, the role of Mr. Avramović stands out more clearly than before. He was not only the main architect, manager, and communicator of the program but crucially influenced complex and difficult processes of its adoption and implementation against many odds and exceptional internal and external constraints. He, therefore, contributed in very significant ways to the very successful currency reform and the relatively successful stabilization program during 1994, before it started to unwind under the multiple political pressures. Perhaps his singular contribution over the long term was that he demonstrated the criticality of sound design, management, credibility, and communication of economic reforms for their success. Finally, regardless of the relatively short period of macroeconomic stability during 1995, hyperinflation was stopped and never returned.

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